THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY SCHOOL AGRICULTURAL SCIENCE TEACHERS IN THE ZAMBEZI REGION, NAMIBIA

BY

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the authorship owner thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Percy Mashebe Mashebe
December 2018

ABSTRACT

The study assessed secondary schools' Agricultural Science teachers' competencies and needs with a view to making recommendations for improving Agricultural Science teacher education in the Zambezi region of Namibia. It specifically aimed to determine what the perceived competencies of male and female as well as experienced and less experienced teachers were in teaching and conducting practical experiments in Agricultural Science at the secondary school level. The study also set out to determine the professional needs of male and female as well as experienced and less experienced Agricultural Science teachers that might be necessary to enable them to keep abreast of contemporary issues facing Agricultural Science in combined (from grade 1 to 10) and secondary (from grade 8 to 12) schools. The Agricultural Science teachers were sampled based on gender (males and females) and teaching experience (<3 years and >3 years). This study adopted a descriptive survey research design. The research instruments used for data collection included teachers' questionnaires and follow-up interview guides. The target population of this study comprised all combined and secondary school Agricultural Science teachers (150 teachers in total i.e. 82 males and 68 females) in 65 secondary schools in the Zambezi region; 142 Agricultural Science teachers out of 150 teachers participated in the study using questionnaires. Purposive sampling was used to select teachers for participation in the follow-up interviews that probed more deeply into teachers' needs and competencies. After preliminary analysis of the questionnaires, 12 sub-samples (consisting of six male and six female Agricultural Science teachers) of the teachers were purposively selected and interviewed. Content validity was used to establish the extent to which the research instrument covered the domains that are being tested. The reliability of the quantitative survey instrument was determined statistically by calculating the Cronbach Alpha coefficient. The research instruments were also tested for content validity by giving the questionnaires and interview question items to a panel of peers for scrutiny. Quantitative data generated in this study were analysed using descriptive statistics provided by the Statisica 13 computer software programme. Chi square tests and analysis of variance (ANOVA) were used to determine whether there are significant differences in the frequency distributions on each of the perceived competencies and needs. Four hypotheses were tested in the study at 0.05 level of significance. Findings revealed that 18 out of 20 (90%) proposed needs between male and female Agricultural Science teachers were not statistically significant ($p>0.05$). The findings of this study further revealed that 13 out of 20 needs were not statistically significant ($p<0.05$), while seven needs were statistically significant ($p>0.05$) between less experienced (< 3 years) and more experienced (> 3 years) teachers. With regard to the perceived competencies, the findings of this study revealed that there were no gender and teaching experience differences for all competencies tested. For that reason, the study proffered that male and female Agricultural Science teachers in schools studied had perhaps acquired virtually comparable quality and level of training. Therefore, percentages were calculated and presented in frequency tables, histograms and bar charts. Data from the follow-up interviews were analysed thematically and presented in the form of themes based on the research objectives. Therefore, the results of the study from the participants interviewed revealed that the majority (67%) of the participants said that the needs were more or less equally similar among Agricultural Science teachers irrespective of gender and years of teaching experience. The results of the study with regard to gender competencies further established that females were more challenged when it came to the practical component of teaching Agricultural Science. Therefore, the study recommends that further studies should be conducted to establish what the actual competencies of female, male, experienced, and less experienced Agricultural Science teachers are in the Zambezi region of Namibia.

KEY WORDS

Combined Schools, Experienced Teachers, Less Experienced Teachers, Perceived Competencies, Perceived Needs, Reliability, Senior Secondary Schools, Teaching, Training Needs, Validity.

OPSOMMING

In hierdie studie word die vaardighede en behoeftes van landbouwetenskap-onderwysers in sekondêre skole ondersoek. Die doel is om aanbevelings ter verbetering van landbouwetenskaponderwysers-opleiding binne die Zambesi-streek van Namibië te voorsien. Die spesifieke doel van hierdie studie is om te bepaal wat die waargenome vaardighede van manlike en vroulike landbouwetenskap-onderwysers, sowel as ervare en minder ervare landbouwetenskap-onderwysers, ten opsigte van die onderrig en die uitvoering van praktiese eksperimente in landbouwetenskap op die sekondêre skoolvlak is. Verder beoog die studie om te bepaal wat die professionele behoeftes van manlike en vroulike landbouwetenskap-onderwysers, sowel as ervare en minder ervare landbouwetenskap-onderwysers is. Daar word ook ondersoek wat benodig word om hulle in staat te stel om by te hou met die huidige vraagstukke rakende landbouwetenskap in die gekombineerde (Graad 1-10) en ook in die sekondêre (Graad 8-12) skole. Die steekproef van landbouwetenskap-onderwysers is saamgestel volgens geslag (manlik en vroulik) en onderwys-ervaring (<3 jaar en >3jaar). Die navorsingsontwerp van die studie behels 'n beskrywende opname. Die navorsingsinstrumente wat vir die data-insameling gebruik is, is enersyds vraelyste aan onderwysers en andersyds opvolg-onderhoudsriglyne. Die teikengroep van die studie sluit in al die gekombineerde en sekondêre skole se landbouwetenskap-onderwysers (150 onderwysers in totaal: 82 manlik en 68 vroulik) in 65 sekondêre skole in die Zambesi-streek. 142 landbouwetenskap-onderwysers uit 150 onderwysers het by wyse van vraelyste aan die studie deelgeneem. Doelgerigte steekproefneming is aangewend om onderwysers te selekteer om deel te neem aan die opvolgonderhoude. Hierdie onderhoude het dieper ingegaan op die onderwysers se behoeftes en vaardighede. Na 'n voorlopige ontleding van die vraelyste, is 12 sub-steekproewe van die onderwysers (naamlik 6 manlike en 6 vroulike landbouwetenskap-onderwysers) doelgerig geselekteer en ook ondervra. Die inhoudsgeldigheid is toegepas met die doel om vas te stel in watter mate die navorsingsinstrument die getoetste domeine volledig gedek het. Die betroubaarheid van die kwantitatiewe opname-instrument is statisties deur die berekening van die Cronbach Alpha koëffisiënt bepaal. Die inhoudsgeldigheid van die navorsingsinstrument is ook getoets deur die vraelyste en onderhoudsvrae-items aan 'n portuurgroeppaneel vir indringende ondersoek voor te lê. Die kwantitatiewe data wat in hierdie studie gegenereer is, is ontleed volgens die beskrywende statistieke soos voorsien deur die Statisica 13 rekenaarsagtewareprogram. Die Chi-kwadraat-toetse en variansie-analises (ANOVA) is aangewend om te bepaal of daar beduidende verskille in die frekwensie-verspreiding van elk van die waargenome vaardighede and behoeftes was. Vier hipoteses is in die studie op die 0.05 beduidendheidsskaal getoets. Die bevindings wys dat 18 van die 20 (90%) van die voorgestelde behoeftes tussen manlike en vroulike landbouwetenskap-onderwysers nie statisties beduidend was nie ($p>0.05$). Die bevindings van hierdie studie toon aan dat 13 van die 20 behoeftes nie statisties beduidend ($p<0.05$) was nie, terwyl 7 behoeftes statisties beduidend ($p>0.05$) tussen minder ervare (<3 jaar) en meer ervare (>3 jaar) onderwysers was. Wat die waargenome vaardighede betref, wys die bevindings van hierdie studie, dat daar geen geslags- en onderwyservaringsverskille ten opsigte van alle getoetste vaardighede was nie. Uit die studie blyk dit dat dit moontlik is dat die manlike en die vroulike landbouwetenskap-onderwysers in die skole wat bestudeer is, 'n feitlik vergelykbare gehalte en vlak van opleiding verkry het. Daarom is die persentasies bereken en in frekwensie-tabelle, histogramme en staafdiagramme uiteengesit. Data van die opvolgonderhoude is tematies ontleed en uiteengesit volgens temas wat uit die navorsingsdoelwitte afgelei is. Hierdie resultate soos afgelei uit die onderhoude met die deelnemers, wys daarop dat die meerderheid (67%) van die deelnemers aangedui het dat die behoeftes min of meer gelyk-ooreenstemmend is onder die landbouwetenskap-onderwysers, ongeag hulle geslag en jare van onderwyservaring. Ten opsigte van die geslagtelike vaardighede, het die uitslae van die studie aangetoon dat vroulike landbouwetenskap-onderwysers die praktiese komponent van landbouwetenskap-onderwys as 'n groter uitdaging beskou. Gevolglik dui die studie aan dat verdere navorsing uitgevoer behoort te word, ten einde vas te stel wat die werklike vaardighede van vroulike en manlike, sowel as ervare en minder ervare landbouwetenskap-onderwysers in die Zambesi-streek van Namibië is.

KERNBEGRIPPE

Betroubaarheid; Ervare Onderwysers; Gekombineerde Skole; Geldigheid; Minder Ervare Onderwysers; Onderwys; Opleidingsbehoeftes; Senior Sekondêre Skole; Waargenome Behoeftes; Waargenome Vaardighede.

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AE - Agriculture Education

ATVET - Agricultural Technical and Vocational Education

BE - Basic Education

BETD - Basic Education Teacher Diploma

CPD - Continuous Professional Development

CPSPs - Continuous Professional Development Programmes

CT - Culture and Training

CRoN - Constitution of the Republic of Namibia

DB - Development Brief

DD - Discussion Document

DFID - Department for International Develeopment

DNEA - Directorate of National Examination and Assessment

EA- The Education Act

ETSIP - Education Training Sector Improvement Programme

ECA - Economic Commission for Africa

ICT - Information and communication technology

JSTC - Junior Secondary Teacher Certificate

KDEGE - Knowledge Development for Economic Growth with Equity

LCE - Learner-Centred Education

LPSN - The Language Policy for Schools in Namibia

LPTC - Lower Primary Teacher Certificate

MoE - Ministry of Education

NCBE - National Curriculum for Basic Education

NCBEN - National Curriculum for Basic Education in Namibia

NCERT - National Council of Education Research and Training

NDA - National Diploma in Agriculture

NDGs - National Development Goals

NERDC - Nigerian Education Research Development Council

NGOs - Non-Governmental Organisations

NHC - Namibia Human Capital

NIED - National Institute for Educational Development

NPE - National Policy on Education

NV - Namibia Vision 2030

PTC - Primary Teacher Certificates

RPCE - Report of the Presidential Commission on Education

SCK - Importance of Subject Content Knowledge

SEP - Special Education Policy

SSE - Senior Secondary Education

SWAPO - South West Africa People Organisation

TLRs - Teaching and Learning Resources

TEA - Towards Education for All

TVET - Technical and Vocational Education and Training

UC - University of Cambridge

UNIN - United Nations Institute for Namibia

UN - United Nations

UK - United Kingdom

UNAM - University of Namibia

WAEL - West Africa Examination Council

WGS - World Geodetic System

CHAPTER 1: INTRODUCTION

This chapter introduces the study reported in this dissertation. The background and problem statement of the study are described, followed by an overview of the particular context where the research was carried out. The chapter concludes with an outline of the structure of the dissertation, as well as an overview of the content of the subsequent chapters.

1.1 Background to the study

The main aim of the study is to assess Agricultural Science teachers' competencies and needs and to make recommendations for improving Agricultural Science teacher education in the Zambezi region, Namibia. According to Michalos and Fulmer (2014:4690), "perceived competence is a psychological construct based on self-evaluation of one's effectiveness or capability in a specific context". They state further: "Perceived competence is one's awareness, beliefs, expectancy, or understanding of abilities, skills, or capacities to be effective in interactions with the environment." The concept of need has different explanations. In the literature, the concept need is variously used to mean discrepancy, acknowledged problem and the prerequisite for more amenities and the wants of people (Mansour, Alshamrani, Aldahmash & Alqudah, 2011). For the purpose of this study, a need is defined as the wants or preferences of an individual or a group of people, in this instance, Agricultural Science teachers. Mansour *et al.* (2011) aver that a need is seen as a want, which implies interest or motivation felt by an individual or group to eliminate a lack. According to Mansour *et al.* (2011) without the identification of teachers' needs, poorly directed and inadequately focused interventions could emerge.

In Namibia, Agricultural Science teachers have had and will continue to have needs that are essential for them to remain effective in delivering the subject matter to learners in their classrooms (McCawley, 2009). This will require in-service education of Agricultural Science teachers in Namibia. Continuous professional development (CPD) of teachers is essential to assist them in gaining the knowledge and skills that are necessary to perform their teaching functions effectively (Garton & Chung, 1997). All areas of teaching methodology, professional competencies and subject content area competencies should be incorporated into professional development programmes to prepare Agricultural Science teachers to successfully deliver the subject content so as to ensure effective learning in a classroom. Effective learning comprises essential components which enthusiastically involves the learners in metacognitive processes of planning (the ability of a learner to develop goals and plans), monitoring (the ability of a learner to monitor his or her own learning) and reflecting (the ability of a learner to reflect on his or her own learning and is versatile across the contexts in which learning is taking place) (Watkins, Carnell, & Lodge, 2007).

Effective Agricultural Science teaching is a process whereby professionally educated teachers are employed to teach learners through the process of theoretical as well as practical inputs available within the school context. Egbule (2004), as cited by Modebelu and Nwakpadolu (2013:163), defines Agricultural Science teaching *"*as a process of training learners in the process of agriculture productivity as well as the techniques for the teaching of agriculture*"*. Agricultural Science is therefore designed to inculcate the necessary skills for the practice of agriculture among male and female teachers, for effective citizenship and to contribute to food security as part of national sustainability (Madu & Lyiola, 2013). The demand for better Agricultural Science instruction at junior and senior secondary education levels in Africa and elsewhere in the world is well recognised (Madu & Lyiola, 2013).

To ensure that quality Agricultural Science teaching and learning takes place, less experienced and experienced teachers must be well equipped for their profession, including enhancing their skills through a period of extended professional development (Garton & Chung, 1997). However, these groups might have different needs and perceived competencies. In Namibia, the majority of the Agricultural Science teachers are males, representing 55% of the 150 teachers providing Agricultural Science instruction in combined and secondary schools in the Zambezi region (Ministry of Education, 2015b). A combined school in the Namibian context is a school that has grade 1 to 10 classes, while a secondary school is a school that has classes from grades 8 to 12.

According to Foster (2001:386), "in a traditional male dominated field, like agricultural education, artificial barriers based on attitudinal bias often prevent qualified women from reaching their potential. As a consequence, there are very few role models for young women entering the profession". As stated by Whent (1993), the most common bias towards female teachers in Agricultural Science teaching is the expectation that female teachers are only capable of teaching particular themes of the curriculum, such as horticulture, compared to male teachers, who are believed to be capable of teaching all themes of the Agricultural Science curriculum. In light of this, it is necessary to establish what are the perceived competencies and needs of male and female Agricultural Science teachers in the Zambezi region. In relation to experienced and less experienced Agricultural Science teachers, experienced (three or more years of teaching) Agricultural Science teachers are on average more effective in nurturing learners' achievement than their less experienced (less than three years of teaching experience) counterparts in a similar classroom setting. Therefore, teachers do better as they gradually gain the necessary teaching experience (Akbari & Tajik, 2009; Ladd, 2013). Experienced teachers are necessary to mentor less experienced teachers and help to construct as well as sustain a sturdy school community (Ladd, 2013).

Determining what the Continuous Professional Development (CPD) needs of all secondary Agricultural Science teachers could serve as a basis for introducing CPD programmes aimed at advancing the standard of teaching and learning (Ikoeoji, Agwubike & Disi, 2007) in more nuanced ways. Hence, there is a need for Agricultural Science teachers to be furnished with the requisite subject content knowledge and teaching methods for teaching Agricultural Science effectively in schools as well as uphold and expand their skills through a life-long career (Garton & Chung, 1997).

Agricultural Science teacher education programmes that are essential to educate pre-service and in-service teachers in teaching methods, subject content and scientific inquiry are utterly essential if effective teaching and learning are to be ensured in Namibia (Ikeoji, Agwubike & Disi, 2007; Darko, Offei-Ansah, Shouqi & Jun-ping, 2015). Moreover, Agricultural Science teacher education preparation in Namibia requires persistent improvement to make certain that Agricultural Science teachers are proficient enough to teach Agricultural Science effectively as a school subject (UNESCO, 2013). Perceived needs of in-service Agricultural Science teachers (experienced and less experienced, as well as male and female teachers) as part of their teacher education preparation programme are therefore deemed necessary (Garton & Chung, 1997).

Agricultural Science teacher preparation cannot be dependent only on the teaching of requisite science content and the skills needed by learners in order to gain access to the Faculty of Agriculture at the University of Namibia. Teacher education programmes need to integrate content knowledge with the teaching methods related to agriculture (Madu & Lyiola, 2013). Therefore, in order for the in-service experienced and less experienced, as well as male and female teachers, to improve their teaching skills, it is necessary to ensure that Agricultural Science teacher education preparation be designed to integrate subject content and teaching methods that are necessary for effective implementation of the Agricultural Science syllabus in combined and secondary education (Madu & Lyiola, 2013). Moreover, if quality agriculture teacher education programmes are not developed (that includes the diverse needs of learners), effective teaching and learning of Agricultural Science in combined and secondary schools might be thwarted (Madu & Lyiola, 2013).

1.2 Statement of the problem

The majority of secondary schools in the Zambezi region offer Agricultural Science as an elective subject from grades 8 to 12. An elective subject in the Namibian context would refer to a school subject that falls outside of the core school subjects such as English, Mathematics, Natural sciences (Biology/Life science and Physical science), Social Sciences (Geography and History) and Silozi (foreign language) (Republic of Namibia, 2014). The need for qualified male and female Agricultural Science teachers is important given the fact that quality teaching and learning depend greatly on the teacher's ability to plan the lesson and to deliver the subject content in a classroom (Modebelu & Nwakpadolu, 2013).

In the Zambezi region, it has been observed by the researcher that institutions of higher learning in Namibia have not designed programmes that incorporate the teaching methods, subject content and development needs of combined and secondary Agricultural Science teachers in Namibia, despite Agricultural Science being offered as an elective subject from senior primary through to senior secondary level. Most of the combined and secondary Agricultural Science teachers have not been trained to be teachers by profession (they are unqualified), and end up teaching Agricultural Science in combined and secondary schools across the country as an opportunity to gain employment directly after completing their agricultural qualification (Republic of Namibia, 2014). Since the phasing out of the Basic Education Teacher Diploma (BETD) programme and the merging of the Colleges of Education and the University of Namibia in 2012, there is a 40% shortage of qualified Agricultural Science teachers at the combined and secondary level in the Zambezi (UNESCO, 2013; Republic of Namibia, 2014).

The University of Namibia (UNAM), which is the pioneer in offering teachers' education programmes in Namibia, has not developed a curriculum that would prepare teachers to teach Agricultural Science in secondary schools (Univesity of Namibia, 2015). This vacuum in the institution's curriculum is a serious problem that needs urgent intervention by government and all stakeholders. The country currently does not educate teachers that are professionally qualified to teach Agricultural Science at secondary level (Republic of Namibia, 2014). Therefore, schools have to employ unqualified teachers who lack the requisite teaching methods and skills to teach Agricultural Science in combined and secondary schools in the Zambezi region. Teachers who are employed by the Ministry of Education (MoE) are mostly holders of a National Diploma in Agriculture (NDA) and/or a Bachelor of Science (BSc) degree in Agriculture obtained from the University of Namibia (UNAM) and from the National University of Science and Technology (NUST). These teachers have the required subject knowledge but do not have the repertoire of teaching methods to effectively teach Agricultural Science as a school subject.

Owing to this shortcoming, these unqualified professional teachers (teachers with no teaching qualifications) face endless challenges in teaching the requisite skills and knowledge to learners and tend to struggle to effectively implement the curriculum in a classroom (Veeman, 1984) and (Modebelu & Nwakpadolu, 2013). The main problem of this study is the significant shortage of trained (qualified) combined and secondary Agricultural Science teachers in the Zambezi region. Based on the data from the regional education office, on average, out of 150 combined and secondary Agricultural Science teachers, approximately 40% of combined and secondary Agricultural Science teachers are unqualified (teachers with no teacher professional qualification) (Republic of Namibia, 2014). There are currently 82 (55%) male and 68 (45%) female teachers out of 150 combined and secondary Agricultural Science teachers providing Agricultural Science instruction in the Zambezi region (Republic of Namibia, 2014). Out of 150 Agricultural Science teachers, approximately 35% are less experienced (having less than three years of teaching) (Republic of Namibia, 2014).

In the Namibian context, a less experienced teacher is a teacher whose teaching experience is less than three years and such a teacher will not be considered for any promotion to head of department. However, a teacher is said to be experienced if he/she has three and more years of teaching experience excluding discontinuities due to study or sick leave and such a teacher shall be considered for a promotional position such as head of department (Ministry of Education, 2015a). The shortage of qualified Agricultural Science teachers in the Zambezi region potentially impacts negatively on the academic performance of learners.

It is against this background that this study was undertaken to assess the perceived competencies and needs of male and female, as well as less experienced and experienced Agricultural Science teachers. In order to make recommendations for the development of intervention programmes aimed at improving the teaching and learning of Agricultural Science in secondary schools in the Zambezi region, Namibia, the study is based on the assumption that the perceived competencies and needs of male and female, as well experienced and less experienced teachers, may differ in some ways.

1.3 Research Hypotheses

The aim of the study is to measure Agricultural Science teachers' competencies and needs with the aim of making recommendations for improving Agricultural Science teacher education. The following null hypotheses will be tested:

$\mathbf{H_1}$: There is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_2}$: There is no significant difference between the perceived competencies of less experienced (less than three years of teaching experience) and experienced (three years and more of teaching) Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_3}$: There is no significant difference between the perceived needs of male and female Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_4}$: There is no significant difference between the perceived needs of less experienced (less than three years of teaching) and experienced (more than three years of teaching) agricultural Agricultural Science teachers in the Zambezi region, Namibia.

1.4 Assumptions of the study

This research study is pinned on the assumption that Agricultural Science teacher participants will be accurate and provide honest expressions of their perceived competencies and needs related to the teaching and learning of Agricultural Science in secondary schools as pronounced in the National Curriculum for Basic Education (NCBE) of Namibia. It is also assumed that the instruments used will produce reliable responses and that the participants (secondary school Agricultural Science teachers in the Zambezi region) fully comprehend the question items in the teachers' questionnaires and follow-up interviews used to collect data.

1.5 Study Area

The Zambezi region of Namibia is a strip of land between Angola in the north and Botswana in the south and borders with Zambia to the northeast. The Zambezi region is located on latitude 17°30′00″S and longitude 24°16′00″E based on the World Geodetic System (WGS) 84 coordinate reference system (Abah, Mashebe, Ubwa & Onjefu, 2015). The Zambezi region is divided into six constituencies (at the time of conducting this study), namely Kibbe, Katima Mulilo Urban, Katima Mulilo Rural, Kongola, Linyanti and Sibbinda (Jones & Dieckmann, 2013).

The study is restricted to the Zambezi region whose context is not representative of the whole of Namibia. The reason for choosing this region is that for the past five years the academic performance of learners in Agricultural Science in the Zambezi region in relation to junior and senior secondary school final-year examination results had a pass rate of below 65%, compared to above 70% in other regions such as the Oshikoto region (Directorate of National Examination and Assessment) (DNEA, 2014). Therefore, the study focuses on the region that is facing more challenges.

1.6 Significance of the Study

The findings of this study could contribute greatly towards strengthening Agricultural Science teachers' education in the Zambezi region and in turn benefit the general public given that Agricultural Science plays a significant role in the drive for social and economic aspirations of communities. The great shortage of qualified Agricultural Science teachers in secondary schools in the Zambezi region gives rise to the need for more effective, life-shifting Agricultural Science teaching and learning strategies to enhance the teaching and learning of Agricultural Science in secondary schools.

Thus, the schools that apply the suggested teaching competencies and needs resulting from the recommendations of this study would be able to successfully provide a solid foundation in Agricultural Science to learners. The study promises to open a window for further research through identifying critical areas in the educational process, particularly in Agricultural Science, that may provide helpful guidelines for future researchers on the subject. New theoretical insights on improved teaching and learning of Agricultural Science may thus be arrived at.

1.7 Limitations of the Study

There might be challenges in carrying out the study and to some extent the research has potential limitations (Thomas & Nelson, 1996). The envisaged challenge could be that certain participants drop out during the process, due to unforeseen circumstances such as teachers being transferred to other schools beyond the perimeter of the study area, early retirements, deaths and resignations of teachers. The time apportioned for the study was constrained to the duration of the study programme as articulated in the approved proposal.

Nevertheless, hard work ensured that full advantage was gained from the time available for all the phases of the research programme. In meeting this challenge, the researcher used the available time and limited funds (in terms of transport) allocated for doing research at the University of Namibia (where the researcher is employed) to carry out the survey and follow-up interviews.

1.8 Definitions of Key Terms

This section outlines key terms that are used in the study:

A lesson plan - is the instructor's road map of what learners need to learn and how it will be done effectively during the class time (Milkova, 2016).

Assessment - is the process of gathering and discussing information from multiple and diverse sources in order to develop a deep understanding of what learners know, understand and can do with their knowledge as a result of their educational experiences; the process culminates when assessment results are used to improve subsequent learning (Huba & Freed, 2000).

Chi-square - is a nonparametric statistical procedure that is used with nominal data to test relationships between the frequency of observations in categories of independent variables; also called goodness of fit (McMillan & Schumacher, 2014:1).

Competencies - are abilities or attributes, described in terms of behaviour, key to effective and/or highly effective performance within a particular job (University Nottingham, 2016).

Context - is any information that can be used to characterise the situation of an entity. An entity is a person, place, or object that is considered relevant to the interaction between the user and the application, including the user and the applications themselves (Dey, 2001:7) cited by (Zimmermann, Lorenz & Oppermann, 2007:559).

Continuing Professional Development (CDP) - opportunities for individuals to increase their current level of knowledge and skills through coursework or other means in order to improve their employment or activities that develop an individual's skills, knowledge, expertise and other characteristics as a teacher (OECD, 2009:49).

Content Knowledge - refers to the body of knowledge and information that teachers teach and that learners are expected to learn in a given subject. It also refers to the facts, concepts, theories and principles that are taught and learned in a specific subject or academic course, rather than the skills such as reading, writing or researching that learners also learn in school (Education Reform, 2014).

Curriculum - is negatively viewed as a syllabus which may limit the planning of teachers to a consideration of the content or the body of knowledge they wish to transmit or a list of the subjects to be taught or both (Kelly, 1999:83) cited by (Tse, 2005:4).

Degree of freedom - is a mathematical concept that indicates the number of observations that are free to vary (McMillan & Schumacher, 2014:2).

Diversity - varieties of different backgrounds of a group of individuals that often require using a variety of methods of instruction (Rahman, Scaife, Yahya & Jalil, 2010).

Effective teaching – is that which leads to improved learner achievement using outcomes that matter to their future success (Coe, Aloisi, Higgins & Major, 2014).

Evaluation - is the process of assessing work completed by an individual, group, or institution with the aim of determining whether the individual, group, or institution has met predetermined standards (Oliver, 2000).

Facilitator - is an individual who assists others in a learning process but does not act as a primary source of knowledge; the facilitator acts as a guide during individual or group learning activities (Thomas, 2006).

In-service - is the education teachers receive to remain current in educational topics of interest, such as subject-related education, technology, special populations, and classroom behaviour and management (Faulkner, 2007).

Level of significance - is a value that is selected to indicate the chance that it is wrong for the purpose of rejecting the null hypothesis; also called level of probability or level of confidence (McMillan & Schumacher, 2014:4).

Need - is defined as the wants or preferences of an individual or a group of people, in this instance, Agricultural Science teachers (Mansour, Alshamrani, Aldahmash, & Alqudah, 2011).

Null hypothesis - is a formal statistical statement of a relationship between two or more variables (McMillan & Schumacher, 2014:5).

Pedagogy - is the art (and science) of teaching (Bhowmik, Banerjee & Banerjee, 2013).

Pedagogical content knowledge - is a type of knowledge that is unique to teachers, and is based on the manner in which teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge, (what they know about what they teach) (Kathryn, 1997).

Perceived competence - is a teacher's decision about his or her capabilities or abilities in teaching a specific school subject (University Nottingham, 2016).

Professional development - can be defined as the learning activities and experiences educators engage, from pre-service education to retirement, in order to increase career-related performances (Rhodes, Stokes & Hampton, 2004; Ruhland & Bremer, 2002) cited by (Cannon, Kitchel & Duncan, 2013:1).

Skills - is a present, observable competence to perform a learned psychomotor act (Harlin, Roberts, Dooley & Murphre, 2007).

Teaching - is an occupation or profession of a group of peoples known as teacher or an activity or activities to help an individual to learn or acquire some knowledge, skills, attitudes or interests. However, the meaning or concept is not so simple (Bhowmik, Banerjee, & Banerjee, 2013).

Training need - is a discrepancy between an educational goal and trainee performance in relation to this goal (Borich, 1980) cited by (Layfield & Dobbins, 2002:46).

Reliability - is the extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable" (Joppe, 2000:1) cited by (Layfield & Dobbins, 2002).

Validity - is the degree to which the variable measures what it is intended to measure. It determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit the bull's eye of your research object? Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others (Joppe, 2000) cited by (Layfield & Dobbins, 2002).

1.9 Outline of the dissertation

This dissertation is comprised of six chapters, as outlined below:

Chapter 1: Introduction

This chapter presents the background and introduction to the study. It gives an account of the statement of the problem and research hypotheses. The chapter further states what the significance of the study is, the limitation of the study and provides definitions of key terms.

Chapter 2: Literature Review

This chapter presents the secondary research in the form a review of related literature from published sources, which is used to support the primary research. This chapter critically reviews related literature on improving teaching and learning in Agricultural Science, addressing components such as the perceived needs of Agricultural Science teacher, the perceived competences of Agricultural Science teacher, and other related concepts as they have been applied in different countries globally, including Namibia.

Chapter 3: Conceptual Framework

This chapter presents the conceptual framework that underpins this study. It provides the framework that guides the researcher in the analysis, as well as interpretation of the data obtained from the Agricultural Science teachers using a questionnaire and follow-up interviews schedule.

Chapter 4: Research Design and Methodology

This chapter describes the study design, population size of the study, the methodology and how the data was gathered. It further presents the research ethics, validity and reliability of the study.

Chapter 5: Results, Interpretation and Discussion

This chapter presents the results of the study. It further presents the discussion on the results and how the results are linked to the literature review and the hypothesis of the study.

Chapter 6: Conclusion and Recommendations

This chapter provides the summary of the research findings and concludes the study. It further outlines recommendations based on the findings and opens possibilities for future research and action. This is followed by the list of references and appendix.

1.10 Summary of the chapter

Chapter 1 has laid the groundwork for the whole study as it outlines all the main components related to the perceived competencies and needs of Agricultural Science teachers in the Zambezi region. It further provides the background and motivation of the study and the problem statement. The definition of some terms used in the document are clearly defined. This chapter further outlines the hypotheses, as well as the assumptions that formed the foundation of this study. In this chapter, the description of the study area, significance of the study, limitation and definitions of key terms used in the study are also outlined.

In the next chapter, a literature review on improving teaching and learning with regard to the perceived competencies and needs of secondary school Agricultural science teachers globally will be provided.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of related literature on the perceived competencies and needs of Agricultural Science teachers with the view to providing a theoretical framework for the study. The literature reviewed focuses on the conceptual constructs of the study, the concept of Agriculture Education (AE), National Curriculum for Basic Education in Namibia (NCBEN), improving teaching and learning of Agricultural Science in secondary schools, perceived competencies of Agricultural Science teachers, perceived needs of Agricultural Science teachers, effective teaching and learning of Agricultural Science in a classroom, professional needs of Agricultural Science teachers, as well as teaching and learning resources for Agricultural Science, the importance of Subject Content Knowledge (SCK), the importance of Pedagogical Content Knowledge (PCK), and the challenges of teaching and learning Agricultural Science in secondary school. It is the desire of every education system all over the world to have effective and competent teachers in all school subjects and Agricultural Science is not an exception.

The next section discusses the historical background of education in Namibia focusing on the following components: Traditional education in Namibia, pre-independence and post-independence education system.

2.2 Historical Background of Education in Namibia

2.2.1 Traditional Education in Namibia

Education in the Republic of Namibia started long ago before the arrival of colonial forces. According to Mwamwenda (2004), in the past communities clustered in village[1] settlements in rural areas and taught their children about their traditions, culture and skills needed for survival. In fact, the general purpose of education in Namibia at that time was meant to prepare their children for adulthood (Mwamwenda, 2004). The role of educating children

[1] A village is considered as a place where a family is clustered. People in the Zambezi region are clustered in villages, signifying their family basis. Every person residing in such a village is particularly a family member. However, the village will still accommodate other people from other families, upon request from the head of the village.

depended largely on the efforts made by their parents in teaching the values and norms that they needed to follow if they were to grow into adulthood (Auala, 1989). Parents taught their children how to build a house from locally available materials (such as thatch, earth and wooden poles), how to fish (using fish baskets), hunting (using traps), moulding clay pots, weaving mats and making clothes from hides of animals (Ilukena, 2008).

According to Ilukena (2008), this type of education was not based on a written curriculum, rather on the experiences the elders had. The main aims of this type of education was to transmit the cultural heritages, values, attitudes and skills from one generation to the next (Ilukena, 2008). In addition, parents taught their children how to grow crops and how to look after their livestock. Parents also taught their children how to use their livestock as a source of transport and power, castration of male animals using traditionally available tools such as knives. This was to prepare them for sustainability when they grew up and when their parents died.

2.2.2 Pre-Independence (1990)

During the colonial era, the colonialists and missionaries brought changes in the Namibia education system. A modern and formal type of education was introduced and this required a different system and infrastructure. The traditional way of learning things was downgraded and the new way of learning and teaching was introduced (Ndilula, 1988). In Namibia, the missionaries were the first people to establish formal schools. Historically, the first school was built at Warmbad in 1805; in 1813, another was built at Betanie.

In 1910, the Roman Catholic Church opened a mission school in Kavango. In 1920, the Seventh-Day Adventists established a school in the Zambezi region, formally known as the Eastern Caprivi Strip (O' Callaghan, 1977). At that time, schooling was only done in the afternoons and was aimed at evangelism, numeracy and basic literacy. However, as the local people acquired basic knowledge in aspects such as reading, writing and numeracy, the missionaries started offering them basic teacher training with the purpose of gradually preparing the local people to take over the teaching in the church (Amukugo, 1993; Roger, 1997; Mbamba, 1981 & Ndilula, 1988).

Schools were built using local materials and the indigenous people under the management of the missionaries did this. In order to sustain the supply of teachers, the missionaries opted to establish teacher-training centres. In 1860, the Rhenish Mission Society opened the first training centre at Otjimbingwe, and later in 1906, Augustineum Teacher Training centre was opened in Okahandja. The Finnish Mission Society opened teacher-training centres at Oniipa in 1910, at Okahao in 1948 and at Oshingambo in 1952. In 1925, the Catholic Church opened St Joseph’s Dobra that was intended to cater for the central regions of Namibia. Many of the teachers who were trained at these centres were black Namibians. The children of the European settlers were sent by their parents to Germany or South Africa for their schooling needs (Auala, 1989; Cohen, 1994; Amukugo, 1993 & Ndilula, 1988 & Roger, 1997).

At the conclusion of German rule in 1915 (1884 until 1915), Namibia was placed under the control of South Africa after Germany was defeated in World War I. This led to the era of South African military rule. When South Africa took over the administration of Namibia, the education system was totally changed (Kuala, 1988; Amukugo, 1993; Katzao, 1999). The German education system was abolished immediately and was replaced by an education system formulated under the Education Act (Act 49 of 1919) that was governed by the Cape Province in South Africa.

The proclamation of the Education Act (Act 55 of 1921) meant that all education services, including the teaching and teacher training services were placed under the South African government (Auala, 1989; Amukugo, 1993 & Katzao, 1999). At that point, the Ministry of Education in South Africa was entrusted with the implementation of all education-related government policies and guidelines.

However, in terms of the Education Act (Act 55 of 1921), the management and supervision of all African schools in Namibia was left under the administration of the missionaries with a clearly set condition. The condition was that, if they accepted any form of government financial funding, they would have to conform to the government rules and regulations (Auala, 1989; Amukugo, 1993 & Katzao, 1999). These government rules and regulations included the establishment, recognition, control, supervision, syllabus and classification of schools, the employment of teachers, conditions of services and inspection.

In 1923, South Africa and most of the missionaries, with the exception of the Finnish Mission Society, held a conference on African education in Windhoek (Auala, 1989; Amukugo, 1993 & Katzao, 1999). The main purpose of this conference was to devise the implementation of the Education Act (Act 55 of 1921), with regard to the structure, subject content and medium of instruction (Tobias, 1981). The only significant change made to the syllabus was that of giving the Afrikaans language a noticeable place in the school system. However, with regard to the content covered in the schools subjects no major alterations were made to the existing German and missionary education system that was initially implemented before the South African administration took over.

The other major component of the conference that was discussed in depth was the training of African teachers (Tobias, 1981). This issue gained prominence at the conference because the Rhenish Mission at Okahandja was shut down in 1901. This missionary centre was used to train African teachers. Hence, it was re-opened soon after the 1923 education conference that was held in Windhoek with financial assistance from the government (Tobias, 1981).

Before independence in 1990 from South Africa, Namibia's education system was a story of Africans (blacks and coloureds) being oppressed and disadvantaged, whereas whites became richer and happier (O'Sullivan, 2004). Namibia was under German colonial rule for a period of 31 years (1884 to 1915) and South African rule for 74 years (1915 to 1989) respectively. During the German era, education was based on the foundation earlier laid down by the missionaries.

The German ruler set up a dual education system: one for Africans and the other for whites. From this understanding, the African education system was aimed at religious development and this prepared Africans for semi-skilled jobs, while the education system for whites mirrored the European system to prepare learners for skilled jobs (Katzao, 1999). The school subjects for African people in Namibia under German colonial rule were arithmetic, carpentry, bricklaying and domestic science. The curriculum was designed with the intention of supplying the workforce that was needed for the expanding settler population (Katzao, 1999).

During the colonial periods, the German and South African rulers sought to deprive the indigenous Namibian people of their possessions, particularly land and also their basic human rights and dignity (Salia-Bao, 1991). The apartheid system (known as a policy of separate development) that was introduced in South Africa by the Nationalist Party after it won the election in 1948 was also introduced in Namibia (O'Sullivan, 2004). In 1949, the Nationalist Party appointed a commission on native education, which scrutinised the existing education system for black African people.

In 1951, the commission reported its findings and put forward recommendations to introduce Bantu education and subsequently the adoption of the Bantu Education Act (Act 47 of 1953). The Bantu education system advocated more on control, rigid discipline, parrot-like teaching and negative principles (Synder, 1991). The objectives of the system were stated as follows: (Amukugo, 1993:57),

> When I have control of Native Education, I will reform it so that Natives will be taught from childhood to realise that equality with Europeans is not for them. People who believe in equality are not desirable teachers for the Natives. Education must train and teach people in accordance with their opportunities in life, in accordance to the sphere in which they live.

The Bantu education system, the contractual labour system and the pass law system were introduced in Namibia by the South African apartheid system (O'Sullivan, 2004). Specifically, the Buntu education system was introduced into Namibia in 1960s. This was the situation until Namibia attained independence in 1990. As Chamberlain (1990) writes: “It would be hard to find a country anywhere in which education (and teacher) standards were lower with the majority of the population” (Chamberlain, 1990) as cited by (O'Sullivan, 2002:524 & O'Sullivan, 2004:586). The Bantu education system sought to offer Africans basic literacy in their mother tongue, as well as a working understanding in English and Afrikaans in order to enable communication with the white elite who needed large numbers of literate black workers for the thriving South African industrial economy (O'Sullivan, 2004).

In fact, education at that time was to stress the value of tribal life and rural skills rather than academic subjects. Schooling in Namibia in general was a privilege of a few (O'Sullivan, 2004). It was evident that Mathematics and Science subjects were neglected and were predominantly for the whites who constituted a very small population of the country (Tjikuua, 2000).

At the conference in 1923, it was thus recommended to train black teachers in Namibia. By 1970, many blacks had access to teacher training institutions such as Augustineum in Windhoek, Cornelius Goreseb in Khorixas, Okakarara in Herero land, and Dobra near Windhoek, Ongwediva in Ovamboland, Rundu in Kavango and Caprivi training in Katima Mulilo. These were senior secondary schools with a teacher-training component (Nujoma, 1991 & Cohen, 1994). In 1982, two teacher-training centres were added; these were Khomasdal Teacher Training College and Windhoek Teacher Training College. The former was meant for coloureds and Basters from Rehoboth and the latter was solely for whites (Beukes, Visagie & Kasanda, 2005). Before the establishment of the Khomasdal and Windhoek training colleges, coloureds and whites were trained in South African colleges and universities. However, the training of coloured and white secondary school teachers continued in South African universities (Beukes, Visagie & Kasanda, 2005).

According to O'Callaghan (1977) and Cohen (1994), the Windhoek and Khomasdal training colleges were able to award three and four-year diplomas respectively, while teacher-training centres outside Windhoek, up until 1976, offered Lower Primary Teacher Certificate (LPTC) and Primary Teacher Certificates (PTC) courses respectively. In 1977, for the first time in Namibia, blacks were trained for the Junior Secondary Teacher Certificate (JSTC) (O'Callaghan, 1977 & Cohen, 1994).

Therefore, the entry requirements for LPTC, PTC and JSTC were respectively standard 6, 8 and senior certificates (O'Callaghan, 1977 & Cohen, 1994). Interestingly, the entry requirements for a Diploma in Education was a senior certificate. This prevented black learners from doing a Diploma in Education course, since none of them at that stage had a senior certificate (O' Callaghan, 1977).

In 1980, the South African government, with the purpose of providing access to tertiary education to all Namibians, eventually established the multiracial Academy for Tertiary Education. The setting up of the academy in Namibia was founded on the following reasons provided by Ilukena, (2008:16):

> Firstly, the government was faced with the embarrassment that a larger number of Namibians outside the country were receiving more university, tertiary education and skills as compared to those inside the country. Secondly, it served as a counter-move to the United Nations Institute for Namibia (UNIN) in Zambia that enrolled learners who fled Namibia during the mid-1970s. Thirdly, the government wanted to defuse international criticism of its policies in Namibia, making it appear that it was moving towards greater self-sufficiency in certain spheres. Lastly, it was confronting the crisis in Namibian human resource output, by boosting the number of blacks and coloureds in higher jobs in government and commerce.

Therefore, the understanding is that prior to Namibia's independence in 1990, education for natives up to matriculation (the entry level to tertiary education) was only provided in two schools nation-wide (O'Sullivan, 2004). According to O'Sullivan (2004), school dropout rates of blacks before independence in Namibia were among the highest in the world. This meant that many learners only received a few years of elementary education in poorly resourced schools (Tjikuua, 2000; O'Sullivan, 2004).

Many schools, particularly those in the Zambezi region were made of local materials such as mud, reeds and thatch with no electricity and potable water supply. Teachers were poorly trained and relied exclusively on rote methods (O'Sullivan, 2004:586). Meanwhile, white schools had more resources and also followed a progressive European curriculum and had well-trained qualified teachers (O'Sullivan, 2004). According to O'Sullivan (2004), violence and conflict together with an armed struggle from 1966 without doubt resulted from the burden of apartheid as well as from the Bantu education system, which was sustained until Namibian independence in 1990.

Many Namibians fled into exile to work to liberate Namibia from the apartheid South African regime (O'Sullivan, 2004). While in exile in the 1970s and 1980s, many Namibians participated in educational programmes that were initiated by the South West African People's Organisation (SWAPO) (Geingob, 1988). These programmes were fully sponsored by the United Nations (UN) and other non-governmental organisations (NGOs) which sought to prepare learners for human resources that would be needed by Namibia after independence.

In 1976, the United Institution for Namibia (UNIN) was established in the Zambian capital of Lusaka (Geingob, 1988). The institution was initiated to accelerate much-needed higher education programmes such as teacher training. However, many Namibians were sent to Cuba, Eastern Europe, Britain and Sierra Leone to further their teacher education training (Geingob, 1988).

Many Namibians in exile pursued their education and were exposed to many practices and ideologies in education and politics respectively (Angula & Lewis, 1997). The education programmes that Namibians in exile participated in at primary and secondary levels respectively, enabled experimentation with the curriculum, approaches and methods that would be implemented in Namibian schools upon gaining independence (O'Sullivan, 2004). One of the approaches was the learner–centred approach. The main idea was to improve teaching and learning in all Namibian schools (O'Sullivan, 2004).

2.2.3 Post-Independence (1990)

At independence in 1990, the new government set out to immediately fix the earlier apartheid education system (Iipinge & Likando, 2012). The initial task of the new government was the total unification of the disjointed education system that was inherited from the apartheid system (Iipinge & Likando, 2012). The main idea of the new government was to have a teacher-training programme that would fully prepare teachers to tackle challenges related to educational reform and to have qualified teachers fill vacant teaching positions in schools (Iipinge & Likando, 2012).

The Basic Education Teacher Diploma (BETD) was thus developed to replace the inherited Bantu Education teacher education programmes (Iipinge & Likando, 2012). In the quest to improve teaching and learning in Namibia, the Namibian Basic Education (NBE) needed to support the actual processes of individual learning rather than continue the colonial teacher-centred Bantu education.

Post-independence education reform was initiated in all aspects of the education system (Iipinge & Likando, 2012). According to Iipinge and Likando (2012), the initial phase of the reform was the unification of the disjointed system of education. With the new educational reform in Namibia, English was introduced as the medium of instruction from senior primary phase (grades 4 to 7) (Iipinge & Likando, 2012).

According to the same authors, a basic curriculum was developed and a learner-centred approach to improve teaching and learning was introduced. Among the initial recommendations of the Ministry of Education and Culture (MEC), as it was called at the time, was the suggestion that a different way of teaching and learning be introduced in order to improve teaching and learning in all schools in Namibia (Iipinge & Likando, 2012).

To successfully undergo the reform, the new government sought the support of international donor agencies, which acted as educational advisors. The most influential advisors were from the Swedish International Development Agency (SIDA) who were involved in devising a new philosophy for education and culture (O'Sullivan, 2002).

Since independence in 1990 to date, the Namibian philosophy of education has been underpinned by the notions of the constitution such as equity, justice, democratic participation and respect for human dignity (Ministry of Basic Education, Sports & Culture, 1993).

According to the Ministry of Basic Education, Sports and Culture (1993), quality teacher education in Namibia has to be measured in terms of the mentioned values and principles. These values are pronounced and clearly explained in the policy of Education for All and supported by Article 20 of the Namibian constitution. Issues of equity, quality and democracy turned out to be very important in the reform process of the education system of Namibia (Ilukena, 2008).

2.3 The Concept of Agriculture Education (AE)

According to Eze & Uzoka (2012:2), it is not possible to give a single meaning of agricultural education. They write: “Agricultural education is an instruction in agriculture useful to farmers, to those engaged in non-formal agricultural occupation and to all persons as part of the general education.” According to Eze and Uzoka (2012), agricultural education is the preparation of learners in the practices of agricultural activities, as well as in the skills needed for the teaching of agriculture in a classroom.

Similarly, agricultural education is a teacher preparation in agricultural production and in pedagogical skills in Agricultural Science subject areas (Olaitan, 1998). In contrast, agricultural education refers to the teaching of skills, values, attitudes and related products (Egbule, 2004), as cited by (Eze & Uzoka, 2012:2). Generally, agricultural education is the type of education that is dedicated in training learners in the perfection of the agricultural production practice, as well as the methods for the teaching of Agricultural Science in a classroom (Eze & Uzoka, 2012). The teaching and learning of Agricultural Science in the Namibian education system takes place in three phases of learning: at senior primary (grades 4 to 7), secondary (grades 8 to 12) and tertiary levels.

In the basic education (grades 4 to 12) curriculum, the senior primary teaching covers the following major Agricultural Science knowledge areas: general agriculture, plant production, animal production and financial management. In addition to the content covered at senior primary level, the secondary level covers farm structure and machinery, and agricultural economics. The tertiary level (four years BSc degree in agriculture) consolidates the content covered in basic education (senior primary and secondary levels) and promotes sustainable agricultural and natural resource development and management in Namibia, through teaching, research and extension services to communal and commercial farming communities, including more practical experience through job attachments for a period of six months in the final year.

2.4 The National Curriculum for Basic Education (NCBE), Namibia

The National Curriculum for Basic Education (NCBE) (2010) builds on the experience and achievements of the first cycle of Namibian curricula and syllabuses that were introduced in the 1990s. The curricula of the first cycle were Basic Education (then grades 1-10); Senior Secondary education; and Special Needs education, building on the foundation laid down in the Constitution of the Republic of Namibia (1990) and the policy Towards Education for All: A Development Brief (1993). This responds to recent changes in Namibian society and to emerging challenges such as globalisation and HIV/AIDS. It is directed towards helping to achieve the national development goals set out in the National Development Programmes 2 and 3, the Education and Training Sector Improvement Programme (2007), and the long-term perspective of Namibia Vision 2030" (Republic of Namibia, 2010:1).

Therefore, the central purpose of the NCBE of Namibia is to make available a clear and summarised outline of the curriculum so that there is uniformity in the implementation of the curriculum in all schools across the country (Ministry of Education, 2008). According to the Republic of Namibia (2010:1), "it describes the goal, aims and rationale of the curriculum, the principles of teaching, learning and assessment, language policy, and curriculum management at school level". The NCBE of Namibia creates a situation for all school learners to be aware of the key learning areas, as well as the basic competencies, which they are expected to attain at the end of their school phase. It also makes provision for all learners to demonstrate the attitudes and values that they need to acquire during their course of study (Republic of Namibia, 2010). It gives a synopsis of the subject combinations and the elective subjects of each phase that are available as well as the amount of teaching and learning time that is allocated to each subject.

The NCBE also outlines the assessment techniques to be followed and outlines how assessment should be combined with the teaching and learning processes. According to the Republic of Namibia (2010), the NCBE serves as a basis for developing course outlines, teaching and learning materials such as teachers' guides and textbooks to be used in the different school subjects. It is also a framework for teachers to develop individual schemes of work as well as lesson plans (Republic of Namibia, 2010).

2.5 The prospect of Agricultural Science education in Africa

In many African countries, the agricultural sector continues to be the leading employer of workforce either directly or indirectly (Olusoga, 2014). It is the backbone of many African and world economies. In Africa, agriculture continues to be the most important source of food for families, household income from sales of agricultural products, job creation/self-employment, world trade for much-needed foreign exchange, raw materials and other products needed by industries to produce goods, and the source of revenue to boost the national economies (Olusoga, 2014).

In the light of these immense benefits, it is very important to accord the teaching and learning of Agricultural Science in African schools the importance it ought to have in order to achieve the United Nations Millennium Development goals (Olusoga, 2014). Agricultural Science education generally unlocks the window of opportunity for many people in any African country to gain access to employment for the reason that Agricultural Science education acquaints citizens with the skills and knowledge indispensable to be self-entrepreneurs. As a result, opportunities for individuals are conceived in which Africans can be engaged in spheres such as crop production, horticulture, poultry farming, livestock production, fish farming, beekeeping, the feed industry to mention but a few (Olusoga, 2014).

Hence, for any African economy to be registered as one of the leading economies on the global stage, employment creation is significant, food production is important and revenue expansion is similarly important. In view of this understanding, it is important to realise that one of the social standards African Agricultural Science education is likely to diffuse is the improving of teaching, learning and practice of agriculture in order to meet up with the contemporary world (Ibrahim, 2014).

2.6 Agricultural Science Education teaching and learning in Sub-Saharan African schools

In view of the importance of agriculture, several African countries have continued to promote the teaching and learning of Agricultural Science as a school subject. For example, as provided in the National Curriculum for Basic Education in Namibia, Agricultural Science education is designed to build a solid foundation for vocational Agricultural Science training in Namibia. Vocational Agricultural Science training is essential to teach the required Agricultural Science knowledge and skills to learners so that upon completion of their basic education they can be self-employed and able to create employment for others (Ministry of Education, 2008). The formal teaching and learning of Agricultural Science as a school subject in Namibia started after the country's independence in March 1990.

In Namibia, the Ministry of Education through the National Institute for Educational Development (NIED) and the University of Cambridge (UC) in the United Kingdom (UK) jointly developed an Agricultural Science curriculum for Namibian schools. In the current Namibian school system, Agricultural Science is taught from grades 4 to 12 in basic education, while at tertiary institutions it is taught as an elective module and minor specialisation respectively (the minor specialisation is more applicable to tertiary education training in the Bachelor of Education (BE) degree) (Ministry of Education, 2008). As part of the recommended learning competencies, a school garden is often used as a means of providing practical experience for all Agricultural Science learners.

According to Akinwande, Olorundare and Uphai (2016), Agricultural Science as a vocational school subject in most African secondary schools has to date not met intended objectives owing to a number of challenges. In Namibia, the academic performance of learners in the subject has so far been comparatively poor, and hence an improvement in the Agricultural Science teacher education becomes necessary to achieve the teaching and learning objectives.

In Nigeria, the teaching and learning of Agricultural Science in schools was first introduced in 1967 (Kaleptwa & Igomu, 2013) and the development of Agricultural Science education curriculum was initiated by Nigerian Education Research Development Council (NERDC) in collaboration with the West Africa Examination Council (WAEC). According to Kaleptwa & Igomu, (2013:1):

> The main objectives of introducing the teaching of Agricultural Science in Nigeria include: 1. encouragement of learners in the use of their hands; 2. appreciation of the dignity of labour; 3. familiarity with biological processes and thereby instilling rationality in the learners; 4. increasing self-sufficiency and self-reliance in food production learners to produce part of their food needs and improve their diet and thus minimise the cost of feeding in their secondary schools.

In the Nigerian school system, the number of years Agricultural Science is taught as a school subject varies from one school to the other depending on the administration of the school, as well as the availability of teachers (Kaleptwa & Igomu, 2013:1). Despite the neglect of agriculture due to the discovery of Nigeria's oil resources, the agricultural sector still contributes more than 30% to the country's gross domestic product (GDP), employs about 70% of the workforce and generally provides over 80% of the country's food resources.

The Federal Republic of Nigeria (2013), in the National Policy on Education (NPE) affirmed that Agricultural Science is one of the school subjects that is offered in junior and senior secondary schools as a pre-vocational elective, as well as a vocational elective subject in that order. According to Akinwande, *et al*., (2016), the agricultural curriculum content of senior secondary schools in Nigeria is structured to cover three major areas: production (this relates to food production), projection (this includes agronomy and forestry) and economic (this relates to agriculture economics and farm management principles).

Even though Agricultural Science is offered as a vocational school subject at secondary level, the academic performance of learners in the subject has not significantly improved (Akinwande *et al*., 2016). As reported by Ikeoji, *et al*., (2007), learners who are graduates of vocational agriculture in most senior secondary schools in Nigeria have failed to take up their functional responsibilities in paid jobs, thereby defeating the goals of current Agriculture Science. This therefore, requires an improvement in the country's Agricultural Science teacher education to achieve the teaching and learning goals.

In Kenya, secondary school Agricultural Science has a distinctive starting point through participatory curriculum development in which agriculture as a school subject was recently introduced in the curriculum (Konyango-Ochieng and Asienyo, 2015). According to these authors, the foremost objective was to make a new outline of education through participatory curriculum development with the purpose of making rural secondary schools in Kenya quicker to respond to community needs. Konyango-Ochieng and Asienyo (2015) noted that in Kenya, the motivations of participatory curriculum developers of school agriculture were also founded on the proposition that investment on secondary school agriculture curriculum would stimulate the engine of economic development by means of shifting farming skills to answer school-leaver employment needs, as well as to stimulate job creation both in the rural and urban areas through agro-based industries.

As stated by Vandenbosch (2006), in the Republic of Botswana Agricultural Science was made a compulsory core subject at junior secondary curriculum since 1986 and at senior secondary level; Agricultural Science is an optional subject but enjoys the popularity of being chosen by the majority of the learners in most public schools. The introduction of agriculture as a school subject in Botswana was because of the recommendations made by the National Commission of Education (NCE) in 1977, which placed emphasis on the insertion of practical subjects like Agricultural Science in the school curriculum.

In the beginning, Agricultural Science as a school subject in Botswana was more theoretically taught with the integration of laboratory practical activities. In the current curriculum, however, participatory curriculum development in Botswana has altered the teaching and learning of Agricultural Science from a theoretical subject to a more field-based practical subject in all public and private schools (Dlamini & Dingwa, 2004). At present in Botswana, teachers and policy makers are aware that Agricultural Science teaching and learning should respond to the needs of people and be more relevant to contemporary issues in terms of curriculum, content, teaching methodology and assessment methods. As reported by Vandenbosch (2006), the Agricultural Science curriculum in Botswana should remain a valuable plan for effectively converting the knowledge, skills and attitudes of all learners into aptitudes and traditions for more sustainable agriculture and rural development.

The government of the Republic of Botswana has made it possible for effective teaching and learning of Agricultural Science to take place in all public schools by providing essential facilities such as small animal farm units, land for the establishment of school gardens and the provision of agricultural tools with safekeeping storerooms (Vandenbosch, 2006). According to the same author, the government of the Republic of Botswana has made funds available for the appointment of qualified teaching and support staff and for the procurement of inputs such as seeds and fertilisers.

In Burkina Faso, Agricultural Science is not taught as a stand-alone subject, but agricultural topics are integrated into other natural science subjects such as biology, botany, ecology, geology and zoology (Vandenbosch, 2006).

According to Vandenbosch (2006), the teaching and learning of Agricultural Science in secondary schools in Ethiopia was phased out, which paved the way for the introduction of

Agricultural Technical and Vocational Education (ATVET) under the ambit of the larger Technical and Vocational Education and Training (TVET) within the education sector.

The government of Ethiopia argued that education in primary and secondary education would focus on shaping the foundation for later skills development provided by the ATVET programme (Vandenbosch, 2006). In the secondary education phase in Ethiopia, agricultural topics are integrated in the teaching of other sciences subjects (Ampiah, Akyeampong & Leliveld, 2004; Apori, Zinnah & Annor-Frempong, 2003).

Agricultural Science as a school subject in Ghana is compulsory in the junior secondary phase and is made optional in senior secondary phase. In Lesotho, agriculture is taught as an optional subject in secondary schools. In Malawi, Agricultural Science is a compulsory subject throughout the secondary phase (form I to IV). The main reason for making Agricultural Science a core subject in secondary schools in Malawi is that agriculture forms the mainstay of the economy of Malawi (Vandenbosch, 2006).

In contrast, according to the same author, Agricultural Science in Mozambique and Rwanda is not part of the curriculum, and particularly in Mozambique, agricultural topics are integrated into the content of other natural science subjects such as biology, chemistry and craft. The integration of Agricultural Science topics in these subjects is not in an orderly manner (Vandenbosch, 2006).

Table 2.1 below represents the information with regard to the general secondary Agricultural Science education in selected counties in sub-Saharan African.

Table 2.1: Agriculture as a subject in general secondary education in selected countries in sub-Saharan Africa.

<table>
<tr><th>Agriculture as a subject in general secondary education in selected countries in sub-Saharan African Country</th><th>Junior Secondary Level</th><th>Senior Secondary Level</th></tr>
<tr><td>Botswana</td><td>Compulsory</td><td>Optional</td></tr>
<tr><td>Burkina Faso</td><td colspan="2">Not offered, limited integration in Life and Earth Sciences</td></tr>
<tr><td>Ethiopia</td><td>Not offered</td><td>Separate ATVET system</td></tr>
<tr><td>Ghana</td><td>Compulsory</td><td>Optional</td></tr>
<tr><td>Kenya</td><td>Optional</td><td>Optional</td></tr>
<tr><td>Lesotho</td><td colspan="2">Optional</td></tr>
</table>

Malawi	Compulsory	
Mozambique	Not offered, limited integration in Natural Science	
Namibia	Optional	
Nigeria	Optional	
Rwanda	Not offered, being piloted in some schools	
South Africa	Not offered	Optional
Swaziland	Optional	
Uganda	Optional	
Zimbabwe	Optional	

Adopted: (Vandenbosch, 2006)

2.7 Improving teaching and learning of Agricultural Science in schools

According to Coe *et al.*, *(*2014:2),

> Schools currently use a number of frameworks that describe the core elements of effective teaching. The problem is that these attributes are so broadly defined that they can be open to wide and different interpretation whether high-quality teaching has been observed in the classroom. It is important to understand these limitations when making assessments about teaching quality.

There are essential components that have been suggested by scholars that teachers should be considered when measuring the quality of teaching and learning (Modebelu & Nwakpadolu, 2013). These components include but are not limited to content knowledge, quality of teaching, classroom environment, classroom management, teachers' beliefs and professional behaviour (Coe *et al.*, 2014).

Effective teachers have profound knowledge of the subject content they teach and when their knowledge plunges to lower levels, it affects negatively on learners' outcomes in the subject (Coe *et al.*, 2014). In improving teaching and learning, teachers should also understand the manner in which learners think about the subject content being taught (Coe *et al.*, 2014; Modebelu & Nwakpadolu, 2013). Improving the quality of teaching would require the teacher to use effective questioning skills and appropriate assessment strategies. Aspects such as reviewing previous learning and giving learners adequate time to practise skills firmly and gradually, bringing together new subject content are believed to be essential elements of quality teaching that leads to improving teaching and learning (Coe *et al.*, 2014).

The classroom environment includes aspects such as quality communication and coordination between teachers as well and learners in a classroom (Coe *et al.,* 2014). Improving teaching and learning in a classroom points to the abilities of teachers to efficiently make use of lesson time, to manage classroom resources and available space, and to manage learners' conduct with respect to stipulated rules. (Coe *et al.,* 2014). Moreover, Coe *et al.* (2014: 3) state that the professional conduct of teachers such as "reflecting on and developing professional practice, participation in professional development, colleague support, liaising and communicating" with the parents of the learners are essential aspects that are needed in order to improve teaching and learning in a school environment.

Improving teaching and learning in a classroom is something that teachers all over the world are concerned about (Modebelu & Duvie, 2012). A highly regarded teacher is an effective classroom manager and communicator who can become accustomed to diverse teaching and learning styles and successfully teach different categories of learners in a classroom. Teaching in the classroom can be improved by bringing together action plans and their implementation. Teachers who make the extra effort to improve their teaching can have substantial influences on the prospects of the learners (Abelega, 2009).

Therefore, for many learners, the classroom is where most of their learning takes place. To ensure their learning potential produces the maximum educational benefits, teachers should be mindful of different factors that can enhance learning in a subject. According to Abelega (2009), in order to improve learning in a classroom, teachers need to examine the classroom environment and implement certain practices that have been proven to increase learners' success. Improvement involves enhancing the capability of teachers to impart appropriate knowledge, skills and attitudes to learners in Agricultural Science, i.e. a special retraining in technical and pedagogical competencies in agriculture given to teachers to make them perform better (Modebelu & Duvie, 2012).

Eze and Uzoka (2012) point out that there are strategies that could be applied to improve teaching and learning of Agricultural Science at combined and secondary school level, and these include the following: competent teachers, suitable curriculum, adequate financial resources, effective organisation of young farmers' clubs, acquisition of more land for school gardens, dynamic methods of teaching, and availability of teaching materials.

2.8 Teaching methods of Agricultural Science knowledge in secondary schools

Teaching methods as defined by Nwokorie and Akpata (2004) comprise repeated teaching processes used in different school subjects that are applied by diverse teachers. The teaching methods are a collection of procedures of interaction between the teachers and the learners in a classroom that are anticipated to lead to the attainment of a scheduled set of learning and lesson objectives (Auwal, 2010). According to Aneke (2015:98), "teaching methods were defined by Merlot (2015) as a plan of action designed to achieve learning programme design for a learner. It could be a master plan or programme procedure schedule to achieve a particular objective". It is important for an Agricultural Science teacher to stay up to date with teaching methods that will help learners to effectively learn and achieve the learning and lesson objectives.

According to Nwokorie and Akpata (2004), it is important for an Agricultural Science teacher to develop a clear awareness that there are general teaching methods in existence and which could be used to ensure that teaching and learning occurs to the benefit of the learners.

In a classroom situation, what learners are able to learn is significantly influenced by how they are taught. In this regard, Agricultural Science teachers worldwide employ an extensive diversity of teaching methods, which are appropriate for different topics within the Agricultural Science classroom setting (Achor, Imoko, & Uloko, 2009). According to Achor *et al.*, (2009) as cited by Auwal, 2013, some teaching methods are totally outdated in relation to the learning context in which they are applied. According to Achor *et al.*, (2009), some teaching methods are introduced from European countries and have no relation with the teaching and learning principles that exist in the Zambezi region of Namibia. This may lead to memorisation of facts and low academic achievements of learners in those subjects, as is evident in the Zambezi region at present (Aneke, 2015).

In an effort to reduce memorisation of facts, teachers need to devise appropriate teaching approaches that will effectively allow learners to actively participate during the teaching and learning process (Auwal, 2013). According to Auwal (2013), teachers and many scholars all over the world have repeatedly pointed out the problems of teaching with a strict teacher-centred approach. This approach has been regarded as an approach resulting in extended periods of continuous teacher talk, which eventually demotes learners to being passive listeners in a classroom (Auwal, 2013).

To allow learners in an Agricultural Science classroom to be passive listeners could lead to a decline in responsiveness and acquisition of knowledge during the teaching and learning process. According to Auwal (2013), to increase learners' responsiveness and acquisition of subject knowledge during teaching, the teacher needs to apply diverse teaching methods. In fact, according to Auwal (2013:64), learners appear to benefit from knowing how to execute a strategy (procedural knowledge), knowing why the strategy works (conceptual knowledge), and knowing where the strategy works (contextual knowledge). Learners learn fabulously when they know how the concepts in Agricultural Science are applied to their particular context.

> Specifically, it is believed that contextualised learning holds promise for improving a learner's ability to synthesise information from disparate sources, for furthering understanding of new and sometimes contradictory data, for assisting in making meaning and ultimately, for enhancing one's ability to think critically and transfer learning to future life experience (Auwal, 2013:64).

Therefore, for an Agricultural Science teacher to support learners to develop logical skills, use concepts appropriately, learn problem-solving skills, cultivate the culture of mature judgement of issues, improve appropriate communication skills, as well as the ability to keep in mind the essential information for learning, suitable teaching methods should be applied effectively (Auwal, 2013).

The lecture method is commonly applied by teachers in teaching the subject content to learners in the class and is regarded as one-way communication with limited room for learner participation in the teaching and learning process. The result is poor attention and understanding by the learners of what is being taught. According to Auwal (2013:64), it is evident from a number of disciplines that oral presentation to a large group of passive learners contributes very little real learning.

According to the same author, it is important to ensure that the teaching methods must be diverse to mirror a contemporary social order commanding the need for operational, cognitive-oriented and judgement-oriented learners in the classroom. In this regard, the choice of suitable teaching methods is essential to the achievement of teaching and learning objectives in an Agricultural Science classroom. This implies that teachers need to choose wisely and use different teaching techniques if they wish to ensure successful teaching and learning. Some of the suitable methods for teaching a practical subject like Agricultural Science include among others practical demonstrations, discussions, exhibitions, field trips, role play, excursions, problem-solving, discovery or inquiry and project-based learning (Datol, 2002 & Nwachukwu, 2001).

In particular, the discussion method is widely acknowledged by many Agricultural Science teachers since the central and essential characteristic is built on the interaction among learners while the teacher plays the role of a facilitator during the teaching and learning process. Auwal (2013:64) writes: "During discussion sessions, learners participate in the process by contributing problems, analysing the factors associated with the problem, developing possible solutions to the problem, putting the solution(s) into action and evaluating the results of the solution."

2.9 Perceived Competencies of Agricultural Science Teachers

Learners can learn the subject content effectively if the skills and knowledge of teachers are improved continuously (Bhargava & Pathy, 2011). As stated by Bhargava and Pathy (2011) simply having subject knowledge and the required qualifications does not give the ultimate guarantee that the teacher's competencies meet the set learning and teaching targets in a classroom. In this regard, it is necessary for an Agricultural Science teacher to have the right intellectual capacity to understand a learner's nature, needs and main beliefs (Bhargava & Pathy, 2011). According to Bhargava and Pathy (2011), an Agricultural Science teacher should be able to display high levels of professionalism that is demanded inside and outside the classroom.

Generally, it is difficult for an Agricultural Science teacher to have all the competencies in faultless combination; however, training and teaching experience may lead in the direction of proficiency (Bhargava & Pathy, 2011). Mostly, a competent Agricultural Science teacher is more consistently sincere and affectionate. Above all, a competent Agricultural Science teacher performs what is required for the desired teaching and learning planned (Bhargava & Pathy, 2011). A competent Agricultural Science teacher is able to motivate learners to learn and at the same time elicit their positive attention during the presentation of the subject matter in a classroom (Bhargava & Pathy, 2011).

According to Bhargava and Pathy (2011) it is well known that there is a resilient bond that exists between teacher competence and effective teaching. In agreement with the same authors, teaching competence further encapsulates the qualities of perceptions, values and beliefs that the teacher takes along as he or she joins the teaching profession. In the study conducted by Powell (1992), it was determined that in the perception of pre-service teachers, content knowledge and ability to talk (teach in a classroom) form the basis of great teaching.

According to Ketele (1996) as cited by Naumescu (2008;1), a competence is a set of organised capacities (activities), which acts on contents in a given category of situations in order to solve a problem. In this definition, a competence is described as an ability to carry out a specified task or activity to predetermined standards of attainment. According to De Bueger-Vander (1995) as cited by Naumescu (2008:1), competence refers to a state of being well qualified to perform an activity, task or job function.

According to Naumescu (2008), a similar development of a more multi-faceted opinion of competency from several scholars in most recent years decode a notion which integrates the ability to transfer skills and knowledge to new situations and environments (Naumescu, 2008:25) and the enactment of responsibilities that are likely to take place in a school setting.

Agricultural Science teacher competency involves the performing of accountabilities, management of classroom responsibilities, the capability to deal with problems in responding to teaching and learning demands, the capabilities to put to task the knowledge, skills and attitudes of learners, as well as considering the aspect of human dignity and values. Naumescu (2008:1-2), has remodelled the progression of the competency concept among science teachers in recent years: "It means not only the mastery of knowledge and methods, or the ability to manage them, but also the ability to integrate different kinds of knowledge, and to use them interchangeably." For a teacher to be competent in a school subject, he/she should have capabilities to marshal an individual's own subject knowledge and ultimately converting it into noticeable achievements (Naumescu, 2008) and (Das & Nalinilatha, 2017). As reported by Naumescu (2008), competencies are believed to be individual characteristics that are put together in a given subject area to effectively implement the subject curriculum. This takes account of the subject teaching and learning process as well as the setting where the individual practices occur (Coggi, 2002).

In Agricultural Science education, studies have been conducted to look at teachers' competencies (Naumescu, 2008). Agricultural Science teachers must be made aware of their distinctive competencies and create opportunities for skills and knowledge growth as they advance in their teaching career (Naumescu, 2008). There are a number of competencies in Agricultural Science education, however not as much is known about which competencies are connected to effective teaching of the subject in a classroom. Programme scheduling, growth and assessment, planning of lessons, implementation of lessons, evaluation of teaching, administration, management, school community associations, skilful character and growth are among the essential competencies are perceived to be essential for effective teaching of Agricultural Science (Naumescu, 2008).

In Namibia and all over Africa, agriculture is the mainstay of the economy, and economic growth and development is practically related to expansion within agriculture. For developing countries such as Namibia to attain agricultural objectives, the countries must increase the level of knowledge, as well as skills in the community (Naumescu, 2008). This can easily be enhanced in a classroom environment. It is apparent that teachers' competencies are an important component in achieving Agricultural Science education objectives in any country (Naumescu, 2008).

According to Naumescu (2008), teachers' competencies amplify the communities' capacity, as well as make them more effective, self-sufficient, inventive and proficient to manage problems related to everyday farming activities. As reported by Naumescu (2008), Agricultural Science education inculcates moral principles, attitudes and skills, as well as knowledge in learners that is obligatory to advance production of agricultural produce in a community.

In Namibia, agriculture was introduced in upper primary schools through to senior secondary schools soon after independence in 1990 with the objective of making all learners independent upon completion of basic education. The need for competent Agricultural Science teachers in schools is thus important to ensure that learners receive the required skills and knowledge that is necessary for them to be self-sufficient (Naumescu, 2008). In schools, teachers are the implementers of the Agricultural Science curriculum and they determine the success of the teaching and learning process in a classroom. The ability to teach the subject is the key to the success of teaching and learning of Agricultural Science in a classroom (Naumescu, 2008).

2.10 Perceived needs of Agricultural Science teachers

Perceived needs are the needs that are felt by a particular teacher, which, as soon as they are voiced, they turn out to be expressed needs (demanded needs) (Mansour, Alshamrani, Aldahmash & Alqudah, 2011). According to Mansour *et al* (2011), teachers' needs are enormous in the education sector of industrialised and emerging countries all over the world. As stated by the same authors, it is evident from the experiences emanating from industrialised and emerging countries that the professional needs of teachers are the pillars in determining the academic performance of learners in schools.

The professional growth of teachers can be conceptualised as a device for driving effective teaching and learning to a greater height and as a strategy for advancing their professional subject knowledge, as well as teaching methods (Mansour *et al.*, 2011). Thus, it is important to comprehend that teaching and learning take place in a contemporary world that is seriously occupied by doubts and cumulative difficulties (Mansour *et al.*, 2011). Teachers of Agricultural Science need continuing professional development of the subject knowledge and skills that are essential for effective teaching and learning of the subject (Mansour *et al.*, 2011).

According to these authors, teachers admit that the quality of Agricultural Science teaching in secondary schools is the main factor in advancing meaningful understanding of the subject and this can only be attained through addressing the needs of the teachers who are the implementers of the curriculum. This assumes that Agricultural Science teaching in secondary schools cannot be realised without the presence of qualified Agricultural Science teachers whose professional needs are not addressed (Mansour *et al.*, 2011).

Currently, the existing state of affairs in the Zambezi region of Namibia does not only relate to the need to prepare teachers with the basic knowledge but it also takes into account the need to confront problems related to the quality of teaching and learning of Agricultural Science in secondary schools in the region. The Zambezi region, like any other region of Namibia (Okavango, Omusati, Omaheke, to mention a few), is threatened with the glitches of inadequately qualified Agricultural Science teachers (Ministry of Education, 2015). The situation of inadequately qualified Agricultural Science teachers in general as documented in the literature is similarly dire in several technologically advanced countries such as the United States of America, as well as United Kingdom (Osman, Halim & Meerah, 2006). Osman, *et al.*, (2006) suggest that effective in-service training programmes ought to take account of programme improvements that are geared in the direction of meeting the specified needs that relate to a teacher's anxieties.

Therefore, teachers need professional development prospects through in-service training in order to develop their capacities to be able to teach Agricultural Science in secondary schools more effectively and efficiently (Osman *et al.*, 2006) and (Osamwonyi, 2016). The situation remains important for teachers' practices associated with the implementation of the Agricultural Science syllabus in the classroom (Davis & Jayaratne, 2015).

In Africa and all over the world agriculture is persistently changing with scientific improvement. Owing to these changes, people should begin to appreciate that Agricultural Science education also needs to change in order to remain relevant to these changes (Osman *et al.* 2006). In a globalised environment, teachers are continuously faced with limitless expectations because of the changes in the communities and technological advancements (Osman *et al.* 2006).

According to Osman *et al.* (2006), learners in the 21st century enter the school classroom with a diverse set of skills, as well as greater potential than the learners of 20th century. These learners might be more innovative with technological advancements than their teachers might be. To determine what skills and knowledge are needed for learners in the 21st century is therefore challenging (Osman *et al.*, 2006). As stated by Davis and Jayaratne (2015:48):

> The University of Melbourne in Australia initiated the assessment and training of 21st-century skills project with the participation of 250 renowned professionals from 60 institutions worldwide to determine the skills necessary for learners to be successful in the 21st century and developed a white paper identifying the 21st-century skills.

In the developed white paper, a number of skills were identified. The skills identified include ways of thinking, ways of working and tools for working together, as well as skills for living in the world (Davis & Jayaratne, 2015:48). Ways of thinking comprise sub-categories of skills, which include learning to learn (metacognition), critical thinking, problem solving, and decision-making. These skills emphasise higher-order thinking skills that are needed by learners in the 21st century (Davis & Jayaratne, 2015). Ways of working encompass communication skills, as well as collaboration skills in the context of globalisation (Davis & Jayaratne, 2015). The tools of working together concern communication and information technology that is regarded as a dynamic skill in the future of the learners (Davis & Jayaratne, 2015). The skills of living in the world include a component of world citizenship, life and career, and personal and social responsibility including cultural competence. Ability to work with communication and information technology is an essential skill in the future. (Binkley, Erstan, Herman, Raizen, Ripley & Miller-Ricci, 2012) as cited by (Davis & Jayaratne, 2015:48).

If Agricultural Science teachers were to teach Agricultural Science effectively in Namibia then it is vital that they teach the skills that would enable learners to meet the challenges of a contemporary world (Davis & Jayaratne, 2015). Identification of the most significant training needs of Agricultural Science teachers in Namibia is crucial in planning effective in-service training programmes that will help teachers to teach effectively in a classroom (Davis & Jayaratne, 2015). Changing demands in agricultural teaching and practices have made it indispensable for Agricultural Science teachers to update their subject content knowledge and teaching methods in order to meet the needs of learners in the classroom (Davis & Jayaratne, 2015). Generally, continuing in-service training programmes, workshops, short courses and seminars are essential for preparing teachers to be effective teachers in the 21st century (Davis & Jayaratne, 2015).

In-service needs of Agricultural Science teachers (experienced and less experienced) all over the world and in the Zambezi region of Namibia in particular is one of the focuses of current preparations of secondary school teachers (Cannon, Kitchel & Duncan, 2012). How to use computers and multi-media equipment during the teaching and learning process in the classroom is acknowledged as the most important in-service training needs of secondary school teachers (Cannon *et al.*, 2012). Duncan, Ricketts, Peake and Uesseler (2006) acknowledge that the development of teaching methods is an important need of Agricultural Science teachers because this will help teachers to inspire learners to learn effectively, to support learners, to develop critical thinking skills, and to help teachers to manage the classroom conduct of learners during the teaching and learning process. Therefore, the study will investigate how Agricultural Science teachers perceive their own professional needs.

2.11 Effective teaching and learning of Agricultural Science in a classroom

According to Watkins, Carnell and Lodge (2007), effective teaching is teaching that enables learners attain the learning objectives outlined by the teacher in the classroom. Effective teaching remains that which results in effective learning in a classroom. According to Bhowmik, Banerjee and Banerjee (2013:2), there are two fundamentals of effective teaching: “The teacher must have a clear idea of what learning is to be nurtured; and the teacher sets up and provides a learning experience that enables this to happen. Bhowmik *et al.* (2013:2), aver that effective teaching is rooted in the following beliefs:

- Pupils learn best in a positive and nurturing environment established by teachers who believe that every pupil is capable of learning.
- All pupils have areas of strengths and interests that can be useful in advancing pupil learning. Effective teachers establish an instructional environment that will draw on these strengths.
- Teachers take into account the whole pupil; in other words, they attend to the cognitive, affective, social and physical dimensions when developing an instructional programme.
- Active engagement and interaction facilitate pupil learning.
- New learning is built upon previously learned information. Learning is enhanced when prior knowledge, cultural and social experiences are valued, acknowledged and leveraged throughout the curriculum.
- Pupil learning is both individually and socially constructed; it is influenced by cultural, familiar, and social contexts.
- Meaningful assessment is both formative and summative; it relies on multiple measures, including informal observations.

To ensure effective teaching and learning, an effective Agricultural Science teacher should make every effort to motivate and engage all learners during the teaching and learning process. (Watkins, Carnell, & Lodge, 2007). Effective Agricultural Science teachers believe that all learners are capable of attaining high grades in their subject and they have the ability to find ways of making each learner successful at the end of the academic year. In fact, an effective Agricultural Science teacher has high expectations of learners in terms of both the learners’ learning and conduct and they have the abilities to support learners to achieve such expectations (Watkins, Carnell, & Lodge, 2007).

Effective Agricultural Science teachers have the abilities to distinguish between the knowledge of different learners in a classroom and comprehend that learners have different abilities that require improvement. Thus, in every classroom, there will be a variety of learner expertise and ability (Watkins, Carnell, & Lodge, 2007). To maximise effective teaching and learning, an Agricultural Science teacher should be able to accommodate all the different needs of all learners in a classroom, instead of pitching their teaching to the middle group and eventually letting some groups of learners be bored and others unable to meet the demands of schoolwork (Coe *et al.*, 2014).

Effective Agricultural Science teachers apply different teaching strategies that accommodate every learner in a classroom and support all learners in attaining their individual greatness (Watkins, Carnell, & Lodge, 2007). According to Watkins *et al*. (2007), it is important to understand that an effective teacher has the abilities to recognise that learners learn very well if the way that the teacher presents the subject content in the classroom recognises their specific ways of life, upbringing as well as abilities.

Effective teaching and learning is largely influenced by the ability of a teacher to use techniques that best serve the learning needs of all learners (Grosser, 2007; Watkins, *et al*., 2007). An effective Agricultural Science teacher provides a grounding in such a manner that raises the spirits of learners to take more responsibility for their own learning. It is essential to appreciate that an effective Agricultural Science teacher supports learners to realise their potential (Grosser, 2007).

According to Grosser (2007), an effective teacher has an in-depth understanding of the subject content, as well as the skills required by learners. In-depth knowledge of the subject content of Agricultural Science inspires learners to love to learn the subject. To ensure effective teaching and learning of Agricultural Science, the teacher should provide a safe and orderly environment (both physically and emotionally) to allow learners opportunities to achieve their academic potential (Coe *et al.*, 2014). This is important because learners learn positively if they are in a classroom where they feel safe and confident enough to take up academic tasks even if initially they were not sure on how to go about it (Grosser, 2007).

To guarantee effective teaching and learning of Agricultural Science, an Agricultural Science teacher should observe every learner's academic achievement very closely. This includes providing regular feedback on the learner's academic performance. This also gives the teacher valuable information to evaluate the impact of their teaching (Coe *et al.*, 2014).

2.12 Professional needs of Agricultural Science teachers

2.12.1 Classroom management skills needs

According to Elias and Schwab (2006:309),

> teachers play a fundamental role in the cognitive and social-emotional development of children by giving them the opportunity to learn. Effective classroom management sets the stage for learning. Without it, classrooms are dis-organised and chaotic and very little academic can happen.

Findings of various scholarly work reveal that teachers in public and private schools play the most important role in determining the future of learners through implementing an effective teaching and learning process in a classroom (Hattie, 2009). Thus, effective classroom management is a prerequisite for effective teaching and learning in a classroom environment. Evertson and Weinstein (2006) suggest that classroom management is related to the engagements teachers in public and private schools undertake to construct an encouraging atmosphere for academic and social-emotional learning to take place in a classroom.

As suggested by Evertson and Weinstein (2006) in Korpershoek, Harms, de Boer, van Kuijk and Doolaard (2014:11), for teachers to achieve proper classroom management, the following "actions" are essential:

> **(1)** Develop caring, supportive relationships with and among learners and **(2)** organise and implement instruction in ways that optimise learners' access to learning. The importance of developing favourable teacher-learner relationships is also expressed by Marzano, Marzano & Pickering, (2003). Additionally, Evertson and Weinstein (2006) state that teachers should, **(3)** encourage learners' engagement in academic tasks, which can be done by using group management methods (for example, by establishing rules and classroom procedures (Marzano, Marzano, & Pickering, 2003). Teachers must, **(4)** promote the development of learners' social skills and self-regulation. Marzano, *et al.* (2003) refer to this as making learners responsible for their behaviour. Finally, (Evertson & Weinstein, 2006) state that teachers

should be able to **(5)** use appropriate interventions to assist learners with behaviour problems.

Evertson and Weinstein (2006) note that the last two endeavours state that effective classroom management has the potential to improve the behaviours of learners in a classroom during the teaching and learning process. Therefore, it is essential to understand that classroom management is a continuous contract that exists between teachers and learners during the teaching and learning process (Korpershoek, Harms, de Boer, van Kuijk & Doolaard, 2014).

Brophy (2006:17) in Korpershoek, *et al.* (2014:11) bring to light a comparable meaning of classroom management as "referring to the actions taken to create and maintain a learning environment conducive to successful instruction (arranging the physical environment, establishing rules and procedures, maintaining learners' attention to lessons and engagement in activities)". The emphasis embedded in this definition indicates the significance of "actions" in use by the teacher to aid learning amongst the learners during the teaching and learning process (Korpershoek *et al.*, 2014).

According to Martin and Sugarman (1993:9), "classroom management refers to those activities of the classroom climate within which effective teaching and learning occurs". Research on learner in-depth management practices which are driven in the belief that learners have the sense of duty for guiding their conducts and are capable enough of handling their actions, enables teachers to cultivate the following classroom management thoughts: "learner ownership, learner choice, community, conflict resolution, natural consequences and restitution" (Levin & Nolan, 2000) as cited by (MCUE, 2008:1). The competence of Agricultural Science teachers in secondary schools to manage classrooms and learner conduct is very important in attaining heartening learning outcomes (Oliver & Reschly, 2007).

Even though in-depth conduct management does not warranty effective teaching and learning in a classroom situation, it helps to create the condition that generates decent teaching and learning to be more likely (MCUE, 2008). In the same way, exceptionally effective teaching and learning limits but does not eliminate classroom conduct complications among learners in a classroom (MCUE, 2008).

According to MCUE (2008), classroom and conduct management influence the strength of character of new teachers in their teaching professions. New Agricultural Science teachers (teachers who recently graduated from college or university) generally show signs of nervousness regarding this aspect (MCUE, 2008). It is evident that teachers who have difficulties in classroom management are often unsuccessful in the teaching of the subject content to learners in a classroom (MCUE, 2008). According to MCUE (2008), teachers in this category tend to show a significant level of anxiety and indications of reduced fitness to execute their teaching functions. Therefore, the incompetence of Agricultural Science teachers to successfully bring about classroom conduct to a set level commonly contributes to low academic attainments of weak learners in classroom assessments and final- year examinations.

Teacher educationalists (in colleges of education and universities) emphasise that the teacher preparation programmes have to teach classroom management skills to pre-service teachers as it is apparent that classroom management skills are not taught thoroughly in the classroom setting (Wagner, Kutash, Duchnowski, Epstein & Sumi, 2005). In this regard, the deficiency of particular expertise and professional development needs in the desired competencies of classroom management are believed to significantly diminish the success of many Agricultural Science teachers, particularly those that enter the teaching profession for the first time (Wagner, *et al.*, 2005).

According to Wagner, *et al.*, (2005), enhancing the capability of Agricultural Science teachers to successfully manage classroom conduct necessitates a methodical tactic in teacher training, as well as continuing professional development programmes. According to Wagner, *et al.*, (2005), new Agricultural Science teachers in secondary schools are unlikely to have classroom management skills given their lack of experience. Even though studies point out that experienced teachers have a smaller amount of concerns regarding classroom management, such studies may perhaps be less a sign that teachers learn over time how to manage classrooms successfully (Wagner, *et al.*, 2005). As a result, enhanced teacher training and continuous professional development in classroom management is an essential component needed by all Agricultural Science teachers in secondary schools (Robert and Ball, 2009). As reported by Wagner, *et al*., (2005), continuing professional development in classroom management is needed for all Agricultural Science teachers, particularly those who enter the teaching profession immediately after graduating from universities or colleges. Successfully managing the classroom is more complicated for new Agricultural Science teachers, who may not have received the necessary training in classroom management and who may perhaps be allocated to classes with weak learners (Wagner, *et al.*, 2005).

2.12.2 Use of Information and communication technology (ICT)

According to Rosen and Well (1995) in Aduwa-Ogiegbaen and Iyamu (2005:105), "the role of information and communication technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy". The highest authorities in the education sector all over the world agree that once appropriately applied, information and communication technology (ICT) embraces extraordinary potential to enhance teaching and learning in a classroom (Aduwa-Ogiegbaen & Iyamu, 2005).

According to Poole (1996) in Aduwa-Ogiegbaen and Iyamu (2005), computer illiteracy is currently considered as the fresh illiteracy globally. This has inspired the aspiration to equip schools with computers in developed countries like the United States of America (Aduwa-Ogiegbaen & Iyamu, 2005). In the United States, for example, nearly everyone has gained the right to use ICT and the procurement of computers for school use has significantly increased (Aduwa-Ogiegbaen & Iyamu, 2005).

By 1985, there were more than one million computers in elementary and secondary schools in the United States (Becker, 2000). According to Aduwa-Ogiegbaen and Iyamu (2005), more than 7500 elementary schools in the United States are believed to own more than 15 computers. The number has significantly increased since developed nations like the United States and Britain allocate more money ($529 million and $325 million respectively) to schools, of which 70% of the money allocated to schools is earmarked to purchase computers for school education (Aduwa-Ogiegbaen & Iyamu, 2005).

According to the same authors, generally even developing countries globally have included ICT in schools. In Africa, many countries have put much effort to provide internet connectivity in schools. Such connectivity has the ability to link schools all over the world in order to advance education and to cultivate skills that learners in schools need for the job market in the 21st century (Aduwa-Ogiegbaen & Iyamu, 2005). For example, programmes such as School Net were initiated in Uganda with the purpose of spreading educational technology all over the country, while in Senegal, teachers as well as learners are using computers as an essential information instrument (Aduwa-Ogiegbaen & Iyamu, 2005).

It is evident that in the Zambezi region of Namibia, chalkboard and textbooks remain dominant in the learning and teaching activities in the classrooms in many of the combined and senior secondary schools. If countries like Senegal and Uganda are using ICT in helping secondary school learners to become better information users, it becomes a serious concern as to why Namibia, particularly in the Zambezi region, is still lagging behind with the use of ICT in schools. According to Aduwa-Ogiegbaen and Iyamu (2005:105), “the Economic Commission for Africa (ECA) has indicated that the ability to access and effectively utilise information is no longer a luxury but a necessity for development”.

Although the chalkboard, textbooks and other teaching and learning resources such as radios and television have been used in the teaching and learning process in the Zambezi region and elsewhere in Africa for a very long time, the impact of these resources on the education process has been very feeble (Aduwa-Ogiegbaen & Iyamu, 2005). ICT, however, could have the capacity to develop learners’ interactive potential in developing the individual learner’s intellectual as well as innovative capabilities (Aduwa-Ogiegbaen & Iyamu, 2005). According to the same authors, it is imperative to believe that ICT provides dynamic teaching and learning as it aids teachers and learners to be creative and more resourceful.

ICT is now the “in thing” globally in all human endeavours, especially in the teaching and learning process. In a classroom, ICT involves the use of multimedia and e-learning resources. Multimedia technology resources afford Agricultural Science teachers and learners a great deal of opportunities for effective teaching and learning outcomes. E-learning is an example of the use of ICT-supported teaching and learning techniques whose use in schools is gaining momentum with the passage of time (Omwenga, 2012). According to Omwenga (2012), multimedia is a prudently plaited grouping of text, graphic, art, sound, animation and video elements. In fact, an integration of multiple media elements such as audio, video, graphics, tests, animation, etc., into one “collective” and “symbolic” whole results in more benefits for the end-user than any of the media elements can provide individually.

As stated by Omwenga (2012:122) the benefits of ICT facilities to Agricultural Science teaching are numerous and include:

- *Allow for creativity* – the teacher has access to several methods he/she can use to pass instruction to his/her learners. He/she chooses the method deemed best suitable to teach a particular subject matter.
- *Saves time* – in as much as the learners have access to the lesson even in the absence of the teachers; the teacher therefore has more time to concentrate on the all-important task of solving more difficult topics.

- *Ineffective learning activities are replaced* – both the teacher and learners have no reason for irrelevancies occasioned by the face-to-face and chalk-talk method. Hence, there is ample time for quality and effective lessons.

There is a need for constant fulfilment of ICT skills by Agricultural Science teachers in the Zambezi region through continuous professional development programmes (CPSPs) in ICT technology. According to Slaouti and Barton (2008), impediments such as access to equipment (computers), time pressure and lack of mentorship programmes, as well as prospects for internship have a bearing on teachers' ability to use ICT in schools.

According to Bakar and Mahomed (2008:5), "the importance of ICT in education has prompted UNESCO's Asia and Pacific Regional Bureau for Education in Bangkok to design a project named "Preparing the next generation of teachers through ICT". This programme was meant to support teacher education institutions in Asia-Pacific regions to make teachers ready on how and when to effectively use the technologies for teaching and learning in the classroom (Bakar & Mahomed, 2008).

2.13 Teaching and learning resources available for effective teaching of Agricultural Science

"Literature is abundant which attempts to relate the concepts of teaching and learning resources and eventually on their overall influence on classroom management and effective curriculum implementation" (Coleman & Anderson, 2001; Orodho, Waweru, Ndichu & Nthinguri, 2013; Sherman, Bohlander & Nell, 1996 and Woodford, Jackson, Gillard, Harley, Cranz & Glennon, 2003) as cited by (Bizimana & Orodho, 2014:112). The challenges associated with the availability and adequacy of teaching and learning resources in schools was found to negatively affect teacher effectiveness in teaching subject content to learners in a classroom (Woodford, *et al*., 2003).

According to Woodford *et al*., (2003) cited in Bizimana and Orodho, (2014: 112), "a resource is a useful or valuable possession or quality of a country, organisation or person". However, Sherman *et al* (1996) vie that resources that are available for an organisation include human, financial, physical and informational resources. On the other hand, Coleman and Anderson (2001) as cited by Bizimana and Orodho (2014) argue that in the education sector, resources are grouped into two components: resources that are used to provide support services in a school, such as the core operational costs of teaching and learning such as tangible (physical) resources; and those that are geared towards the day-to-day running of the buildings, administration and management of the schools.

According to Bizimana and Orodho (2014), school teaching and learning resources that are essential for effective teaching and learning include the buildings such as classrooms with lockable entrances for safekeeping of school materials. Inadequacy of these resources would affect the day-to-day running activities of the school.

Teaching and learning resources (TLRs) are mainly comprised of materials resources (textbooks, learners' workbooks, computers, projects etc.), school physical resources (classrooms, laboratories, chairs and tables) and human resources (qualified teachers) (DFID, 2007). From the studies conducted in the past in respect of the availability of resources in schools it was discovered that teaching and learning resources are lacking in public schools (DFID, 2007).

The lack of teaching and learning resources in schools has been a serious challenge for teachers in implementing the school curriculum. According to Lyons (2012) and (Bosompem, Kwarteng, & Obeng-Mensah, 2012), teaching and learning is a complex activity that involves the interplay of teachers' motivation, learners' motivation and physical facilities such as classrooms, teaching resources, skills of the teachers and the demands of the curriculum. The availability of teaching and learning resources improves the competence of teaching and learning in schools, as they are the indispensable basic resource that stimulates teachers' performance in any school subject. Teaching and learning resources increases access to learning since learners are less likely to be preoccupied with other social aspects that are expected to threaten their learning when they are in schools that provide them with inspirational, meaningful and applicable knowledge. Adequate teaching and learning resources of high quality should thus be provided in schools to ensure effective teaching and learning processes in a classroom. Inadequate teaching and learning resources in a school have the potential to compromise the quality of teaching and learning (Bizimana & Orodho, 2014). This results in low academic performance, as well as a high dropout rate of the learners, high incidence of learner misbehaving within and outside the classrooms, poor teacher motivation, as well as failure to attain the intended academic performance targets that are set for learners and teachers (Bizimana & Orodho, 2014).

According to Sood (2000), literally a school will require a building, some provision of chairs and tables for learners and teachers, potable drinking water, public health facilities, teaching and learning materials, teachers and supportive staff. A shortage of any of these resources would make the teaching and learning experience unsuccessful (Sood, 2000).

As urged by NCERT (2005), teaching and learning resources seem to be of three sorts. The first sort of teaching and learning resource relates to the instructional materials. This includes minerals, rocks, raw materials, semi-finished and finished manufactured articles, plant and animal specimens that are needed for teaching and learning in a classroom. Also included among the instructional materials are the reagents (chemicals) and apparatus required to carry out laboratory experiments in a laboratory.

Similarly, included in the first group are the garden tools that are needed by learners for gardening-related practical activities. The second sort of education materials relates to the demonstration of actual objects and phenomena in a classroom. According to NCERT (2005), these include three-dimensional materials (experimental models and globes, among others) and two-dimensional materials (teaching and learning aids such as charts, pictures, photographs, maps, diagrams and drawings) and audio-visual materials (such as motion pictures, film clips, tape and recordings, videos etc.). Audio-visual learning and teaching materials help learners to acquire the necessary skills and knowledge and access to the phenomena that are inaccessible to direct observation (NCERT, 2005). The third sort of teaching and learning resources includes written descriptions such as scientific, scholarly, references and teaching aids. The teaching aids in this sort of resource include textbooks, learners' workbooks, and books for recording scientific observations, laboratory manuals and files for safekeeping of hard-copy materials (NCERT, 2005).

School programmes cannot succeed without adequate facilities such as classrooms, chairs, tables and other learning resources such as textbooks and learners' workbooks (Sood, 2000). The science laboratories need to be well equipped and timeously supplied with adequate consumables for effective teaching and learning (NCERT, 2005). Schools should operate with adequately stocked libraries with up-to-date resource books with sufficient study space and should cater to the teaching and research needs of the teachers and learners (Bizimana & Orodho, 2014). The Agricultural Science school garden should be well equipped with all the basic tools that would help the learners to do practical activities more effectively.

2.14 Lesson planning and teaching

Completely respectable teachers have more or less a form of plan when they walk into their classrooms (Jensen, 2001). According to Jensen (2001), it can be as simple as a perceptual worksheet or as composite as a detailed two-sheet typed lesson plan that follow a prescribed format. Generally, lesson plans are in black and white just for the teacher's specific understanding and are likely to be practically ordinary. There are times when the plan has to be on paper to be given to the supervisor, and for that reason, it will be a more of an official and comprehensive document. A lesson plan is remarkably valuable tool that works for teachers as a combination guide, resource and historical document echoing the actual teaching learning values in the classroom (Jenkins, Kitchel & Hains, 2010).

According to Jenkins *et al.,* (2010), a lesson can be referred to by many descriptions, such as a road map, a game plan or an outline. Irrespective of the similarities, a lesson plan is necessary for less and more experienced teachers. Therefore for the teacher to decide what to teach, in what order and for how long are the basic components of effective lesson planning. The lesson plan is set in the mind of the teacher and serves as a map to guide the teacher as to what needs to be done next, aligning the subject content to the specific learning objectives for the learners to attain at the conclusion of the lesson (Jenkins, *et al*., 2010; Jenkins & Kitchel, 2009).

A lesson plan is essential in teaching and learning as it serves as a record of what was done in previous lessons. A record of previously taught lessons is very important so that an account of what was taught in the previous class is checked to avoid "reinventing the wheel". Lesson planning is important to ensure that when a subject teacher is on leave, a substitute teacher should not be uncertain as to what to teach (Jensen, 2001). Lesson planning is essential as this makes the teachers well prepared to teach. A good lesson plan guides but does not dictate what and how a teacher should teach.

According to Reed and Michaud (2010:1), "lesson planning is at the heart of being an effective teacher". An imaginative procedure permits teachers to vehemence their understanding of the concepts of Agricultural Science teaching pedagogy by means of the teacher's knowledge of the learners, the syllabus and the environment where teaching and learning is taking place. According to Jensen (2001) as cited by Reed and Michaud (2010:1):

> There are a number of benefits to writing a lesson: firstly, lesson planning produces more unified lessons. It gives the teachers the opportunity to think

> deliberately about choices of lesson objectives, type of learning activities that will meet these objectives, the sequence of those learning activities, the materials needed, how long each learning activity might take and how learners should be clustered in manageable groups. Secondly, the lesson planning process allows teachers to evaluate their own knowledge with regards to the content to be taught.

This is important when the teacher has to teach complex scientific topics such as plant genetics; the teacher would become aware of the complexity of a topic during lesson planning, which enables him/her to take the necessary steps to acquire the needed resource materials that will help the teacher to effectively teach the topic in the class (Reed & Michaud, 2010). According to Jensen (2001) as cited by Reed and Michaud (2010:1), "the teacher with a lesson plan then is a more confident teacher". This means that the teacher is aware of what is to be taught, how it will be taught, when it will be taught and which teaching strategy will be used.

During the teaching and learning process in the classroom, the lesson is likely to flow very well since all the teaching, learning materials have been collected, and specifics have been made clear ahead of time (Reed & Michaud, 2010). According to Jensen (2001), some teachers feel that lesson planning takes too much of their time, yet lesson plans can be used again the following academic year for the same class group. As stated by Jensen (2001), lesson planning now can save time in the future. Lesson planning can be useful in subject management for other people, since substitute teachers tend to face challenges of teaching another teacher's class group where lesson plans are not available (Reed & Michaud, 2010).

2.15 Importance of Subject Content Knowledge (SCK)

Agricultural Science subject content knowledge as well as practical subject skills are significant components of being an effective Agricultural Science teacher in secondary schools (Wilkins, 2002) and (Okiror, Hayward, & Winterbottom, 2017). Also of significance are the beliefs of teachers about Agricultural Science, as well as Agricultural Science teaching which repeatedly influence teaching practices (Wilkins, 2002). In order to prepare teachers well to apply teaching practices that support the ideas of "reform-oriented" Agricultural Science teaching and learning, it is essential to appreciate exactly how teachers' content knowledge as well as their approaches would influence their beliefs and ultimately influence their teaching practices (Wilkins, 2002).

The dedicated learning prospects for Agricultural Science teachers have progressively focused on excavating teachers' subject content knowledge. Agricultural Science teachers' content knowledge creates a change in the teaching and learning process of Agricultural Science in a classroom. Subject content knowledge is essentially important in the sense that it influences how teachers engage learners with the subject matter, how teachers evaluate and use teaching and learning materials and is related to what learners in a classroom learn.

According to Anders (1995), teachers with less knowledge in Agricultural Science tend to focus on a set of rules rather than on the fundamental Agricultural Science point of view. Experienced teachers are expected to approach learners' request for information in the context of the subject area and help them willingly, rather than considering specific answers in reply to learners' inquiries (Anders, 1995). According to Brickhouse (1990), Agricultural Science teachers with profound subject content knowledge are more likely to pose questions than those with delicate subject content knowledge and put forward alternative justifications, as well as to suggest supplementary appeal for facts. Subject content knowledge of Agricultural Science could have an influence on the Agricultural Science teacher's assessment of the teaching and learning materials.

Agricultural Science teachers with profound subject content knowledge are more skilful at identifying coherent Agricultural Science learning materials, while those with less subject content knowledge are likely to tussle to identify coherent learning materials. Generally, in Agricultural Science subject content knowledge also has a bearing on the Agricultural Science teachers' teaching choices when using materials at their disposal (Brickhouse, 1990). Teachers with inadequate subject content knowledge tend to deviate from the teaching materials articulated in the course outline and amplify then with subject content illustrations of their own choice, which tends to be unclear to learners or interfere with the concepts learners are expected to learn from the subject course outline. Teachers with solid subject content knowledge have a sense of how to build a successful lesson by presenting and narrating the subject concepts in a logical manner (Lederman, 1999 & Wilkins, 2002).

2.16 Importance of Pedagogical Content Knowledge (PCK)

According to Cochram (1997:2),

> Pedagogical content knowledge is a type of knowledge that is unique to teachers and is based on the manner in which teachers relate what they know about teaching (their pedagogical knowledge) to what they know about what they teach (their subject matter knowledge).

It is the combination of the teachers' pedagogical knowledge as well as their degree of subject matter knowledge that encompasses pedagogical content knowledge (Shulman, 1986). For Shulman (1986:9),

> Pedagogical content knowledge ... embodies the aspects of content most germane to its teachability. Within the category of pedagogical content knowledge I include, for the most regularly taught topics in one's subject area, the most useful forms of representation of those ideas, most powerful analogies, illustrations, examples, explanations and demonstrations - in a word, the ways of representing and formulating the subject that make it comprehensible to others… [It] also includes an understanding of what makes the learning of specific topics easy or difficult: the conceptions and preconceptions that learners of different ages and backgrounds bring with them to the learning of those most frequently taught topics and lessons.

Many people would agree that an understanding of subject content matters most for teaching in a classroom. Up until now what institutes understanding of the subject content is inaccurately clear. In the mid-1980s, a most important stride prompted a fresh upsurge of attention in the conceptualisation of teacher subject content knowledge. Shulman (1986) and his colleagues as cited by Ball (2008:389) suggested a distinct "domain of teacher knowledge that was referred to as pedagogical content knowledge". What motivated general curiosity was the submission that there is content knowledge exclusive to teaching definite subject matter that is more particular to a professional knowledge. The constant demand of the concept of pedagogical content knowledge is that it ties in the middle of subject content knowledge and the teaching practice. According to Ball (2008:389), "although the term pedagogical content knowledge is widely used, its potential has been only thinly developed".

Effective teachers use a collection of teaching strategies for the reason that there is no particular and general approach that suits all the circumstances in a classroom. Diverse strategies are used, not in the same ways with diverse groups of learners to develop their learning outcomes

(Bhowmik, Banerjee & Banerjee, 2013). Pedagogy includes a collection of teaching strategies that support knowledgeable commitment, linked to the extensive world, helpful classroom settings, as well as appreciation of difference, and should be applied through all learning and subject areas (Bhowmik, *et al.*, 2013). Pedagogical practices encourage the interests of learners and teachers, as well as the school community.

According to Bhowmik *et al*. (2013), pedagogy advances learners' as well as teachers' self-confidence and underwrites to their wisdom of determination for being at school. Pedagogy also helps the community to build self-confidence in the quality of learning as well as teaching in the school (Bhowmik, *et al.*, 2013). According to Bhowmik, *et al*., (2013:1), "some teaching strategies are well suited to teach certain skills and fields of knowledge than the other. Some teaching strategies are better suited to certain learner background, learning styles and abilities".

2.17 The necessity for pedagogical technique in Agricultural Science education

The teaching of Agricultural Science in secondary schools includes learning agricultural basic knowledge, comprehending agricultural concepts, problem-solving and environmental systems (Sahin, Kumar, & Altun, 2016). According to the same authors, Agricultural Science teachers in secondary schools must use suitable pedagogical techniques to facilitate a deeper understanding of the subject, as well as the learning of specific Agricultural Science content in the classroom. It is essential for a teacher to teach Agricultural Science content with basic scientific concepts and be able to respond to the queries of learners (Sahin, *et al.,* 2016). According to Okanlawon and Akanni (2009), Agricultural Science teachers must be aware of what is going to be taught in the classroom and how to do it perfectly and efficiently for learners to assimilate the learned content without difficulties.

Therefore, for effective teaching of Agricultural Science in secondary schools, creative teaching behaviour, well-defined classroom management principles, encouraging interpersonal responsibilities, and personal qualities are essential performance areas for an effective Agricultural Science teacher (Roberts & Dyer, 2004). An Agricultural Science teacher must be able to identify suitable teaching approaches to effective teaching and learning of the subject content (Modebelu & Nwakpadolu, 2013). According to the same authors, this involves the teacher's abilities to effectively plan the lesson instructions and utilise adequate teaching skills, teaching methods per topic or theme and teaching aids.

2.18 Challenges of teaching and learning Agricultural Science in specific schools

Agriculture is regarded as one of the backbones of human livelihood worldwide. This has prompted the introduction of Agricultural Science in both combined and senior secondary schools in Namibia. According to Darko, Yuan, Simmons, Abbey, Liu and Kumi (2016:2604), "in the United States of America for instance, formal Agricultural Science programmes are pursued in secondary schools, community colleges and universities". This state of affairs is not significantly different in African countries, including Namibia.

Therefore, among the objectives of the Agricultural Science curriculum in secondary schools in Namibia and elsewhere in Africa are to support the learners to cultivate a culture of "self-resilience" in agricultural practices, make evident that agriculture is a commendable and moneymaking means of support, and to boost expertise necessary in carrying out agricultural practices (Darko, *et al*., 2016). This is to promote a professional point of view in agriculture and to empower schools to take vigorous starring role in countrywide growth through agricultural activities (Darko, *et al*., 2016).

In Namibia and all over the world, education is understood as fundamental to economic growth and this cannot be accomplished devoid of justifiable outlay in "human capital" through teaching and learning. It is for this reason that teacher preparation in Namibia through the University of Namibia has remained dedicated to making the subject of teacher training the foundation stone of the approach to develop basic education quality and increase learning outcomes in public and private schools in Namibia. Effective teaching and learning of Agricultural Science hinge on the availability of the required teaching and learning resources. The availability of teaching and learning resources add to the effectiveness of teaching and learning, as these are fundamental things that can bring about high academic performance of learners (Darko, *et al*., 2016).

According to Darko, *et al*. (2015), teaching and learning of Agricultural Science as a practical science subject is composed of learning specifics, instructions, appreciative of simple practical main beliefs of concepts and clarification of concepts, as well as practical marvels. It is therefore necessary for teachers to apply suitable pedagogy to bring to good understanding as well as learning of specific learning responsibilities (Darko, *et al.*, 2015). It is essential that facets of Agricultural Science similar to learning specifics, instructions, appreciative of simple practical main beliefs of concepts and clarification of ideas, as well as "practical phenomena" necessitate a good sympathetic capacity to resolve related complications by learners in a classroom. Regrettably, learners have a tendency to learn by rote concepts that call for "analytical thinking" and "elementary knowledge" in the concept concerned owing to the subject persistently being taught theoretically than practically during the teaching and learning process in a classroom (Darko, *et al.*, 2015).

The specifics, concepts and instructions of Agricultural Science are learned by rote learning by learners, but repeatedly these specifics, concepts and instructions are not tied to the context that would allow learners to present the subject content in a logical manner. Ultimately, learning does not effectively and efficiently take place (Darko, *et al.*, 2015). It is essential for a trained Agricultural Science teacher to be acquainted with what choice to make, when to make such choice and the distinct effects of such choice on the teaching and learning of Agricultural Science during the teaching and learning process in a classroom (Darko, *et al.*, 2015).

Agricultural Science as a school subject consists of many practical activities and this requires a good supply of resources to successfully carry out the practical activities. Therefore, the lack of financial resources significantly impede the effective teaching and learning of Agricultural Science in schools. According to Awuku, Baiden, Brese and Ofosu (1991), a shortage of schoolbooks, poor management and poor funding are among the underlying forces that slow down the teaching and learning of Agricultural Science in schools. In the same way, Ssekamwa (2009) as cited by Darko, *et al.* (2016) pointed out that a shortage of financial resources and lack of funds to conduct practical activities such as educational excursions and hands-on practical activities have significantly reduced the effectiveness of carrying out such educational experiments that are essential for effective teaching and learning of Agricultural Science in schools. This has led to the theoretical teaching and learning of Agricultural Science in schools (Darko, *et al.*, 2016).

According to Wootoyitidde (2010) as cited by Darko, *et al.* (2016), Agricultural Science as an applied science necessitates amenities such as land, tools and well-equipped laboratories for effective teaching and learning of the subject. These amenities entail many financial resources, which many schools are not able to afford and hence affect the teaching and implementation of the Agricultural Science curriculum in a classroom. Generally, it is essential for learners to learn and practice Agricultural Science skills with facilities such as land, equipment, tools and other inputs such as inorganic fertilisers and seeds.

2.19 Summary of the chapter

This chapter reviewed related literature and gave an in-depth account on improving teaching and learning, the perceived competencies and needs of Agricultural Science teachers with the view to providing the theoretical basis of the study. Particular attention in this chapter was given to the following components: the national curriculum for basic education in Namibia, improving teaching and learning of Agricultural Science in secondary schools, perceived competencies of Agricultural Science teachers, perceived needs of Agricultural Science teachers, and effective teaching and learning of Agricultural Science in a classroom.

Furthermore, professional needs of Agricultural Science teachers, teaching and learning resources available for effective teaching of Agricultural Science and lesson planning and instruction has been discussed. The literature review also covered the importance of subject content knowledge, importance of pedagogical content knowledge and the challenges of teaching and learning Agricultural Science in secondary school. The chapter concluded with a detailed discussion on the challenges of teaching and learning Agricultural Science in secondary school. The information provided in this chapter is essential to enable a complete analysis of the issues that may emanate from the research findings. The next chapter discusses the conceptual framework underpinning this research.

CHAPTER 3: CONCEPTUAL FRAMEWORK

3.1 Introduction

This chapter presents the conceptual framework that underpins this study. The scope of this study necessitates a conceptual framework, which to a greater degree assimilates all the major components under investigation. The foremost intention of this chapter is to provide the framework that guides the researcher in the analysis, as well as interpretation of the data obtained from the Agricultural Science teachers using a questionnaire and follow-up interviews.

A conceptual framework is a coherent and inclusive theoretical framework developing from the inductive process whereby small concepts of preceding literature, theories and other relevant data are joined together to articulate an enormous map of likely associations (Imenda, 2014). According to (Imenda, 2014:189):

> A conceptual framework may be defined as an end result of bringing together a number of related concepts to explain or predict a given event, or give a broader understanding of the phenomenon of interest – or simply, of a research problem.

A conceptual framework is used in research to sketch potential reason of action, or to show a favoured method to an act or thought (Adom, Hussein, & Agyem, 2018). In other words, it can also work as a lens to provide consistency for an empirical inquiry (Adom, *et al.*, 2018).

Therefore, the conceptual framework of this study is in two two key dimensions. The first key dimension provided details of the perceived competencies of the Agricultural Science teacher as the variables in a study such as pedagogical knowledge, pedagogical content knowledge, communication skills, collaboration skills, inter-personal skills, social responsibility, reasoning and problem solving skills and decision-making skills. These variables are referred to in the conceptual framework as the primary issues because they form the basis of the entire study (Adom, *et at.*, 2018). In other words, these variables encompasses the issues that provoked the researcher to engage in this study in order to address the research hypothesis of this study.

The second key dimension of the conceptual framework of this study provided details on the perceived needs of Agricultural Science teachers as the variables in a study such as tools (available resources), in-service training needs (workshops, short courses and seminars), ICT skills and formal further training. These variables are also referred to in the conceptual framework as the most important issues because they form the basis of the entire study (Adom, *et at.*, 2018). Therefore, the conceptual framework of this study is used by the researcher as an explanation of how the research problem would be explored as it presents an integrated way of looking at a problem under study (Imenda, 2014). The conceptual framework used in study is presented in a diagrammatic form, followed by explanations of the variables.

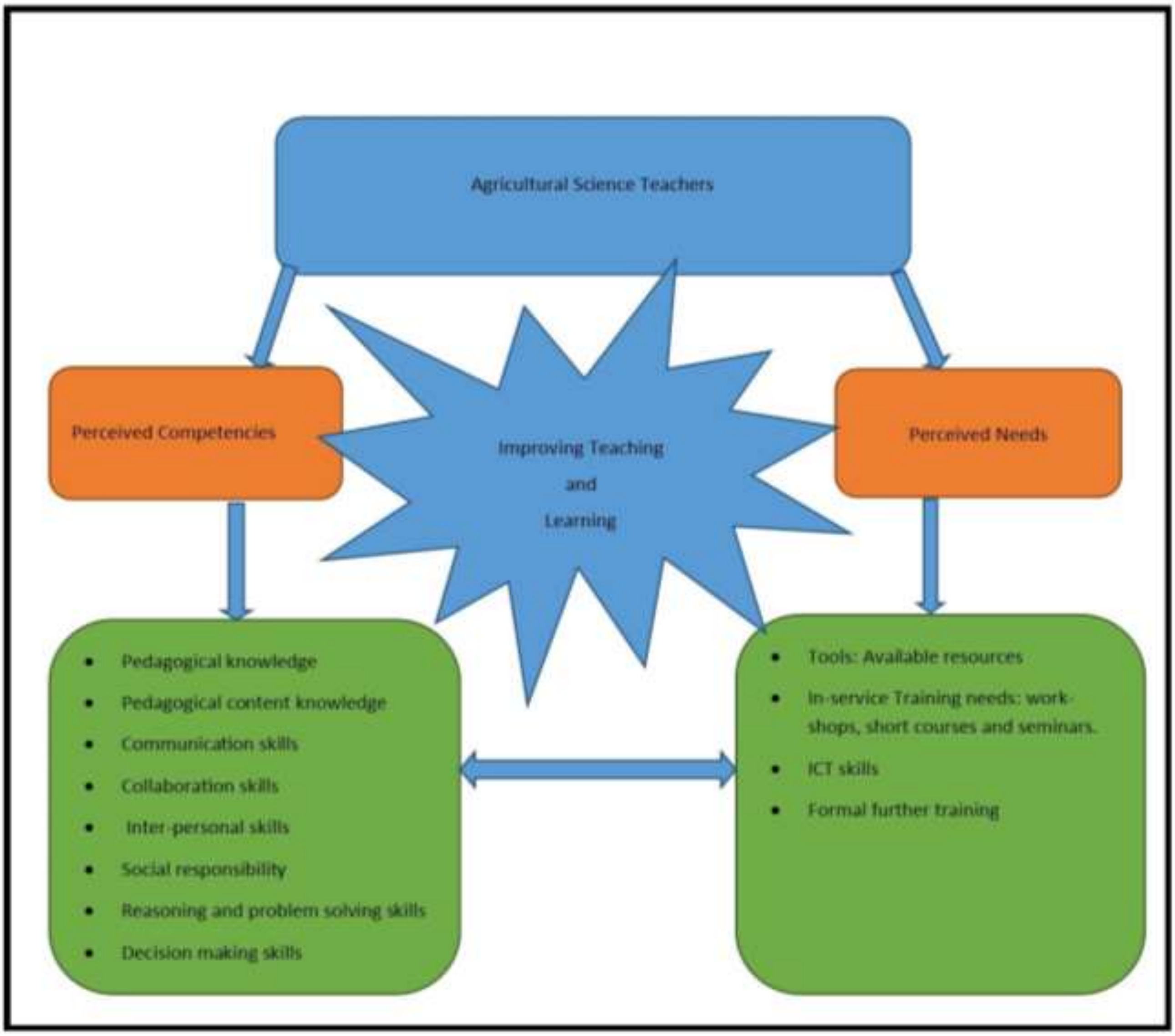


Figure 3.1: Conceptual Framework of the study

Figure 3:1 above shows the conceptual framework for Agricultural Science teachers' perceived competencies and needs. A detailed elaboration of the framework now follows, focusing on the two key dimensions of perceived competencies and perceived needs.

3.2 Perceived Competences of Agricultural Science Teachers

3.2.1 Pedagogical knowledge and pedagogical content knowledge

The education that every teacher receives in college/university focuses on pedagogical and subject knowledge on broader perspectives. Agricultural Science teachers in the Zambezi region lack pedagogical knowledge and as a consequence pedagogical content knowledge too. According to Cochran (1997:1):

> Pedagogical content knowledge is a type of knowledge that is unique to teachers, and is based on the manner in which teachers relate their pedagogical knowledge (what they know about teaching) to their subject matter knowledge, (what they know about what they teach).

Therefore, when contemplating the teaching of Agricultural Science in secondary schools, the pedagogical content knowledge of Agricultural Science teachers cannot be overlooked. In fact, pedagogical content knowledge is the most important component of effective teaching practice and is significant to teachers' curriculum decisiveness at the classroom level (Jones & Moreland, 2015). According to Jones and Moreland (2015:66):

> Good teacher knowledge of subject content was found to have a positive effect on decision-making related to changing pedagogical strategies for creating better learning opportunities. In addition, sound content knowledge seems to have a positive effect on planning, assessment, implementation of curriculum and curriculum development.

Therefore, it is important to note that Agricultural Science teachers require a variety of pedagogical approaches to harmonise the scope of classroom context. According to Jones and Moreland (2015:66), for Agricultural Science teacher to create a perfect decision about what and how to teach needs rigorous knowledge and broad pedagogical knowledge. As described by Shulman (1987:9), pedagogical content knowledge is "the most useful form of content representation … the most powerful analogies, illustrations, examples, explanations and demonstrations … the ways of representing and formulating the subject that makes it comprehensible for others".

In this understanding, when doing the job of teaching, the broad knowledge acquired during college/university training needs to be re-aligned towards meeting the specific job requirements depending on the complexity of the working environment and the diversity of learners. Furthermore, the teaching job is undergoing daily transformation in order to meet changing societal demands. Moreover, as the education system increases in complexity in a rapidly advancing world, teachers are faced with great challenges in updating their technical and professional skills that must be acquired to meet the complexity and diversity of the learners. Depending on a teacher's work environment, the competencies and skills needed to satisfactorily deliver in teaching Agricultural Science to junior and senior secondary school learners may vary. The specific competencies and skills that are needed by teachers are now discussed.

3.2.2 Communication Skills

Communication is an important competency for every teacher who takes up teaching as a career (Prozesky, 2000 & Mikre, 2011). According to the same authors, an effective teacher is supposed to be an effective communicator. With different verbal and non-verbal communication skills, an effective Agricultural Science teacher has the ability to take difficult concepts and effectively communicate them in a way that can easily be understood by the learners (Prozesky, 2000). Thus, fluent communication is critical in Agricultural Science's content delivery and the attainment of the learning objectives. Agricultural Science has specialised terms and registers, and if these are not communicated in an appropriate manner during teaching, learners' understanding and participation in the classroom will be adversely affected. This also has an extended effect on their performance, especially in tests and examinations (Mikre, 2011).

3.2.3 Collaboration Skills

In order to improve teaching and learning, effective collaboration among Agricultural Science teachers is critical (McClure, 2006). According to McClure (2006), collaborative skills are valued because they build a more vibrant classroom relationship between the teacher and the learners. Agricultural Science teachers may therefore need to join forces in meeting current demands and have a determined desire to work together as professionals for the benefit of the learners in the region. In improving teaching and learning, collaborative teaching among Agricultural Science teachers is important because it helps to generate innovative ideas that are essential for capacity building (Gross & Witte, 2013). This promotes diverse learning settings for learners with different interests in the field of Agricultural Science (McClure, 2006).

3.2.4 Interpersonal Skills

Strong interpersonal skills are an essential perceived competency if Agricultural Science teachers are to focus on improving teaching and learning in the classroom (Jasminka & Michael, 2007). It is important to note that teachers not only interface with their professional colleagues, but they need to develop strong interpersonal skills that would link them with their learners in and outside the classroom, with school management, parents and the community. Improving teaching and learning demands collaborative efforts from all role players to achieve the learning goals (Weaver, 2005).

3.2.5 Social Responsibility

In order to improve teaching and learning in a classroom, it is a social responsibility of all Agricultural Science teachers to provide a nurturing and friendly learning environment in order for all the learners to take responsibility for their learning (Carroll & Shabana, 2010). It is important to note that Agricultural Science teachers can influence socially the attitudes of their learners, how they reason and what they turn out to be while in and outside the classroom. In order to improve teaching and learning of Agricultural Science among their learners, the social responsibility aspect requires of Agricultural Science teachers to be a model for learners to emulate (Wheeler, Colbert & Freeman, 2003).

3.2.6 Reasoning and problem-solving skills

According to Johnson (1998), it is important to understand that problems consist of a number of subjects that must be acknowledged and that need to be resolved. Therefore, the ability of an Agricultural Science teacher to improve teaching and learning of Agricultural Science in the classroom may also depend on his/her reasoning and problem-solving skills (Mettas, 2011). Competence in these skills will help the teacher to avoid conflicts with the learners during the teaching process and with other Agricultural Science teachers during interaction (Johnson, 1998 & Mettas, 2011). Reasoning and problem-solving skills will help the Agricultural Science teacher to strengthen his/her understanding and to promote positive acknowledgements about other teachers' inputs (Johnson, 1998). Reasoning and problem- solving skills are indispensable for academic as well as societal achievements (Middleton, 2005). When teachers possess problem-solving skills, they literally gain the necessary self-confidence in their capacities to make a lasting impact on their teaching and agricultural practices (Johnson, 1998). Possessing reasoning and problem-solving skills that are merged into the teaching of Agricultural Science is essential for Agricultural Science teachers, if they are to be effective in their teaching (Johnson, 1998).

3.2.7 Decision-making skills

Agricultural Science education affords the probabilities for teachers to cultivate a consciousness and knowledge of the significance of making knowledgeable choices that contribute to the improvement of humanity (Mettas, 2011). Such consciousness and knowledge develops Agricultural Science teachers' intellect and inspires a tendency to mirror more critically and take informed decisions on teaching (Patronis, Potari & Spiliotopoulou, 1999). Therefore, it is important to understand that the most vibrant characteristic of an Agricultural Science teacher is to empower learners to make intelligible decisions (Mettas, 2011).

3.3 Perceived Needs of Agricultural Science Teachers

As the global economies, move forward, secondary Agricultural Science teachers face the challenge of providing learning experiences that prepare their learners to enter the job market or to pursue tertiary education opportunities (Cannon, Kitchel & Duncan, 2012). Budget cuts due to the economic meltdown in Namibia in recent years added to the challenges of meeting the education needs of secondary Agricultural Science learners in the Zambezi.

Therefore, in order to prepare learners for the job market and possible admission to tertiary institutions, secondary agricultural school teachers are required to keep abreast of the needs of learners and also to stay at the forefront of good teaching practices related to the subject content, practical activities and teaching methodology (Cannon, *et al.*, 2012). To be able to meet these demands, secondary Agricultural Science teachers' perceived needs need to be met by all stakeholders, particularly the Ministry of Education, which is the custodian of the education sector in Namibia. Therefore, the perceived needs of Agricultural Science teachers include the following: tools (available resources, in-service training needs, ICT skills and formal further training.

3.3.1 Tools (available resources)

According to Daluba (2012), effective teaching of Agricultural Science depends on teacher competencies such as teaching experience, knowledge of the subject content, teaching methods use and availability of teaching resources. It is important to note that teaching resources are certainly linked to the academic performance of learners (Daluba, 2012). Agricultural Science teaching is more effective when teaching and learning resources are available and are appropriately used (Daluba, 2012). According to Jiriko, Olorunaiye, Nwafulugo and Omengala (2015), the teaching of Agricultural Science can be made more effective if Agricultural Science teachers have knowledge of how to use available local resources.

3.3.2 In-service training needs

For teachers to improve and sustain their teaching, workshops, seminars and short courses are continuously needed (Oluwole & Ige, 2014). It is because of the need for the development of competencies of Agricultural Science teachers that continuous teacher training is needed through in-service teacher education programmes (Oluwole & Ige, 2014). According to Oluwole and Ige (2014), in-service training is an essential component in being responsive to the paucity of teachers' competencies. Agricultural Science teachers need to keep abreast of agricultural development and technology to be effective (Oluwole & Ige, 2014).

According to the same authors, teachers need to improve their academic knowledge and enhance their skills while on the job in order to be effective teachers. Therefore, Agricultural Science teachers need carefully planned in-service training programmes throughout their teaching career (Oluwole & Ige, 2014). According to Emeya (2017), the underlying principle of in-service training of Agricultural Science teachers is to develop their teaching attributes, subject content knowledge, skills, competence and success in their teaching.

3.3.3 ICT skills

ICT has become one of the basic building blocks of teachers in recent times and the mastery of ICT skills in education is an essential need among teachers (Al-Ansari, 2006). According to

Al-Ansari (2006), the education sector globally has been affected by ICT, which without doubt has also affected the teaching and learning process in a classroom. As reported by Al-Ansari (2006), a great deal of research has confirmed that ICT has benefits for teachers in enhancing the quality of their teaching. According to (Yusuf, 2005), ICT has the potential to improve the quality of teaching, research and also accelerate, improve and cultivate the motivation of teachers. ICT could help teachers to communicate more effectively, what they are required to teach in a classroom and at the same time strengthen their teaching (Yusuf, 2005).

3.3.4 Formal further training

In the quest for improving teaching and learning, formal further training opportunities for serving teachers is important (Kunzman, 2003). According to Kunzman (2003), trained teachers in secondary schools are one of the single-most important factors influencing learner academic performance. Trained teachers assist learners to cultivate the ways of thinking and understanding that are fundamental for academic success. In order to achieve increased levels of performance, the development of skills and knowledge among service teachers is important.

According to Mokhtar (2010), trained teachers are typically more efficient. Teachers therefore need further formal training in order to improve their competency. Further formal training among Agricultural Science teachers is important because it helps to open up opportunities of individual teachers and increases the value of teachers to the school (Mokhtar, 2010).

3.4 Summary of the chapter

This chapter gave an account on the conceptual framework that underpinned the essence of this study. Particular attention was given to the perceived competencies of Agricultural Science teachers, such as pedagogical knowledge and pedagogical content knowledge, communication, interpersonal, social responsibility, reasoning and problem-solving and decision-making skills. The chapter further gave an account on the perceived needs of Agricultural Science teachers, such as available resources, in-service training needs, ICT skills and formal further training needs. All the variables indicated in the conceptual framework have been utilized in the study to analyse the research hypothesis of the study.

The conceptual framework provided a focus or lens for analysing and interpreting the data. The key concepts comprising the conceptual framework guided the formulation of the survey items and interview questions and as a consequence the data that were produced. Following the data production, the conceptual framework was used to guide the analysis and interpretation of the data. The next chapter discusses in detail the different methods, which were employed in the collection, analysis, presentation and interpretation of data generated in this study. In the next chapter, the researcher affords a framework of the research methodology of the study and examines improving teaching and learning in the Zambezi region, Namibia, and the perceived competencies and needs of secondary school Agricultural Science teachers.

CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1 Introduction

This chapter discusses in detail the different methods, which were employed in the collection, analysis, presentation and interpretation of data generated in this study. The components that are discussed in this chapter include the following: research design, study area, target population, sample and sampling, data collection, reliability and validity, data analysis and ethical considerations.

4.2 Research design

Christensen (1994:293) defines a research design as "the outline, plan or strategy; specifically the procedure used in seeking an answer to the research question(s). It specifies how to collect and analyse data". The study adopted a descriptive survey research design. Survey research design is a plan, structure and strategy that the researcher employs in response to a research problem using a questionnaire in collecting, analysing and interpreting data.

A descriptive design allows for the total description of an occurrence (Leedy & Ormorod, 2001). Leedy and Ormorod (2001) aver that descriptive research scans a circumstance as its stands. It is used in an effort to enable the researcher to obtain detailed information that will describe the existing phenomenon by probing individuals about their perceived competencies and needs (Leedy & Ormorod, 2001). Adoption of a descriptive survey research design enables the researcher to reach as many participants as possible within a reasonable period of the study and in gaining insights into the existing situation (Singleton & Strants, 2005) and (Babbie, 2010). Survey research is used,

> to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyse trends across time, and generally, to describe what exists, in what amount, and in what context" (Isaac & Michael, 1997) as cited by (Glasow, 2005:1).

There are three features of a survey research design: first, survey research is used to quantitatively describe specific aspects of a given population. These aspects usually encompass scrutinising the associations among variables. Second, the data necessary for a survey are typically collected from people and are therefore biased. Finally, survey research uses a carefully chosen quota of the population from which the findings of the study can in the end be generalised to the entire population (Glasow, 2005).

According to Glasow (2005:1), "in a survey research, independent and dependent variables are used to define the scope of the study, but cannot be explicitly controlled by the researcher". It is important for the researcher before conducting a survey to establish a model that ascertains the potential association that may exist among these variables. A survey is then built to examine this model compared to the observations of the phenomena (Glasow, 2005).

Therefore, a survey is capable of obtaining information from large samples of the population and is suitable to gather demographic data that describe the composition of the population (McIntyre, 1999). As stated by Glasow (2005), due to the high representativeness brought by the survey approach, it is often easier to find the statistical significant results than through using other data-gathering methods. With the application of a survey, multiple variables can also be effectively analysed (Glasow, 2005).

According to Bell (1996), a survey is more inclusive in the types and numbers of variables that can be studied, require minimal investment to develop and administer, and are relatively easy for making generalisations. Surveys can also elicit information about attitudes that are otherwise difficult to measure using observational techniques (McIntyre, 1999). It is therefore important to note that surveys only provide estimates for the true population, not exact measurements (Salant & Dillman, 1994).

Surveys are in general not appropriate where an understanding of the historical context of an occurrence is required (Pinsonneault & Kraemer, 1993). According to Bell (1996), biases may occur, either in the lack of response from intended participants, or in the nature and accuracy of the responses that are received. On-purpose misquoting of behaviours by participants to complicate the survey or to hide inappropriate behaviour are thought to be the other causes of inaccuracy in the surveys (Bell, 1996). The other disadvantage of surveys is that participants may have trouble evaluating their particular conduct or have poor ability to remember the state of affairs surrounding their conduct (Pinsonneault & Kraemer, 1993).

Therefore, for this study a survey research design was employed because all combined and secondary school Agricultural Science teachers in the Zambezi region participated in the study. In addition, the data being gathered possesses a better description of the relative characteristics of all Agricultural Science teachers in combined and secondary schools in the study area. The choice of this approach was based on the fact that, matched with other methods of data gathering, surveys are able to extract data that are near to the exact characteristics of the population.

For this study, a survey will include a quantitative component and a smaller qualitative component (Creswell, 2014). Mixed method approaches were used because the problem the researcher investigated required the researcher to collect both qualitative and quantitative data, that the researchers' mixed methods approach was a sequential one where the qualitative component followed and enriched the findings of the quantitative study.

4.3 Types of surveys and steps for conducting surveys

4.3.1 Cross-sectional survey

A distinctive technique of conducting a survey is a cross-sectional survey, where a set of data is collected for a sample at one point in time (Guyette, 1983). With a cross-sectional survey, data may perhaps be collected from a sample of the population or from the whole population or community (Guyette, 1983). When data are analysed from a cross-sectional survey, the outcomes can be different from tabulations of answers on a particular question to more complex analysis ascertaining the associations among variables. Despite the fact that the data are collected at the same period with cross-sectional survey, there are ways and means of comparing items or looking at the variations (Machin & Campbell, 2005).

4.3.2 Longitudinal survey

A longitudinal survey involves following the development of a study's participants over time (Guyette, 1983; Machin & Campbell, 2005) in collecting data from the same group at different points in time (Guyette, 1983). One of the main challenges likely to be experienced by a researcher when following the same group of participants over an extended period is the withdrawal of the participants from the study due to various reasons (Guyette, 1983). In a longitudinal survey, it may be sometimes be possible to use the previous results for a past perspective, and follow up with the same set of questions in a current study (Guyette, 1983).

Although this method carries an advantage of reduced time and funds, it also requires caution in ensuring that the questions are asked in the same way at the different points in time as done in the previous study (Machin & Campbell, 2005).

4.3.3 Steps for conducting a survey

According to Guyette (1983:49-59),

> The following steps are intended as a general outline of the methods generally used in conducting a survey:
>
> - Defining the purpose of the survey is an important first step in developing the research design. The more tightly focused the study, the more useful the results are likely to be for community development.
> - Locating previously conducted surveys on the similar aspect is a step that would enable the researcher to discover examples of different types of survey design and appropriate instruments to be used for data collection.
> - Deciding on the type of survey design that will best accomplish the goals and objectives of the study is a critical step in the survey process.
> - Selecting the sampling methods to be used related to the type of survey design and to the population included in the study.
> - Deciding on the method of collecting the data is an important step in designing the survey. The most common methods of data collection are the questionnaire and interview schedule, though organisational records, census data and the data from previously conducted surveys sometimes supplement these types of data. A questionnaire is a set of questions that are answered directly on paper by the participants, while an interview schedule is a set of questions that are asked of the participants in an interview.
> - Conducting a pre-test with the questionnaire or interview schedule is a step to minimise problems before the actual data collection begins. One of the first ways to check over the instrument is to read it over yourself to see if there are any uncertain or vague questions. Then after this preliminary check, a pre-test or trial run of the data collection method should be conducted. For

the pre-test, a sample of individuals similar to those planned for the survey sample are chosen. The pre-test provides an opportunity to see if the data collection methods are culturally appropriate, easily understood, or complete. The questionnaire or interview schedule is generally revised, or re-written, if the pre-test indicates that changes are needed.

- Collecting data involves effective use of the instruments developed for data collection.
- Follow-up is an important step to plan for the survey process, for a certain number of participants frequently do not mail back questionnaires or co-operate on the interview at the first try. With the questionnaire method, an initial response rate of less than 50% may indicate problems with the questionnaire or the method of communicating with the participants.
- An outline of how the analysis of the data will be conducted is an important part of the research design. This step is interrelated with the design of data collection instruments, for the data must be collected according to a certain format (such as numerical or descriptive) to allow for certain types of summaries.
- Reporting or sharing the results of the survey is a vital step in returning the efforts to the community.

A cross-sectional survey was used in this study to collect data from the whole population (all Agricultural Science teachers in the Zambezi region teaching grades 8 to 12) at one point in time. For this study, a cross-sectional survey was conducted using self-administered questionnaires and follow-ups of face-to-face interviews. In this study, face-to-face interviews were used to minimise non-response and maximise the quality of the data collected. The following steps were used in this study in planning a cross-sectional survey:

- **Defining the study population** – for this study the population was clearly defined. The target population of this study comprised all combined and secondary school Agricultural Science teachers (150 teachers in total i.e. 82 males and 68 females) in 65 secondary schools in the Zambezi region. Defining the population of this study helped the researcher to narrow the scope of the study and focus only on combined and secondary Agricultural Science teachers in the Zambezi region. This was important in ensuring that the researcher remained focused only on this particular group of teachers. Defining the study population also helped the researcher to stay on the right path during the whole study and to ensure that results would apply to the identified population at the conclusion of the study. Narrowing the study population to Agricultural Science teachers made the study more manageable in terms of time and resources.

- **Collecting the data** – Data collection marked the commencement of the study. The collection of data was a critical stage in proving the information needed to answer the research hypothesis of this study. In this regard, structured questionnaires were used to collect quantitative data on the Agricultural Science teachers' perceived needs and competencies in teaching and conducting practical experiments in Agricultural Science, agricultural teachers' qualifications, teaching methods and availability of teaching and learning resources in secondary schools. Follow-up interviews were also used to collect qualitative data from the participants.
- **Analysing the data** - All the time, effort and resources that were dedicated to the component of defining the study population and collecting the data of this study culminated in this final step. Therefore, the results of the analysis were then reviewed and summarised in a manner directly related to the research hypothesis of this study.

4.4 Study Area

4.4.1 Geographical Location

The study area is located in the north-eastern part of Namibia (Figure 4:1). The Zambezi region is one of the 14 regions (Figure 4:1), which were declared by the Namibian government in 1991 and 2016. In 1998, the boundary of the Zambezi region was altered and currently runs through the Bwabwata Game Reserve to southeast of Omega. The western part of the new boundary was added to the newly formed Kavongo East region. The Zambezi region covers an area of just over 20 000 km^2 and the region stretches plus minus 450km^2 from east to west and up to plus minus 110km^2 from north to south. The Zambezi region is divided into three separate areas (Zeller, 2000):

- The western-most part of the Zambezi, the area between Kavango region and the Kavango river,
- Western Zambezi game park, the area between Kavango and the Kavango river,
- Eastern Zambezi region, the area covering the Kwando to Impalila Island in the eastern-most corner.

Geographically, the Zambezi region branches out from the rest of Namibia and extends almost to the middle of southern Africa. "The Zambezi region is a strip between Angola in the north and Botswana in the south and borders with Zambia to the north-east. The Zambezi region is located on latitude 17°30′00″S and longitude 24°16′00″E based on the World Geodetic System (WGS) 84 coordinate reference system. The area is blessed with arable land and sufficient rainfall" (Abah, Mashebe, Ubwa, & Onjefu, 2015:30). The Zambezi region borders were largely defined at the Berlin Conference of 1890 and the borders follow rivers or carefully worked out straight lines (Zeller, 2000). The Zambezi region is part of the Kalahari Basin (Zeller, 2000).

The average temperature of the study area is swathed in adequate sunlight, with stable eastern wind flows, less evaporation and high rainfall, and is considerably warmer than the rest of the country (Mashebe, Andries & Zulu, 2016). This makes the study area a perfect habitat for most vegetation to flourish very well (Mendelsohn & Roberts, 1997). The area is characterised by heavy rainfall seasons, which begins in November through to mid-April of the subsequent year. In periods of high rainfall, the average rainfall of the study area is approximately 700mm per annum. The highest rainfall is normally recorded in the months of December and early January of the subsequent year.

However, in periods of poor rainfall, the study area normally receives an average rainfall of less than 300mm. In 1969, 1978 and 2009 floods matched up with the annual peak of rainfall input within the study area and the upper catchments in Zambia (Mashebe, *et al.,* 2016). The records of mean temperatures obtained from the meteorological station in the Zambezi region vary significantly, and point to in the course of winter periods temperatures of less than 5^{o}C can be recorded and +39^{o}C in summer can be recorded (Mashebe, *et al.,* 2016).

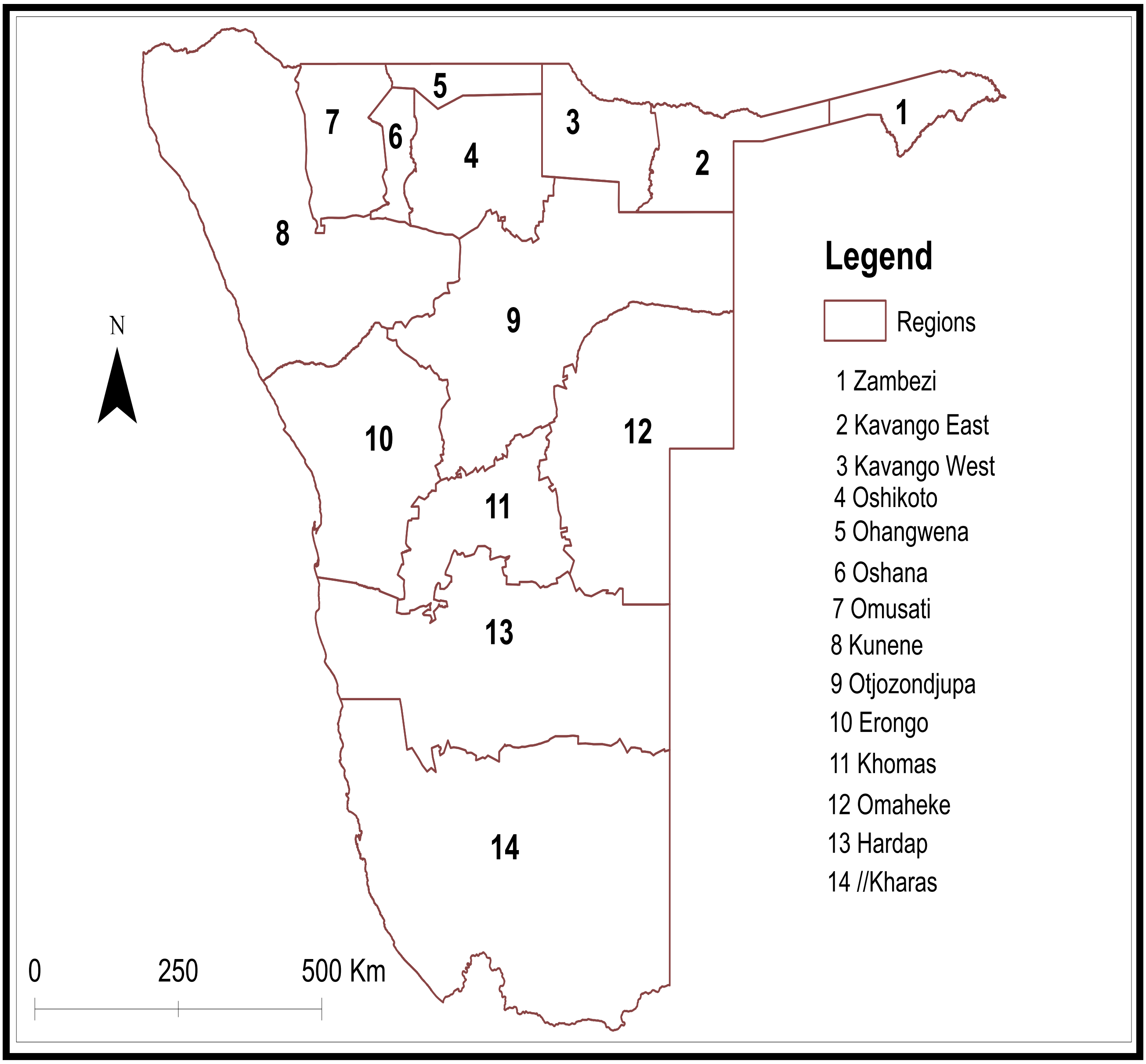
The climate of the study area can be categorised into two distinct periods: the dry period (late April and November) and the wet period (November to early April) (Mashebe, *et al.*, 2016). It is important to note that the rainfall pattern in the study area is significantly variable. This variation of the rainfall pattern of the study area has direct effects on the education and general livelihoods of the rural communities in the study area (Mashebe, *et al*., 2016). In certain periods, this variation exposes them to heavy flooding; making it difficult to access schools and other essential services such as health, and sometimes it exposes them to poor crop production, leading to starvation of the affected community, especial school-going children and the elderly (Mendelsohn & Roberts, 1997).

There are 65 secondary schools in the Zambezi region, which are clustered into five circuits and each circuit has an education inspector allocated to it. Among the 65 secondary schools, 10 are senior secondary schools (which cater for grades 11 and 12) and 20 are junior schools (which cater for grades 8 to 10) and 35 are combined schools (which cater for grade 0 to 10) with a total of approximately 150 Agricultural Science teachers (Ministry of Education, 2015).

A combined school in the Namibian context is a school that includes grades from lower primary through to junior secondary level (grades 0 to 10) under one roof. There are currently approximately 82 (55%) male and 68 (45%) female teachers respectively. Among the approximate 150 combined and senior secondary schools Agricultural Science teachers, just about 35% are less experienced in teaching Agricultural Science as a school subject.

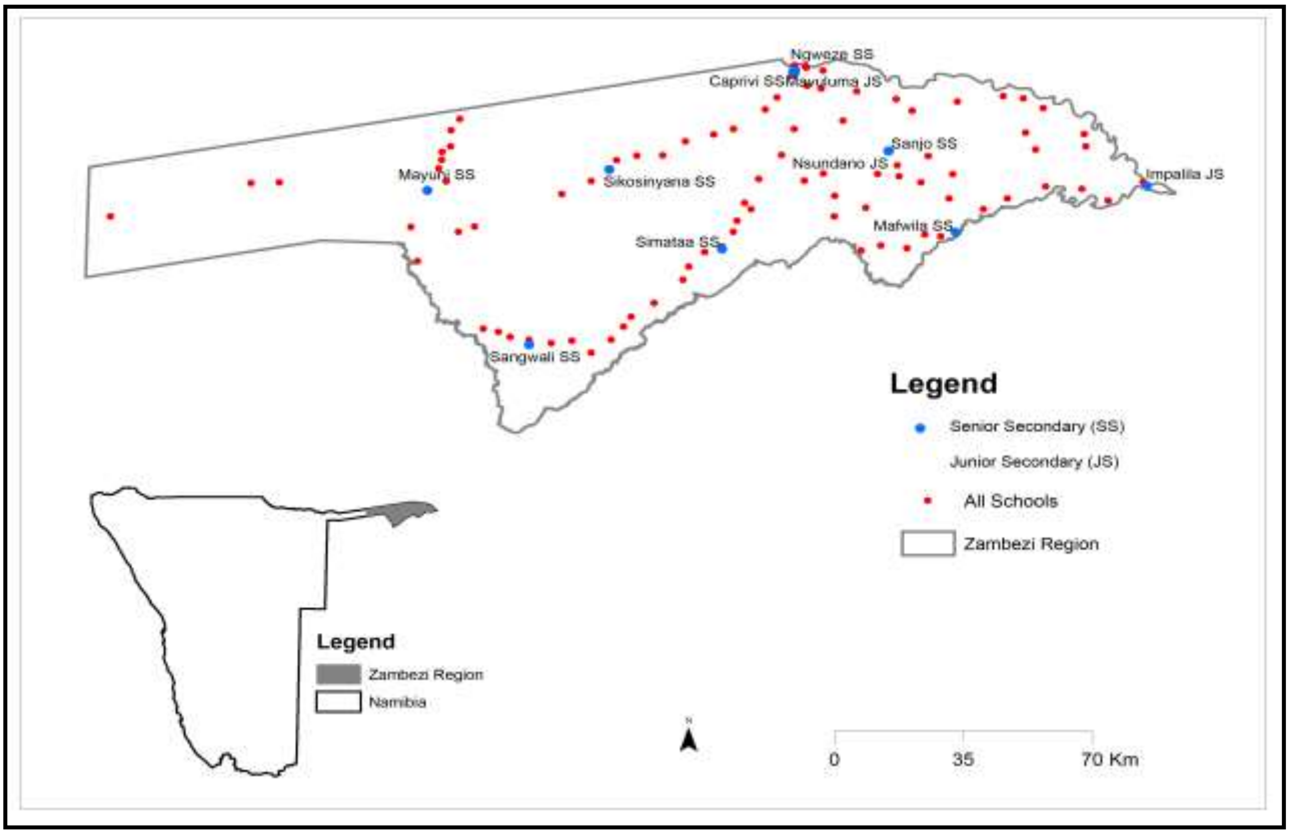
4.4.2 Agricultural activities in the study area

Subsistence farming and fishing are the predominant agricultural activities for the people in the study area (Figures 4.1 & 4.1) and "this makes up the social wellbeing, demography and the economic status" (SPC, APF, & SEIEA, 2015:57-70) of the community. The communities in the study area are engaged in cash-crop farming on a small scale; mainly on the Fluvisol soil type with limited application of external inputs, such as inorganic fertilisers. No irrigation systems are used in this area, with farmers rather practising only dryland farming. Cattle and chickens are evident in nearly every village throughout the study area. Sale proceeds from cattle, harvested cash crops and chickens provide extra income towards community members' sustainability.



Source: (Mashebe , 2018)

Figure 4.1: Map of Namibia with all the regions



Source: (Mashebe, 2018)

Figure 4.2: Map of schools in the Zambezi region

4.5 Target Population

The target population of this study consists of all combined and secondary school Agricultural Science teachers (150 teachers in total) teaching grades 8, 9, 10, 11 and 12 in 65 schools in the Zambezi region.

4.6 Sample and Sampling

The Zambezi region has 65 public secondary schools (10 senior secondary and 55 combined schools) which are co-educational, and eight senior secondary schools, which are hostel schools. Since the numbers of secondary Agricultural Science teachers in the Zambezi region are low, all Agricultural Science teachers in the 65 schools were included in the study. Eight Agricultural Science teachers from five secondary schools were used in the pilot study and 142 from 60 secondary schools were used in the actual study.

Purposive sampling was used to select 12 teachers (6 males and 6 females) for participating in the follow-up interviews in which the researcher probed further into teachers' perceived needs and competencies (Table 4:1). Eight of the interviewees were drawn from combined schools, while four were drawn from senior secondary schools. The number of interviewees that were drawn from combined schools was more than the number of the interviewees drawn from senior secondary schools. This was because the number of combined schools (55 schools) in the region are more than that of the senior secondary schools (10 schools).

The participants were drawn from four rural combined schools, four urban combined schools, two rural senior secondary schools and two urban senior secondary schools. To qualify for selection for the follow-up interviews, a teacher must have been teaching Agricultural Science in combined and secondary schools in the Zambezi region. The follow-up interview was carried out with one participant at a time. In order to avoid missing out information during the interviews, a voice recorder was used and later the interviews were transcribed (Barreiro & Albandoz, 2001). Table 4.1 below represents a list of schools from which teachers were purposively selected to participate in this study.

Table 4.1: Purposive selected Agricultural Science teachers for the follow-up interviews

Name of School	Urban	Rural	Participants
Sachinga Combined School		**X**	2
Kayenda Combined School		**X**	1
Kasheshe Combined School		**X**	1
Liselo Combined School	**X**		1
Mavuluma Combined School	**X**		2
Sikosinyana Senior Secondary School		**X**	1
Caprivi Senior Secondary School	**X**		1
Ngweze Senior Secondary School	**X**		3
Total	**4**	**4**	**12**

4.7 Data Collection Instruments

Data collection is a systematic way of gathering information, which is relevant to the research objectives (Orodho, 2014). The data were collected using structured questionnaires and follow-up interviews.

4.7.1 Questionnaires

The structured questionnaires were used to collect quantitative data on the teachers' perceived needs and competencies in teaching and conducting practical experiments in Agricultural Science, agricultural teachers' qualifications, teaching methods and availability of teaching and learning resources in secondary schools. The questionnaires were used for this study since they are deemed more cost-effective and easy to administer, as well as to analyse. In addition, questionnaires bring about many essential data and provide more depth of response from the participants. A structured questionnaire is one in which the questions asked are specifically decided in advance.

Certain question items were adopted and modified from the Pan-Canadian Assessment Programme (PCAP) (PCAP, 2010) and Centre for Study of Learning and Performance (CSLP) (CSLP, 2007). PCAP is an assessment of academic attainment used in Canada and its results are significant for monitoring the advancement of secondary school learners in participating provinces and territories and used to help in improving the curriculum and teaching practices of in-service teachers and college graduate learner teachers (PCAP, 2010). The CSLP was used in Canada to learn more about teaching and learning processes used in the classroom and to critically learn more about the teaching approaches used by teachers (CSLP, 2007).

Therefore, these instruments (teachers' questionnaire and the follow-up interview schedule, *see* Appendix B and C) were improved and contextualised in this study to critically ascertain the perceived competencies and needs of Agricultural Science teachers in the Zambezi region, Namibia, covering the aspects related to teaching and learning processes, as well as the teaching strategies used by agricultural teachers in a classroom.

4.7.2 Follow-up Interviews

After preliminary analysis of the questionnaires, one-on-one follow-up interviews were used to collect additional qualitative data on the Agricultural Science teachers' professional needs and to assist in validating data produced from the teachers' questionnaires. Follow-up interviews were carried out during school hours (i.e. during participants' free periods) with the purpose of getting an in-depth understanding of what people say about a phenomenon that requires skills beyond those used in ordinary conversations (Rubin & Rubin, 1995).

According to Maree (2011:87), "an interview is a two-way conversation in which the interviewer asks the participants questions to collect data and to learn about the idea, beliefs, view, opinions and behaviours of the participants". The duration of the interviews were between 30 and 45 minutes and they were conducted in a place deemed comfortable for the participants.

The foremost purpose of qualitative interviews is to perceive the world through the eyes of the participants. The broad-spectrum purpose is to get hold of good descriptive data that will help the researcher to understand the participants' construction of knowledge as well as social reality (Maree, 2011). In practice there are three types of interviews, these are structured, unstructured and semi-structured interviews.

- **Structured interviews**

According to Maree (2011), structured interview questions are detailed and developed in advance, much as they are in survey research. In general, structured interviews make sure that participants have the same chances to offer the information and are evaluated precisely, as well as consistently (Maree, 2011). A structured interview targets trying to find facts, attitudes, knowledge and behaviour of the participants. In addition, it seeks to find truthful information devoid of influence from the researcher.

- ❖ **Advantages of structured interviews:** All participants are asked the same set questions in the same order (standardised question items); possibilities to pre-code responses using a computer to analyse the data make it easier to produce numerical data, as well as being able to quote interviews in the study; precise data that is linked directly to the research topic is easy to get and allows the researcher to prompt interviewee by providing a set of example responses (Maree, 2011).
- ❖ **Disadvantages of structured interviews:** The researcher may generate preconceived notions by the communication style that is used to give questions or likely responses;

there is restricted chance for interviewees to go further than the set questions unless incited by researcher (Maree, 2011).

- **Unstructured interviews**

Unstructured interviews often take the form of a conversation with the intention that the researcher explores with the participants their views, ideas, beliefs and attitudes about certain events or phenomena (Dana, Dawes & Peterson 2013). Participants may put forward clarifications or at times provide perceptions of events. However, the main emphasis is on their personal perceptions of the event or phenomenon being studied and usually the participants provide answers in their own words (Maree, 2011).

Generally, unstructured interviews are frequently used in baseline surveys where concepts and hypotheses have not yet been established, as well as when the complexity of the data is more important that simplicity of investigation (Jary & Jary, 1995).

- **Semi-structured interviews**

Semi-structured interviews are commonly used in research projects to corroborate data emerging from other sources. According to Maree (2011), semi-structured interviews do not allow for the examining and interpretation of the answers, in other words semi-structured interviews essentially delineate the line of inquiry.

For this study, follow-up structured interviews were used as a means to increase the consistency and trustworthiness of the data for the study and were seen as the easier and most useful option to collect data that could inform the results of the survey (Maree, 2011). Structured interviews were also used because all the participants needed to be presented with exactly the same question items in the same order (Maree, 2011).

4.8 Piloting

According to Mugenda and Mugenda (2003), piloting denotes pre-testing of the research tool by administering it to a carefully chosen sample which is comparable to the real target population or sample (in this case Agricultural Science teachers) the researcher intends to use in the study. For this study, piloting of the teachers' questionnaires was done with 8 Agricultural Science teachers from 5 secondary schools in the Zambezi region who did not form part of the actual study. The pilot study was meant to identify question items in the survey questionnaire that were unclear or imprecise to the participants and hence make the necessary corrections or revisions (de Villiers, 2011). The pilot study similarly aided the researcher in acquainting himself with the administration components of the questionnaire. In addition, the purpose of piloting the research tools was to ensure Agricultural Science teachers not only comprehend the question items but also understand them in a similar way. This was also meant to establish whether any of the question items would make the participants feel uncomfortable.

Moreover, piloting was necessary for this study to find out the duration it would take the participants to complete the survey in real time. The piloting was conducted from the first week of May 2017 to the end of May 2017. The procedures that were followed in the piloting phase of the research tools include:

- The questionnaire was administered in the same way as well as under similar circumstances as the researcher intended to carry it out in the actual data-collection process.
- Attention was drawn to cases where participants hesitated to provide answers and where they asked the researcher for clarification. In both cases, notes were taken for action and corrections.
- At the conclusion of the piloting process, the researcher asked the participants how they understood each question and the response choices of the questionnaire. The researcher went through the questionnaire once again, precisely per question item to ensure that errors were identified and corrected. The idea was to get responses from the participants of what they felt was being asked and to allow them to assist with the wording of the question items. This was important to establish the clarity of the question items of the questionnaire. The participants were also asked whether the flow of the question items needed revision. Feedback on the research tool was done by asking one participant at a time. Views and suggestions were noted for further actions.

4.9 Reliability

Reliability in this instance relates to the correctness and truthfulness of the research instrument (Krippendorf, 2004). In other words, it concerns whether the instrument will yield consistent results if administered to a similar group of participants under comparable conditions (Krippendorf, 2004). According to Mukwambo, Ngcoza and Chikunda (2015:201), “reliability is the repeatability of the outcome of a measure, and is affected less by random errors". The items of the teachers' questionnaire and interviews were carefully phrased to eliminate ambiguity following a pilot study with a smaller group that is representative of the population (Krippendorf, 2004). The reliability of the quantitative survey instrument was determined statistically by calculating the Cronbach Alpha coefficient. Cronbach's alpha offers a valuable lower bound on reliability (Debas & Athanasiou, 2009). Cronbach's alpha will in general increase when the associations among the items increase. Hence, the coefficient measures the internal consistency of the test. In this respect, its highest theoretical value is "1", and, its smallest value is "0", even though it can be negative (Debas & Athanasiou, 2009:491). A generally accepted rule of thumb is that an alpha of 0.6-0.7 indicates acceptable reliability and 0.8 or higher indicates good reliability, while 0.95 or higher indicates very high reliability, agreeing with Golafshani (2003:601) "although the term reliability is a concept used for testing or evaluating quantitative research, the idea is most often used in all kinds of research".

The following sections (Table 4:2) of the questionnaire responses were selected and the calculated alpha (based on the formula below) figures were summarised as in Table 4:2 below:

$$Alpha = \frac{n}{n-1} \times \left(1 - \frac{{\sigma_0}^2}{\sum {\sigma_t}^2}\right)$$

Where: $n = number\ of\ questions\ in\ the\ section$

$${\sigma_0}^2 = variance\ for\ all\ responses\ for\ all\ questions\ within\ a\ section$$

$$\sum {\sigma_t}^2 = sum\ of\ individual\ variances\ for\ each\ question\ within\ a\ section$$

Table 4.2: Summary of Alpha calculation for the survey items

Sections of the teacher's questionnaire	**Alpha**	**Brief Comment on Reliability of the question items of the questionnaire**
Resource Utilisation	0.79067	Good Reliability
Teaching and Learning Resources	0.87180	Very High Reliability
Physical Resources	0.93093	Very High Reliability
Time Spent on Teaching and Learning	0.85703	Very High Reliability
Learners' Abilities	0.99141	Very High Reliability
Teaching Confidence	0.91700	Very High Reliability

Teaching Challenges	0.95090	Very High Reliability
Perceived Needs	0.99404	Very High Reliability
Perceived Competencies	0.99565	Very High Reliability

(Source: Fieldwork)

4.10 Validity

As reported by Golafshani (2003), validity refers to the credibility of the research with the understanding that the instruments or procedures that will be used in the research will measure what they are supposed to measure. In this study, the research instruments (teachers' questionnaires and interview question items) were closely linked to the research's focus. The instruments were also tested for content validity by giving the questionnaire and interview question items to a panel of peers for scrutiny (Polit & Hungler, 1995). The panel determined the content validity of the questionnaire to see whether it is focused on teachers' perceived needs and competencies. It was done with the interview questions.

The panel of experts was composed of four members, one Agricultural Science senior education officer (from the Ministry of Education in the Zambezi region), two education Agricultural Science lecturers (from the University of Namibia), one senior Agricultural Science officer (from the Namibia College of Open Learning) (NAMCOL). They are classified as experts in Agricultural Science based on their academic qualifications (Bachelor of Agricultural Science and Masters in Agricultural Science respectively), as well as the vast experience they have in Agricultural Science teacher training and years of teaching and assessment of the subject in secondary schools in Namibia.

It is important to note that the concept of validity is described by a wide range of terms in qualitative studies (Golafshani, 2003). According to Winter (2000) as cited by Golafshani (2003:602), "this concept is not a single, fixed or universal concept, but rather a contingent construct, inescapably grounded in the processes and intensions of particular research methodologies and projects".

According to Lincoln and Guba (1985) as cited by Golafshani (2003), the ability to sustain the credibility of the report depends on the matters, quantitatively deliberated as validity as well as reliability. According to Golafshani (2003), the notion of ascertaining correctness through procedures of reliability as well as validity is substituted by the awareness of credibility, which is "defensible" (Johnson, 1997:282), as well as founding sureness in the verdicts (Lincoln & Guba, 1985).

4.11 Data Collection Procedure

The Ministry of Education (Zambezi regional education office) was contacted and a list of schools with the number of Agricultural Science teachers and their years of teaching experience (for each school) was obtained prior to administering the questionnaires. The questionnaires were administered and collected personally by the researcher with the purpose of improving the return rate of the completed questionnaires. The questionnaires were administered once, the duration of the completion of a single questionnaire was 30 to 45 minutes, and it was conducted in a place deemed comfortable for the participants. The specific data that the questionnaires produced included the quantitative data on the teachers' perceived competencies and needs in teaching and conducting practical experiments in Agricultural Science, agricultural teachers' qualifications, and teaching methods and availability of teaching and learning resources in secondary schools.

4.12 Data Analysis

Data analysis involves "categorising, ordering, manipulating and summarising the data and describing them in meaningful terms" (Brink, 1996:178). Data analysis also means, "the systematic organisation and synthesis of the research data and the testing of research hypothesis, using those data" (Polit & Hungler, 1995:639). "Data are empirical representations of concepts and measurement links data to concepts" (Neuman, 2006:181). The researcher will discuss both the quantitative and the qualitative data analysis as both were used in this study.

4.12.1 Quantitative Data Analysis (QDA)

According to Babbie (2010:445), "quantitative analysis involves the techniques by which researchers convert data to numerical forms and subject them to statistical analysis". Quantitative data analysis is the preparation and transformation of numerical raw data into processed and meaningful data through the application of rational and critical thinking. Quantitative data analysis may include the calculation of frequencies of variables and differences between variables, as well as the use of parametric statistical tests. Quantitative data analysis is essentially concerned with the distribution and dispersion of observed values or responses to a phenomenon of interest. “The manipulation of the observations are undertaken for the purpose of describing and explaining the phenomenon that those observations reflect” (Babbie, 2010:422).

Parametric statistics is concerned with data measurable on interval or ratio scales, so that arithmetical operations are applicable to them, enabling parameters such as the mean and standard deviation (SD) of the distribution to be defined. The analysis involves random selection of data and normal population distribution, in keeping with variance homogeneity and other assumptions.

Parametric data has an underlying normal distribution, which allows more conclusions to be drawn as the shape can be mathematically described. Anything else is non-parametric. A normality test is conducted before performing parametric tests. According to Creswell (2014) and Babbie (2010), a quantitative approach is usually associated with finding evidence to either support or reject hypotheses formulated at the earlier stages of the research process. A major benefit of a quantitative research approach is that it is possible to draw more conclusions from its analysis, which have generally a universal application. However, its major weakness is the very strict nature of application (Babbie, 2010).

The quantitative data analysis used in this study includes descriptive statistics (it deals with the presentation of numerical data in either tables or graphs form) and ANOVA. Statistica 13 computer software was used with the assistance of the Stellenbosch University statistician. The research design for this study was purely descriptive and in which the participants were engaged only once and as such only associations between variables could be established. Descriptive statistics were conducted on nominal (gender) and interval (Likert-scale) research data. As part of the results, data were tabulated for the different variables in the data set by constructing frequency and percent distributions.

This process provided a comprehensive picture of what the overall data looked like, which assisted in identifying patterns. A percentage distribution displayed the proportion of participants who were represented within each category of participants. The perceptions of participants on various perceived needs were measured on a 3-point Likert scale ranging from most preferred (3), least preferred (2) and not needed at all (1) (*see* Appendix B) and competencies were measured on a 4-point Likert scale ranging from strongly agree (4), agree (3), disagree (2) and strongly disagree (1) (*see* Appendix B). The mean and standard deviations were used to determine the level of opinion of the participants for each competence in relation to gender and teaching experience of the participants (*see* Appendix E for a detailed analysis).

Chi-Square test was used to investigate whether distributions of categorical variables such as gender, experience and needs among the participants showed statistically significance differences from one another (*see* Appendix D for a detailed analysis). ANOVA test was also used to determine whether there were any statistically significant differences between the independent variables such as gender, experience and competencies among the participants (*see* Appendix E for a detailed analysis). Percentages were calculated and presented in frequency tables, as well as bar charts and histograms.

4.12.2 Qualitative Data Analysis (QDA)

One of the most significant steps in qualitative research process is analysis of data. According to Cohen, Manion and Morrison (2007:461), "qualitative data analysis can be described as the process of making sense from research participants' views and opinions of situations, corresponding patterns, themes, categories and regular similarities". "Qualitative analysis is the non-numeric examination and interpretation of observations, for the purpose of discovering underlying meanings and patterns of relationships" (Babbie, 2010: 394). Qualitative data analysis (QDA) is the procedure of transforming transcribed data such as interviews into findings (Elo & Kyngas, 2007). According to (Flick, 2013:5-6),

> The analysis of qualitative data can have several aims. The first aim may be to describe a phenomenon in some or detail. The second aim may be to identify the conditions on which such differences are based. The third aim may be to develop a theory of the phenomenon under study from the analysis of empirical material.

According to Babbie (2010), the benefits of qualitative data analysis are that of simplicity and the less affected by outliers, while the weakness of qualitative data analysis is that related to the fact that the results are only applicable in specific context and population examined.

In this study a content analysis of the qualitative data was done. According to Erlingsson and Brysiewicz (2017), a universal initial point of departure for qualitative content analysis is often transcribed interview transcripts. The goal in qualitative content analysis is to thoroughly transform a significant quantity of transcripts into a highly prepared and brief abstract of the main findings of the study (Erlingsson & Brysiewicz, 2017). Qualitative content analysis has been defined by Hsieh and Shannon (2005:1278) as "a research method for the subjective interpretation of the content of text data through the systematic classification process of coding and identifying themes or patterns". In all qualitative analysis, it is important to understand that content analysis is a reflective process (Erlingsson & Brysiewicz, 2017).

Therefore, data from the follow-up interviews of this study were analysed thematically and presented in the form of themes, categories and patterns into which data from the field was compounded. The analysis process of content analysis of the qualitative data for this study was carried out as follows:

- Recording of data was done by audio recording on a smartphone voice recorder, while another smartphone voice recorder was used in recording to serve as backup in case of electronic failure and malfunctioning of the other device. This was necessary also to ensure that all voices could be clearly heard by ensuring the quality of the recordings. Note taking in a field notebook was also done and served as additional backup and afforded the context to the interviews.
- Verbatim transcription of the responses from the interview was carried out immediately upon returning from schools every day during the weekdays. This was done with the assistance of an experienced person (a person who has done transcribing before and received training) with the purpose of speedy completion. To ensure that the researcher became familiar with the data that was voice recorded and transcribed into text for the purpose of analysis and interpretation, the recorded voices (original interviews) and transcripts of the completed verbatim transcriptions were listened to and read simultaneously. The taking of field notes was also done during the capturing process to capture non-transcribable text with the purpose of gaining as much of the complete picture as possible of data.
- The completely recorded transcript and the field notes recorded in the field notebook were thoroughly read at the beginning to obtain an overall and complete idea of the content and context of the collected data before the process of coding the data began.

- Focusing the analysis to the research topic and identifying key questions that the analysis was expected to answer was done. Thereafter, the transcribed transcript was organised into patterns, categories and themes.
- Identifying patterns and connections within and between categories was carried out with the purpose of assessing the relative importance of different themes underlying the complicated variations that were important to the analysis. This was done by capturing the similarities and differences in the participants' (Agricultural Science teachers') responses within the categories. This was done by counting the number of times the theme came out. The counting of the number of times the themes came out was important in giving rough estimates of the relative importance. This was not important for statistical analysis, but rather helpful to reveal the general patterns in the data.
- Interpretation of the data, in other words attaching meaning and significance to the data, was the final stage of the qualitative data analysis of this study. This was done by listing the key important findings that were identified when the data was categorised and sorted. The outline for presenting the results of qualitative data from the follow-up interviews was finally developed as needed to complete the writing of the dissertation. This was at first done by describing the profile of the participants. Fictitious names of the participants and schools were used (to hide the identity of the participants' name of school phase). School phases and years of teaching experience form the profile of the participants.

The identified units of meaning (through coding) significantly showed relation to and consistency with the questions that were asked during the interviews (*refer to* Appendix C). The connected units of meaning from the transcripts were thoroughly allocated to the final themes. The outline for presenting components (themes) of the results of qualitative data is given below:

- ❖ Motivation
- ❖ Other school subjects taught
- ❖ Perceived competencies and teaching experience
- ❖ Perceived needs
- ❖ Leadership qualities

- The envisaged changes

4.13 Ethical considerations

Ethics encompasses a system of good values, which describes what is considered good for individuals and the public (Jerald & Robert, 2008). Van Tonder and Pera (1996:4) define ethics as "a conduct considered correct". The Oxford English Dictionary (1976) as cited by (Burgess, 1989:1) defines ethics as "relating to morals, treating of moral questions; morally correct, honourable… set of principles of morals… science of morals, moral principles, rules of conduct, whole field of moral science". Raffe, Bundell and Bibby (1989) in Burgess (1989), identified a number of principles in survey research: ethical values in survey research related to the appropriate behaviour of associations among researchers and "three groups of people": resource providers, data subjects and a broad amorphous group that are referred to by the authors as "the public". It is important to note that about the providers of resources, such as sponsors or institutions. The researcher should make clear their full commitments in advance and morally respect them.

According to Raffe, *et al.*, (1989) in Burgess (1989), resource providers should not have the right of confidentiality, nor should they have any intellectual property rights that would allow them to inhibit any publication of the results of the study. In this regard, prior existence of appropriate codes of conduct are essential and would strengthen the capacity of the researcher in ensuring that such conditions are clearly set and incorporated into any written formal contract of the study. The researcher should understand that there is a group of resource providers whose importance may be overlooked; these are the gatekeepers who have some form of control over the access of the sample frames or the actual sample members of the study population.

According to Raffe, *et al.*, (1989) in Burgess (1989:15), "with respect to data subjects, researchers should be conscious of their intrusive potentials, and should seek to minimise any intrusion; the confidentiality of data must be respected and protected by positive measures; and data subjects should be told the purpose of the research and should have adequate opportunity to withhold their cooperation".

According to the same authors in Burgess (1989), with respect to the public, the researchers should pursue openness, sensitivity, accuracy, honesty and total objectivity in the choice of topics, methods, analysis and dissemination. Generally, this includes respecting the interests of different groups of people in society, avoiding research designs which preclude particular outcomes of the enquiry, disseminating findings fully, as well as widely, and facilitating the re-use of data. Therefore, the application of these principles in any given situation will require judgement upon which two honest researchers could honestly disagree (Raffe, *et al*., 1989; Burgess, 1989).

In this study, participants were fully informed about what the research entails and their involvement in it, and permission for their charitable interest was obtained. “While it might be argued there are few scandals in educational research (or scandals that become public) it is difficult for researchers to deny that ethical, moral and political questions do not surround their day-to-day experience of educational research” (Burgess, 1989:1).

The participants’ privacy was assured and no names and physical addresses were required from the participants. Permission was sought from the Ministry of Education regional office in the Zambezi region to conduct the research in schools (Appendix J). Ethical clearance was obtained from the Ethics Committee (Human Research) of Stellenbosch University and the ethical research standards of Stellenbosch University were adhered to as articulated in its policies and regulations for postgraduate study (*see* Appendix K).

4.14 Summary

This chapter discussed in detail the research design and the methods that were used in this study. The study adopted a descriptive survey research design. The chapter also presented the target population of the study, the sampling technique used to select teachers for participation in the follow-up interviews used in this study. The chapter further discussed the description of the research instruments: the teachers’ questionnaire and follow-up interviews used for data collection, reliability, validity, data analysis and ethical considerations.

The chapter further gave a detailed account of the type of surveys that can be used in different types of studies. With regard to the current study, the qualitative data included recorded responses from structured interviews. The qualitative data analysis of this study involved the breaking down of the qualitative data into manageable categories, patterns and themes in accordance with the aims of the study. The methodology that was used in this study for the analysis of the qualitative data was centred on the content analysis procedures. The chapter ends with a discussion on the ethical considerations of the study.

The next chapter presents the results and discussions of the study that were drawn from the teachers' questionnaire (*see* appendix B) and follow-up interviews (*see* appendix C) with the Agricultural Science teachers who participated in this study.

CHAPTER 5: RESULTS, INTERPRETATION AND DISCUSSIONS OF THE FINDINGS

5.1 Introduction

It is worth mentioning that the response rate of the participants who completed the questionnaire was 142 (95%). A total of eight (5%) Agricultural Science teachers were included in a pilot study. This chapter presents the background information on the participants, availability of teaching and learning resources and teaching needs, competencies, experience and gender of the Agricultural Science teachers in the Zambezi region. The findings of this study were obtained based on the research question items of the questionnaire and follow-up structured interviews. The analysed data in percentage frequencies is presented in the form of bar charts, pie graphs, histograms and tables. The Chi Square (*see* Appendix D) and ANOVA (*see*

Appendix E) tests were carried out to test the hypotheses of the study. The next section presents the background information of the participants and the general demographic characteristics of the participants.

In this chapter, the data captured from the quantitative and qualitative research are presented, analysed, discussed and interpreted as the next step of the research process. One hundred and fifty participants were targeted in this study. The findings of this study were firstly presented as an analysis and discussion of quantitative data obtained from the individually completed questionnaires. The analysis of the quantitative data from the questionnaires was followed by the analysis and discussion of the qualitative data that was recorded from the structured interviews. It is therefore important to remain mindful that the data from the quantitative and qualitative components of this study and the literature reviewed are connected. The connected data finally conclude the findings, recommendations and conclusions of this study. The next section presents the background information of the participants and their general demo-graphic characteristics.

5.2 Background information of the participants

One hundred and forty two Agricultural Science teachers participated in this study, from a target population of 150. The shortfall of eight participants who did not participate in the survey were included in the pilot study. A pilot study is referred to as a small-scale study of a whole survey, or is a study to pre-test the research instrument such as a questionnaire and or interview guides the researcher intends to use to collect data (Mubashir; Michael; Campbell; Cooper and Lancaster, 2010; and Thabane, Ma, Chu, Cheng, Ismaila, Rios, Robson, Thabane & Goldsmith, 2010). The Agricultural Science teachers who participated in the pilot study did not form part of the actual study.

5.2.1 Gender of participants

Out of 142 participants, 85 (60%) were males and 57 (40%) were females (Figure 5:1). This statistic was likely since male teachers are more likely to be involved in farming activities because agriculture has been traditionally viewed as a field for males. The finding is consistent with that of Olajide, Odoma, Okechukwu, Iyare and Okhaimoh (2015) who studied the "problems of teaching Agricultural Science practical work in secondary schools in Delta State, Nigeria", where the majority of participants were males (62.19%). Similarly, Kabugi's (2013) study on challenges of teaching and learning of agriculture in secondary schools in Kakuyuni division, Kangundo district, Machakos County, Kenya, report that the majority (80%) of the participants were male teachers.

However, by comparison there are more female Agricultural Science teachers in Namibia than in other parts of Africa. Nevertheless, the need to recruit more female Agricultural Science teachers and workers in the agricultural sector in Namibia and elsewhere on the African continent is obvious. Figure 5:1 below shows the gender distribution of participants.

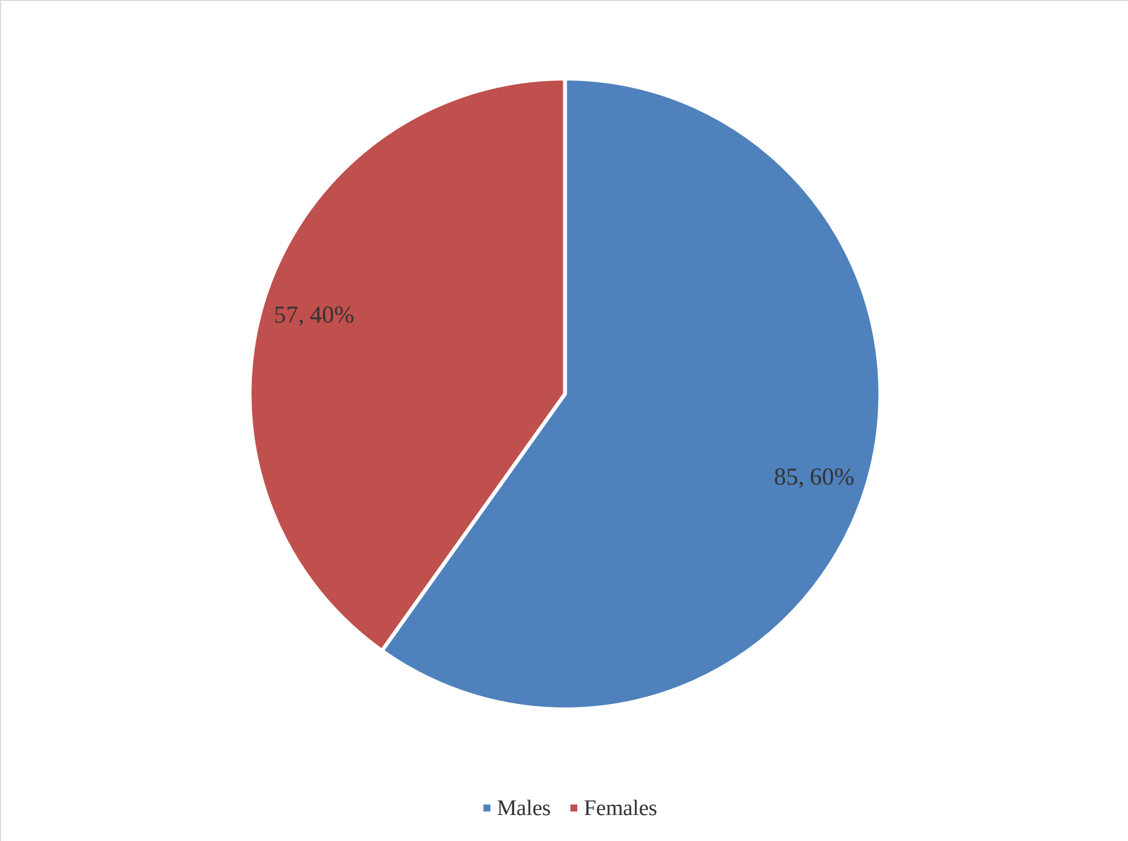


Figure 5.1: Gender distribution of participants

5.2.2 Teaching experience of Agricultural Science Teachers

One hundred and thirty nine (98%) of the participants in the Zambezi region have teaching experience (of Agricultural Science) of 3 years and more of teaching experience and only three (2%) have <3 years of experience (Figure 5:2). These demographics of the study are similar to that in Kenya (Kabugi, 2013) and Ghana (Darko, *et al*., 2016) where Agricultural Science teachers with many years of teaching experience respectively comprised 40% and 60% of the study participants.

Generally, it can be mentioned that most of the Agricultural Science teachers in the Zambezi region have taught Agricultural Science for an extended period and therefore have sufficient teaching experience and understanding in relation to decisions they need to take about the challenges they would encounter in the teaching and learning the subject in combined schools and secondary schools. In the view of Darko, *et al.* (2015:14):

> It is, therefore, very important for any professional teacher to know what decisions to make, when to make them and the effect of such decisions on

the teaching-learning encounter. These decisions, which give direction, purpose, meaning and structure to classroom interaction, provide teaching with its professional touch.

Figure 5.2 below shows the distribution of teachers by years of teaching experience.

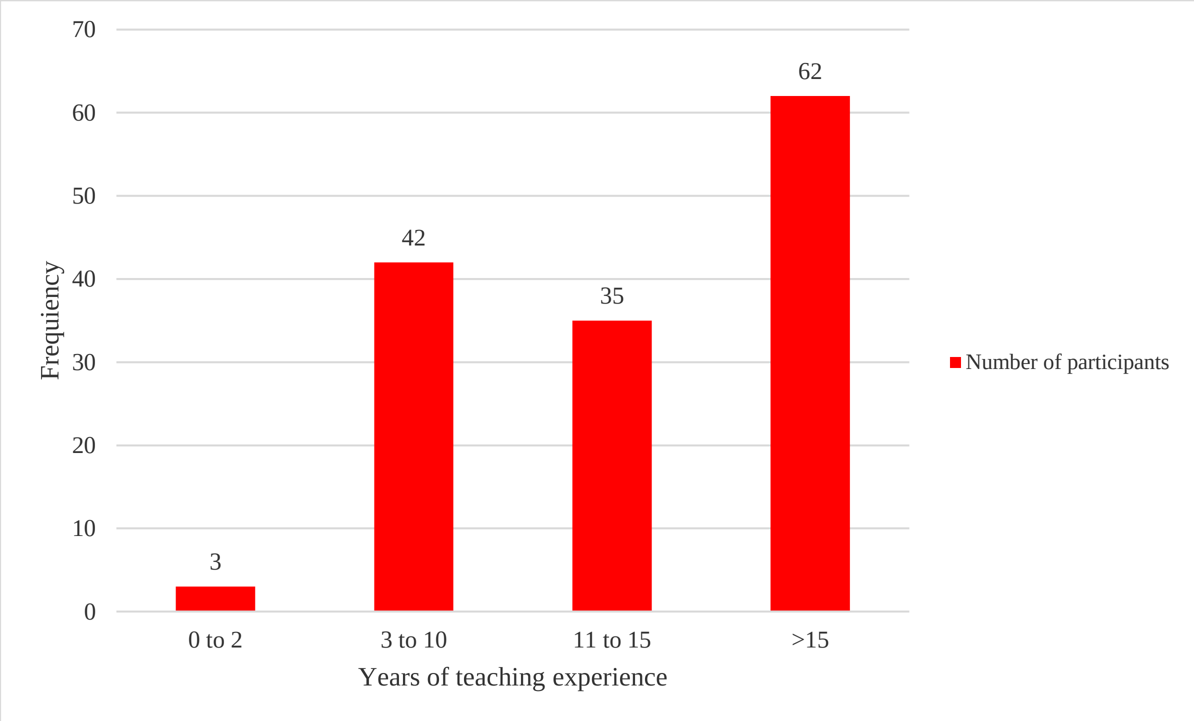


Figure 5.2: Distribution of responses of participants by teaching experience

5.2.3 Participants' experience and grades taught

Of the 28 (20%) teachers who taught grades 11 to 12, 71% were teachers with >15 years of teaching experience, while those with <15 years of teaching experience comprised a similar proportion (14.2%). Teachers with <3 years of teaching experience did not teach grades 11 to 12. Of the 78 (55%) teachers who taught grades 8 to 10, the corresponding proportion (percentage) for teachers with >15 years, 11 to 14 years, 3 to 10 years and <3 years were respectively 39%, 27%, 33% and 3%.

The above analysis shows that teachers with longer service and with substantial teaching experience are allocated to teach grades 11 to 12. This could mean that the students could benefit more from their experience and hopefully perform well in the subject. Longer service, of course, does not always mean better quality teaching. The fact that teachers with longer service (39%) also teach grades 8 to 10 could be related to the fact that this category represents 62% of the total participants.

It may be concluded that since grade 10 and 12 learners are examined externally, these grades need to be taught by well-experienced teachers. However, Rice (2010:1) in a study on the impact of teacher experience argues that "experience matters, but more is not always better. The impact of experience is strongest during the first few years of teaching; after that, marginal returns diminish". Rice further contends that teachers show the greatest productivity gains during their first few years on the job, after which their performance tends to level off.

Ladd (2008) states that teachers with more than 20 years of teaching experience are understood to be more effective in their teaching than those with less than five years of teaching experience. However, Ladd further avers that teachers with more than 20 years of teaching experience are not greatly effective in their teaching compared to teachers with five years of teaching experience.

The findings of this study have revealed that, overall, the majority 114 (80%) of the participants were teaching in grade 8 to 10 and only 28 (20%) were found to be teaching in grade 11 and 12 with teaching experience 0 to15 years and more (Figure 5:3). The study established that the number of schools that offer tuition from grade 8 to 10 is much higher (55 schools) compared to the schools that offer tuition in grade 11 and 12 (10 schools). Figure 5.3 below represents the distribution of teaching experience and the grades taught.

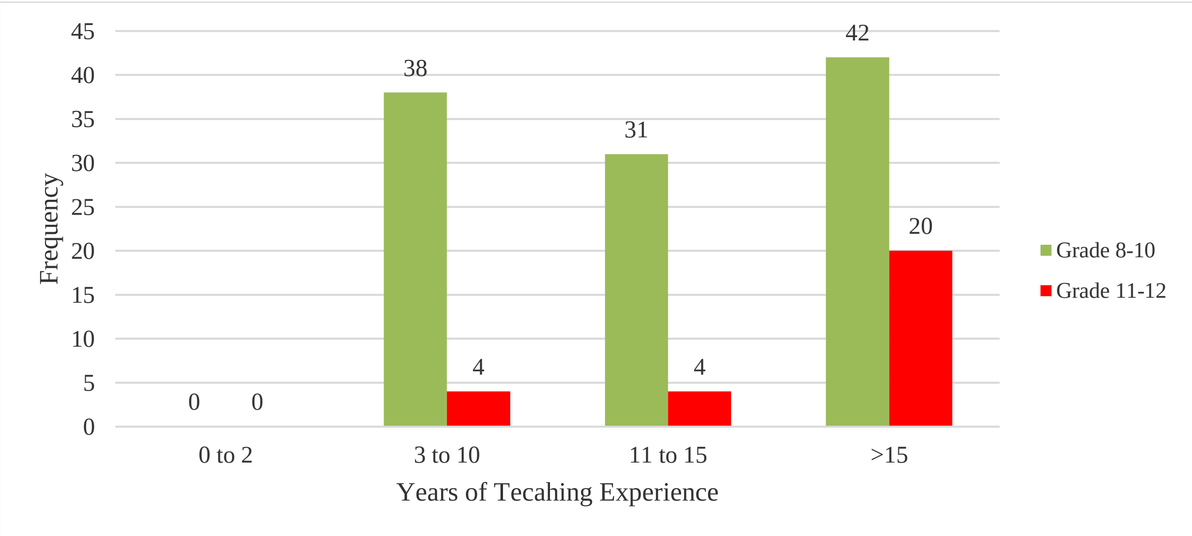


Figure 5.3: Distribution of responses of participants by years of teaching experience and grades taught

5.2.4 Number of teaching lessons per week

Results of the study revealed that the majority of the participants (53%) had less than 21 teaching periods per week in Agricultural Science in the grades they taught. Forty-seven percent of the participants had more than 21 teaching periods per week (Figure 5:4). Secondary school teachers in Namibia have a maximum of 40 teaching periods per week, and they are required to have more than 53% (i.e. more than 21 teaching periods) of the 40 teaching periods per week (Ministry of Education Arts and Culture, 2001 & Ministry of Education Arts and Culture, 2018).

Therefore, teachers, like any other civil servant in Namibia, are expected to work for eight hours per day, totalling 40 hours in a week. A school where a teacher has more than 40 teaching periods per week should require the services of an extra teacher to take up the extra teaching load. In some schools, it is evident that one grade can have two or three streams of classes. The grouping of a particular grade into three class groups (10A, 10B and 10C for example) would help to boost the workloads for some teachers in certain schools (particularly those in urban areas). The grouping of learners into two or three class groups makes the number of teaching periods per week near to normal (30 to 35 teaching periods per week) as specified by the Ministry of Education. This suggests that teachers with the workload that is less than 21 periods per week must teach other subjects in order to have the teaching periods per week as required by the Ministry of Education.

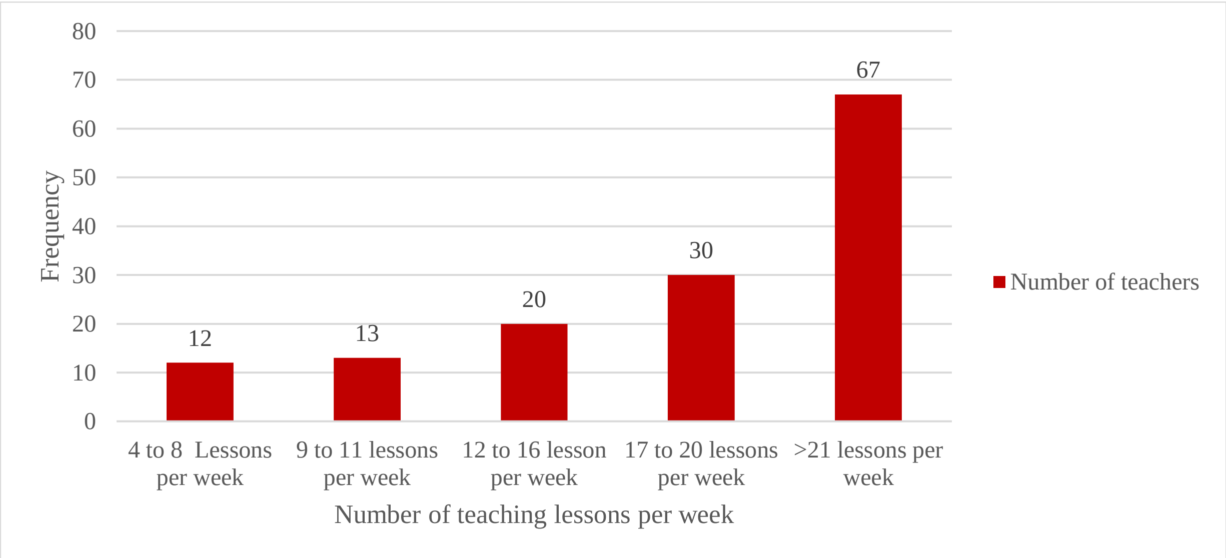


Figure 5.4: Number of teaching lessons per week

5.2.5 Gender and years of teaching experience

More male teachers (26%) as compared to female teachers (18%) have teaching experience of >15 years. The same is true for 3 to 10 years teaching experience with the corresponding proportion of 9% and 20% male teachers. However, the proportion of male and female teachers with 11 to 15 years teaching experience and <2 years are nearly similar (Figure 5:5). This is encouraging because it indicates that the number of female teachers being recruited to the profession is increasing. Figure 5.5 below represents the gender of participants and their years of experience.

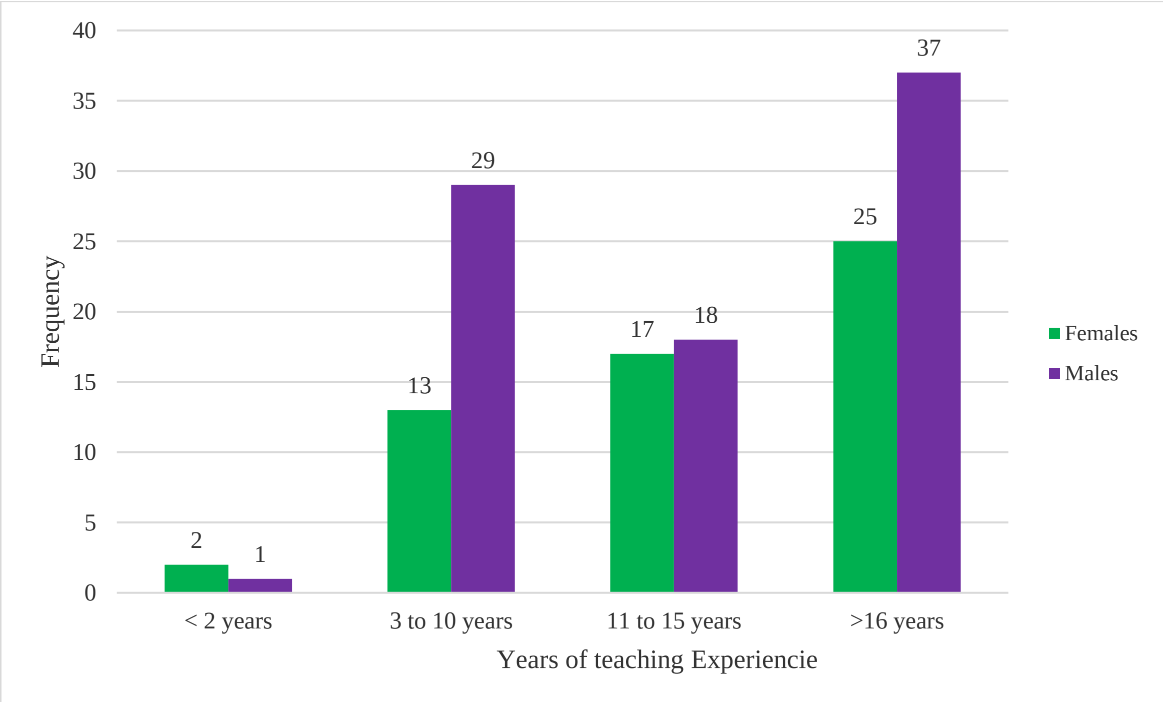


Figure 5.5: Gender and years of teaching experience

5.2.6 Qualifications of participants

The participants were asked to indicate their academic and professional qualifications. The results are summarised in Figure 5:4 below. For this study, the participants consist of male and female Agricultural Science teachers holding either Basic Education Teacher Diploma (BETD), Bachelor's Degree in Education (BED) a National Diploma in Agriculture (NDA) or Bachelor of Science Degree in Agriculture (BSC) respectively. The results show that a proportion of participants (35%) are BETD holders and 25% hold a Higher Education Diploma (HED).

The high number of BETD teachers is likely as BETD specialising in Agricultural Science is the lowest professional qualification that one should possess to be qualified to teach Agricultural Science in a combined school in Namibia. Participants with HED also have a knowledge base to teach Agricultural science in secondary schools.

The demographical information on qualifications in this study is consistent with the findings of Olajide, Odoma, Okechukwu, Iyare and Okhaimoh (2015) who focused their investigation on the problems of teaching Agricultural Science practical in secondary schools in Delta State, Nigeria. The authors revealed that only about 24 (34%) of the Agricultural Science teachers are Bachelor's degree holders in education. The findings of this study further established that among the Agricultural Science teachers in the Zambezi region who participated in this study, some of the teachers were holders of degrees in agriculture but had no qualification in education. Teachers without educational qualifications could be classified as unqualified teachers. A teacher considered most qualified and suitable to teach Agricultural Science should have sufficient subject content and teaching methodology knowledge.

The findings agree with the opinions of Abe (2014), who studied "the effect of teachers' qualifications on students' performance in mathematics". The author opined that a teaching qualification is one of the requirements that enables a person to become a qualified teacher in secondary schools. However, the results of this study suggest that a teaching qualification is not sufficient unless it is accompanied by mastery of the subject to be taught.

The results of the study revealed that only 12 (8%) and seven (5%) of the participants had formal academic qualifications in agriculture (Bachelor of Science in Agriculture and National Diploma in Agriculture). This category of teachers, in the view of Abe and Adu (2013), would be regarded as unqualified teachers. Teacher qualification in the Namibian context is thought to be one of the predictors of the teachers' abilities to comprehend and implement teaching instructions effectively and efficiently (Abe & Adu, 2013). According to Uche and Umoren (1998) cited in Edu, Edu and Kalu (2012:22), "similarly, educational qualification is said to be an important aspect of how a teacher perceives areas of difficulty in teaching".

The results of the study further revealed that the number of participants who hold a Bachelor of Science degree in Agriculture was only 12 (8%), while the number of teachers who are Master's degree holders was merely 1%. The highest qualification for the Agricultural Science teachers in the Zambezi region was a Master's degree, while the lowest was a Diploma in

Education. The results of this study are not in agreement with those of Sorensen (2010) in the study on in-service needs of agriculture teachers. The author revealed that the participants comprised of teachers holding either a Bachelor's degree or a Master's degree and none had a qualification lower than a Bachelor's degree. In other words, the teachers were better qualified.

For an Agricultural Science teacher to be effective in the teaching of the necessary know-ledge, he/she must equally have both academic as well as professional qualifications. An Agricultural Science teacher must be pedagogically knowledgeable, while at the same time possess distinctive qualities such as being humane, compassionate but collected and determined (Kaleptwa & Igomu, 2013). In fact, Agricultural Science teachers must be of high subject mastery since in the words of Okorie (2007) as cited by Kaleptwa and Igomu (2013:6) "a teacher cannot teach a skill in which he has no mastery". According to the same author, it is only a qualified Agricultural Science teacher who can comfortably organise the resources needed for effective teaching.

Figure 5.6 below shows the distribution of participants according to qualifications.

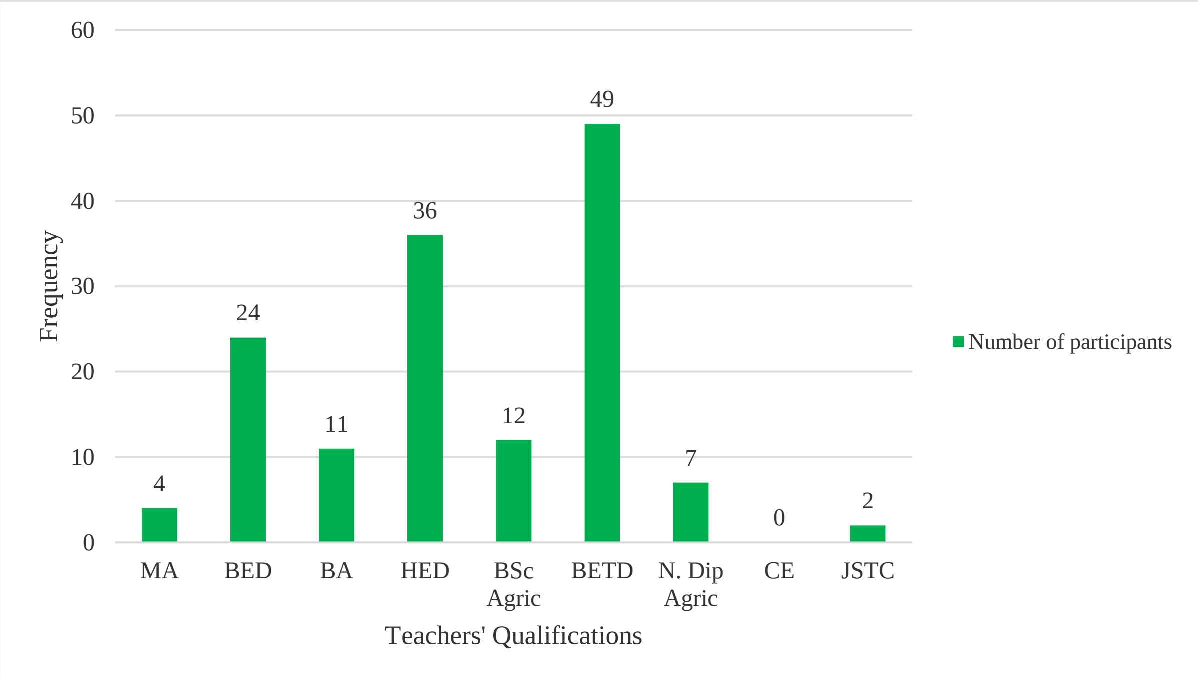


Figure 5.6: Qualifications of participants

5.2.7 Qualifications and grades taught

Data in Figure 5:7 shows the qualifications of the participants and the grades they were teaching. Generally, it is evident from the results of the study that a substantial number of the participants (48/34%) who hold professional educational qualifications (BETD) taught in grades 8 to 10 and are classified as qualified teachers. Only 1.4% of the participants were holders of a Junior Secondary Teachers Certificate (JSTC), these teachers were classified as under qualified. To teach in grades 8 to 10 a teacher should have obtained at least a three-year teacher education qualification (i.e. BETD majoring in Agricultural Science education).

The results of this study further revealed that among the participants (11/8%) with a National Diploma in Agriculture and a Bachelor of Science degree in Agriculture taught in grade 11 and 12 (secondary level) respectively. This category of teachers is regarded to be well grounded in the subject content, however lacked the teaching methodology component. Since they lacked the teaching methodology, this category of teachers was classified as unqualified teachers. From the results of the study, it was established that a sizeable number of teachers with a Higher Education Diploma and a Bachelor of Education degree (majored in Agricultural Science education) were found to be teaching grades 8 to 10.

The results of the study suggests that these teachers were under-utilised (i.e. teaching in lower grades while having the necessary qualifications to allow them to teach at secondary level) since a teacher holding a Higher Education Diploma (HED) and better should teach in grade 11 to 12 (secondary level) only. It is worth mentioning that teachers who are holders of BETD (majoring in Agricultural Science education) are classified as qualified teachers to teach Agricultural Science in combined schools (grades 1 to 10) and not qualified to teach at secondary schools (grades 11 and 12). This is because the BETD programme in Namibia was designed to train teachers to teach in the primary grades (grades 4 to7) up to grade 10 only.

Therefore, the findings of this study are not in consistent with the conclusions that were made by Kabugi (2013) in the study on the "challenges to teaching and learning of agriculture in secondary schools, Kenya". The author concluded that the majority of teachers (6/60%) who were teaching Agricultural Science in secondary schools were found to be qualified and the rest were not qualified (not trained in agriculture education).

Figure 5.7 below represents the qualifications of participants per grade taught.

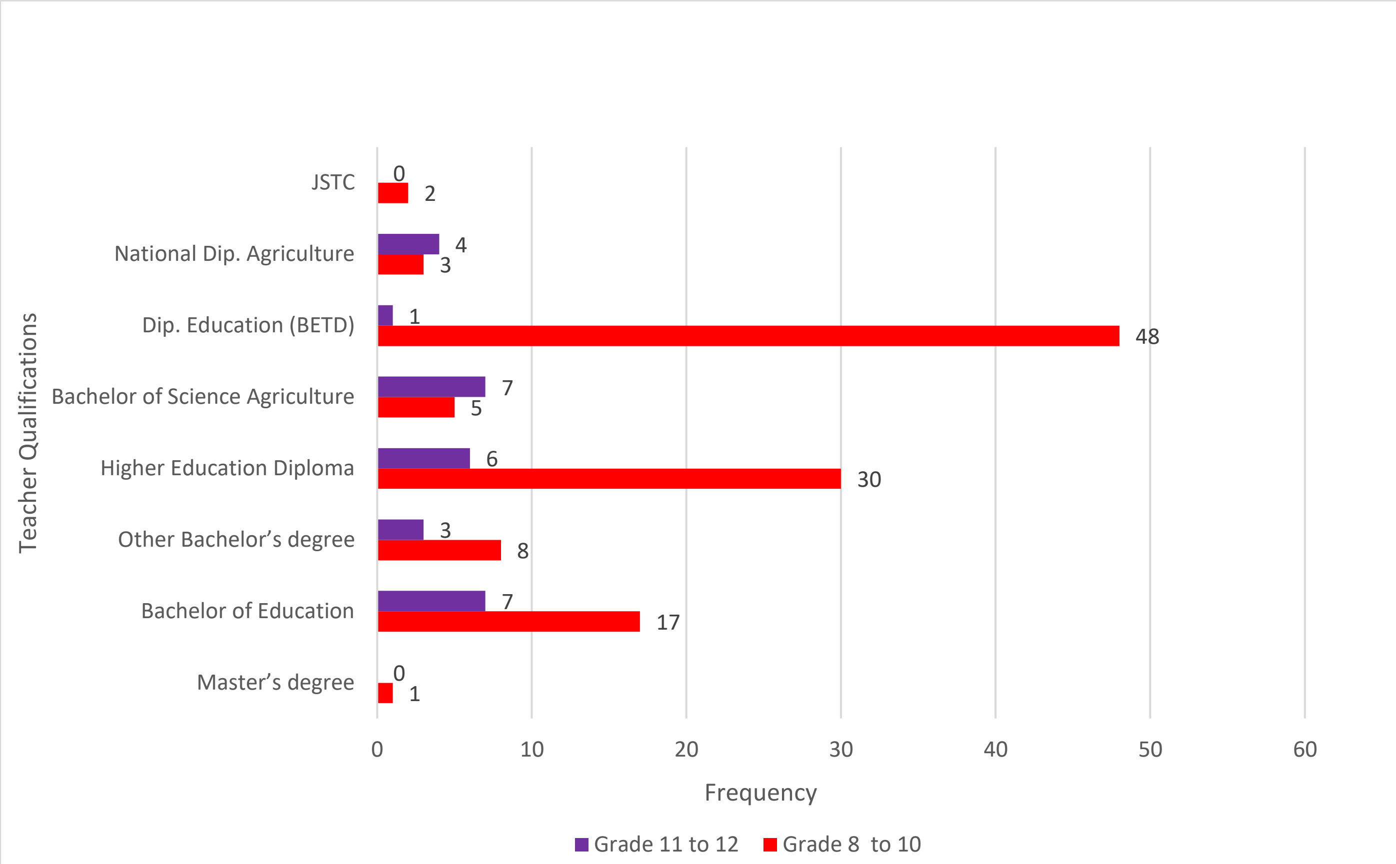


Figure 5.7: Distribution of participants' qualifications and grades taught

5.2.8 Employment status

The results of this study revealed that the majority 137 (96%) of the participants are permanently employed, while the rest are employed on temporary basis (Figure 5:8). The demographic data were likely with regard to employment status and it is hoped that teachers employed on permanent basis would be motivated to effectively conduct themselves positively with regard to their teaching duties. Whether this is the case or not was not tested in this study. However, studies by Ghenghesh (2013) report that job security is a motivating factor for teachers and those such teachers are more effective in service delivery. The author further suggests that employment status is considered important at it necessitates continuing commitment to the job. Figure 5.8 below represents the employment status of teachers.

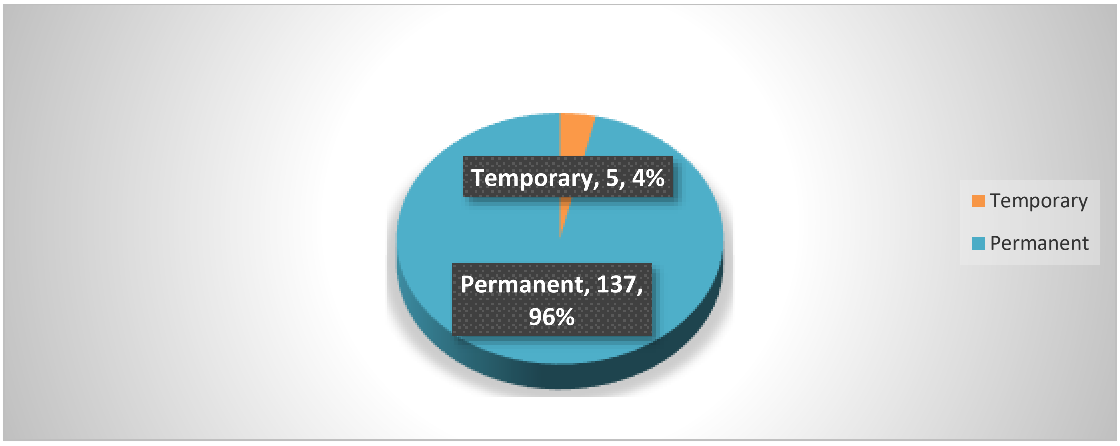


Figure 5.8: Distribution of employment status of participants

5.2.9 Teaching expertise in Agricultural Science and their qualifications

Table 5:1 summarises the level of education and the teaching expertise of the participants for this study. The results of the study revealed that 108 (76%) of the participants felt that they had some expertise to teach Agricultural Science in secondary schools, 9 (6%) felt that they lacked expertise, while the rest were not sure**.** The results of the study show that 100% of the Master of Art degree, Bachelor of Art degree and JSTC holders felt that they had acquired expertise in teaching Agricultural Science.

The results of the study revealed that 1 (8.3%) of the participants with a Bachelor of Science Agriculture felt that he/she did not have the expertise for teaching Agricultural Science. A further 42.9% of the participants who hold a National Diploma in Agriculture felt that they were not sure whether they had expertise in teaching Agricultural Science. It is worth mentioning that any Agricultural Science teacher who has a Bachelor of Science in Agriculture or a National Diploma in Agriculture he/she is considered, by virtue of the qualification, to have sufficient subject knowledge to be able to teach Agricultural Science at secondary level with a minimum level of difficulty.

Therefore, it was established that the majority (108/76%) of the participants felt that they had some expertise in teaching Agricultural Science in secondary schools, while the rest felt that they are not sure.

Table 5.1 below represents the distribution of responses on their expertise and the qualification they hold.

Table 5.1: Distribution of responses of participants on expertise and qualification

	Expertise in Teaching Agriculture						
Qualification	N	Yes (n1)	% (n1/n*100)	No (n2)	% (n2/n*100)	Unsure (n3)	% (n3/n*100)
Master's degree (MA degree)	1	1	100	0	0	0	0
Bachelor of Education	24	21	87.5	0	0	3	12.5
Bachelor's degree (BA degree)	11	11	100	0	0	0	0
Higher Education Diploma	36	31	86.1	1	2.7	4	11.5
Bachelor of Science Agriculture	12	11	91.7	0	0	1	8.3
Dip. Education (BETD)	49	27	55	8	16	14	28.6
National Dip. Agriculture	7	4	57.1	0	0	3	42.9
JSTC	2	2	100	0	0	0	0
Total	**142 (100%)**	**108 (76%)**		**9 (6%)**		**25 (18%)**	

5.2.10 Working time allocated to teaching duties

The majority of the participants (88/62%) devoted more than 75% of their working time to teaching, while the rest did not (Figure 5:9). Agricultural Science is a subject that requires practical work and much time is needed to spend on teaching and learning activities. The results of the study revealed that the remainder of the time was devoted for lesson preparations and marking of learners' work such as homework, class activities and projects. These arrangements in the schools studied are in line with the subject policy for Agricultural Science in Namibia, which encourages uninterrupted periods (two periods following each other) on the school timetable for Agricultural Science to make available enough time for teaching and practical (Ministry of Education, 2009).

According to the Ministry of Education (2009:3), "the allocation of secondary time periods allocation as set out in the Curriculum for Basic Education are as follows: for grades 5 to 10, a

5-day cycle 8 periods x 40 minutes of which Agricultural Science is allocated 4 periods per week (160 minutes per week). The other cycle is 7-day cycle 5 periods x 45 minutes and Agricultural Science is allocated 5 periods per week" (225 minutes per week). For grades 11 to 12 there are also two cycles that are available: a 5-day cycle 8 periods x 40 minutes and Agricultural Science is allocated 6 periods per week (240 minutes per week), while the 7-day cycle is 7 periods x 45 minutes and Agricultural Science is allocated 7 periods per week (315 minutes per week)". Figure 5.9 represents the proportion of time allocated to teaching duties.

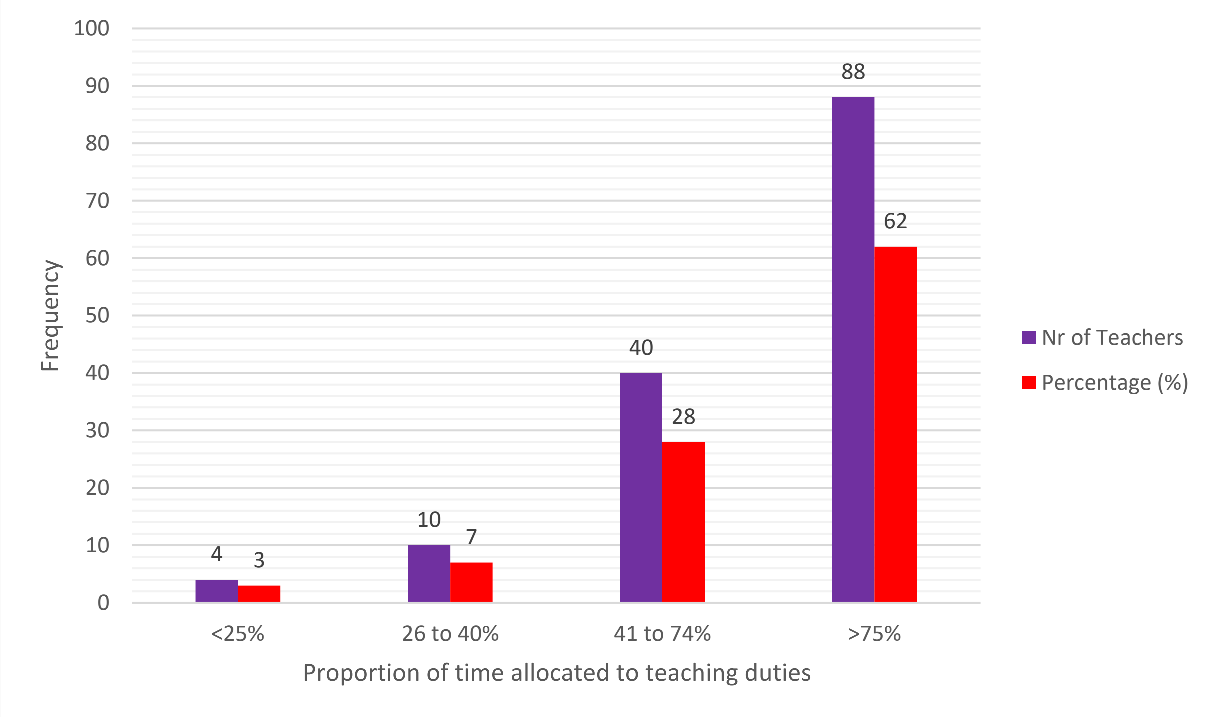


Figure 5.9: Distribution of responses of participants with regard to the proportion of teaching time

5.2.11 Enrolment numbers of learners

The number of learners in the various classes ranges from 15 to 25 and >45. 75% of the classes have 26-40 learners. A small proportion of participants (7%) indicated that the enrolment numbers of learners in their classes were <25 learners. The findings of this study are not in conformity with the findings by Sorensen (2010) in the study on in-service needs of Utah agriculture teachers. The author revealed that the average number of learners enrolled in agricultural biology were 19.92, since it is evident from the results of this study that the majority of the classes in the Zambezi region in Namibia had more than 25 learners. Figure 5.10 represents the responses of teachers on the enrolment of learners.

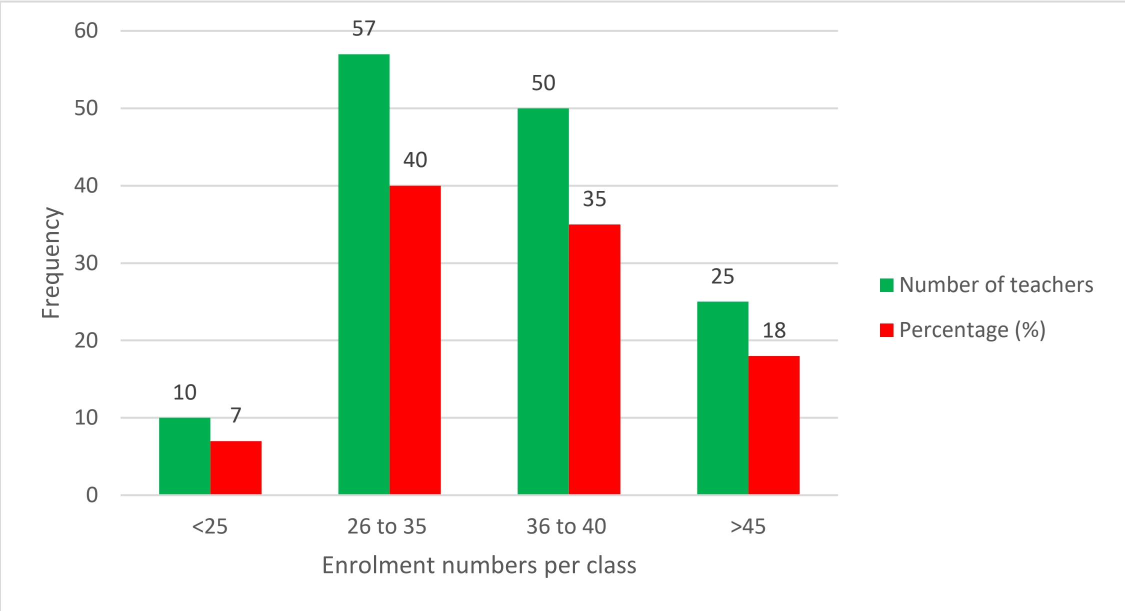


Figure 5.10: Distribution of enrolment numbers of learners in the classrooms

5.2.12 In-service training

Figure 5:11 shows that 88 (62%) of the participants had not enrolled for an in-service training programme in the past three years, but the rest had done so. In-service teacher education is concerned with the activities in which in-service teachers should participate with the aim of upgrading their professional skills and subject knowledge. In this regard, in-service teacher training is meant to fill the cracks of teaching shortfalls of Agricultural Science teachers. It is important to understand that the skills appropriate for the preceding generation might no longer prepare learners for the world beyond school (Osamwonyi, 2016). “In-service training education can simply be defined as the relevant courses and activities in which a serving teacher may participate to upgrade his professional knowledge, skills, and competence in the teaching profession” (Osamwonyi, 2016:83).

The possible reason why a higher proportion of teachers had not participated in or undertaken an in-service training is that it is a personal initiative that has financial implications for those involved. In fact, there are no ministerial programmed in-service training opportunities for teachers in order for them to upgrade their skills in the teaching of Agricultural Science in secondary schools in the Zambezi region. According to Osamwonyi (2016:83),

> In-service education is designed for the labour [sic] development of the school system and the educational enterprise as a whole. If teachers are to perform their functions effectively and efficiently, it becomes imperative for them to require training in new skills and modern methodology.

Figure 5.11 represents the distribution of responses of participants on in-service education received.

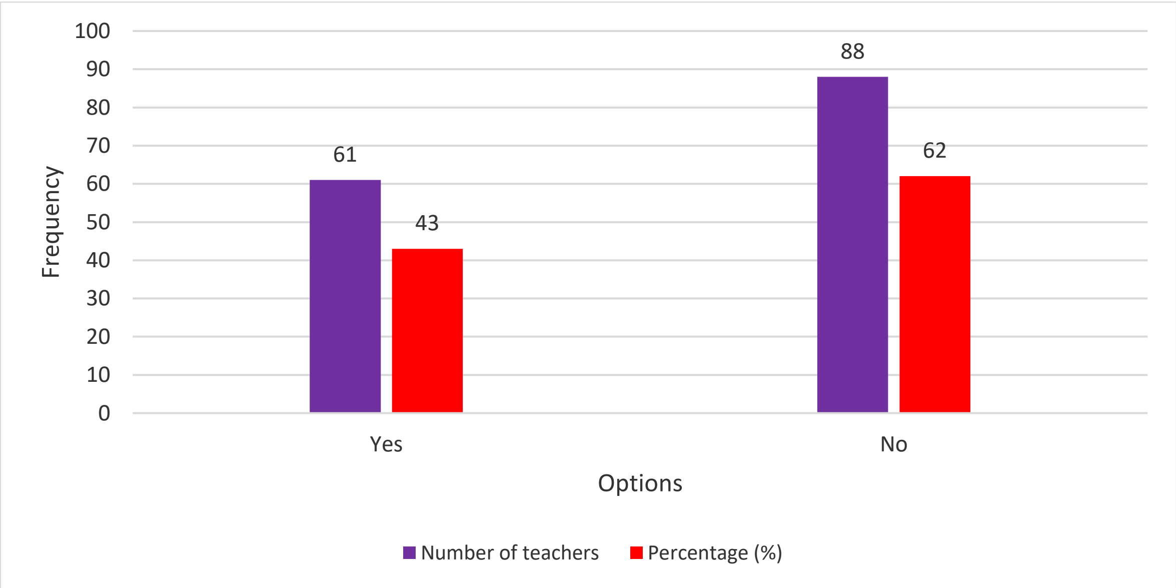


Figure 5.11: Distribution of responses of participants on in-service education

5.2.13 Relevance of in-service education

It was established that 82 (58%) of the participants did not find the in-service education programmes they enrolled for relevant, while the rest did (Figure 5:12). The results of the study were doubtful because the most important indicator of the quality of in-service training is its relevance to teachers' needs. The results of the study suggest that if teachers do receive in-service education, which is not directly useful to their work, then they perceive it to be a waste of time and resources. The findings of the current study might suggest that before introducing an in-service training programme for teachers, it is important to carry out a need assessment among participants in the Zambezi region. This will help to ascertain the gaps and resources needed to fill the identified gaps. According to Emeya (2017:72):

> In-service is the only teacher-training programme that aims at improving the professional knowledge, vocational skills, competencies and attitudes of practising Agricultural Science teachers. In-service training or education include planned or organised efforts to improve the knowledge and competencies of Agricultural Science teachers aimed at making them more effective on the job. The main objective of in-service education therefore is the continuous provision of information that will keep Agricultural Science teachers abreast of developments in their job. The need for well-planned and regular in-service training of Agricultural Science teachers cannot be over-emphasised. Since existing pre-service teacher education programmes by their nature cannot equip intending Agricultural Science teachers with all the needs for a lifetime of work in the classroom, in-service training helps to promote personal intellectual and professional growth of Agricultural Science teachers.

Figure 5.12 represents the distribution of responses to the relevance of in-service education programmes offered to teachers.

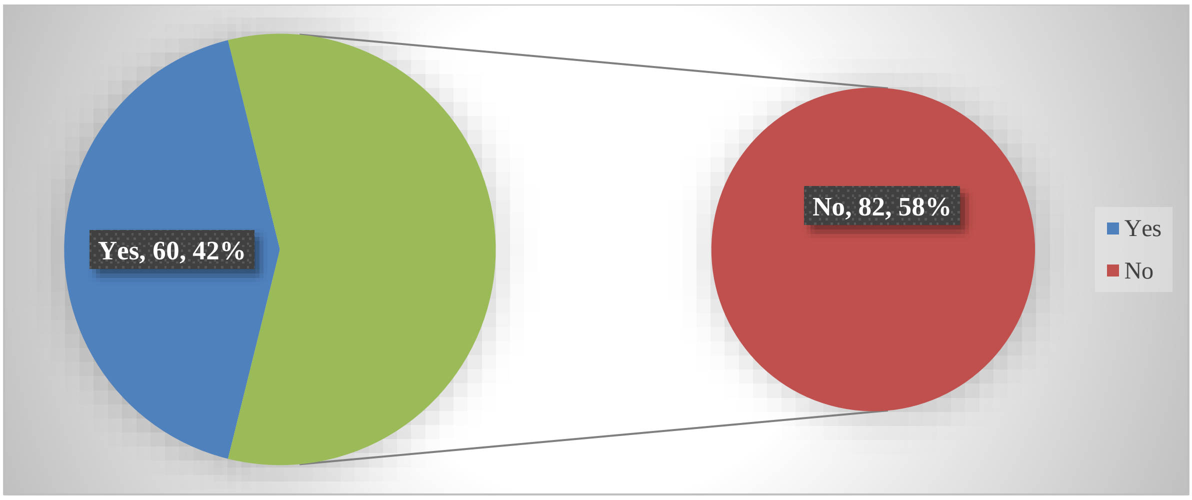


Figure 5.12: Distribution of responses of teachers with regard to the relevance of in-service education

5.2.14 Availability and the extent of use of teaching and learning resources

To establish the availability of teaching and learning resources and their use in schools, participants were asked to rate the level of availability of different teaching and learning resources used in schools. The "strongly agree" and "agree" responses were recorded in one category of response called "at least agree"; the same with "unsure" (no idea), "disagree" and "strongly disagree" responses in one category of response called "at least disagree" as suggested by (Mouton, 2015). Mouton (2015:118) stated that "if the participants could not decide whether he/she disagrees or agrees, he/she definitely did not agree, otherwise agree or strongly agree would have been chosen. The undecided responses was similar to disagreeing with the statement".

The results of this study revealed that the majority (66%, 84% and 88%) of the participants indicated that they at least disagree with regard to the availability of water supply to the agricultural school gardens, teaching and learning resources and the number of Agricultural Science textbooks. These resources are key to effective teaching and learning. Therefore, lack of such resources as revealed by the results of the study is likely to have a negative impact on the academic performance of learners. Teachers and learners in the Zambezi region are expected to produce good academic results at the end of the year, but if teaching and learning resources such as textbooks are not adequate, the academic performance of learners is expected to decline drastically. Lack of water supply to school gardens is a serious problem, since agricultural science is a practical subject, and learners need water to plant vegetables for learning purposes.

The results of the study revealed that the majority (71%) of the participants indicated that they at least agree that the Agricultural Science teacher's guide is available, while the rest indicated that they at least disagree. The teacher's guide is an important document, which all participants need to possess as it guides the teacher as to what needs to be taught in the subject.

With regard to the use of Agricultural Science resource persons in the school, excursions or field trips and access to computer with internet connectivity, the majority (79%, 88% and 96%) of the participants indicated that they at least disagree, while the rest indicated that they at least agree. This might suggest that the Zambezi regional education office has done less, if nothing, in supporting Agricultural Science teachers. The availability of an Agricultural Science resource person is an important component in classroom teaching. A resource person is greatly needed to assist teachers who have recently joined the teaching profession (with no teaching experience) and those who are struggling in the area of curriculum implementation and interpretation. The other unlikely results were with regard to a lack of excursions or field trips for Agricultural Science learners.

Since Agricultural Science is a practical subject, learners need to be exposed to the outside classroom environment, where they are expected to relate what they have learnt in class to what they can physically see and touch in the field. The lack of excursions or field trips among Agricultural Science learners needs to be seriously addressed if improvement in teaching and learning of Agricultural Science is to be realised.

The results of the study revealed that the majority (96%) of the participants have no access to computers with internet connectivity. Learning in recent times is a global activity. For teachers to teach Agricultural Science effectively and efficiently they need to have access to the internet that will connect them to the rest of the world, and to have access to new teaching and learning strategies that are being used worldwide. Teachers need internet connections to be able to network with other teachers within Namibia and beyond.

Participants were asked about the extent of use of Agricultural Science tools, reference books, syllabus and teacher's guide in their teaching. The majority (81%, 98%, 99% and 79%) indicated that they at least agree while the rest indicated that they at least disagree. The results of the study were expected and suggest that on average (93%) of the participants use Agricultural Science tools, syllabus, reference books and teacher guides in their teaching. Participants were further asked about the extent of use of excursions or field trips and the teacher's guide. The results of the study revealed that the majority (85, 72%) of the participants indicated that they at least disagree, while the rest indicated that they at least agree. The results were unlikely because excursions or field trips and teacher's guide are essential components that are needed in the effective teaching and learning of Agricultural Science in schools.

With regard to the extent of using group discussions in teaching, the majority (91%) indicated that they at least agree, while the rest indicated that they at least disagree (Table 5:2). This was expected because the Namibian education system encourages learner-centred learning, where learners are not viewed as empty funnels but as constructors of knowledge. Through group discussions, learners are expected to critically apply their understanding and be able to give collaborative solutions to a problem. Table 5.2 below represents the teachers' responses to the availability and extent of use of teaching and learning resources.

Table 5.2: Distribution of responses of participants on the availability and extent of use of teaching and learning resources

Resources	Strongly Agree	Agree	No Idea	Disagree	Strongly Disagree	Total
1. The number of desks and chairs in the classroom are adequate.	35 (25%)	33 (23%)	37 (26%)	21 (15%)	16 (11%)	**142 (100%)**
2. Agricultural school garden for practical purposes is adequate	32 (23%)	28 (20%)	34 (24%)	21 (15%)	27 (19%)	**142 (100%)**
3. The water supply to the agricultural school garden is reliable.	21 (15%)	27 (19%)	18 (13%)	21 (15%)	55 (39%)	**142 (100%)**
4. Teaching and learning resources agriculture are adequate	2 (1%)	21 (15%)	24 (17%)	37 (26%)	58 (41%)	**142 (100%)**
5. The number of Agricultural Science textbooks are adequate.	4 (3%)	13 (9%)	17 (12%)	33 (23%)	75 (53%)	**142 (100%)**
6. The Agricultural Science teacher's guide is available.	63 (44%)	39 (27%)	41 (3%)	19 (13%)	17 (12%)	**142 (100%)**
7. Teaching resources such as chalks, duster, charts, are adequate	24 17%)	48 (34%)	43 (30%)	19 (13%)	8 (6%)	**142 (100%)**
8. Use of Agricultural Science resource persons in the school is frequent.	8 (6%)	19 (13%)	12 (8%)	22 (15%)	81 (57%)	**142 (100%)**
9. Use of excursions or field trips for your learners is frequent.	2 (1%)	16 (11%)	4 (3%)	24 (17%)	96 (68%)	**142 (100%)**

Resources	Strongly Agree	Agree	No Idea	Disagree	Strongly Disagree	Total
10. Access to computer with internet connectivity.	2 (1%)	4 (3%)	3 (2%)	35 (23%)	100 (70%)	**142 (100%)**
11. I make use of the Agricultural Science tools in teaching.	28 (20%)	87 (61%)	6 (4%)	17 (12%)	4 (3%)	**142 (100%)**
12. I make use of the reference books in teaching.	103 (73%)	37 (26%)	1 (1%)	1 (1%)	0 (0%)	**142 (100%)**
13. I make use of the syllabus in teaching.	137 (92%)	10 (7%)	1 (1%)	0 (0%)	0 (0%)	**142 (100%)**
14. I make used of the teacher's guide in teaching.	62 (44%)	50 (35%)	4 (3%)	17 (12%)	9 (6%)	**142 (100%)**
15. I make use of excursion/field trips in teaching.	4 (3%)	17 (12%)	5 (4%)	31 (22%)	85 (60%)	**142 (100%)**
16. I make use of internet in teaching.	14 (10%)	26 (18%)	5 (4%)	47 (33%)	50 (35%)	**142 (100%)**
17. I make use of the discussion groups in teaching	97 (68%)	33 (23%)	2 (1%)	5 (4%)	5 (4%)	**142 (100%)**

5.2.15 Resources utilisation

To find out the resources most commonly used in teaching and learning of Agricultural Science in secondary schools in the Zambezi region, the participants were asked to point out how often they used various teaching and learning resources in their Agricultural Science classrooms. The findings of this study are illustrated in Figure 5:13. The results of this study revealed that the Agricultural Science syllabus document (41/99%), scheme of work (108/76%), textbooks (92/65%) were respectively the most frequently used by many of the Agricultural Science teachers who participated in this study. It is true that these are key teaching resources without which there may be no effective teaching.

Therefore, these results are not surprising. The results of the study also revealed that teachers sometimes used worksheets (73/51%), revision guides (69/49%) and teacher's guides (54/38%), while rain gauges (99/70%), measuring tapes or line (70/49%), small tools (48/34%) respectively were rarely used by teachers in their teaching of secondary school Agricultural Science learners in the Zambezi region. It is not clear to the researcher, however, why a teacher's guide should only be used sometimes and not often.

It is also questionable that revision guides, worksheets and handouts are only used sometimes. One might have expected to see the use of tools in the "often used" category because Agricultural Science subject is practical-oriented. The fact that a rain gauge was rarely used could be because it is more of a teaching resource in geography, and not Agricultural Science. The same may be true for the rare use of measuring tapes/lines because these are more commonly used in teaching of physics.

The findings of this study are supported by data of different researchers that have examined the use of teaching and learning resources in social studies classrooms in the diverse states of Nigeria (Arisi, 1998; Ekpo, 2001 & Inyang-Abia, 1992), which studied the use of instructional materials by social studies teachers in secondary schools in Oredo local government area of Edo State, Nigeria. The author revealed that more than 90% of schools investigated in Edo State lacked the use of teaching and learning resources.

Similarly, Ekpo (2001), in the study of the strategies for managing school curriculum and resources in Nigeria, established that the most problematic issues troubling education in Nigeria are the lack of use of relevant teaching and learning resources. Similarly, Inyang-Abia

(1992), in the study on the cultural dimension in curriculum materials, the author also indicated lack of use of teaching and learning materials in most schools in Akwa Ibom State, Nigeria. The findings of this study conclude that most Agricultural Science teachers in the Zambezi region who participated in this study are able to use a syllabus, scheme of work and textbooks in their teaching; and on the other hand, they rarely use rain gauges, measuring tapes and small tools as essential teaching and learning resources.

Figure 5.13 represents participant's views on research allocation for teaching Agricultural science.

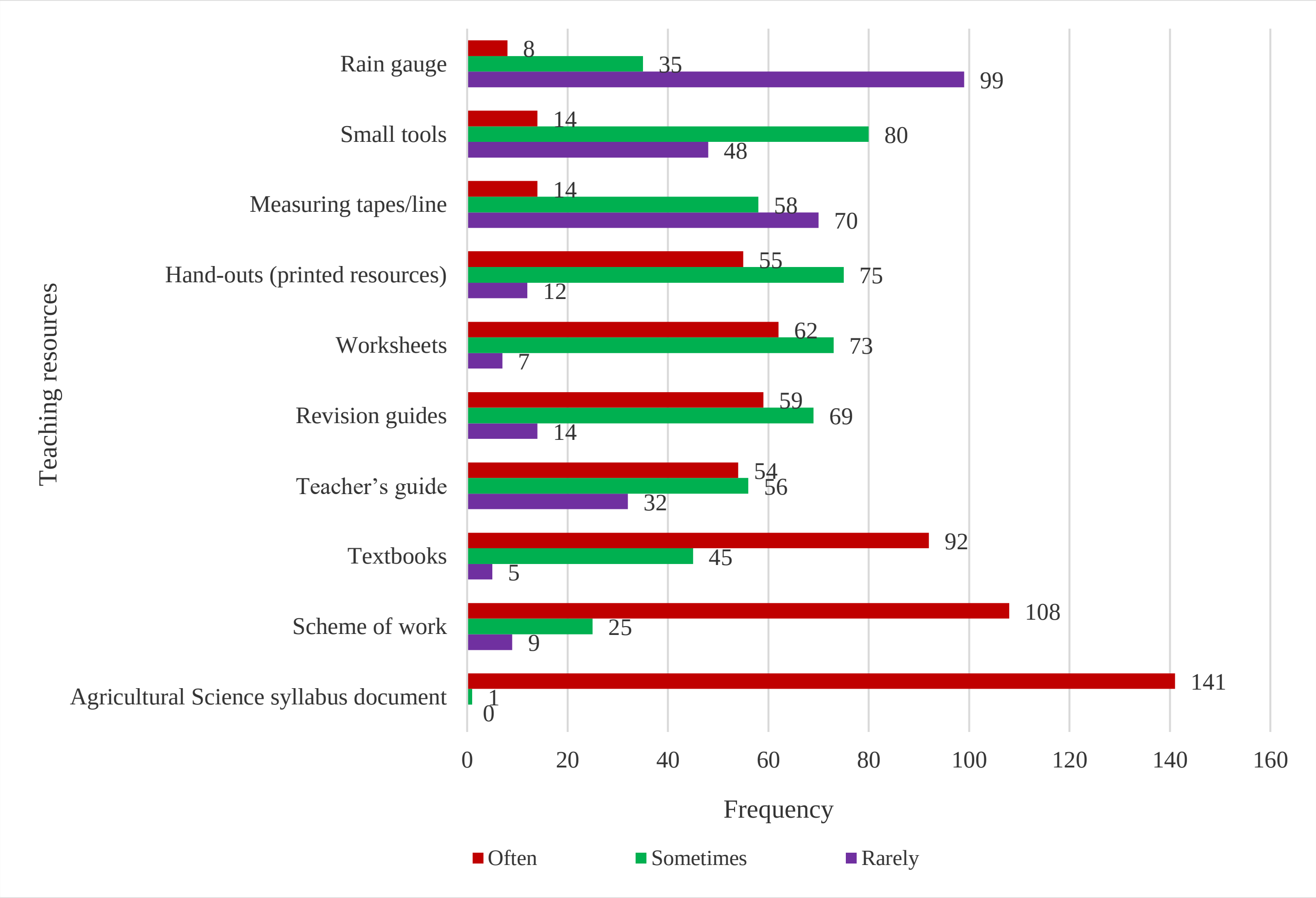


Figure 5.13: Distribution of responses of participants on resource utilisation

5.2.16 Perceptions of teachers on teaching and learning of Agricultural Science

To find out about the views of the participants with regard to teaching and learning of Agricultural Science in secondary schools, teachers were asked to indicate their views. The results of the study are shown in Table 5:4.

Table 5:4 shows that the majority 120 (85%) of the participants perceived that acquiring Agricultural Science teaching methods, skills and subject content knowledge is essential for effective teaching. The results of this are in agreement with the findings by Harlin *et al.* (2007) in their study on knowledge, skills, and abilities for Agricultural Science teachers using a focus group approach. The author revealed that pre-service and in-service agricultural teachers articulated numerous skills that are necessary to be an effective teacher. The results of the current study revealed that 114 (80%) of the participants perceived that teacher education programmes need to integrate content knowledge with teaching methods related to Agricultural Science.

The results of this study are consistent with the opinion expressed by Mohd and Effandi (2015) in their study on the integration of teacher's pedagogical content know-ledge into the teaching linear equation. The authors opined that the teaching and learning process necessitates teachers to possess the components of the subject content and the student knowledge, as well as the diverse methods in which the content knowledge of the subject can be applied in the classroom. The results of this study revealed that 110 (77%) of participants indicated that Agricultural Science teacher education preparation in Namibia requires persistent innovation to make certain that agriculture teachers are capable of teaching Agricultural Science effectively as a school subject.

It was revealed that 40 (28%) of the participants strongly agreed that there is a difference between the perceived needs of experienced and less experience teachers, while 34 (24%) of the teachers who participated in the study agreed that there is no difference in the Zambezi region. The results of this study corroborate the findings by Scheeler (2008:146) in a study on generalising effective teaching skills: the missing link in teacher preparation. The author stated that “newly certified teachers may be highly qualified due to coursework yet not be very effective once in their own classrooms because they do not generalise newly acquired teaching techniques to real world setting”. Similarly, Dickson, Tennant, Kennetz, Riddle-barger and

Stringer (2013:76) in their study on 'teacher preparation to classroom practice: perceptions of novice emirati teachers' revealed that,

> Although teacher education aims to integrate the theoretical and practical aspects of teaching, both aspects of which are important for teachers to carry out their duties, novice teachers many have difficulty applying experiences from their education programme to the reality of teaching.

The results of the study revealed that 19 (13%) of the participants do not have any idea as to whether there is a difference between the needs of experience and less experienced teachers. The results revealed that the majority 44 (31%) of the participants strongly disagreed that there is no significant difference between the perceived competencies of experienced and less experienced Agricultural Science teachers in the Zambezi region, while 40 (28%) agreed that there is significant difference between the perceived competences of experienced and less experienced teachers.

With regard to the question on whether there is no significant difference between the perceived competencies of male and female Agricultural Science teachers, the majority 37 (26%) of the participants said there is no difference, while 35 (25%) revealed there is a difference. Therefore, it can be concluded that since all the teachers are teaching in generally similar school contexts, the needs for teachers who are experienced and those who are less experienced are commonly alike.

The competencies between male and female Agricultural Science teachers are largely assumed to be of no difference as all these teachers have undertaken similar training programmes that qualified them to be competent Agricultural Science teachers in secondary schools. Table 5.3 represents the distribution of participants' responses to their views of Agricultural Science teaching.

Table 5.3: Distribution of responses on the perception of teachers

	Strongly Agree	Agree	No Idea	Disagree	Strongly Disagree	**Total**
Teacher education programmes need to integrate content knowledge with the teaching methods related to Agricultural Science	114 (80%)	24 (17%)	3 (2%)	1 (1%)	0 (0%)	**142 (100%)**
Agricultural Science teacher education preparation in Namibia requires persistent innovation to make certain that agriculture teachers are capable to teach Agricultural Science effectively as a school subject	110 (77%)	29 (20%)	2 (1%)	1 (1%)	0 (0%)	**142 (100%)**
Acquiring Agricultural Science teaching methods, skills and subject content knowledge are essential for effective teaching.	120 (85%)	19 (13%)	2 (1%)	1 (1%)	0 (0%)	**142 (100%)**
There is no significant difference between the perceived needs of experienced and less experienced Agricultural Science teachers in the Zambezi region.	32 (23%)	34 (24%)	16 (11%)	27 (19%)	33 (23%)	**142 (100%)**
There is a significant difference between the perceived needs of experienced and less experienced Agricultural Science teachers in the Zambezi region.	40 (28%)	32 (23%)	19 (13%)	27 (19%)	23 (16%)	**142 (100%)**
There is no significant difference between the perceived competencies of experienced and less experienced Agricultural Science teachers in the Zambezi region.	24 (17%)	27 (19%)	16 (11%)	31 (22%)	44 (31%)	**142 (100%)**
There is a significant difference between the perceived competencies of experienced and less experienced Agricultural Science teachers in the Zambezi region.	34 (24%)	40 (28%)	17 (12%)	25 (18%)	26 (18%)	**142 (100%)**

	Strongly Agree	Agree	No Idea	Disagree	Strongly Disagree	**Total**
There is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region.	32 (23%)	37 (26%)	27 (19%)	20 (14%)	26 (18%)	**142 (100%)**
There is a significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region.	27 (19%)	24 (17%)	27 (19%)	35 (25%)	29 (20%)	**142 (100%)**

5.2.17 Teaching methods used

Participants were asked to specify the teaching methods they used in teaching Agricultural Science in secondary schools. The results of this aspect of the study are presented in Figure 5:13. The results of the study show that 115 (81%) of participants indicated that the question-and-answer method was frequently used. This finding is consistent with that of Omar (2009:2) in a study on "teachers' questioning techniques and their potential in heightening pupils' inquiry", which revealed that "effective questioning by teachers directs pupils into understanding lesson content, arouses their curiosity, stimulates their imagination, and motivates them to seek out new knowledge". Hussin (2006) also supports this in a study on dimensions of questioning in a qualitative study of current classroom practice in Malaysia. The author reveals that if applied very well and skilfully in a classroom, questioning would stimulate learners' thinking abilities. Similarly, this promotes learners' investigative abilities in the form of thought-provoking assumptions, as well as uncovering contradictions that would lead to the attainment of new knowledge (Hussin, 2006).

The study also revealed that group discussions, teacher exposition and demonstration, as well as collaborative teaching methods were used a lot as indicated by 97 (68%), 90 (63%) and 73 (51%) of the participants. This is in agreement with the finding by Kabugi (2013) whose study showed that 7 (70%) of agriculture teachers indicated that group work was frequently used. It is also not clear why the majority of the participants did not use field excursions as a teaching method, yet it should be a requirement for teaching a practical subject such as Agricultural Science. This is also consistent with the argument made by Awuku, Baiden, Brese and Ofosu (1991) in their book "senior secondary school agricultural and environmental studies". The authors contend that it is not at all times easy to describe a good teaching method.

With regard to teaching methods, this study is in agreement with the findings by Badu-Nyarko and Torto (2014) in their study on "teaching methods preferred by part-time tertiary students in Ghana". The authors revealed that teacher exposition (lecturing method) was found to be generally used in teaching part-time students as it was pointed out by 77.5% of those students registered in specialised courses and 98.8% of the students registered in academic courses.

It is also revealed that the majority 79 (56%) of the participants indicated that field excursions were not used at all by serving Agricultural Science and only 8 (6%) indicated that field excursions were used a lot in their teaching of Agricultural Science in secondary education. The results of this study contrast with the opinion by Nkereowajiro (2014) reported in a study conducted on the "impact of students' field trips on academic performances in Agricultural Science in selected secondary schools in River State, Nigeria". The author opined that students integrate, comprehend and are able to make the connections of the new information to that which they previously knew when they see, feel, touch and hear.

The findings of this study further revealed that practical activities/experiments were used by 83 (58%) of the participants in their teaching. The findings of this study are not in agreement with the findings by Kabugi (2013), in which only 1 (10%) of the participants indicated that experimental projects were used in the classroom teaching.

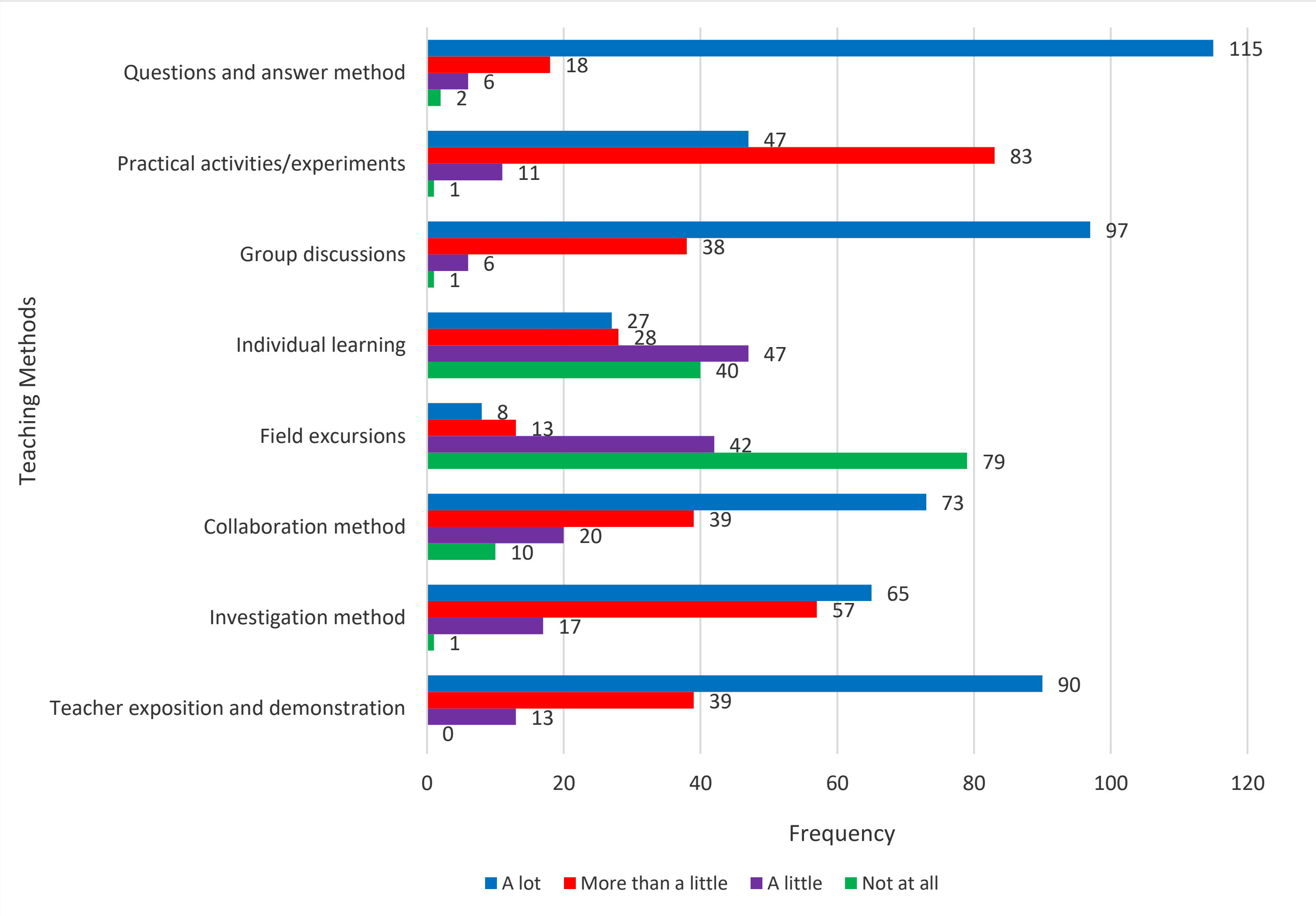


Figure 5.14: Distribution of responses of participants on the extent of using different teaching methods

5.2.18 Views on importance of teaching and learning methods

Figure 5:14 shows that 127 (89%) of the participants indicated that the class discussion method was considered to be very valuable to use in their teaching of Agricultural Science. The results were expected because classroom discussion is understood to be a valuable teaching technique for increasing higher-order thinking skills among learners, the skills that facilitate learners to understand, examine, as well as to use information meaningfully. In this regard, learners are given the opportunity to give details of their thinking and point of view, instead of simply reporting or narrating remembered facts and details of the subject matter.

In this view, learners are not passive recipients of the information that is transmitted to them by a teacher. In other words, learners are seen to be active participants. This is in line with the opinion by Engle and Ochoa (1988:47) cited by Larson (2000:662) who opined that for "classroom discussions to educate students, there should be serious interaction where students support their ideas with evidence, where their opinions are subject to challenge by their peers as well as the teacher, and where the teacher's ideas are equally open to criticism".

The findings of this study are in line with views by Amin, Sailesh, Mishra, Reddy and Mukkadan (2015:149) that "along with the teaching, it is needed to involve the student actively in discussions, which are found to be more beneficial as they improve communication skills of students and also helps them to reproduce the same effectively in examinations". The authors also found that 83.33% of the participants preferred teaching followed by group discussions as supportive for students to comprehend, recall as well as replicate what they have learnt during the examinations. In a study by Badu-Nyarko and Torto (2014:227), the authors opined, "participatory methods like the discussion method, case study and demonstrations are very important". Classroom discussions is an important process because it expedites abstract learning process in a classroom (Larson, 2000).

The results of this study suggests that classroom discussions contribute meaningfully to a discussant's thoughtfulness about the topic being discussed; affords discussants opportunities to present their diverse ideas about a particular topic, as well as providing opportunities to contest or agree with different ideas. This creates a situation that would inspire mutual alterations among the discussants' thoughts to produce a group decision or agreement. The study also found that working in groups (113/80%), problem solving based activities (109/77%) and question-and-answer methods (109/77%) were regarded as very valuable teaching techniques. Group discussions are an important factor in improving teaching and learning as they shape as well as direct the assessment of a topic being discussed. The result of the study that was surprising is that teachers prefer, or consider as valuable, "rehearsing" as a teaching and learning method (94/66%). This is seriously surprising because teachers should not promote "rehearsing" but rather "understanding" in whatever description. An equally contradicting view is that teachers consider individual learning as only "slightly valuable" (63/44%). Naturally, learners can only master any subject when they improve their "individual learning" because several ideas emerge out of such a practice or experience. Generally, it can be concluded that participants in their teaching predominantly used class discussions, problem-solving and question-and-answer methods. Figure 5.15 represents teachers' views on teaching methods used.

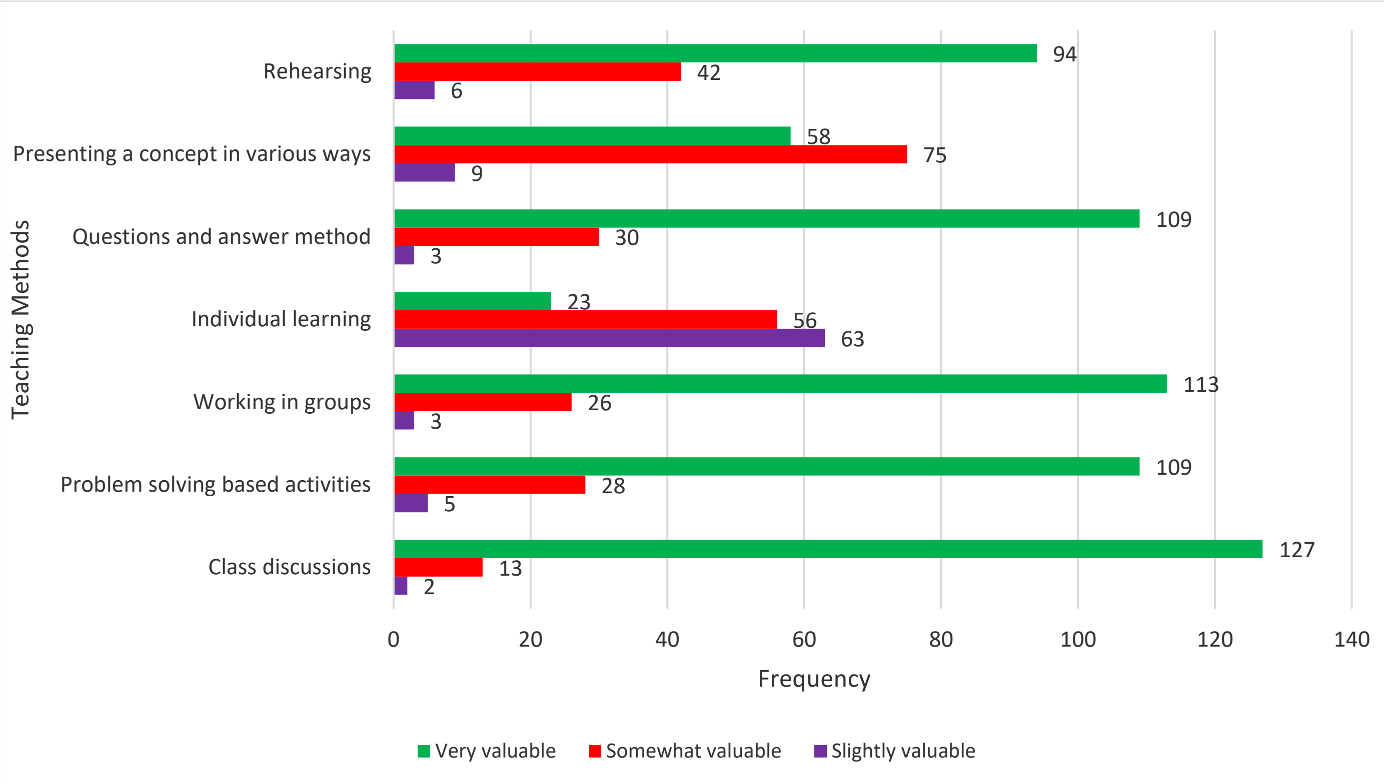


Figure 5.15: Views of participants on teaching methods

5.2.19 Time spent on teaching and learning

The teaching time allocated to Agricultural Science in secondary schools is 4 periods per week and each period runs for 40 minutes. Therefore, the total amount of time allocated to Agricultural Science in secondary schools amounts to 200 minutes per week for 196 days school calendar per academic year. The results of the study revealed that the greater part of the teaching time of the majority of the participants (135/95%) was spent on teaching the whole class.

It is also evident from the results of the study that a substantial amount of time is spent possibly on teaching slow learners. The results of the study suggest that this aspect if ignored would lead to some learners not improving at all. The results of the study are also not surprising because a considerable amount of time is spent on projects. Since Agricultural Science is a practical-oriented subject, it is important for learners to have adequate amount of time for them to engage in project-related activities.

The results of the study as shown in Figure 5:16 show that learners should have to spend less than <35% of their time on research work given the fact that much of their time should be spent in a classroom as dictated by the curriculum. However, in this subject it is also important to expose learners to new agricultural practices, which can only be learnt through research-based activities using available library resources such as the internet and international peer-reviewed journals in their discipline.

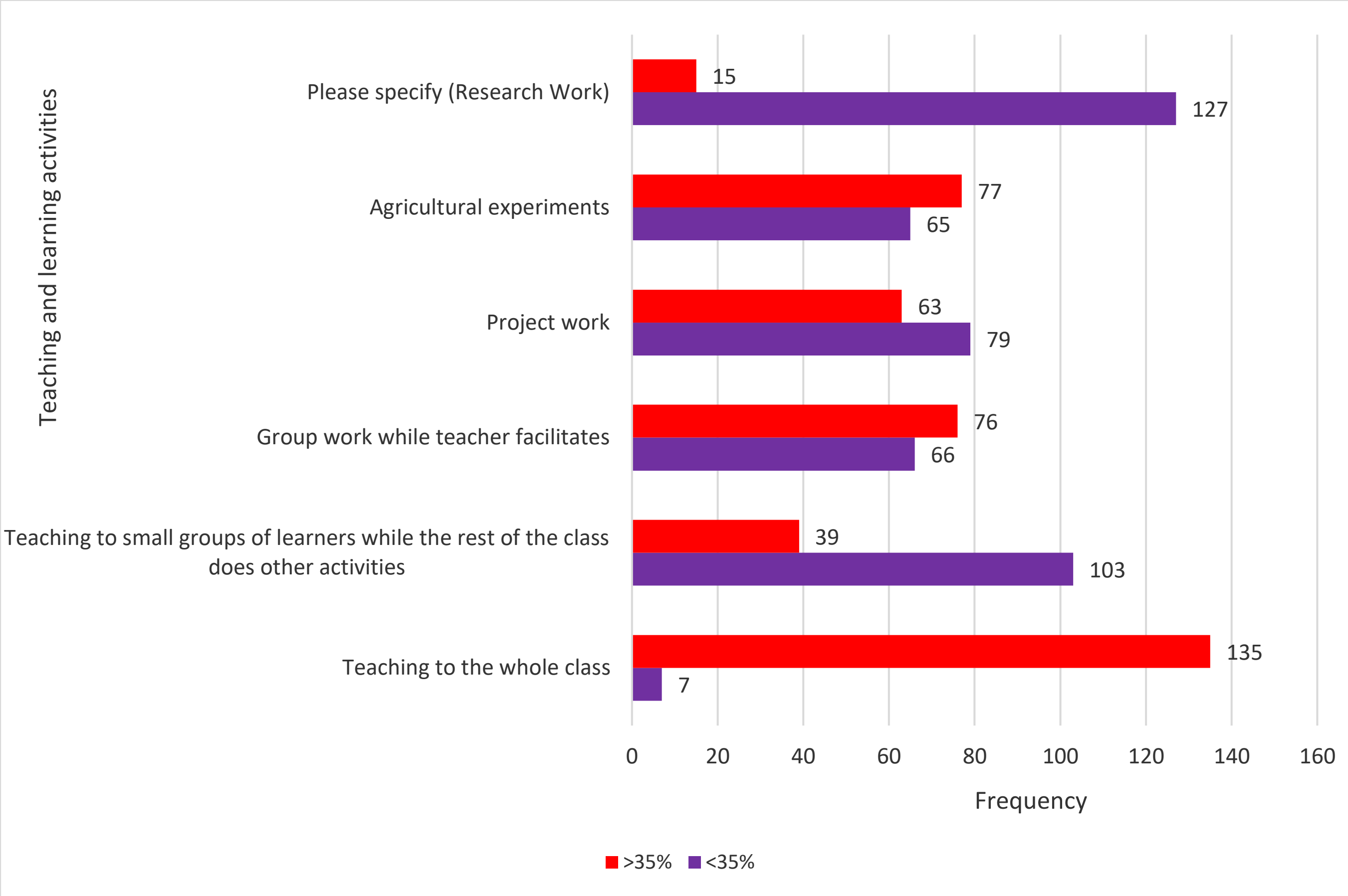


Figure 5.16: Distribution of responses of participants on the time spent on teaching and learning

5.2.20 How the learners exhibit their abilities in learning

Participants were asked about how often learners in their classrooms exhibit certain activities in the classroom. The results in Table 5:6 revealed that 91 (64%) of participants indicated that learners "sometimes" do explain their investigations orally in the classroom. Learners are supposed to provide their feedback orally through presentations in the classroom. Therefore, the results of the study suggest that teachers need to do more in encouraging their learners to orally present their findings to the whole class rather than only as written reports.

The results of the study revealed that the majority (72/51%) of the participants indicated that learners "sometimes" use appropriate agricultural terminology, while the rest "rarely or not at all" and "often" use appropriate Agricultural Science terminology in their classrooms.

Learners are expected in their classroom, when presenting their findings, to use appropriate Agricultural Science terminology for effective learning of the subject content. If this is ignored over an extended period in the teaching and learning process, learners will not improve in their learning. An equally contradictory view is that the majority of the participants (83/58%) indicated that learners "sometimes" justify their reasoning and problem-solving abilities in their classrooms. Logically, learners can only master any subject content when they show their skills and their abilities to justify their reasoning and problem-solving expertise because a number of ideas arise out of such a practice or experience.

Therefore, the study suggests that participants should make the necessary efforts for learners to move from the "sometimes" category to the "often" one. The results of the study are in line with opinions by Brent (2005:57) who averred that "students have different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices". Table 5.4 below represents the distribution of responses on learners' abilities manifest in their learning.

Table 5.4: Distribution of responses of teachers on how learners' abilities exhibit in their learning

	Rarely or not at all	Sometimes	Often	**Total**
Explain their investigation orally in class.	6 (4%)	91 (64%)	45 (32%)	**142 (100%)**
Explain their investigation in writing (as an assignment)	4 (3%)	61 (43%)	77 (54%)	**142 (100%)**
Use appropriate agricultural terminologies in class.	5 (4%)	72 (51%)	65 (46%)	**142 (100%)**
Justifying their reasoning and problem solving abilities.	4 (3%)	83 (58%)	55 (39%)	**142 (100%)**

5.2.21 Level of teaching confidence

Figure 5:17 shows that the majority 134 (94%), 133 (94%) and 68 (48%) respectively of the participants are very confident in teaching plant production, animal production and the agricultural technology components of the Agricultural Science curriculum, with general agriculture ranking the highest (139/98%) in teaching confidence level. The results of the study were surprising because all participants would have received similar training in Agricultural Science that should have made them confident to teach Agricultural Science content at secondary level. It is expected of them to remain competent in teaching the themes covered in the curriculum in order to effectively and efficiently improve teaching and learning of Agricultural Science.

Therefore, the results of the study suggest that a high level of perceived subject knowledge is an indication of high self-confidence and results in reduced lack of teacher confidence and increased preparedness in presenting a particular theme or topic of the curriculum. The results of the study are in sync with the opinions of Wilson and Flowers (2002). These authors opined that in-service training should be developed to build the self-confidence, as well as self-perceived subject knowledge of Agricultural Science teachers in relation to their implementation of the curriculum. The issue that needs attention is to establish why teachers are only “somehow confident” in the teaching of financial management and agricultural economics subject content. Efforts should be made to make all Agricultural Science teachers feel “very confident” in teaching all subject matter in the Agricultural Science curriculum.

The results of the study suggest that the Ministry of Education, as the custodian of the Namibian teaching service, should provide opportunities for the retraining of Agricultural Science teachers. First, by introducing how the curriculum will satisfy the desired subject knowledge, and second, by proceeding with intensive hands-on training to increase the confidence levels of teachers in teaching the Agricultural Science curriculum in secondary schools. Figure 5.17 represents the distribution of participants’ responses on the level of confidence of teaching the different components of Agricultural Science.

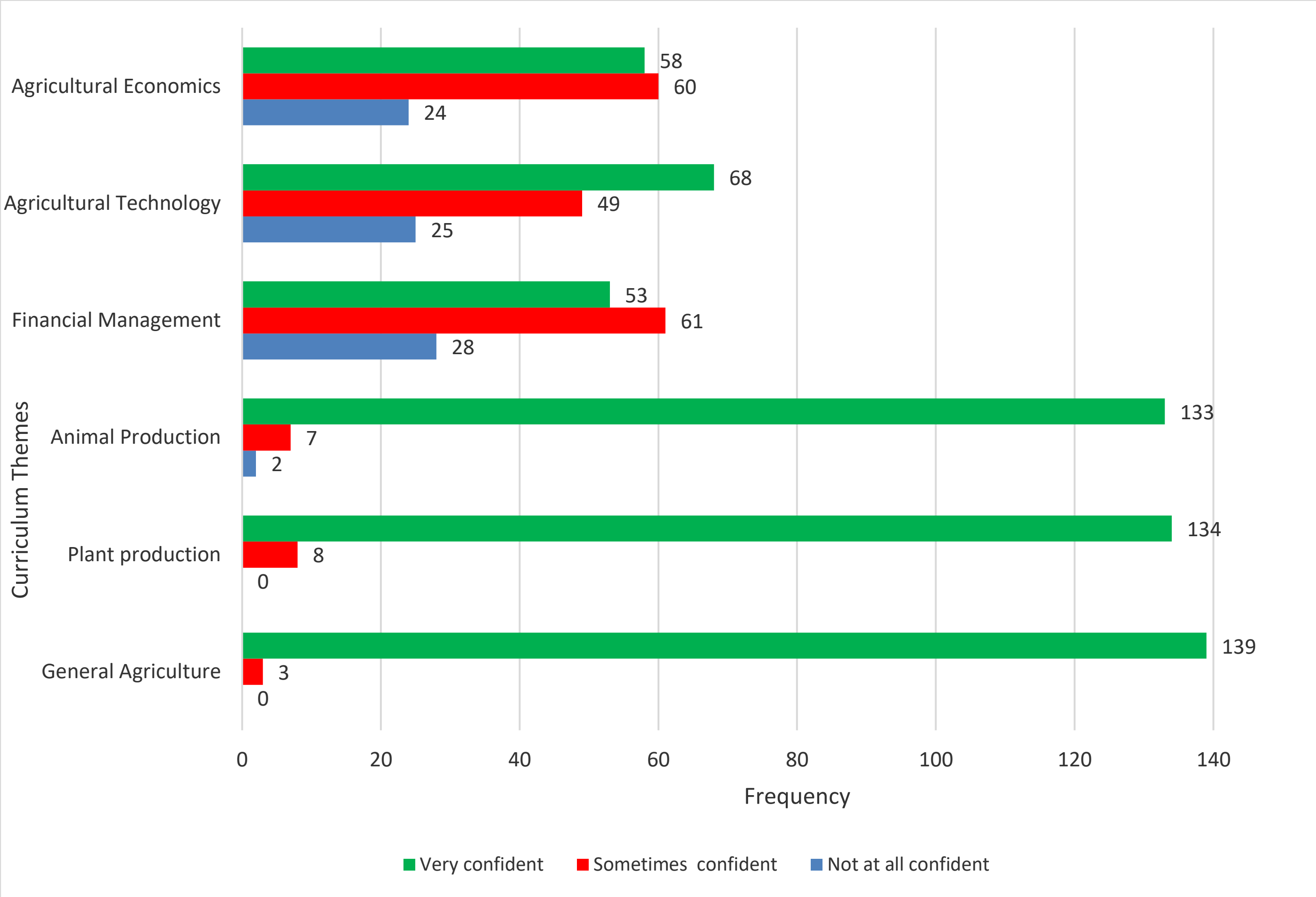


Figure 5.17: Responses of participants on the level of teaching confidence

5.2.22 Challenges in teaching Agricultural Science

The most predominate challenges faced by the participants in this study were shortage of textbooks (105/74%), shortage of Agricultural Science tools/equipment (105/74%), inadequate teaching and learning resources for lesson planning (78/55%), heavy workloads (61/43%) and lack of professional development or in-service training (51/36%), respectively. Resources such as textbooks and tools are essential components for effective teaching and learning and if ignored over a lengthy period will negatively affect teaching and learning in and outside the classroom. For effective teaching and learning in the classroom, resources such as textbooks and other learning materials are considered as essential tools.

Therefore, lack or shortage of these learning materials make Agricultural Science teachers handle the subject content in an abstract way, as a result depicting it as shrivelled and not stimulating. The results of the study suggest that lack of teaching and learning resources in secondary schools threatens academic outcomes since learners are more likely to be absent from schools that fail to make available attention-grabbing, significant as well as applicable learning know-ledge for them. Therefore, it is important, based on the results of this study for Agricultural Science teachers to be provided with such resources for effective teaching and learning.

Globally, several studies have been conducted on the impact of teaching resources on education. Okongo, Ngao, Rop and Nyongesa (2015) in their study on "Effect of availability of teaching and learning resources on the implementation of inclusive education in pre-school centers in Nyamira North Sub-County, Nyamira County, Kenya", mentioned that the achievements of students in the West Africa School Certificate Examination (WASCE) were associated with the availability of resources for teaching. They concluded that learning resources have an important influence on the academic performance of learners since resources expedite learning of abstract concepts, as well as ideas, and effectively discourage learning through memorisation (Okongo, Ngao, Rop, & Nyongesa, 2015). The findings of this study are consistent with those by Darko *et al.*, (2015), who conducted their study on "The challenges in the teaching and learning of Agricultural Science in selected public senior high schools in the Cape Coast Metropolis, Ghana". The authors revealed that inadequate teaching and learning materials and their availability were the major challenges faced by secondary Agricultural Science teachers.

This study further revealed that limits in the Agricultural Science teacher's own subject knowledge and teaching methods (107/75%), lack of electricity for electronic appliances (107/72%), pressure from parents or guardians (100/70%), curriculum content inappropriate for the grade level (99/70%) and too much content in the syllabus (99/70%) were found to be the least of the challenges faced by Agricultural Science teachers in the Zambezi region, since only 57/40% in total of the teachers indicated that they face a great challenge (Figure 5:17).

Generally, it can be concluded that most of the schools in the Zambezi region are electrified and the curriculum content is appropriate for the grades teachers are teaching, including their own understanding of the subject content they teach in those particular grades. Sixty-one (43%) of the participants indicated that too heavy workloads and large class sizes (80/56%) posed some challenges, while only 23 (16%) of the participants indicated that the workload was of little or no challenge to them. The findings are in agreement with the findings of Darko, *et al*.

(2015:13) in their study on "Challenges in the teaching and learning of Agricultural Science in selected public senior high schools in the Cape Coast Metropolis, in Ghana". The authors revealed that the foremost challenges facing the teaching and learning of Agricultural Science in secondary schools were frequent use of a lecture method in teaching, large class sizes and the poor remuneration of teachers. Generally, it can be concluded that the workload among Agricultural Science teachers and large class sizes contributed significantly to poor performance among Agricultural Science teachers in externally examined grades such as grades 10 and 12.

Figure 5.18 represents the distribution of responses to teaching challenges.

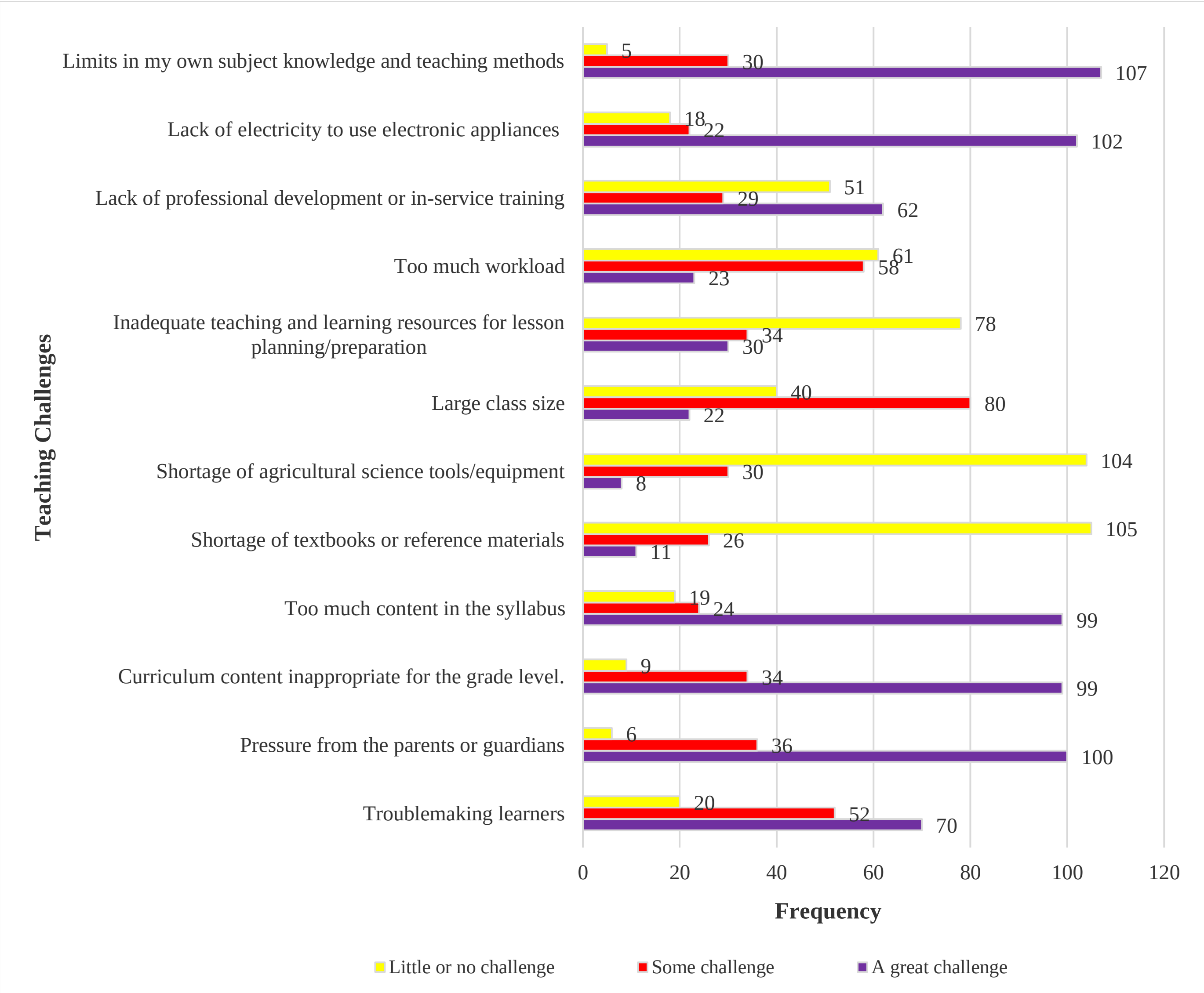


Figure 5.18 Responses of participants on the teaching challenges

The next section presents the main findings of the four-research hypothesis that were tested.

5.3 Quantitative Data Analysis (Main Findings)

Using Statistical 13 computer software, to test whether there is a statistically significance difference at 0.05 level of significance between the perceived needs, gender and experience, the data were subjected to Chi-Square (χ^2) statistical analysis, while the variation on the perceived competencies between gender and experience were subjected to ANOVA.

5.4 Testing and Analysis of Null Hypothesis (Main findings)

5.4.1 Null Hypothesis 1

HO: There is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region, Namibia.

The results of the study (Table 5:5) indicate that there was no gender differences for all competencies tested. Therefore, the null hypothesis three that states that there is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region was not statistically significant ($p>0.05$) for all the competencies tested (*see* Appendix E for a detailed analysis). The explanation for this result could be related to the fact that male and female Agricultural Science teachers in schools studied had perhaps acquired the same kind of training. It can be pointed out that the participants had nearly similar quality and level of training.

The results of this study are consistent with the findings of the study that was conducted in India by Sain, Kaware and Duuglas (2014) in a comparative study on the teaching competency between novice and veteran teachers in the teaching learning process of a secondary school in Bilaspur City in Chhattisgarh. The study revealed that there is no significant difference in the teaching competencies of male and female teachers.

In another study conducted in Indonesia by Mustafa (2013) on professional competency differences among high school teachers, the author revealed that the professional competency among female teachers was found to be higher than that of male teachers. The findings by Mustafa (2013) were found to be comparable with an earlier study by Bakalis (2003), which revealed that female teachers are more committed in their teaching profession compared to male teachers. It is also evident that the other attribute with regard to commitment of teachers is that male teachers normally have several interests running at the same time, as a result reducing their commitment to one specific job.

The results of this study are also consistent with the research results by Shulman (1990), in a study on knowledge and teaching. The author revealed that the competencies related to classroom management such as the ability to communicate effectively during the teaching and learning process showed no statistically significant difference between male and female teachers. However, in a study conducted in Nigeria by Adodo (2014), on an evaluation of secondary school teachers' competency in evaluating students' cognitive and psychomotor achievement in basic science and technology (BST), the author found that there is a statistically significant difference between teachers' gender and their competency in evaluating the student's cognitive achievement in BST.

Therefore, it is worth saying that teachers, regardless of their gender, generally put much emphasis on the delivery of teaching in the classroom towards academic improvement, which as a result does not show obvious difference (Marks, 1991 in Mustafa, 2013). A limitation of the current study reported is that the data produced is self-report data. The actual competencies of male and female teachers might be significant different if observed directly.

Table 5.5: Summary statistics of the cross-tabulation on differences between gender and perceived competencies

Competencies	**ANOVA gender; LS Means**	**Decision**
1. The teacher should have the ability to effectively demonstrate to learners the correct way to solve a problem	Current effect: F(1, 139)=1.2065, p=0.27 Mann-Whitney U p=0.83	No statistically significant difference
2. The teacher should have the ability to appreciate that it is better when a teacher not a learner decides what activities are to be done in a classroom.	Current effect: F(1, 140)=.88550, p=0.35 Mann-Whitney U p=0.46	No statistically significant difference
3. Teachers know a lot more than learners, they should not let learners develop answers that may be incorrect when they can just explain the answers directly,	Current effect: F(1, 140)=.02724, p=0.87 Mann-Whitney U p=0.85	No statistically significant difference
4. The teacher should have the ability to know that learners learn best by finding solutions to problematic questions on their own.	Current effect: F(1, 140)=.58722, p=0.44 Mann-Whitney U p=0.56	No statistically significant difference
5. The teacher should have the ability to appreciate that instruction should be built around problems with clear, correct answers and around ideas that most learners can grasp quickly.	Current effect: F(1, 140)=.02158, p=0.88 Mann-Whitney U p=0.89	No statistically significant difference
6. The teacher should have the ability to believe that how much learners learn depend largely on the prior knowledge they have, that is the reason why teaching facts is necessary.	Current effect: F(1, 140)=.09366, p=0.76 Mann-Whitney U p=0.71	No statistically significant difference
7. The teacher should ensure active involvement of the learners in the learning process (Collaborative learning).	Current effect: F(1, 140)=.00016, p=0.99 Mann-Whitney U p=0.80	No statistically significant difference
8. The teacher should have the ability to allow learners to be creative, make decisions and think of solutions to problematic topics themselves before the teacher shows them how well they are solved.	Current effect: F(1, 140)=.34663, p=0.56 Mann-Whitney U p=0.45	No statistically significant difference

Competencies	ANOVA gender; LS Means	Decision
9. The teacher should have the ability to evaluate development and achievement of learners with regard to learning.	Current effect: $F(1, 140)=.07306$, $p=0.79$ Mann-Whitney U $p=0.61$	No statistically significant difference
10. The teacher should appreciate that learners' thinking, reasoning and problem-solving abilities are more important than specific learning content.	Current effect: $F(1, 140)=.47729$, $p=0.49$ Mann-Whitney U $p=0.25$	No statistically significant difference
11. The teacher should implement fundamental values and principles that the Namibian education system is based on.	Current effect: $F(1, 140)=.05730$, $p=0.81$ Mann-Whitney U $p=0.99$	No statistically significant difference
12. Teachers should have the ability to communicate effectively.	Current effect: $F(1, 140)=.00548$, $p=0.94$ Mann-Whitney U $p=0.96$	No statistically significant difference

5.4.2 Null Hypothesis 2

Ho: There is no significant difference between the perceived competencies of less experienced (<10 years) and experienced (>10 years) Agricultural Science teachers in the Zambezi region, Namibia**.** Participants were asked to indicate their perceived competencies relative to teaching experience. The results of the study (Table 5:6) indicate that there was no differences in teaching experience for all competencies tested. Therefore null hypothesis four that states that there is no significant difference between the perceived competencies of less experienced (<10 years) and experienced (>10 years) Agricultural Science teachers in the Zambezi region was not statistically significant (p>0.05) for all the competencies tested (*see* Appendix E for a detailed analysis).

Thus the conclusion made since the obtained p-value for each of the competencies is higher than the predetermined level of significance (0.05), is that there is no statistically significant difference in the teaching competencies of less experienced and experienced Agricultural Science teachers in the Zambezi region. The justification for this result could be related to the fact that <10 years and >10 years Agricultural Science teachers in schools studied had perhaps acquired the same kind of training. This can be stated as the participants had virtually comparable quality and level of training.

The results of this study are in disagreement with the comparative study that was conducted in India by Sain, *et al.* (2014) on the teaching competency between novice and veteran teachers in the teaching learning process of a secondary school of Bilaspur City in Chhattisgarh. The study "concluded that there is significant difference in the teaching competency of novice[2] teachers and veteran[3] teachers". The results of this study also do not agree with the findings of the research study by Mustafa (2013) on professional competency differences among high school teachers in Indonesia. The author revealed that there is significant difference in terms of professional competency based on teaching experience. In understanding the findings by Mustafa (2013), it means that teachers who are experienced outperformed the less experienced teachers regarding the mastery of professional competency. This was not evident with the findings of this study. It could be concluded that experience seems to play a lesser role in the

[2] Novice – Beginner/Less experienced teacher

[3] Veteran – Experienced teacher

teaching and learning process among Agricultural Science teachers in the Zambezi region. As mentioned, a limitation of the current study is that it is based on self-report data and findings might be different if the teachers' professional competencies were observed directly.

Table 5.6: Summary statistics of the cross-tabulation on differences between perceived competencies and experience

Competencies	**ANOVA teaching experience; LS Means**	**Decision**
1. The teacher should have the ability to effectively demonstrate to learners the correct way to solve a problem.	Current effect: F(2, 138)=.73821, p=0.48 Kruskal-Wallis p=0.46	No statistically significant difference
2. The teacher should have the ability to appreciate that it is better when a teacher not a learner decides what activities are to be done in a classroom.	Current effect: F(2, 139)=.27787, p=0.76 Kruskal-Wallis p=0.67	No statistically significant difference
3. Teachers know a lot more that learners, they should not let learners develop answers that may be incorrect when they can just explain the answers directly,	Current effect: F(2, 139)=.92520, p=0.40 Kruskal-Wallis p=0.34	No statistically significant difference
4. The teacher should have the ability to know that learners learn best by finding solutions to problematic questions on their own.	Current effect: F(2, 139)=.02037, p=0.98 Kruskal-Wallis p=0.77	No statistically significant difference
5. The teacher should have the ability to appreciate that instruction should be built around problems with clear, correct answers and around ideas that most learners can grasp quickly.	Current effect: F(2, 139)=.54830, p=0.58 Kruskal-Wallis p=0.43	No statistically significant difference
6. The teachers should have the ability to believe that how much learners learn depend largely on the prior knowledge they have, that is the reason why teaching facts is necessary.	Current effect: F(2, 139)=.54830, p=0.58 Kruskal-Wallis p=0.43	No statistically significant difference
7. The teacher should ensures active involvement of the learners in the learning process (Collaborative learning).	Current effect: F(2, 139)=1.7022, p=0.19 Kruskal-Wallis p=0.10	No statistically significant difference
8. The teacher should have the ability to allow learners to be creative, make decisions and think of solutions to	Current effect: F(2, 139)=.71798, p=0.49 Kruskal-Wallis p=0.39	No statistically significant difference

Competencies	ANOVA teaching experience; LS Means	Decision
problematic topics themselves before the teacher shows them how they are solved.		
9. The teacher should have the ability to evaluate development and achievement of learners with regard to learning.	Current effect: F(2, 139)=.40250, p=0.67 Kruskal-Wallis p=0.39	No statistically significant difference
10. The teacher should appreciate that learners' thinking, reasoning and problem solving abilities are more important than specific learning content.	Current effect: F(2, 139)=1.0505, p=0.35 Kruskal-Wallis p=0.19	No statistically significant difference
11. The teacher should implement fundamental values and principles that the Namibian education system is based on.	Current effect: F(2, 139)=.34177, p=0.71 Kruskal-Wallis p=0.76	No statistically significant difference
12. Teachers should have the ability to communicate effectively	Current effect: F(2, 139)=1.0393, p=0.36 Kruskal-Wallis p=0.14	No statistically significant difference

5.4.3 Null Hypothesis 3

H_0: There is no statistically significant difference between the perceived needs of male and female Agricultural Science teachers in the Zambezi region, Namibia. Table 5:7 shows Chi square and the p-values for the differences between the perceived needs of male and female teachers. When participants were asked about their most and least preferred perceived needs for effective and efficient teaching of Agricultural Science subject in their classrooms, 18 out of 20 (90%) proposed needs were not statistically significant ($p>0.05$) (Table 5:8). The two needs which showed a statistically significant difference ($p < 0.05$) are those related to preparing Agricultural Science instructional and learning activities and the teaching of Agricultural Science through field excursions and scientific visits (*see* Appendix D for a detailed analysis). The fact that the participants, irrespective of gender, were drawn from the same category (Agricultural Science) of teachers who faced similar challenges in various schools, may explain why 18 (90%) of their teaching needs are highly similar.

The results revealed that 49% of the male teachers considered the need for preparing materials for Agricultural Science instructional and learning activities as most preferred, while 28% of the female teachers also considered it as a most preferred need and the rest did not. The results of the study suggest that although male and female teachers do have comparable opportunities to prepare Agricultural Science instruction and learning activities for their teaching, female teachers are more meticulous and usually pay more attention to details as compared to male teachers. The findings of this study are in line with the views of Alao (2014) in the study "Teacher effectiveness among female teachers in primary and secondary schools in south-western Nigeria". The author stated that female teachers are friendly, tolerant and meticulous in preparing learner activities in the classroom.

Therefore, it would be realistic to say that based on the results of this study, female teachers do not consider preparing Agricultural Science instruction and learning activities as a key component in the teaching of Agricultural Science as they believed that sufficient pre-service training was received in this regard. It is also evident in schools studied that individual teachers prepare their instructional and learning activities guided by curriculum documents from the Ministry of Education.

The results of the study further show that the majority (65%) of the female teachers and the majority (59%) of the male teachers considered field excursions as a less preferred need while the rest did not. The questions that this result raises include: (a) Do male teachers believe that the current number of field excursions and scientific visits scheduled for the teaching of this subject are adequate? The reverse would be true for female teachers. (b) Does the statistical difference portray the real picture relative to the real difference? The answer to this question is that the difference is quite small (6%). The implication of this small difference would require further research to establish why the small difference existed. To this researcher, the overall result indicates that both male and female teachers do not consider this need a very important one because the majority 109 (77%) of both genders perceive it as least preferred or not needed at all.

Table 5.7: Summary statistics of the cross-tabulation on relationship between perceived needs and gender

Needs	**Chi- square (χ^2, df=2) and p-value**	**Decision**
1. Updated knowledge of Agricultural Science-related career opportunities	χ^2=3.34, p=0.18841	No statistically significant difference
2. Select an appropriate instructional strategy	χ2=1.72, p=0.42365	No statistically significant difference
3. Learning new methods of teaching Agricultural Science	χ2=3.88, p=0.14376	No statistically significant difference
4. Methods of motivating learners to learn Agricultural Science	χ2=0.88, p=0.64490	No statistically significant difference
5. Update knowledge of applications of Agricultural Science	χ2=5.65, p=0.05945	No statistically significant difference
6. Delivery of Agricultural Science concept to learners	χ2=1.93, p=0.38174	No statistically significant difference
7. Preparation of Agricultural Science instructional and learning activities	χ2=6.63, p=0.03636	**Statistically significant**
8. Evaluating learners’ progress in Agricultural Science	χ2=3.29, p=0.19258	No statistically significant difference

Needs	**Chi- square (χ^2, df=2) and p-value**	**Decision**
9. Writing Agricultural Science instructional objectives	$\chi2=3.36$, p=0. 18599	No statistically significant difference
10. Develop an instructional plan for a unit of Agricultural Science	$\chi2=2.91$, p=0.16880	No statistically significant difference
11. Update one's knowledge in instructional and learning theory of Agricultural Science	$\chi2=1.31$, p=0.23382	No statistically significant difference
12. Selection of new textbooks for Agricultural Science	$\chi2=3.17$, p=0.52073	No statistically significant difference
13. Planning and conducting learner field excursions	$\chi2=3.56$, p=0.20513	No statistically significant difference
14. Classroom management skills	$\chi2=0.53$, p=0.16899	No statistically significant difference
15. Assessing learners' learning	$\chi2=3.04$, p=0.76644	No statistically significant difference
16. Questioning and classroom discussion techniques	$\chi2=6.39$, p=0.21900	No statistically significant difference
17. Teaching Agricultural Science through field excursion and scientific visits	$\chi2=0.98$, p=0.04096	**Statistically significant**

Needs	**Chi- square (χ^2, df=2) and p-value**	**Decision**
18. Developing creative thinking among Agricultural Science learners.	$\chi 2=0.49$, $p=0.61350$	No statistically significant difference
19. ICT needs	$\chi 2=0.49$, $p=0.78352$	No statistically significant difference
20. Formal Further training	$\chi 2=1.14$, $p=0.56540$	No statistically significant difference

5.4.4 Null Hypothesis 4

Ho: There is no significant difference between the perceived needs of less experienced (<10 years) and experienced (>10 years) agricultural science teachers in the Zambezi region, Namibia. The opinions expressed by the participants indicate that 13 out of 20 needs did not show statistically significant differences, while 7 needs showed statistically significant ($p>0.05$) difference between less experienced (<10 years) and more experienced (>10 years) teachers (*see* Appendix D for a detailed analysis). These are discussed below:

- **Delivery of Agricultural Science concepts to learners related to teaching experience**

There was a significant difference ($p<0.05$) between the teachers with shorter teaching experience (<10 years) relative to those with longer teaching experience (>10 years) with regard to the delivery of Agricultural Science concepts to learners (Table 5:8). While 60% of teachers with <10 years of teaching experience considered delivery of Agricultural Science concepts to learners as a most preferred need, only 34% of those with a teaching experience of >10 years thought so (*see* Appendix D for a detailed analysis). Whether this need had a negative effect on the delivery of Agricultural Science to learners by less experienced teachers could not be ascertained from the results of this study.

However, the results point out those teachers with less teaching experience possibly need help to improve their performance in the delivery of this subject. The results also raise the question of whether or not the Agricultural Science teachers acquired appropriate and adequate skills during their training. Rice (2010) pointed out that teacher experience promotes effectiveness and teacher competencies only develop over time in the teaching and learning process in a classroom. According to the same author, teachers with less experience are less effective than experienced teachers in the delivering of the subject content and handling of learners' behaviour. However, Rice (2010:2) contends, "studies have documented some evidence that effectiveness declines after some point, particularly among high school teachers".

Therefore, it is worth mentioning that the majority 27 (60%) of teachers with <10 years of teaching experience need more help in the delivering of Agricultural Science concepts to secondary schools learners. This should be emphasised in both pre-service and in-service teacher education programmes. This is important in order for this particular group of teachers to improve teaching and learning and to enhance the academic performance of Agricultural Science learners in secondary schools (Emeya, 2017).

Table 5.8: Summary statistics of the observed frequencies on the delivery of Agricultural Science concepts to learners related to teaching experience

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=11.55, p=0.02101			
	Needs6 Most Preferred Needs	Needs6 Least Preferred Needs	Needs6 Not needed at all	Row Totals
0 – 10	27	12	6	45
Row %	60.00%	26.67%	13.33%	
11 – 15	11	13	11	35
Row %	31.43%	37.14%	31.43%	
15 and more	22	30	10	62
Row %	35.48%	48.39%	16.13%	
Totals	60	55	27	142

- **Teaching experience in relation to preparation of Agricultural Science instructional and learning activities**

The results of this study, as shown in Figure 5:19, show that 58% of teachers with <10 years of teaching experience indicated that the need to prepare Agricultural Science instructions and activities in the quest to improve teaching and learning is the most preferred need as compared to teachers with 11 to 15 years of teaching experience.

However, as shown in Figure 5:11 below teachers with >10 years of teaching experience indicated that to prepare Agricultural Science instruction and activities is most preferred (*see* Appendix D for a detailed analysis). It could be said that these teachers, despite enjoying a large share of teaching experience, still need some form of continuous professional development, which is not mandatory in the Namibian context and not provided by the Namibian Ministry of Education. Continuous professional development in this regard is essential for them to keep abreast of contemporary issues in teaching and learning. It can be concluded that teachers with less than 10 years of teaching experience need more support to enable them to have the needed competencies to plan and prepare Agricultural Science instruction and activities that are needed to enhance effective teaching and learning. Figure 5.19 shows a categorised histogram of teaching experience in relation to perceived needs.

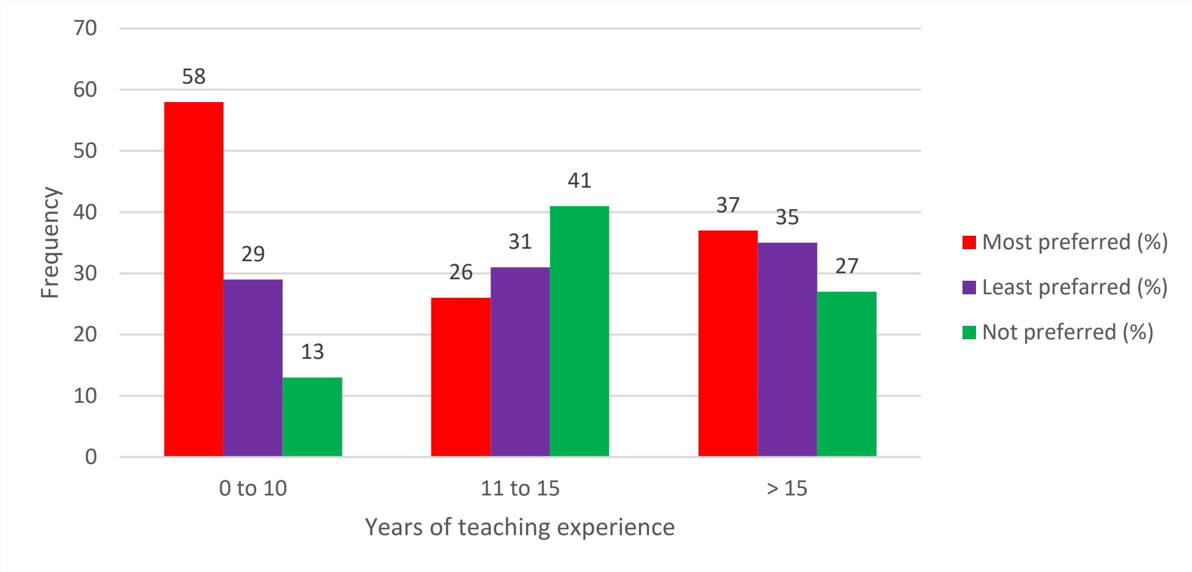


Figure 5.19: Categorised histogram: teaching experience in relation to preparation of Agricultural Science instructional and learning activities

- **Writing Agricultural Science instructional objectives as related to teaching experience**

Table 5:9 shows that 32% of more experienced teachers (>10 years) believed that writing Agricultural Science instructional objectives was a most preferred need as compared to 44.4% of less experienced teachers (<10 years) (*see* Appendix D for a detailed analysis). Teachers with more years of teaching experience should have acquired this skill through their long teaching experience. Whereas older teachers may have not been trained properly on this aspect, possibly because it was not considered as a critical concern then, this shortcoming may have been overcome by their many years of teaching experience. The newly trained teachers, presumably those with <10 years teaching experience, would have been expected to have attended more recent training in which the writing of Agricultural Science instructional objectives was highly emphasised. There might also have been a greater emphasis placed on this in their preservice education. As such, this cohort of teachers would presumably not have a serious concern about this need. However, this assumption will have to be tested in future studies by interrogating the content and development of the teacher education syllabi/ curriculum over the years.

Table 5.9: Summary statistics of the observed frequencies on writing Agricultural Science instructional objectives as related to teaching experience

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=9.73, p=0.04522			
	Needs9 Most Preferred Needs	Needs9 Least Preferred Needs	Needs9 Not needed at all	Row Totals
0 – 10	20	13	12	45
Row %	44.44%	28.89%	26.67%	
11 – 15	6	13	16	35
Row %	17.14%	37.14%	45.71%	
15 and more	25	13	24	62
Row %	40.32%	20.97%	38.71%	
Totals	51	39	52	142

- **Developing an instructional plan for a unit of Agricultural Science**

The results of an overall significant (P<0.05) difference on the perceived need for developing an instructional plan for a unit of agricultural science, in which the greatest proportion (44.4%) of less experienced teachers (<10 years) considered this as a most preferred need compared to 33% of the more experienced teachers (> 10 years) (Table 5:10) (*see* Appendix D for a detailed analysis). It is clear, if not obvious, that developing an instructional plan in teaching is a basic requirement. However, developing a coherent, relevant and valuable instructional plan requires skill and knowledge such that the plan yields benefits to the learners. It is possibly the lack of such skills that makes the less experienced teachers consider this a most preferred need. Training in skills upgrading courses (through in-service training and workshops) could provide the needed skills to less experienced teachers. This finding could also indicate that this competence is gained with teaching experience.

Table 5.10: Summary statistics of the observed frequencies on developing an instructional plan for a unit of Agricultural Science

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=9.85, p=0.04303			
	Needs10 Most Preferred Needs	Needs10 Least Preferred Needs	Needs10 Not needed at all	Row Totals
0 – 10	20	15	10	45
Row %	44.44%	33.33%	22.22%	
11 – 15	7	13	15	35
Row %	20.00%	37.14%	42.86%	
15 and more	25	13	24	62
Row %	40.32%	20.97%	38.71%	
Totals	52	41	49	142

- **Questioning and classroom discussion techniques**

The key result for this need is that 99 (69.7%) of all participants indicate that they consider this a most preferred need (Table 5:11). This implies that it is a need that requires immediate attention. There was no difference between less (<10 years, 68.89%) and more experienced (>10 years, 70.1%) teachers, as the proportions are essentially similar (*see* Appendix D for a detailed analysis). It can be concluded that the cause of an overall significant difference was the variables least preferred and not preferred at all.

Table 5.11: Summary statistics of the observed frequencies on questioning and classroom discussion techniques

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=10.91, p=0.02756			
	Needs16 Most Preferred Needs	Needs16 Least Preferred Needs	Needs16 Not needed at all	Row Totals
0 – 10	31	14	0	45
Row %	68.89%	31.11%	0.00%	
11 – 15	21	10	4	35
Row %	60.00%	28.57%	11.43%	
15 and more	47	10	5	62
Row %	75.81%	16.13%	8.06%	
Totals	99	34	9	142

- **Developing creative thinking among Agricultural Science learners as related to teaching experience**

The most noticeable aspect of this need is that the majority 91(64%) of participants perceived this as a most preferred need (Table 12). Equally noticeable is the fact that 77.78% of the less experienced teachers (<10 years) considered this as a most preferred need compared to 57.73% of more experienced teachers (>10 years) (*see* Appendix D for a detailed analysis). The conclusion from the results of this need is that it requires immediate attention and that efforts need to be undertaken to improve the performance of the less experienced teachers in this regard so that there could be satisfactory delivery of teaching when this need is addressed. The results of this study revealed that, in most cases, it appears that less experienced teachers have more perceived needs for the various dependent variables. The most attributes of young teachers, which would make them perceive themselves deficient on these variables, could include lack of self-confidence and reticence in executing their teaching duties.

It can be concluded that all teachers (91/64%), regardless of the years of experience, need the necessary support in developing creative thinking among Agricultural Science learners in order to improve their academic performance. The lack of mandatory in-service-education programmes could explain why this need is there.

Table 5.12: Summary statistics of the observed frequencies on developing creative thinking among Agricultural Science learners as related to teaching experience

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=13.24, p=0.01016			
	Needs18 Most Preferred Needs	Needs18 Least Preferred Needs	Needs18 Not needed at all	Row Totals
0 – 10	35	10	0	45
Row %	77.78%	22.22%	0.00%	
11 – 15	16	15	4	35
Row %	45.71%	42.86%	11.43%	
15 and more	40	17	5	62
Row %	64.52%	27.42%	8.06%	
Totals	91	42	9	142

- **Formal further training**

It is true that more experienced teachers (>10 years) are usually older teachers and would not prefer formal further training as compared to younger teachers. The possible reason for this is that they have other pressing responsibilities at home and in society that makes them less willing to go to distant formal training facilities/arrangements. It could reasonably be expected that this view may affect the result on this independent variable. The results, however, indicate that 23 (51.11%) and 42 (43.3%) of less experienced and more experienced teachers, respectively, consider a variable a most preferred need (Table 5:13) (*see* Appendix D for a detailed analysis). Just as in other variables, it appears evident that young teachers require training in those variables that they consider as most preferred needs. Several intervention measures should be identified, including workshops, seminars and formal training, to address these needs.

Table 5.13: Summary statistics of the observed frequencies on formal further training

Teaching experience	Marked cells have counts > 10. Chi-square(df=4)=16.30, p=0.00264			
	Needs20 Most Preferred Needs	Needs20 Least Preferred Needs	Needs20 Not needed at all	Row Totals
0 – 10	23	9	13	45
Row %	51.11%	20.00%	28.89%	
11 – 15	9	2	24	35
Row %	25.71%	5.71%	68.57%	
15 and more	33	9	20	62
Row %	53.23%	14.52%	32.26%	
Totals	65	20	57	142

Table 5.14: Summary statistics of the cross-tabulation on relationship between perceived needs and experience

Needs	**Chi- square (χ^2, df=4) and p-value**	**Decision**
1. Update knowledge of Agricultural Science-related career opportunities	χ2=4.66, p=0.32417	No statistically significant difference
2. Select an appropriate instructional strategy	χ2=1.63, p=0.80359	No statistically significant difference
3. Learning new methods of teaching Agricultural Science	χ2=1.43, p=0.83941	No statistically significant difference
4. Methods of motivating learners to learn Agricultural Science	χ2=1.33, p=0.85578	No statistically significant difference
5. Update knowledge of applications of Agricultural Science	χ2=4.64, p=0.32615	No statistically significant difference
6. Delivery of Agricultural Science concept to learners	χ2=11.55, p=0.02101	**Statistically significant**
7. Preparation of Agricultural Science instructional and learning activities	χ2=12.24, p=0.01567	**Statistically significant**
8. Evaluating learners' progress in Agricultural Science	χ2=4.70, p=0.31894	No statistically significant difference
9. Writing Agricultural Science instructional objectives	χ2=9.73, p=0.04522	**Statistically significant**
10. Develop an instructional plan for a unit of Agricultural Science	χ2=9.85, p=0.04303	**Statistically significant**

Needs	**Chi- square (χ^2, df=4) and p-value**	**Decision**
11. Update one's knowledge in instructional and learning theory of Agricultural Science	$\chi2$=3.26, p=0.51580	No statistically significant difference
12. Selection of new textbooks for Agricultural Science	$\chi2$=6.81, p=0.14631	No statistically significant difference
13. Planning and conducting learner field excursions	$\chi2$=5.72, p=0.22106	No statistically significant difference
14. Classroom management skills	$\chi2$=5.16, p=0.27139	No statistically significant difference
15. Assessing learners' learning	$\chi2$=8.51, p=0.07461	No statistically significant difference
16. Questioning and classroom discussion techniques	$\chi2$=10.91, p=0.02756	**Statistically significant**
17. Teaching Agricultural Science through field excursion and scientific visit	$\chi2$=3.58, p=0.46654	No statistically significant difference
18. Developing creative thinking among Agricultural Science learners.	$\chi2$=13.24, p=0.01016	**Statistically significant**
19. ICT needs	$\chi2$=2.60, p=0.62647	No statistically significant difference
20. Formal Further training	$\chi2$=16.30, p=0.00264	**Statistically significant**

5.5 Summary of quantitative data analysis

This section presented the statistical analysis of the data using Chi Square and ANOVA in testing the four hypothesis of the study at 0.05 level of significance (*see* Appendix E for a detailed analysis). As summarised in Table 5:5, there was no statistically significant ($p>0.05$) difference between gender with regard to 90% of the proposed needs. With regard to delivery of Agricultural Science concepts to learners (Table 5:7) there was a statistically significant ($p<0.05$) difference between teachers with shorter teaching experience (<10 years) relative to those with longer teaching experience (>10 years). The results of the study further revealed that (Table 5:14) there was no significant gender differences between gender for all professional competencies tested.

With regard to teaching experience, the results of the study (Figure 5:15) indicated that there were no significant differences between less experienced and more experienced teachers for all competencies tested.

The next section presents the qualitative analysis of the data derived from the follow-up interviews (*refer to* Appendix C).

5.6 Qualitative Data Analysis (Follow-up Interviews) (Appendix C)

Qualitative data analysis can be referred to as the process of generating meaning from research participants' viewpoints and thoughts of a particular situation, matching patterns, themes, categories and common similarities (Cohen *et al*., 2007). According to Flick (2013: 5),

> Qualitative data analysis is the classification and interpretation of linguistic (or visual) material to make statements about implicit and explicit dimensions and structures of meaning making in the material and what is represented in it. Meaning making can refer to subjective or social meanings.

This section presents the qualitative data generated through structured interviews (*see* appendix C). The structuring of the qualitative data analysis was steered by the requirements of the research components measuring the perceived competencies, experience and the perceived needs of Agricultural Science teachers in the Zambezi region. The research components had primarily moulded the kind of data, categories and patterns to be discussed. "A pattern is a relationship among categories" (McMillan & Schumacher, 2014:406). According to McMillan and Schumacher (2001:461) the methodology was one where “most (of the) categories and patterns emerged from data, rather than being imposed on the data prior to data collection”. It is important to identify the key issues raised by the participants for each question asked. Participants may be saying the same thing but use different words to express their views and thoughts. Therefore, it is the duty of the researcher to reduce all the views and thoughts for each question into a few specific themes. Then the researcher relates these themes with the results of the quantitative data and literature relevant to the identified themes. For this study, the outline for the qualitative data analysis is hence as follows based on the questions of the structured interviews (see Appendix C):

The brief profile of the participants in terms of their:

- Motivation
- Other school subjects taught by the participants
- Teacher competency in relation to gender and teaching experience
- Teaching experiences
- The needs of participants in relation to gender and teaching experience

5.6.1 The brief profile of the participants

This section presents a brief account analysis of the 12 participants interviewed for this study. Their teaching experiences (in years), perceived competencies and needs were asked for. In keeping with the ethical considerations of Stellenbosch University, the identities of participants and their schools were not exposed; participants and schools were given fictitious names.

The profile of the participants interviewed as shown in table 5:17, the majority (10/83%) of the participants had >10 years of teaching experience and only 2 (17%) of the participants had <10 years of teaching experience. Teachers in the Zambezi region have longer years of teaching experience since 83% have >10 years of teaching. This proportion agrees with the results of the questionnaire, which revealed that the majority (68%) have longer years of teaching experience (>10 years). For the past two years, teaching positions have been frozen due to the economic crunch the government of Namibia is facing.

Therefore, given the long teaching experience (>10 years) the majority (75%, on average) of the participants in the Zambezi region it is expected of the region to perform very well in Agricultural Science. This is because experienced teachers are expected to have the academic abilities to impart the subject knowledge effectively and efficiently to learners in a classroom. In view of this, Tan (1996), stated that experienced teachers are more skilled in attending to noticeable facts in the teaching context; in other words, they are more skilled in understating student behaviours and have the abilities to match the identified student behaviours with solutions while teaching in a classroom. “Experienced teachers are more adept at identifying important cues in the teaching environment critical for decision-making.

Generally, experienced teachers attend mostly to positive student cues and needs of the students, whereas novice teachers mainly focus on students' disruptive behaviour and interest” (Tan, 1996:154). Therefore, it is evident that lack of ability of inexperienced teachers to assess student behaviour while teaching perfectly and initiating best possible solutions to student behaviours equals justification towards unpredictable academic performance (Tan, 1996).

Table 5.15: Summary of the profiles of the participants (Follow-up interviews) (Appendix K)

Participant Code	School phase	School Code	Years of teaching experience
1. P1	Combined School	CS1	5 years of teaching experience
2. P2	Combined School	CS2	15 years of teaching experience
3. P3	Combined School	CS3	25 years of teaching experience
4. P4	Combined School	CS4	35 years of teaching experience
5. P5	Combined School	CS5	7 years of teaching experience
6. P6	Combined School	CS6	26 years of teaching experience
7. P7	Combined School	CS7	22 years of teaching experience
8. P8	Senior Secondary School	SS1	23 years of teaching experience
9. P9	Senior Secondary School	SS2	17 years of teaching experience
10. P10	Senior Secondary School	SS3	26 years of teaching experience (grade 8 – 10) at a senior secondary school
11. P11	Senior Secondary School	SS4	12 years of teaching experience
12. P12	Senior Secondary School	SS5	15 years of teaching experience

Codes: P= Participants, **CS**= Combined School, **SS**= Senior Secondary

5.6.2 Motivation

School context plays an important role in promoting effective and efficient teaching and learning. It is important to note that a well-resourced school enhances motivation among the teaching staff in imparting skills to learners. Therefore, provision of adequate teaching and learning resources enhances quality teaching and thus motivates the teachers to effectively impart skills to learners. In this study, participants were asked the question: "What motivated you to teach Agricultural Science at a combined and/or secondary school?" According to one participant,

> *After completing my National Diploma in Agriculture, we were not absorbed in agriculture itself, so we decided to join the teaching profession, obviously that's how I entered this teaching profession and then I was teaching from Grade 8-12* (P8: lines 1088 – 1091).

The above-mentioned quote clearly indicates that some of the Agricultural Science teachers in the Zambezi region entered the teaching profession because they could not get employment in the Ministry of Agriculture after completion of their National Diploma in Agriculture. It could be argued that such teachers had no passion initially from becoming Agricultural Science teachers, but because they could not secure employment in the agricultural sector, they opted to settle for the teaching positions that were available in the Ministry of Education.

What follows is the range of themes developed from answers for the question "What motivated you to teach Agricultural Science in combined/ or secondary school?"

5.6.2.1 The importance of agriculture

The results of this study have revealed that the importance of agriculture was mentioned by 25% of the participants who participated in the interviews, this component being allied to the national and regional values of agriculture (*refer to section* 2.5, p. 23). The following quotes from participants serve as case in point:

> *Aaah, with the subject agriculture, we know agriculture is the backbone of the country. So, I saw the need of educating the citizens that in future they can do something in agriculture to make sure there is food in the country and also to provide employment for other citizens (P1: lines 20-22).*

> *What motivated me most is the the the (stammering) when I look at the background of our region, we lack more agriculturalists more especially extension officers in our region and also as the backbone of the country I saw it important, it is better for me to take agriculture so that some of the learners they may become extension officers and so on and so on (P5: lines 375-378).*

> *It is one which can improve the living standard of people within the community then that's why I was forced to do agriculture as a profession (P7: lines 693-694).*

All of the above stated responses from the participants in the researcher's view pointed to the importance of agriculture as the backbone of the country being the factor that triggered their motivation to teach Agricultural Science in schools. In line with the responses of the participants, it is also important to note that agriculture provides food; employment and income to the communities (*refer to sections* 1.1, p. 2; 2.5, p. 22-23).

5.6.2.2 To build capacity for learners

Building capacity for learners is a key motivator for 50% of the participants who participated in the interviews, which is also a critical concern for Sub-Saharan Africa and Namibia (*refer to section* 2.17, p. 52). Responses in relation to building capacity of learners include the following verbatim responses from the participants:

> *So, basically on the secondary level those are people which are near the workforce and who have a better understanding" (P1: lines 22-24).*

> *I think during my time when I was still schooling, I had the desire to become an agriculturalist. So then practically I found it withhold to agriculture so that I may be able to give knowledge to my learners so that they may be able to do agriculture as well even at home. Thank you (P4: lines 256-258).*

> *Then I was specialising in agriculture and that's why I decided that it's better to take agriculture because I could have some knowledge on it that I can inspire with the learners" (P6: lines 497-498).*

> *The one that motivated me, I have seen that agriculture is too practical and then it can be done even at home, then it can help me to go ahead in farming method and also I can have that skills and knowledge, aaa, that is why I am motivated in teaching agriculture (P10:lines 1102-1104).*
>
> *…therefore there is a need to impart knowledge and transfer it to a Namibian child so that they can build themselves" (P12: lines 1251-1252).*

The significance of the above responses from the participants in this study is that they support the rationale of the study (*refer to section* 3.3.2, p. 57), which also suggests that the teaching and learning of Agricultural Science in schools is of paramount importance.

5.6.2.3 To improve learners' performance

Improving the performance of learners was also a key motivator for the participants (17%) who participated in the interviews to develop the desire to teach Agricultural Science in combined and secondary schools in the Zambezi region, since it is reported that there is poor performance in the subject (*refer to section* 1.2, p.5). The (verbatim) response of a participant associated with improving learner performance includes the following:

> *There is a call of me teaching agriculture at combined school. I find that the performance of our grade 10 learners, grade 9 learners were not pleasing, so I feel that I would improve the education in terms of teaching agriculture because I would focus on the practical activities, thank you (P2: lines 119-122).*

Concerning the view and perception of the participant as outlined above about improving learners' performance (*refer to sections* 2.6, p. 23; 2.13, p. 45; 3.3.1, p. 57) in Agricultural Science in secondary schools is related to the focus on practical activities, meaning hands-on tasks which help learners to improve academic performance as they enjoy learning by doing. The response from the participant agrees with the views of Bosompem *et al* (2012:19): "Motivation is important because performance is also linked to it."

5.6.2.4 Agriculture is a practical subject

Practical activities make the subject attractive to teachers and learners who love teaching and learning by doing. Practical activities are unavoidable in Agricultural Science (*refer to sections* 3.4, p. 59; 5.2.10, p.100) as regarded by the Ministry of Education in the Republic of Namibia. The participants who regard Agricultural Science as a practical subject echoed the related responses as follows: "…I studied agriculture because most of the things done there is practical and it is the thing which is also done in Namibia..." (P7: lines 907-908). "The one that motivated me, I have seen that agriculture is too practical…" (P10: line 1317).

5.6.2.5 Trained and have professional qualifications to teach the subject

This was also seen as a key motivator to teach Agricultural Science by 59% of the participants in the interviews in accordance with their professional mandate (*refer to section* 5.2.6, p.93-95). Some of the responses of the participants regarding training and professional qualifications to teach the subject include the following: "The reason why I am teaching it at a school level it is because I specialized in it" P3: line 339). "…I was specialising in agriculture and that's why I decided that it's better to take agriculture because I could have some knowledge…" (P 7: lines 712-713).

> *After completing my National Diploma in Agriculture, we were not involved in agriculture itself, so which means we decided to join the teaching profession, obviously that's how I entered this teaching profession and then I was teaching from Grade 8-12 (P8: lines 1038-1040).*

From the responses from some of the participants in relation to training and professional qualifications, it was evident that they felt that they are qualified to teach Agricultural Science in secondary schools. However, the researcher's argument is that in Namibia, there is no institution of higher learning where professional qualified Agricultural Science teachers (specialising in Agricultural Science education) are trained, yet some of the participants are saying they are trained and qualified Agricultural Science teachers. "… I am qualified to teach the subject, because of the qualification I have in agriculture…" (P12: lines 1465-1466). The researcher's argument in this respect, with regard to the records of responses given by some of the participants, would be that this is not the case, since they obtained their Agricultural Science qualifications (not in education) from the University of Namibia and Polytechnic of Namibia.

A qualified secondary-level teacher must have a professional qualification in education. Agriculture education is only offered as a minor specialisation at the University of Namibia and teachers with this specialisation are only allowed to teach from grade four to seven (*refer to sections* 1.2, p.4; 1.6, p.7; 2.10, p. 37; 5.2.6, p. 94).

In the next section, responses recorded from the participants in relation to other school subjects taught by the participants will be discussed.

5.6.3 Other school subjects taught

What follows is the theme developed from answers to the question "other than Agricultural Science, which other school subject(s) are you teaching at your school?" The results of the study revealed that the majority (83%) taught other subjects in addition to Agricultural Science, while 17% of the participants were only teaching Agricultural Science. Life Science was taught by 50% of the participants who indicated that they were teaching other subjects in addition to Agricultural Science.

Life Science content is near related to Agricultural Science content and this makes it much easier for the participants to teach Life Science. Some of the responses by the participants in relation to teaching other school subjects include the following: "Good, I am able to teach Life Science grade 8-10" (P2: line 128). "I am teaching Life Science as…" (P4: line 475). "I have been teaching Life Science for 4 years grade 10…" (P11: 1474). From the responses of the participants, it is evident that the participants were teaching subjects other than Agricultural Science. This could suggest that the number of lessons per week were not enough, so offering other subjects could help participants beef up the number of periods they are required to teach per week.

The researcher's contention is that these teachers have the necessary subject knowledge in the other subjects, or they were given other subjects to teach, such as Life Science, with the purpose of beefing up the numbers of teaching lessons. The next section deals with the analysis and interpretation of nurturing learner achievements.

5.6.4 Perceived competencies and experience

A competent Agricultural Science teacher is more consistently sincere and affectionate, and. performs what is required for the desired teaching and learning (*refer to section* 2.9, p. 31).

What follows are the components that emanated from the interview questions related to the perceived competencies and experience (*refer to* Appendix C).

5.6.4.1 Nurturing learner achievements

Teachers and teaching practices play an important role in nurturing learners' achievement and outcomes at schools. Therefore, there is one way to nurture learners' achievement and this is the one that focuses on the teacher and what the teacher knows and can do. In this study, the participants were asked to explain what experienced Agricultural Science teachers do more effectively in nurturing learners' achievement than less experienced Agricultural Science teachers do in a similar teaching context.

Seventy-five percent of the participants who participated in the interviews mentioned that they have the knowledge of both theory and practical, while 25% indicated that they have the ability to identify the needs of the syllabus and that of the learners that are essential in nurturing learners' achievement in Agricultural Science. In coherence with the literature review related to nurturing learners' achievements (*refer to sections* 1.1, p. 2; 2.11, p. 37; 3.3.4, p. 58), some of the responses from the participants indicated the importance of having subject knowledge, both theoretically and practically: "With the experienced Agricultural Science teachers, they have a know-how of both theory and practical, but with the unexperienced Agricultural Science teachers, they wouldn't do much."

> *Yes you would find that experienced Agricultural Science teachers they have knowledge on the lesson not only theoretically but as well as practically because in agriculture we believe that learners learn more if they see, hear and touch things by themselves and feel them. If they do not touch, the soil they do not crop crops so there is no way they will be able to learn agriculture very well. Less experienced Agricultural Science teachers they just go on teaching the syllabi as well as the textbook just in the class by the situation, but when it comes to outside situation they do not do anything (P4: lines 483-487).*

> *Aaah, the experienced Agricultural Science teachers always do they impart more knowledge and eeeh practical activities because agriculture is not only in class, it is both practical and aaah theory so. Experienced*

> *Agricultural Science teachers will concentrate in both categories which is eem practical and theory, while inexperienced Agricultural Science teachers will concentrate on theory because he lacks maybe understanding or maybe the know-how (P5: lines 603-606).*

Some respondents expressed an explicit connection between the ability to identify the needs of the syllabus and nurturing learners' achievements. Examples of such responses were:

> *What I have realised so far is that an experienced Agricultural Science teacher is that he can condense the syllabus, an inexperienced Agricultural Science teacher he might be wondering, he might be touching here and there without knowing exactly what are the needs of the syllabus. In case of an experienced Agricultural Science teacher you will find that by heart he can even outline what are the needs of the syllabus, the basic competencies and everything (P3: lines 354-357).*

> *An experienced teacher, one is familiar with the syllabus itself... unlike a teacher who is not experienced, whereby, one he doesn't know what are the expectations of the examination, what are the expectation of the learners (P11: lines 1493-1499).*

What is apparent from the above-cited responses from the participants related to nurturing learner achievements is the fact that learners' achievements agreed with notions from the literature reviewed (*refer to section* 2.9, p. 37). In examining the responses critically, this suggests that for a teacher to be able to nurture learners' achievement he/she must have the subject knowledge and should have the ability to clearly interpret the curriculum.

In the following section, responses that denoted the views and perceptions of the participants with regard to teacher competency in relation to gender will be presented and discussed.

5.6.4.2 Teacher competency in relation to gender

What follows is the analysis and interpretation developed from answers of the participants to the question "What are your views about the perception that male Agricultural Science teachers are more competent than female Agricultural Science teachers in teaching Agricultural Science as a school subject in either combined or secondary schools?"

The results of the qualitative analysis obtained through the interviews of the 12 participants are in line with the quantitative results obtained from the questionnaire (*refer to section* 5.8.3, p. 144). When asked about the difference in gender competency, 42% of the participants said that there is gender difference, while the majority (58%) indicated that there is no difference with regard to the competencies among male and female Agricultural Science teachers in the Zambezi region. The following were some of the examples of responses from participants:

"Yah that might be true even though it is not true … there but the reality what I have realised is that the performance between both sexes male and female there are just the same" (P3: lines 372-379). "For me I do not see there is a difference …" (P5: line 629).

The above-mentioned quotes clearly indicate that there is no difference in gender competency among Agricultural Science teachers in the Zambezi region. This could suggest that Agricultural Science teachers in the Zambezi region are likely to have undertaken similar training that would have prepared them to be competent regardless of their gender to teach Agricultural Science in secondary schools effectively and efficiently. The responses from the participants who indicated that there is a difference in gender competency include the following:

> *Yes, this is a, you find that when it comes to practical... eeeh... unlike for now we were laying the pipeline for the garden and community hostel you would find that the ladies they are not aware on these connections, the different connections that is done in agriculture with male because they are hard work they are able to learn and to connect, do the connections by themselves (P4: lines, 518 – 522).*

> *The competency is more or less the same but you find that agriculture is a, it is competency subject that have the theory and practical, so with the male yes they can do both, male and female they can do both well in the theory but it come to practical you will find that now male become more competent than female, because female can't do work than men do (P1: lines 49-53).*

The above-mentioned quotes related to the responses from the participants who said that there is a difference in gender competency among the Agricultural Science teachers in the region. This is more particular to the practical aspects of the subject where females could not do well. The examples of such practical activities are those related to the handling of heavy materials and the handling animals like cattle. This kind of practicality puts demands on the physical abilities of the teacher and has little effect regarding the competency of teaching the subject. Examples of such responses were:

> *I don't think so, I can see that the female are more competent, even though agriculture can be like if genders the male are higher in agriculture, but coming to teaching female Agricultural Science Teachers are more competent (P10: lines, 1429 – 1431).*
>
> *My perception is that, I disagree with that. I disagree with that male teacher are more competent than the female. To my side I feel that female are better, because it is like, female when they are in class, they act like mothers (P11: lines, 1579 – 1582).*

Figure 5.20 shows clearly that the majority (7/58%) of the participants indicated that there is no difference in gender competency among Agricultural Science teachers in the Zambezi region. However, the quote above shows those participants were able to defend their gender abilities, i.e. female participants were able to side their abilities (competency) by saying that they (females) are better than males.

Generally, the majority were fair enough to say that there is no difference between males and females teachers with regard to the ability to teach the subject (Agricultural Science). Das and Nalinilatha (2017:513) relate the above responses from the participants with regard to gender differences to the conclusion in their study on "A study on teaching competency of secondary school teachers". The authors concluded, "there is no significant difference towards teaching competency among secondary school teachers with respect to gender".

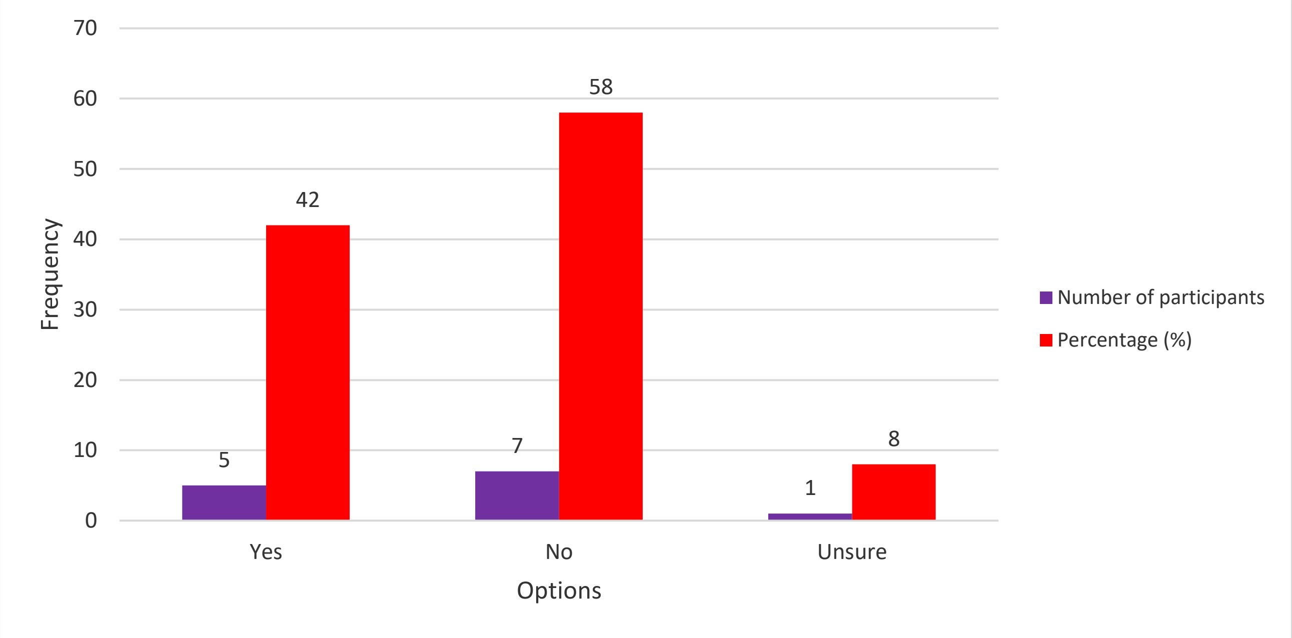


Figure 5.20: Views of participants on the difference in gender competency among Agricultural Science teachers in the Zambezi region.

In summary, with regard to gender competencies among Agricultural Science teachers, literature has revealed that "it is a general belief that agricultural education is a masculine discipline; this has been established from research as pointed out by low enrolment of females in the course across secondary to tertiary institutions in Nigeria" (Moda & Ahmed, 2017:131). Some traditional practices and precisely some societal formal procedures had steered the perception that females teachers cannot carry out some other things to the males' abilities in particular, science subjects to which Agricultural Science is part of (Mushi, 1996). This concurs with the findings from this study: the participants interviewed indicated that females are more challenged when it comes to the practical component of teaching Agricultural Science.

For example, they indicated that handling animals and pipe laying is more problematic among female teachers. Another participant also said "I don't think so, I can see that the female are more competent, even though agriculture can be like if genders the male are higher in agriculture but coming to teaching female Agricultural Science teachers are more competent" (P10: lines, 1429 – 1431).

5.6.4.3 Performance in relation to teaching experience

Performance in relation to gaining teaching experience focuses on the abilities of Agricultural Science teachers in managing the delivery of the subject knowledge to learners in the classroom more effectively and efficiently. This includes, for example, aspects such as syllabus interpretation, developing a scheme of work, planning the lesson experience, classroom management and assessments. The views expressed by the participants coincided with certain components of the literature in this study (*refer to sections* 2.9, p. 31; 3.4.1, p. 59; 4.11, p. 78; 4.1.2.1, p. 80; 5.2.2, p. 88; 5.2.3, p. 89; 5.2.5, p. 92; 5.3, p 105; 5.8.2, p. 134; 5.8.4, p. 148; 5.10.1, p. 153). Responses from the participants related to performance in relation to gaining the necessary teaching experience revealed that experienced teachers are more knowledgeable and equipped with the subject content than less experienced teachers. Examples of some of the responses were:

> *So the more you teach, the time you spend on the subject you will become knowledgeable and more equipped to subject content" (P1: lines 42-43).*

> *You will find that, when I first start they will be some challenges that I will meet along the way but as time goes by I come back to teach the same let's say the syllabus or the same grade the other year then such challenges that I faced previously I may be able to have come with some solutions then now I will be implementing, I will change from how I tackled it previously to another way, to a better way (P9: lines1195-1199).*

> *Yes they do better when they gain experience, like me when I came here I was from a combined school, I wasn't have the knowledge for the senior secondary, then the AST who was having that experience was helping how to go ahead with some of the topic, then now I gained most the experienced, I have the experience that I was not having even if I am teaching in grade 10 now I know than the time when I was based in grade 10 and 8 and 9 only (P10: lines 1359-1363).*

From the responses of the participants above, it seemed evident that teaching experience influences the manner in which the Agricultural Science teacher will gain the necessary subject knowledge. This suggests that the more years of teaching experience a teacher has the better the teacher will be able to teach the subject more effectively in the classroom. The next section will discuss the Agricultural Science training undertaken by the participants.

5.6.4.4 Agricultural Science training

In chapter two, reference was made to vocational Agricultural Science training being essential to teach the required Agricultural Science knowledge and skills to learners so that upon completion of their basic education they can be self-employed and able to create employment for others (*refer to section* 2.6, p. 23). In chapter three further reference was made to the importance of improving teaching and learning through formal further training opportunities for serving Agricultural Science teachers (*refer to section* 3.4.4, p. 61). Concerning the views and perceptions of the participants in this study about Agricultural Science training, most felt that Agricultural Science subject content and practical knowledge is important for effective teaching of the subject inside and outside the classroom (*refer to sections* 5.5.4, p. 124; 5.8.4, p. 148). Some of the responses serve as particular examples:

Oooh, that training I underwent covered everything that am facing now in the workforce where both the theory and content knowledge was given to me, it's what am using to teach" (P1: lines 58-59).

Which means at the Polytechnic of Namibia, I think the content part of the course itself agriculture we were given to the fullest possible use. So which means I may say that theoretically and practically am above average (P8: Lines 1088-1090).

> *Though we did also much what of the theory part with maybe let's say 60% practical then that itself prepared us and then we also had like the school-based studies where we were sent in schools, we do our practical in schools and also when it comes to things like crops, we had our field like a young farmer association where we used to like do our practical, we grow, whatever we produce we sell, so such things, they helped us much to be better agricultural science teachers that we are today (P9: lines 1225-1230).*

The above responses from the participants related to training are supported by the views of (Kunzman, 2003 and Mokhtar, 2010). The relevance of these responses and those outlined in subsequent sections was that they validate the purpose of this study.

5.6.4.5 Qualities of a competent Agricultural Science teacher

An eagle eye's view of the responses related to the qualities of a competent Agricultural Science teacher to a greater degree indicated consistency with the other section of this study, for example qualities of *values* and *beliefs* (*refer to section* 2.9, p. 32) and humane, compassionate but collected and determined (*refer to section* 5.2.6, p. 94). This consistency signified the relation between the role of Agricultural Science teachers in the implementation of the curriculum in the classroom and assessment. Participants were asked: "In your view, what are the qualities of a competent teacher in the assessment of learners in Agricultural Science as a school subject?" Responses from the participants in relation to qualities of a competent Agricultural Science teacher included the ability of a teacher to combine theory and practical, classroom leadership and having subject knowledge.

The following are some the examples of the responses from the participants: "The Agricultural Science teacher should understand the subject content…" (P12: line 1707). If you are a manager, you need to plan and implement and control and evaluate.

> *Yes the quality there when it comes to qualities I might say agriculture is a practical subject. So being a practical subject the first thing that the AST should know is that you should be able to combine the 2 theory and practice together so that at least learners do not only learn theoretically, what they learn theoretically at least they should be able to do them or take them into practice (P3: 383-386).*

The next section deals with the analysis and interpretation with regard to the perceived needs of Agricultural Science teachers. Under this section the Agricultural Science teachers' needs, perceived needs in relation to experience and gender are discussed.

5.6.5 Perceived needs

As pointed out previously, the perceived needs are the needs that are felt by a particular teacher, which, as soon as they are voiced, turn out to be expressed needs (demanded needs) (*refer to* 2.10, p. 34). Currently, the existing state of affairs in the Zambezi region of Namibia does not only relate to the need to prepare teachers with the basic knowledge, but also takes into account the need to confront problems related to the quality of teaching and learning of Agricultural

Science in secondary schools in the region (*refer to section* 2.10, p. 34). In the next sub-sections, the recorded viewpoints and perceptions of the participants with regard to the perceived needs will be presented under the following: Agricultural Science teachers' needs, perceived needs in relation to teaching experience, and perceived needs in relation to gender.

5.6.5.1 *Agricultural Science teachers'* needs

Participants were asked the question: "What are your needs as an agricultural science teacher that will ensure that you're effective in teaching the subject?" In response to this question, participants indicated several needs related to the teaching and learning of Agricultural Science in schools. A grouping was done on the strength of the analysis of the responses of the participants who participated in the interviews and the following groups of responses were identified: Responses related to resources, training workshops and support. These needs are briefly discussed here.

- Resources

Responses were recorded that look up to the perceived needs of Agricultural Science teachers that are essential for effective teaching of Agricultural Science in the Zambezi region. Resources in relation to this study include Agricultural Science garden tools or equipment, teaching and learning materials such as papers, charts, projectors, water and textbooks that are essential to effectively and efficiently teach Agricultural Science in schools. For learners to attain the basic learning competencies of a particular component of the curriculum in Agricultural Science largely depends on the availability of teaching and learning resources. In the same vein, for learners to attain the necessary basic practical learning competencies it is important that resources such as garden tools and equipment are available at schools.

The indication for lack of resources must also be viewed together with the need for facilities like school gardens. In this study, sufficient resources were identified as a pre-requisite for effective teaching and learning of Agricultural Science in schools. The responses that covered the perceived needs for resources were consistent with the earlier point of view from the literature reviewed (*refer to sections* 2.2.2, p. 18; 2.7, p. 28; 2.12.2, p. 43; 2.13, p. 44-46; 2.17, p. 51; 3.41, p. 59) and the results from the quantitative analysis (*refer to sections* 5.2.13, p. 103; 5.3, p. 104; 5.3.1, p. 109). These responses after careful scrutiny were categorised into the following sub-groups:

- Material resources

The viewpoints associated with the expressed perceived need for material resources include, among others, a need for teaching and learning resources. In particular, responses related to teaching and learning resources reiterated the need for textbooks (*refer to sections* 2.13, p. 44-46, 5.3, p. 104 & 108; 5.6, p.128). Participants also reported a definite need for garden tools or equipment like spades, digging forks; rakes and watering cans that are essential in carrying out practical activities in the school garden (*refer to section* 2.13, p. 46).

- Physical resources

Physical resources play a critical role in the teaching and learning of Agricultural Science in schools. In articulating the perceived needs for physical resources, participants in this study emphasised the importance of a school garden and laboratory facilities in the teaching and learning of Agricultural Science in schools. The identification of the need for physical resources can be seen as a challenge many schools in the Zambezi region are facing and this can be viewed together with the previous section as the most critical resource (*refer to section* 2.13, p. 45). Physical resources are a basic component that should be made available in all schools that offer Agricultural Science as a school subject in the Zambezi region. Physical resources are the most important link between teaching and learning in a school and is the pillar for effective curriculum implementation by teachers.

- Financial resources

Responses in relation to the perceived need for financial resources included a need for funding, because no funds are being made available by the central government for schools to procure teaching and learning resources such as charts and textbooks that are needed for effective teaching and learning of the subject in the a classroom (*refer to sections* 2.7, p. 29; 2.17, p. 52-53).

❖ Training Workshops

The responses from the participants in this study concerning perceived needs were associated with a need for training workshops to upgrade Agricultural Science teachers' skills and knowledge. The participants viewed workshops as a component that is of paramount importance in the teaching and learning process and that could go a long way to determine the academic performance of learners in the subject since it is through workshops where teachers are able to network with one another and learn new things related to the subject they are teaching. The following verbatim quotes from the participants serve as a case in point:

> *Aaah, there are many needs in this subject as I have mentioned that it's the content and practical subject, aah, mostly what is done is theory in classes and less practical is done and also there are no workshops conducted whereas different ideas from different Agricultural Science teachers, stakeholders can come together and share these things, so we need workshops for agricultural components, for practical and others would be, and also tools that can be used in the subject for practical (P1: lines 63-67).*

> *Alright, as I have already said that we need workshops every time, workshops to improve here and there, we will need... aaah tools that we can use, because most of the schools in the region don't have tools, even when we teach, we just teach theory, we also need aah, eeeh, excursions like going out to see for the learners to see what you are teaching them in class (P5: lines 436-439).*

The significance of the responses of the participants related to the need for workshops was that Agricultural Science teachers in the Zambezi region need repeated training workshops that are aimed at keeping teachers abreast with contemporary issues related to the subject content, practical activities and teaching methods. In conclusion, these specific responses from the participants related to workshops are supported by the findings obtained through the questionnaire of this study (*refer to section* 2.8.2, p.139 & 142). The significance of these specific responses from the participants and those outlined in subsequent section (refer to *section* 5.10.3.3) was that they support the basis of this study.

❖ Support

The need for support from the central government of the Republic of Namibia was reiterated in responses of the participants and have a close relation with the expressed need for financial resources and training workshops (*refer to sections* 2.7, p. 52; 2.13, p. 44; 5.10.3.1 & 5.10.3.2). The need for support that came out strongly from the responses of the participants is related to financial support needed to fund workshops for Agricultural Science teachers in the Zambezi region.

A lack of support from the central government of the Republic of Namibia was seen as a serious problem and as such, some of the responses on this section implied that they wanted the Ministry of Education to provide support to all Agricultural Science teachers. Therefore, the extent of attention from the participants to this particular aspect signified a need for more support from the Ministry of Education as the leading custodian of the teaching service in the Zambezi region.

5.6.5.2 Perceived needs in relation to teaching experience

Participants were asked: “In your view, how do you think that the perceived needs of less experienced agricultural science teachers differ from the perceived needs of experienced Agricultural Science teachers with regard to the implementation of the Agricultural Science curriculum?” (*refer to* Appendix C). From the responses of the participants, it seemed evident that the perceived needs of less experienced and experienced Agricultural Science teachers do differ in relation to the teaching of the subject in and outside the classroom.

This suggests that less experienced teachers (<3 years of teaching experience) tend to struggle with a great number of components related to the teaching of the subject in and outside the classroom, while experienced teachers struggle less. This implies that the less experienced teachers (<3 years of teaching experience) need training in the form of workshops that will help them to develop a clear understanding of the demands of the curriculum with the purpose of improving their teaching abilities.

In relation to the perceived needs of experienced and less experienced Agricultural Science teachers, the responses from the participants captured the need for workshops, and the failure to identify the teaching and learning resources among the less experienced Agricultural Science teachers. The following are some of the responses: “Their needs, they should just be brought in in workshops and even for short trainings also to put them in line with the changes in the subject” (P1: lines 79-80).

“…need more meetings, more workshops, mini workshops…” (P2: lines 236-237).

Regarding the failure to identify the teaching and learning resources by the less experienced teachers, the following were the responses from the participants:

Eel hopefully I think that the experienced agricultural science teachers, you

> *know even when some resources are not there he will be to use his experience to get resources, but with an unexperienced Agricultural Science teachers since he is still struggling and know which subject or textbook can be used so he will struggle to get the necessary information that he may be able to use in order to support the teaching and learning situation to go through successfully (P4: lines 533-537).*
>
> *I think the Agricultural Science teacher with experience will go an extra mile to look for more teaching aids like other activities if maybe, for example he is teaching about cattle aah, aah, identification he may take his or her learners to the kraal that nearby, but the one who is not experienced will not waste his time to out and those extra activities (P5: lines 663-666).*

5.6.5.3 Perceived needs in relation to gender

Participants were asked the question: "In what way do the perceived needs of male Agricultural Science teachers differ from the perceived needs of female Agricultural Science teachers with regard to the implementation of the Agricultural Science curriculum in school? (*refer to* Appendix C)". From the responses of the participants in relation to the perceived needs relative to gender, it was evident that the majority (67%) of the participants indicated that there were no differences in the perceived needs of male and female Agricultural Science teachers, while the rest said they differ (*refer to* Figure 5:20).

The results of the study suggest that Agricultural Science teachers are all guided by a similar school curriculum and their needs are expected to be more similar, and on the other hand they are teaching the same subject in a near similar context (*refer to sections* 5.8.1, p. 129-133). Responses from the participants serve as examples: "For me I don't see that they differ…" (P5: line 674). "They are not different, they cannot be different they are just the same, it's just a matter of the way of teaching otherwise everything is just the same" (P6: Lines 834-835).

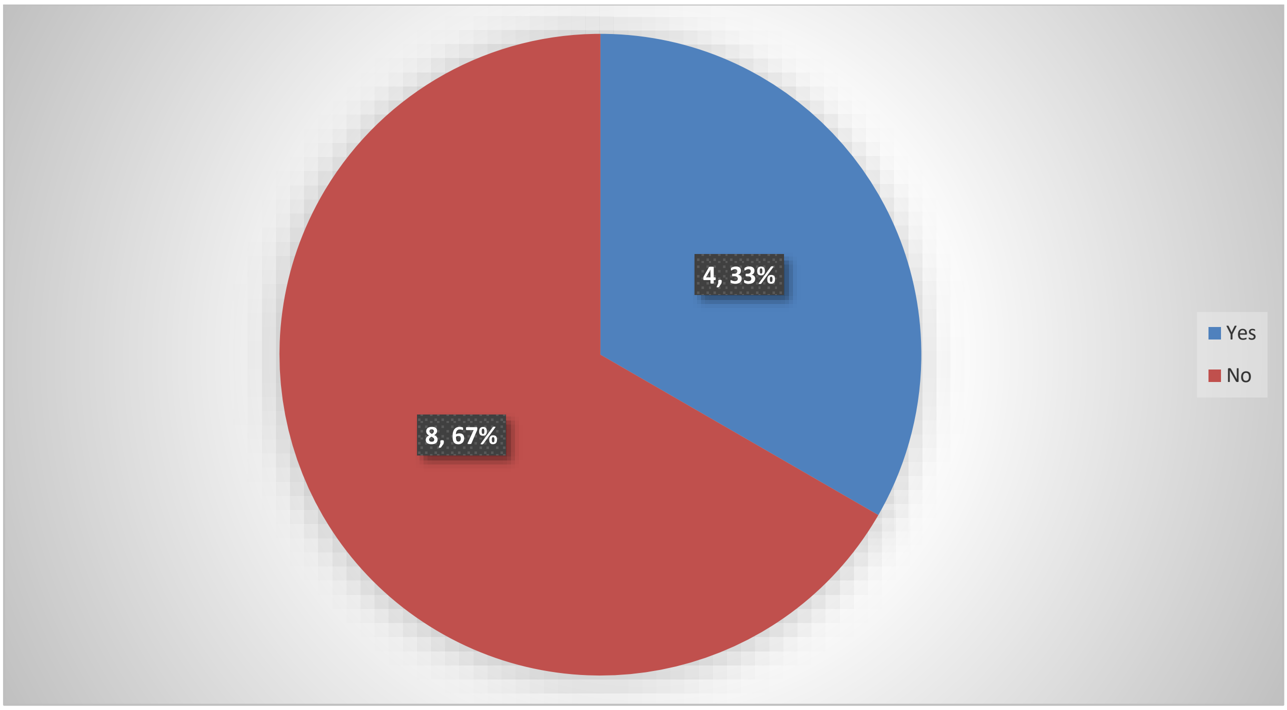


Figure 5.21: Views of participants on Agricultural Science teachers' needs in Zambezi region in relation to gender.

In summary, with regard to the needs of both male and female teachers, the results of this study based on the views of the participants interviewed revealed that the majority (67%) of the participants said that the needs are more or less equally similar among Agricultural Science irrespective of gender.

5.6.6 Leadership qualities

It is beyond doubt that the quality of leadership related to subject management in a particular school should be the central point in improving teaching and learning in the Zambezi region, Namibia and beyond. Therefore, it is important to note that school management regards leadership qualities and subject teachers as essential components to ensure a holistic approach in improving teaching and learning of Agricultural Science in secondary schools (*refer to section* 5.2.6, p. 94). Participants were asked the question: "What leadership qualities do you think you need to teach Agricultural Science as a school subject to ensure the continuation of its reputation in the school?" Responses from the participants were recorded in supporting the importance of quality leadership within the school context to ensure that learners are helped to perform in their academic undertakings. In the interviews, participants were undivided in their views that leadership qualities within the school context form an important component in improving teaching and learning.

The following are some of the examples of responses in this regard: "If you are a manager you need to plan and implement and control and evaluate" (P1: lines 1127-1128). "Then also manage time effectively, just in short" (P9: line 1269). "Number one, they should know how to handle discipline… so a teacher must be qualified to handle such type of behaviours…" (P2: lines 281-287). In the researcher's view, the school management and subject teachers who demonstrate poor quality management will find it complicated to help learners to perform well in their academic activities.

Poor quality management in the context of this study relates to ineffective teaching of the subject, lack of support in terms of learning resources and failing to control learners' unacceptable behaviours. In the next section, the envisaged changes by the participants will be discussed.

5.6.7 The envisaged changes

From the findings of this study based on the responses of the participants to the question, "What changes do you think you need to bring to the teaching of Agricultural Science in your teaching career?" (*refer to* Appendix C), participants envisaged particular changes. The purpose of this question in the interview schedule (*refer to* Appendix C) was to give the participants the opportunity to provide information with regard to the changes needed in the teaching of Agricultural Science in the Zambezi region. The following are the components they envisaged: enhancing practical the component, promoting frequent training workshops and facilitating frequent field excursions.

5.6.7.1 Enhancing the practical component

Responses from the participants that were recorded specifically referred to enhancing practical activities that are necessary in increasing the level of understanding of the subject content by the learners (*refer to sections* 2.3, p. 21; 2.6, p. 23; 2.8, p. 31; 2.15, p. 48; 3.4, p.59). On enhancing practical component in Agricultural Science, one participant expressed that:

> *Aaah, just enhancing on the practical part, the practical component is mostly*

> *not done in learning and teaching. So bringing more practicals would really help for our pre-receivers which are learners to understand more about this subject, practical part because mostly what is delivered is theory (P1 lines 95-98).*

Another participant in this regard alluded to the aspect of enhancing practical activities in the teaching and learning of Agricultural Science in secondary schools in order to give learners the opportunity to have a hand on the activities. The participant expressed that "eeeh I think the changes that I was looking at is to try and do more practical…" (P4: line 564). A further related response from one of the participants concerning enhancing practical activities should be viewed in the sense that practical activities in schools are given less attention:

> *Mmmh, I think we will need more of, more practical because currently what we are tackling more at is a theory part, so at least the theory part even if we tackle it, learners will understand but if they could be more practical whereas they are involved in doing it themselves then that would help much (P9: lines 1291-1274).*

From the responses of the participants, it is important to note that learners learn more effectively and efficiently by doing, interaction and touching. The responses of the participants are in conformity with the views by Okiror *et al.*, (2017:26),

> Agriculture is a subject that is best learned by doing when students interact with animals or grow and market their own crops to the school kitchen or other roadside buyers. They need to see the fruit of their labour and the benefits of honest income from their own hands.

5.6.7.2 Promoting frequent training workshops

In order to improve teaching and learning of Agricultural Science in schools, it is inevitable that adequate training workshops related to the teaching of Agricultural Science are continuously carried out (*refer to sections* 2.10, p. 36; 3.4.2, p. 60; 5.8.2, p.137). During the interviews it was evident that participants are in favour of frequent training workshops for teachers, particularly for those with less teaching experience (<3 years) in order to help them to develop an understanding of contemporary issues related to the teaching of Agricultural Science: "What I am seeing is, for example, now we are having problems of not attending more workshops" (P6: lines 875-876). "…they are not training teachers specifically for agriculture in education" (P11: lines 1643-1644). The responses from the participants regarding training workshops as indicated above are near related to the opinion of Osamwonyi (2016): "There is no doubt that in-service training education will continue to fill the missing links created by the changing society between pre-service education and teacher's effectiveness in the world of work."

5.6.7.3 Facilitating frequent field excursions

Field excursions are an important component in the teaching and learning of Agricultural Science in secondary schools. It is important to note that when learners undertake educational field excursions during their academic time the main aim is not only recreational or pleasure, but also to give learners opportunities to gain additional knowledge through direct experiences (*refer to sections* 2.17, p. 52; 5.3, p. 104-105; 5.5, p. 116). Generally, the main purpose of field excursions is to give learners first-hand experiences that cannot be had in the classroom context.

Therefore, field excursions are important to Agricultural Science teaching and learning, since first-hand experience can serve as the driving force for making a subject more interesting to learners. One participant felt strongly about the importance of field excursion in teaching Agricultural Science:

> *Not only that one, learners should be exposed like in grade 10, grade 8, they have introduced conservancy, let's not talk conservancy in the class, take the learners go out there and expose themselves, so that they should know that this is the conservancy (P2: lines 304-307).*

The significance of the participant's response with regard to field excursions in relation to the envisaged changes was that field excursions must be an important component in the teaching and learning of Agricultural Science in secondary schools in order to build the required teaching competencies (*refer to sections* sections 2.17 and 5.3).

5.7 Summary of qualitative data analysis

This section presented the qualitative analysis of the data derived from the follow-up interviews with regard to the perceived competencies and needs of Agricultural Science teachers. The results of the qualitative data revealed that the majority (58%) of the participants indicated that there is no difference with regard to the competencies among male and female Agricultural Science teachers in the Zambezi region. This could suggest that Agricultural Science teachers in the Zambezi region are likely to have undertaken similar training that would have prepared them to be competent regardless of their gender to teach Agricultural Science in secondary schools effectively and efficiently. With regard to the needs of Agricultural Science teachers, the analysis of the qualitative data revealed that the majority (67%) of the participants indicated that there were no differences in the perceived needs of male and female Agricultural Science teachers, while the rest said they differ. Therefore, the results of the study suggest that Agricultural Science teachers are all guided by a similar school curriculum and their needs are expected to be more similar, and on the other hand, they are teaching the same subject in a near similar context.

5.8 Summary of the chapter

This chapter presented the findings of this study. Quantitative data generated in this study were analysed using descriptive statistics provided by the Statisica 13 computer Software programme. Chi square test and ANOVA were used to determine whether there are significant differences in the frequency distributions on each of the perceived competencies and needs. Four hypotheses were tested in the study at 0.05 level of significance. Qualitative data were analysed looking at the profile of the participants in terms of their teaching experiences, teacher-perceived competencies and needs. The verbatim extracts of the inter-views of the participants related to what motivated them to teach Agricultural Science were provided. Direct extracts of the interviews with regard to gender competency were also provided.

The next chapter will draw conclusions and make recommendations with regard to improving teaching and learning the perceived competencies and needs of Agricultural Science teachers in the Zambezi region.

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1 Introduction

The previous chapter presented the results of the study, which emanated from the discussions of the data analysis. This chapter presents the conclusions drawn from the findings of the study and will make recommendations with regard to improving teaching and learning that are necessary for policy-makers to implement. This study assessed secondary schools Agricultural Science teachers' competencies and needs with a view to making recommendations for improving Agricultural Science teacher education in the Zambezi region of Namibia. It aimed to determine what the perceived competencies of male and female teachers as well as experienced and less experienced teachers were in teaching and conducting practical experiments in Agricultural Science at the secondary school level.

The study also aimed to determine the professional needs of male and female teachers as well as experienced and less experienced Agricultural Science teachers that might be necessary to enable them to keep abreast of contemporary issues facing the teaching of Agricultural Science in combined and secondary schools.

6.2 Conclusions

The main aim of the study was to assess Agricultural Science teachers' competencies and needs and to make recommendations for improving Agricultural Science teacher education in the Zambezi region.

Null Hypothesis one sought to determine whether there is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region. With regard to gender, the results of the study revealed that there were no gender differences for all competencies tested. In this regard, it can be concluded that gender showed no influence in the teaching competencies among the participants.

Null Hypothesis two was pursued to find out whether there is no significant difference between perceived competencies of less experienced and experienced Agricultural Science teachers in the Zambezi region. With regard to the perceived competencies and experience, the study revealed that there is no statistically significant difference in the teaching competencies of less experienced and experienced Agricultural Science teachers in the Zambezi region.

Null Hypothesis three attempted to find out whether there is no significant difference between the perceived needs of male and female Agricultural Science teachers in the Zambezi region. In conclusion, based on the analysis and interpretations of the data, the study revealed that 18 (90%) out of 20 proposed needs did not produce statistically significant differences ($p>0.05$), while the two needs that did show statistically significant differences ($p< 0.05$) are those related to preparing Agricultural Science instructional and learning activities and the teaching of Agricultural Science through field excursions and scientific visits. The results revealed that 49% of the male teachers considered the need for preparing materials for Agricultural Science instructional and learning activities as most preferred, while 28% of the female teachers also considered it as a most preferred need and the rest did not. The results of the study suggest that, though male and female teachers do have comparable opportunities to prepare Agricultural Science instruction and learning activities for their teaching, female teachers are more meticulous and usually pay more attention to details as compared to male teachers.

The results of the study further show that the majority (65%) of female teachers and the majority (59%) of male teachers considered field excursions as a less preferred need, while the rest did not. The results of the study therefore concludes that the difference in teaching preferences with regard to teaching the subject through excursions between male and female teachers who participated in this study was 6% and this will require further probing through research to establish as to why the difference exists.

Null Hypothesis four sought to ascertain whether there is no statistically significant difference between the perceived needs of less experienced and experienced Agricultural Science teachers in the Zambezi region. The results of the study revealed that 13 out of 20 needs were not statistically significant, while 7 needs were statistically significant ($p>0.05$) difference between less experienced (< 10 years) and more experienced (> 10 years) teachers (*see* Appendix D for a detailed analysis). Therefore, it can be concluded that teachers with <10 years of teaching experience might need more help in the delivering of Agricultural Science concepts to secondary schools learners, in respect of certain items on the research instrument. This is important in order for this particular group of teachers to improve teaching and learning and to potentially enhance the academic performance of Agricultural Science learners in secondary schools.

With regard to preparing Agricultural Science instructions and activities, the results of this study revealed that teachers with >10 years of teaching experience indicated that the need is most preferred. Therefore, it could be concluded that despite enjoying a large share of teaching experience, they need some form of continuous professional development. In this regard, continuous professional development is essential for them to keep abreast of contemporary issues in the teaching and learning of Agricultural Science.

It can further be concluded that teachers with less than 10 years of teaching experience need more support to enable them to have the needed competencies to plan and prepare Agricultural Science instruction and activities needed to enhance effective teaching and learning of Agricultural Science. A voluntary in-service programme might adequately address this aspect of a teacher’s work.

The results of this study revealed that more experienced teachers (>10 years) believed that writing Agricultural Science instructional objectives was a most preferred need as compared to less experienced teachers (<10 years). It is important to note that more experienced teachers should have acquired this skill through their long teaching experience. It can thus be assumed that older teachers may have not been trained properly on this aspect, possibly because it was not considered as a critical concern at the time.

However, this shortcoming may have been overcome by their long teaching experience. Newly trained teachers, those with <10 years teaching experience, are expected to have attended more recent training in which the writing of Agricultural Science instructional objectives is emphasised. As such, this cohort of teachers (<10 years teaching experience) should not have a serious concern over this need.

However, this assumption will have to be tested in future studies by interrogating the contents and developments of the teacher training syllabi/curriculum. The results of the study further revealed an overall significant ($P<0.05$) difference on the perceived need for developing an instructional plan for a unit of Agricultural Science, in which the greatest proportion of less experienced teachers (<10 years) considered this as a most preferred need, compared to a smaller proportion of the more experienced teachers (>10 years). Therefore, it is clear, if not obvious, that developing an instructional plan in teaching is a basic requirement in teaching.

6.3 Limitations of the study in light of the reported findings

First, one reason why there were no statistically significant differences between gender in teaching experience and perceived competencies is probably due to the bias disposition of the participants to honestly provide certain information that they may consider too sensitive to avail any person. This is because, when teachers report about themselves (participant's self-report) in a survey study as done in this research, they may not want to view themselves as incompetent, but they may express some of their needs (therefore some differences on the dependent variable's perceived needs was found). In other words, it seems the teachers provided socially desirable responses to avoid portraying themselves in a negative way. According to Korb (2011:2), "many researchers argue that participants do not respond truthfully on self-report questionnaires".

However, self-report questionnaires which ask participants to answer direct questions about themselves are extensively used to explore participants' beliefs, attitudes, feelings, and opinions (Singleton, 2010) cited by (Korb, 201:2). The conducts that may not be noticeable during the data-collection process among the participants are easily identified when a researcher uses self-reporting method (Kormos & Gifford, 2014).

Second, the other limitation encountered in the course of data collection was the participants' level of comprehension of the questionnaire items. Although the researcher took time to pilot the research instruments, explained the research objectives vividly to the study participants and explained what their expected roles were, as well as clarified questions raised by the participants, the questionnaire responses suggest that some items were not properly understood.

Even though, the results of the pilot study were used to improve the questionnaire items before they were administered in the main study, to improve the internal reliability and validity of the questionnaire in similar studies in the future study, the researcher can also randomly ask few questions from the questionnaire during discussions that precede the use of the questionnaire in order to ascertain the comprehension level of the study participants. This approach may create better background understanding for the study participants prior to completing the questionnaire. In the views of Koda (2005) cited by Gürses and Bouvet (2016:20), "for successful comprehension to occur, the reader extracts and integrates various pieces of information from the text and interprets this information by combining it with his or her background knowledge".

Third, it was also observed that some of the study participants rushed through the questionnaire without giving full attention to the items. This is apparent from the way some avoidable errors were noticed in the written responses provided by the participants. Thus, similar research in the future should consider collecting data when the participants' (teachers) activities are minimal, such as at the beginning of the school term or immediately after learners' examinations.

6.4 Reflections on the data-collection process

However, it is important to admit that there were some positive aspects that occurred during the data-collection process. The researcher at all times aligned his time at the convenience of the participants and this facilitated full coverage of the interview sections with the respondents. On the other hand, because the researcher was a full-time employee of the University of Namibia and was not on study leave during the study period, it was very demanding to combine the field data-collection with regular work responsibilities.

This made the duration of the data-collection period longer than planned. If given another opportunity to carry out the study, the researcher would take study leave in order to concentrate fully on the data-collection process within the planned period. This would save time, energy and resources for both the researcher and the study participants.

6.5 Practical significance of the study

This study was able to establish the baseline data of the competencies and needs of the Agricultural Science teachers in the Zambezi region of Namibia. Some of the issues identified as affecting the optimal performances of the Agricultural Science teachers pertains to professional qualifications and subject knowledge, workload and working environment, as well as institutional supports towards continued professional development. Considering the importance of professionally qualified and competent teachers to the future of Agriculture Science development in the Zambezi region and in Namibia as a whole, relevant recommendations have been made based on the research finding to guide the educational stakeholders (Ministry of Education) in identifying programmes and activities that will strengthen effective teaching and learning of Agricultural Science in the study area.

The teaching and learning of Agricultural Science in schools is important in order to build a solid foundation in theory (content) and practical component among Agricultural Science teachers. Therefore, in building a solid foundation in the subject content and practical components, Agricultural Science teachers in the Zambezi region should be acknowledged by all stakeholders as the key components in shaping the quality of teaching and learning of the subject in schools. This can be strengthened through in-service training needs and competencies that are essential for effective teaching. In the context of this study, Agricultural Science teachers serve the role of experts under whom learners will learn the theory and practice of Agricultural Science in order to inculcate the culture of food production among the learners.

Teacher expertise in agricultural education differs from teacher expertise in other fields. In this respect, Swanson (1971) as cited by Robert and Ball (2009:83) reiterated: "The teacher must have extensive training and expertise in the occupation or technology which he teaches. Very little compromise can be made in the skills of the teacher if effective instruction is to take place." Therefore, the teaching of Agricultural Science in secondary schools in the Zambezi region should not be managed as a science subject as such but to a certain extent as a vocational school subject that should prepare learners with the necessary theoretical and practical skills for a significant livelihood (Ikeoji *et al.*, 2007).

6.6 Contribution of the study to body of literature

The findings of this study provided research-based baseline data/information on the competencies and needs of Agricultural Science teachers, which has implications for the teaching, and learning of Agricultural Science in the Zambezi region of Namibia. Although some of the needs, such as academic qualifications, high workload and working environment of Agricultural Science teachers have been reported in the literature, such literature data alone cannot be used to address the teachers' perceived needs and competencies.

In chapter two sections 2.9, p. 31 and 2.10, p. 43, the researcher centred his study on different studies such as those, which gave particular interest to the perceived competencies and perceived needs of Agricultural Science teachers. In these studies, a number of findings gave particular emphasis to certain components that call for improving the teaching and learning of Agricultural Science in secondary schools related to the perceived competencies and needs of teachers. Some of the findings originating from this study are consistent with several of the findings emanating from earlier studies, particularly those discussed in chapter two sections 2.9, p. 31 and 2.10, p. 43.

For example, the following components were identified by earlier studies and were also obvious in this study as important components that may need attention with regard to the effective teaching and learning of Agricultural Science in secondary schools in the Zambezi region: improving the skills and knowledge of teachers (Bhargava and Pathy, 2011; Powell, 1992; Naumescu, 2008; Mansour, *et al*., 2011), effective in-service training programmes for teachers (Davis and Jayaratne, 2015; Cannon, *et al.*, 2012), effective teaching methods (Duncan *et al.*, 2006).

Thus, by carrying out this study in the Zambezi region with its history of learners' poor performances in Agricultural Science, it has contributed to establishing literature in the Namibian context on teachers' needs and competencies in Agricultural Science.

6.7 Recommendations

On this basis of the findings of this study, the following recommendations are proffered:

- The specific needs, which were statistically significant ($p< 0.05$) should be given priority by the Ministry of Education in the Republic of Namibia when planning, designing and cultivating teacher education programmes for contemporary teachers.
- Authorities in both public and private combined and secondary schools in Namibia should make provision for the continuous professional development of in-service Agricultural Science teachers to be made compulsory, irrespective of gender, competencies and years of teaching experience. Continuous professional development is essential for them to keep abreast of global contemporary issues in the teaching and learning of Agricultural Science in secondary schools.
- More academic workshops and seminars for capacity building of teachers on new methods of teaching Agricultural Science, instructional planning, lesson implementation, lesson evaluation process and peer teaching programmes are highly

recommended and must be initiated in order to adequately support Agricultural Science teachers irrespective of years of teaching experience and level of competencies in order for them to stay abreast of contemporary issues in the teaching and learning of Agricultural Science in combined and secondary schools. Support of this nature will enable Agricultural Science teachers to have the needed competencies to plan and prepare Agricultural Science instruction and activities, to develop clear and specific instructional objectives and to impart the necessary skills to learners that are needed to enhance effective teaching and learning of Agricultural Science in combined and secondary schools.

- Education programmes for pre-service teachers in institutions of higher learning in Agricultural Science teaching need to be introduced in secondary education teacher training and must be crafted to adequately cover the learning content and methodologies needed to teach Agricultural Science in secondary schools in Namibia and in the Zambezi region in particular. Components such as tests, practical activities, assessment procedures and evaluation techniques need to be adequately addressed in the teacher training programme curriculum to prepare in-coming teachers with adequate knowledge in this important area of classroom teaching.
- The use of Agricultural Science resource persons (teachers) in schools must be planned and frequently carried out in order to support in-service teachers and provide induction programmes for novice teachers. This is important to allow novice teachers to settle in and be able to teach with confidence.
- The Namibian government should provide and improve infrastructural facilities (school gardens, livestock units) and adequately provide them with agricultural tools and equipment needed for effective teaching and learning of Agricultural Science in combined and secondary schools.
- Special activities such as field trips or excursions should be planned and adequately funded for Agricultural Science teachers to take learners to various educational places for further exposure.
- Both male and female, experienced and less experienced teachers in the Zambezi region should be given equal opportunities with regard to all the aspects related to the teaching and learning of Agricultural Science in combined and secondary schools.

- Female students should be encouraged to take Agricultural Science as a school subject at secondary and subsequently at tertiary level through teaching training programmes.
- At tertiary level, the lecturers of Agricultural Science education should make efforts towards improving the level of competencies of Agricultural Science students to a higher standard. This is important in helping teachers impart the necessary skills to learners.
- Further studies need to be carried out to interrogate the content and methodologies used in the training of Agricultural Science teachers and developments of the teacher-training curriculum. This will help policy-makers and implementers to initiate mitigation strategies that will help to improve teaching and learning of Agricultural Science in combined and secondary schools.
- Further studies should be conducted to establish what the actual competencies of female, male, experienced, and less experienced Agricultural Science teachers are in the Zambezi region of Namibia.
- Further studies should be conducted to establish why differences exist between genders with regard to teaching Agricultural Science through field excursions.

6.8 Summary of the chapter

The hypothesis of the study has been addressed with quantitative (questionnaire) and qualitative (follow-up interviews) methods. Participants in the Zambezi region provided helpful

information that was sought to complete this study. Without any doubt, there is a need for the Ministry of Education and the stakeholders in the Zambezi region to address the raised issues. The researcher hence recommends that all the recommendations made in this study be given attention to improve teaching and learning of Agricultural science in the Zambezi region.

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APPENDIX SECTION

1. Appendix A: Work schedule of activities for the study from 2017 to 2019

Table 4.1 provide the details of proceedings during the course of the study. The questionnaire and the follow-up interview guides are found in the APPENDIX as formerly pointed out.

Table 0.1: Work schedule of activities for the study from 2016 to 2018

Key Activities	2016												2017												2018											
	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December	January	February	March	April	May	June	July	August	September	October	November	December
Registration and finalise the research proposal as well as drafting the questionnaire																																				
Addressing the comments from the promotor																																				
Submitting corrected version to the promotor																																				
Conducting preliminary literature																																				
Write Chapter one of the dissertation (Introduction)																																				
Write Chapter two of the dissertation (Theoretical/conceptual framework)																																				
Write Chapter three of the dissertation (Literature review)																																				
Write Chapter four of the dissertation (Research Design and Methodology)																																				
Piloting the research instruments (Questionnaires and Focus group guideline)																																				
Revise earlier chapters (addressing the comments from the promotor)																																				
Data collection (Field work) and analysis																																				
Write Chapter five of the dissertation (Results and Discussions)																																				
Write Chapter six of the dissertation (Conclusions and Recommendations) and submitting chapters for support and guidance to the supervisor																																				
Revision and editing and submitting all chapters (draft)																																				
Work on feedback and submit																																				
Editing and submit final research dissertation for examination and oral																																				
Addressing examiners' comments and oral examination																																				

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2. Appendix B: Teachers' questionnaire for Agricultural Science in the Zambezi region

Declaration of confidentiality and anonymity to the participants

I am a PhD learner of Higher Education at Stellenbosch University in the department of Curriculum Studies and I am conducting a research on a topic: **Improving Teaching and Learning in the Zambezi Region, Namibia: The Perceived Competencies and Needs of Secondary Agricultural Science Teachers.** Kindly provide me with the necessary information that is required to complete this study. The information that you will provide shall be treated with a high degree of confidentiality and shall only be used for academic purposes. Anonymity is highly guaranteed for the protection of your views and opinions.

SECTION A: BACKGROUND INFORMATION

These question items are about you as a teacher, your education as well as your teaching experience. In responding to these question items, kindly mark with an ***X in*** *the suitable box.*

1. Indicate your gender (Kindly mark with an X in the suitable option).

Code	Gender	Option
1	Male	
2	Female	
3	Other (Please specify)	

2. **How many years of teaching experience do you have?**

   Exclude where possible periods of absence (not due to illness) such as study leave. **(***Kindly mark with an* ***X in*** *the suitable option).*

Code	Years	Option
1	0 – 2	
2	3 – 10	
3	11 – 15	
4	15 and more	

3. **What grade(s) do you teach? (Kindly mark with an X in the suitable option).**

Code	Grade	Option
1	8-9	
2	8-10	
3	11-12	

4. **How many teaching periods do you have per week? (Kindly mark with an X in the suitable option).**

Code	Number of periods	Option
1	4-8	
2	8-12	
3	12-16	
4	16-20	
5	20-28 and more	

5. **What is your highest academic qualification? (Kindly mark with an X in the suitable option).**

Code	Qualification	Option
1	PhD	
2	Master of Education	
3	Other Master's degree	
4	Bachelor of Education	
5	Other bachelor's degree	
6	Higher Education Diploma	
7	Bachelor of Science Agriculture	
8	Dip. Education (BETD)	
9	National Dip. Agriculture	
10	Certificate in Education	
11	Others (Please specify)	
12	No degree or diploma	

Adopted and modified from (CSLP, 2007)

6. **What is your employment status as a teacher? (Kindly mark with an X in the suitable option).**

Temporary is where the teaching contract ends at the end of the academic year. You become permanently employed when your probation period is confirmed.

Code		Yes	No
1	Permanent		
2	Temporal		

7. Would you consider yourself an expert in the teaching of Agricultural Science? (Kindly mark with an X in the suitable option).

Code		**Option**
1	Yes	
2	No	
3	Not sure	

8. Approximately, what proportion of your teaching duties is in Agricultural Science for this academic year? (Kindly mark with an X in the suitable option).

Code	**Percentage (%)**	**Option**
1	Less than 25%	
2	25% to 40%	
3	41% to 74%	
4	75% or more	

9. Specify the enrolment numbers of your learners in the grades that you are teaching? (Kindly mark with an X in the suitable option).

Code	**Enrolment numbers**	**Option**
1	15-25	
2	25-35	
3	35-40	
4	45 and more	

10. Have you enrolled for an in-service training programme in the past three years? (Kindly mark with an X in the suitable option).

Code		**Option**
1	Yes	
2	No	

11. If yes, to question 10 above, did you find it applicable to your professional development? (Kindly mark with an X in the suitable option).

Code		**Option**
1	Yes	
2	No	
3	Not Applicable	

SECTION B: AVAILABILITY OF TEACHING AND LEARNING RESOURCES

*These question items are about the availability of teaching and learning resources that are needed for an Agricultural Science teacher to be competent enough in a classroom and school. In responding to these questions, kindly mark with an **X** the appropriate box.*

12. Use: 5 = Strongly Agree; 4 = Agree; 3= No Idea; 2 Disagree; 1 = Strongly Disagree

Code	**Physical Resources**	**5**	**4**	**3**	**2**	**1**
1	The number of desks and chairs in the classroom are adequate.					
2	The size of the agricultural school garden for practical purposes is adequate for the learners to do practical activities					
3	The water supply to the agricultural school garden is reliable.					
4	The teaching and learning resources in the agriculture classroom are adequate for the number of learners in your classroom.					
	Teaching and learning Resources					
Code	**Resources**	**5**	**4**	**3**	**2**	**1**
5	The number of Agricultural Science textbooks are adequate.					
6	The Agricultural Science teacher's guide is available.					
7	Teaching resources such as chalks, duster, charts, models, are adequate.					

8	Use of Agricultural Science resource persons in the school is frequent.					
9	Use of excursions or field trips for your learners is frequent.					
10	Learners in your classroom have access to computer with internet connectivity.					
Extent of Teaching and learning resources Utilization						
Code	**Utilization of resources**	**5**	**4**	**3**	**2**	**1**
11	I make use of the Agricultural Science tools in teaching.					
12	I make use of the reference books in teaching.					
13	I make use of the syllabus in teaching.					
14	I make used of the teacher's guide in teaching.					
15	I make use of excursion/field trips in teaching.					
16	I make use of internet in teaching.					
17	I make use of the discussion groups teaching					

Adopted and modified from (PCAP, 2010)

13. How often are the following teaching and learning resources used in your Agricultural Science class?

Code	Teaching and learning resources	Rarely or not at all	Sometimes	Often
1	Agricultural Science syllabus document			
2	Scheme of work			
3	Textbooks			
4	Teacher's guide			
5	Revision guides			
6	Worksheets			
7	Hand-outs (printed resources)			
8	Measuring tapes/line			
9	Small tools			
10	Rain gauge			

Adopted and modified from (PCAP, 2010)

SECTION C: TEACHING NEEDS, COMPETENCIES, EXPERIENCE AND SEX OF AGRICULTURAL SCIENCE TEACHERS

These questions are about your teaching needs and competencies in relation to sex and the years of your teaching experience. In responding to these questions, kindly mark with an ***X*** *the appropriate box.*

14. Use: 5 = Strongly Agree; 4 = Agree; 3= No Idea; 2 Disagree; 1 = Strongly Disagree

Code		**5**	**4**	**3**	**2**	**1**
Teaching experience						
1	Teacher education programmes need to integrate content knowledge with the teaching methods related to Agricultural Science					
2	Agricultural Science teacher education preparation in Namibia requires persistent innovation to make certain that agriculture teachers are capable to teach Agricultural Science effectively as a school subject					
3	Acquiring Agricultural Science teaching methods, skills and subject content knowledge are essential for effective teaching.					
4	There is no significant difference between the perceived needs of experienced and less experienced Agricultural Science teachers in the Zambezi region.					
5	There is a significant difference between the perceived needs of experienced and less experienced Agricultural Science teachers in the Zambezi region.					
6	There is no significant difference between the perceived competencies of experienced and less experienced					

	Agricultural Science teachers in the Zambezi region.					
7	There is a significant difference between the perceived competencies of experienced and less experienced Agricultural Science teachers in the Zambezi region.					
8	There is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region.					
9	There is a significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region.					

Adopted and modified from (PCAP, 2010)

15. To what extent do you use the following teaching methods in your Agricultural Science classrooms?

Code	**Extent of using teaching methods**	**Not at all**	**A little**	**More than a little**	**A lot**
1	Teacher exposition and demonstration				
2	Investigation method				
3	Collaboration method				
4	Field excursions				
5	Individual learning				
6	Group discussions				
7	Practical activities/experiments				
8	Questions and answer method				

Adopted and modified from (PCAP, 2010)

16. On average, over one academic year, what percentage of the total teaching and learning time would you say is spent on the following activities in your Agricultural Science classroom?

Code	**Time spent on teaching and learning**	**Less than 10%**	**10% to 25%**	**25% to 34%**	**35% to 54%**	**55% to 74%**	**75% or more**
1	Teaching to the whole class (for example lecturing, teacher's exposition, demonstration, giving learning instructions, going over the previous given homework or project).						
2	Teaching to small groups of learners while the rest of the class does other activities.						
3	Group work while teacher facilitates.						
4	Project work such as learners working on a long-term project in the school garden.						
5	Agricultural experiments.						
6	Please specify						

Adopted and modified from (PCAP, 2010)

17. In your view, based on your teaching experience, how valuable are the following teaching and learning methods in helping learners learn Agricultural Science?

Code	**Teaching and methods or approaches**	**Slightly valuable**	**Somewhat valuable**	**Very valuable**
1	Class discussions			
2	Problem solving based activities			
3	Working in groups			
4	Individual learning			
5	Questions and answer method			
6	Presenting a concept in various ways			
7	Rehearsing			

Adopted and modified from (PCAP, 2010)

18. How often do learners do the following in your Agricultural Science classroom teaching?

Code	**Learners' abilities in learning and teaching**	**Rarely or not at all**	**Sometimes**	**Often**
1	Explain their investigation orally in class.			
2	Explain their investigation in writing (as an assignment)			
3	Use appropriate agricultural terminologies in class.			
4	Justifying their reasoning and problem solving abilities on a particular activity in class.			

Adopted and modified from (PCAP, 2010)

19. Based on your teaching experience, how confident are you in your ability to help learners develop understanding in each of the following themes of Agricultural Science syllabus?

Code	**Level of Teaching confident of the syllabus themes such as:**	**Not at all confident**	**Sometimes confident**	**Very confident**
1	General Agriculture			
2	Plant production			
3	Animal Production			
4	Financial Management			
5	Agricultural Technology			
6	Agricultural Economics			

Adopted and modified from (PCAP, 2010)

20. To what extent do the following present challenges with regard to your teaching competencies in teaching Agricultural Science in your classroom?

Code	**Teaching challenges**	**Little or no challenge**	**Some challenge**	**A great challenge**
1	Troublemaking learners			
2	Pressure from the parents or guardians			
3	Curriculum content inappropriate for the grade level.			

4	Too much content in the syllabus			
5	Shortage of textbooks or reference materials			
6	Shortage of Agricultural Science tools/equipment			
7	Large class size			
8	Inadequate teaching and learning resources for lesson planning/preparation			
9	Too much workload			
10	Lack of professional development or in-service training			
11	Lack of electricity to use electronic appliances			
12	Limits in my own subject knowledge and teaching methods			

Adopted and modified from (PCAP, 2010)

SECTION C: PERCEIVED TEACHERS' NEEDS AND COMPETENCIES

*These questions are about perceived teachers' needs and perceive competencies on teaching and learning. In responding to these questions, kindly mark with an **X** the appropriate box.*

21. What are your most and least preferred perceived needs of teaching Agricultural Science effectively and efficiently in your classroom?

Code	Needs	Most Preferred Needs	Least Preferred Needs	Not needed at all
1	Update knowledge of Agricultural Science-related career opportunities			
2	Select an appropriate instructional strategy			
3	Learning new methods of teaching Agricultural Science			
4	Methods of motivating learners to learn Agricultural Science			
5	Update knowledge of applications of Agricultural Science			
6	Delivery of Agricultural Science concept to learners			
7	Prepare Agricultural Science instructional and learning activities			
8	Evaluating learners' progress in Agricultural Science			

9	Writing Agricultural Science instructional objectives			
10	Develop an instructional plan for a unit of Agricultural Science			
11	Update one's knowledge in instructional and learning theory of Agricultural Science			
12	Selection of new textbooks for Agricultural Science			
13	Planning and conducting learner field excursions			
14	Classroom management skills			
15	Assessing learners' learning			
16	Questioning and classroom discussion techniques			
17	Teaching Agricultural Science through field excursion and scientific visit			
18	Developing creative thinking among Agricultural Science learners.			
19	ICT needs			
20	Formal Further training			

Adopted and modified from (CSLP, 2007)

22. Would like to ask about your personal perceived competencies on teaching and learning. Please indicate how much you agree or disagree with each of the following statements.

Code	Competencies	Strongly Disagree	Disagree	Agree	Strongly Agree
1	The teacher should have the ability to effectively demonstrate to learners the correct way to solve a problem				
2	The teacher should have the ability to appreciate that it is better when a teacher not a learner decides what activities are to be done in a classroom.				
3	Teachers know a lot more that learners, they should not let learners develop answers that may be incorrect when they can just explain the answers directly,				
4	The teacher should have the ability to know that learners learn best by finding solutions to problematic questions on their own.				
5	The teacher should have the ability to appreciate that instruction should be built around problems with clear, correct answers and around				

	ideas that most learners can grasp quickly.				
6	The teachers should have the ability to believe that how much learners learn depend largely on the prior knowledge they have, that is the reason why teaching facts is necessary.				
7	The teacher should ensures active involvement of the learners in the learning process (Collaborative learning).				
8	The teacher should have the ability to allow learners to be creative, make decisions and think of solutions to problematic topics themselves before the teacher show them how well they are solved.				
9	The teachers should have the ability to evaluate development and achievement of learners with regard to learning.				
10	The teacher should appreciate that learners' thinking, reasoning and problem solving abilities are more important that specific learning content.				

11	The teacher should implements fundamental values and principles that the Namibian education system is based on.				
12	Teachers should have the ability to communicate effectively				

Adopted and modified from (CSLP, 2007)

"Thank you for your time"

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3. Appendix C: Follow-up interview questions (guides) for teachers

IMPROVING TEACHING AND LEARNING IN THE ZAMBEZI REGION, NAMIBIA: THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY AGRICULTURAL SCIENCE TEACHERS

Question measuring the perceived competencies and experience of Agricultural Science teachers in the Zambezi region.

1. How many years of teaching experience do you have?
2. What motivated you to teach Agricultural Science at combined and/or secondary school?
3. Other than Agricultural Science, which other school subject (s) are you teaching at your school?
4. Do you feel that you are competent enough to teach Agricultural Science?
5. Explain what experienced Agricultural Science teachers do more effectively in nurturing learners' achievement than less experienced Agricultural Science teachers in a similar teaching context.
6. In your view, how do you think that teachers do better as they gradually gain the necessary teaching experience?
7. What are your views about the perception that male Agricultural Science teachers are more competent than female Agricultural Science teachers in either teaching Agricultural Science as a school subject in combined or secondary school?
8. In your view, what are the qualities of a competent teacher in the assessment of learners in Agricultural Science as a school subject?
9. In what way did the agricultural training you underwent help to make you a competent teacher in Agricultural Science?

Questions measuring the perceived NEEDS of Agricultural Science teachers in the Zambezi region.

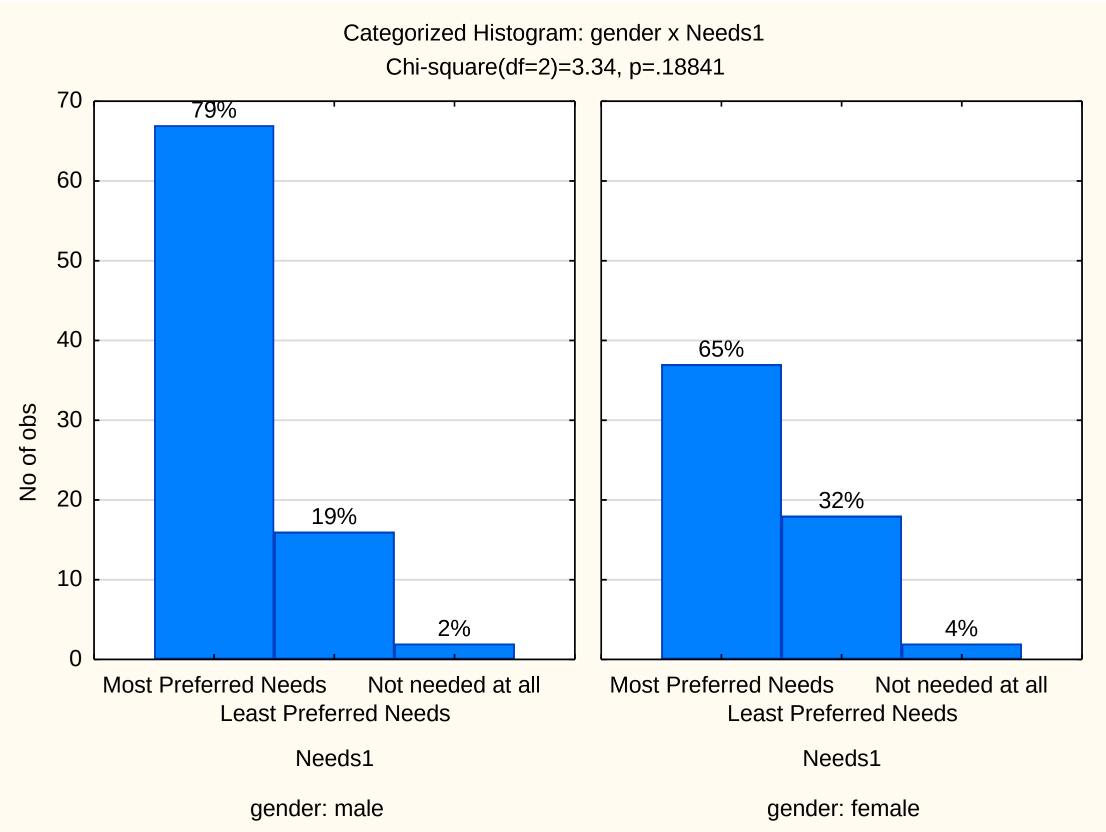
1. What are your needs as an Agricultural Science teacher that will ensure that you are effective in teaching the subject?
2. In your view, how do you think that the perceived needs of less experienced Agricultural Science teachers differ from the perceived needs of experienced Agricultural Science teachers with regard to the implementation of the Agricultural Science curriculum?
3. In what way do the perceived needs of male Agricultural Science teachers differ from the perceived needs of female Agricultural Science teachers with regard to the implementation of the Agricultural Science curriculum in school?
4. What leadership qualities do you think you need to teach Agricultural Science as a school subject to ensure the continuation of its reputation in the school?
5. What changes do you think you need to bring to the teaching of Agricultural Science in your teaching career?

"Thank you for your valuable time"

4. Appendix D: Basic statistics/tables chi-square (spreadsheet107 in results.stw) gender | needs: observed frequencies

Tabel 0.2: gender | Needs1 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.34, p=.18841			
	Needs1 Most Preferred Needs	Needs1 Least Preferred Needs	Needs1 Not needed at all	Row Totals
male	67	16	2	85
Row %	78.82%	18.82%	2.35%	
female	37	18	2	57
Row %	64.91%	31.58%	3.51%	
Totals	104	34	4	142



Figuur 0.1: **Categorized Histogram: gender x Needs1**

Table 0.3: gender | Needs2, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=1.72, p=.42365			
	Needs2 Most Preferred Needs	Needs2 Least Preferred Needs	Needs2 Not needed at all	Row Totals
male	44	31	10	85
Row %	51.76%	36.47%	11.76%	
female	25	27	5	57
Row %	43.86%	47.37%	8.77%	
Totals	69	58	15	142

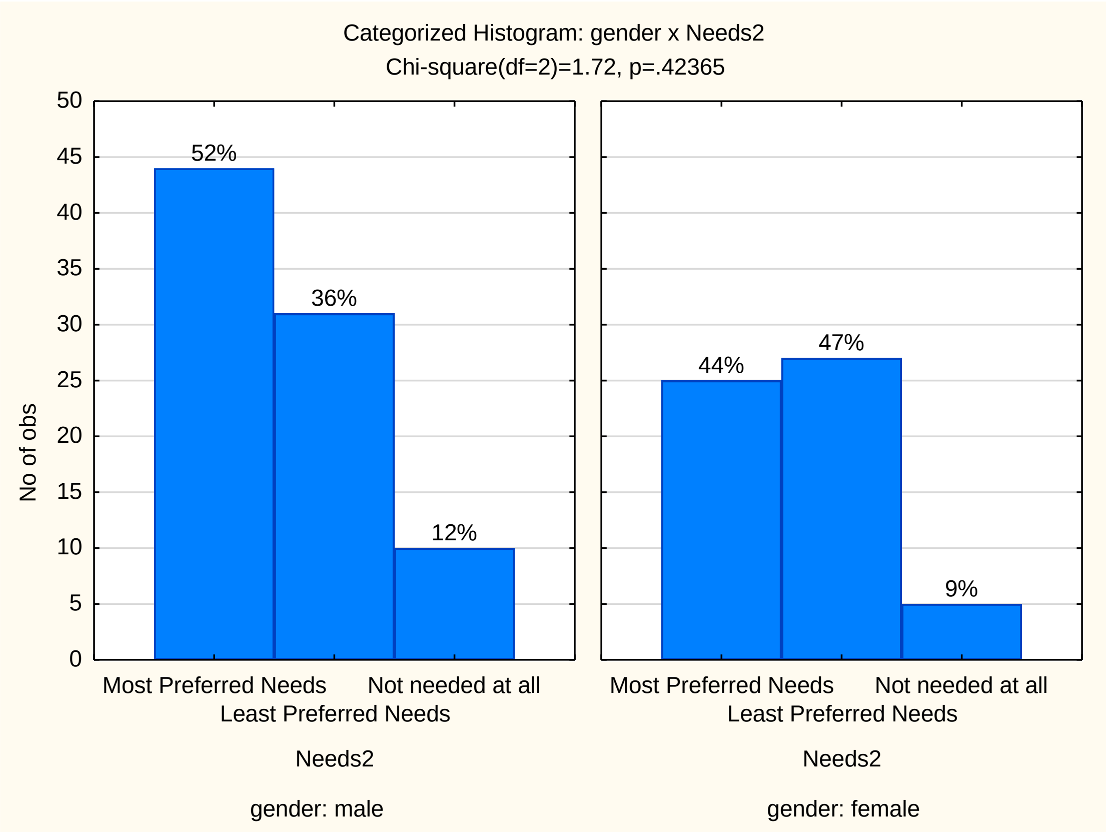


Figure 0.2: Categorized Histogram: gender x Needs2

Table 0.4: gender | Needs3, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.88, p=.14376			
	Needs3 Most Preferred Needs	Needs3 Least Preferred Needs	Needs3 Not needed at all	Row Totals
male	53	25	7	85
Row %	62.35%	29.41%	8.24%	
female	34	22	1	57
Row %	59.65%	38.60%	1.75%	
Totals	87	47	8	142

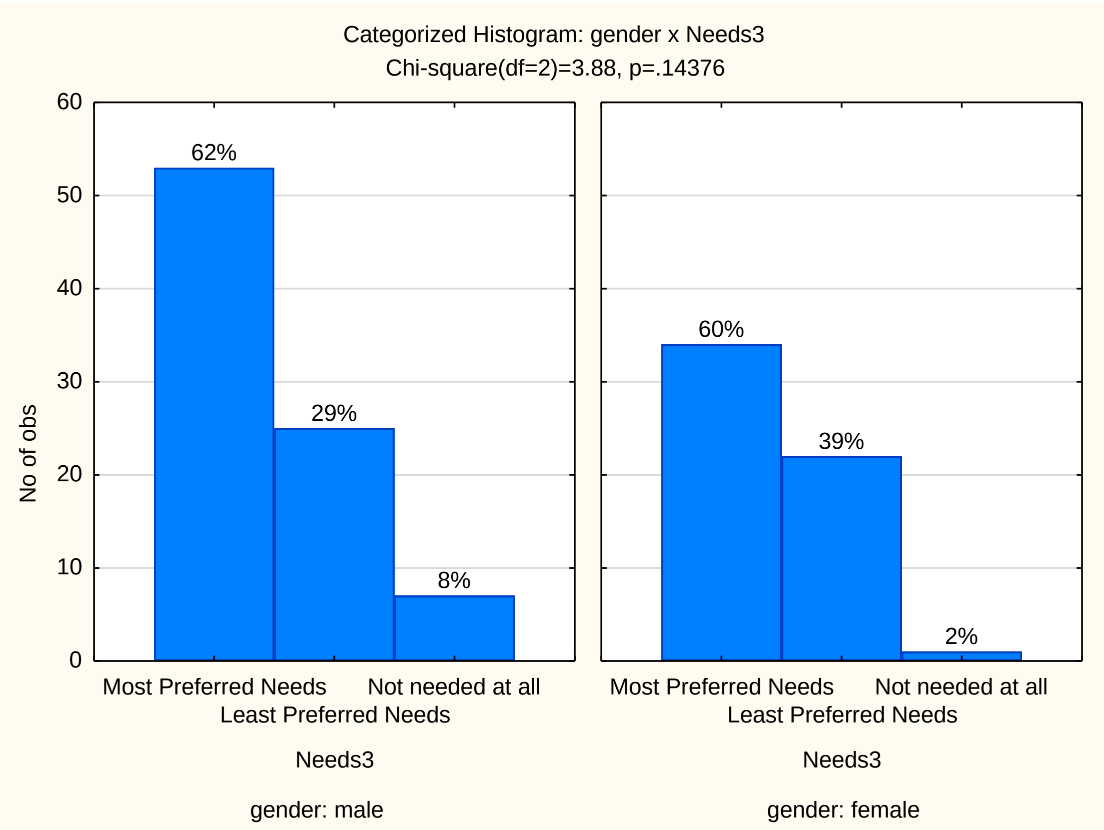


Figure 0.3: Categorized Histogram: gender x Needs3

Table 0.5: gender | Needs4, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=0.88, p=.64490			
	Needs4 Most Preferred Needs	Needs4 Least Preferred Needs	Needs4 Not needed at all	Row Totals
male	51	25	9	85
Row %	60.00%	29.41%	10.59%	
female	31	21	5	57
Row %	54.39%	36.84%	8.77%	
Totals	82	46	14	142

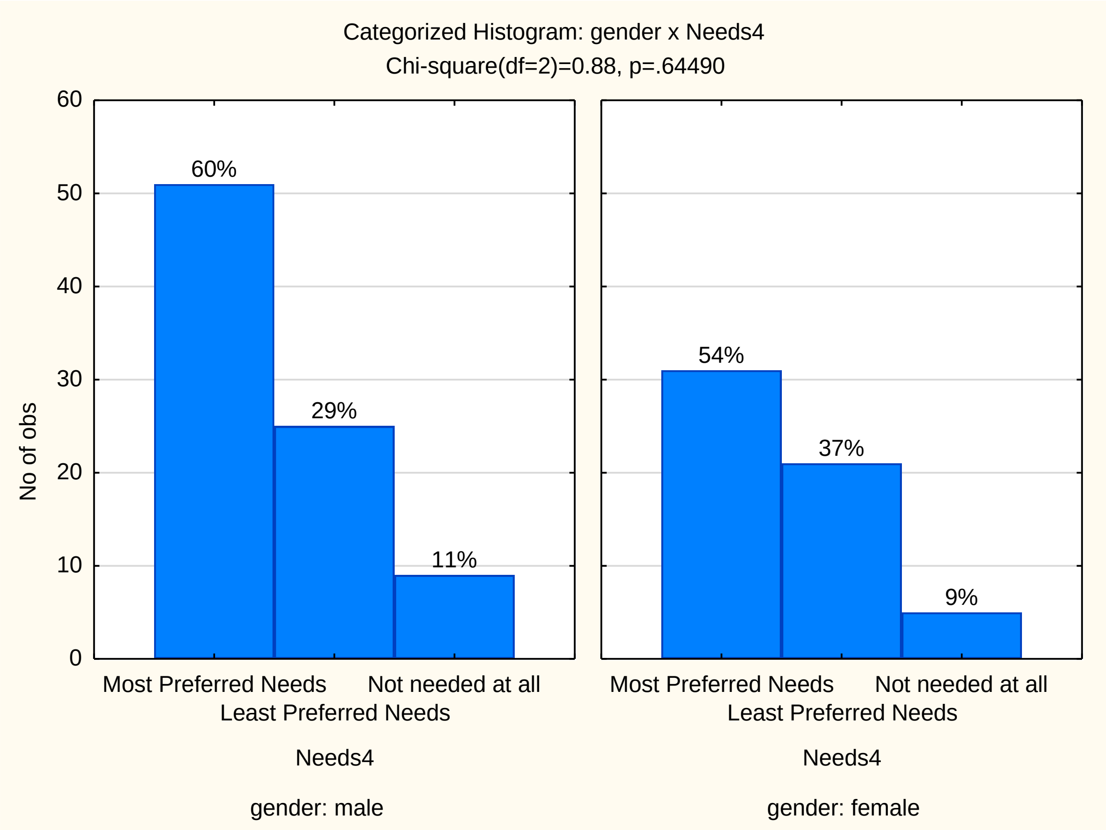


Figure 0.4: Categorized Histogram: gender x Needs4

Table 0.6: gender | Needs5, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Needs5 Most Preferred Needs	Needs5 Least Preferred Needs	Needs5 Not needed at all	Row Totals
	Marked cells have counts > 10. Chi-square(df=2)=5.65, p=.05945			
male	64	15	6	85
Row %	75.29%	17.65%	7.06%	
female	33	20	4	57
Row %	57.89%	35.09%	7.02%	
Totals	97	35	10	142

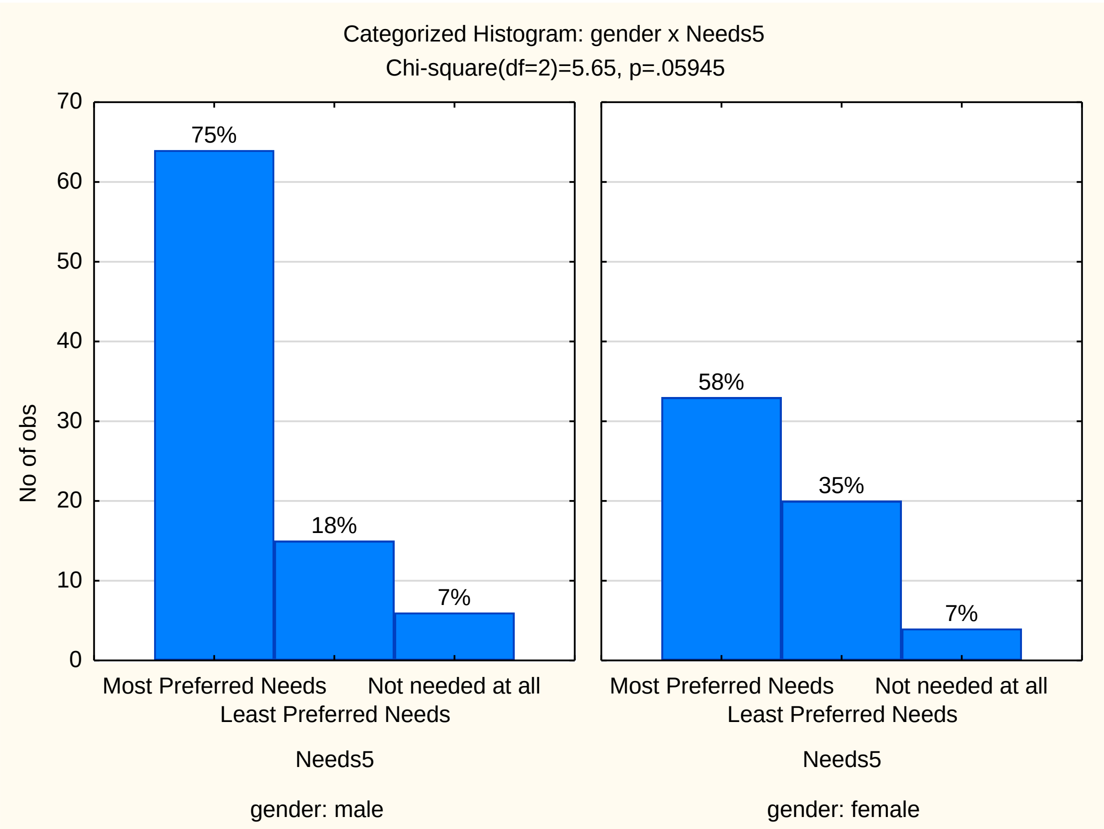


Figure 0.5: Categorized Histogram: gender x Needs5

Table 0.7: gender | Needs6, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=1.93, p=.38174			
	Needs6 Most Preferred Needs	Needs6 Least Preferred Needs	Needs6 Not needed at all	Row Totals
male	39	29	17	85
Row %	45.88%	34.12%	20.00%	
female	21	26	10	57
Row %	36.84%	45.61%	17.54%	
Totals	60	55	27	142

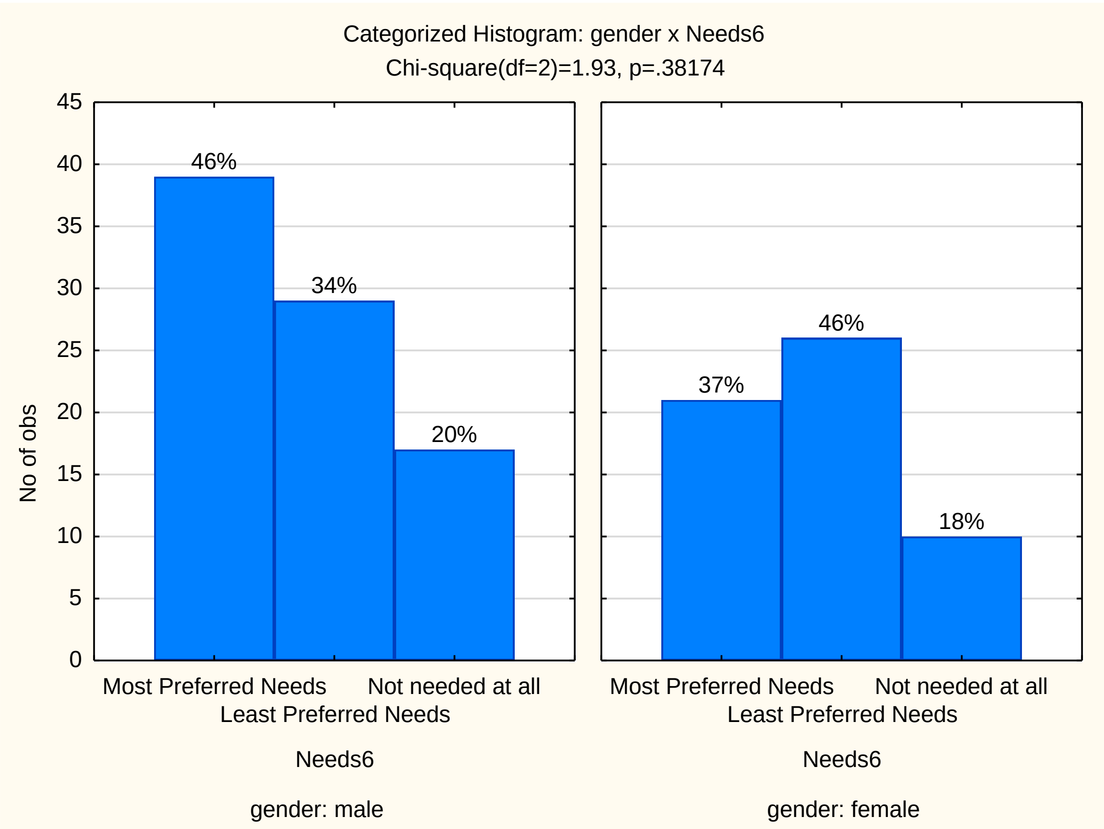


Figure 0.6: Categorized Histogram: gender x Needs6

Table 0.8: gender | Needs7, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=6.63, p=.03636			
	Needs7 Most Preferred Needs	Needs7 Least Preferred Needs	Needs7 Not needed at all	Row Totals
male	42	23	20	85
Row %	49.41%	27.06%	23.53%	
female	16	23	18	57
Row %	28.07%	40.35%	31.58%	
Totals	58	46	38	142

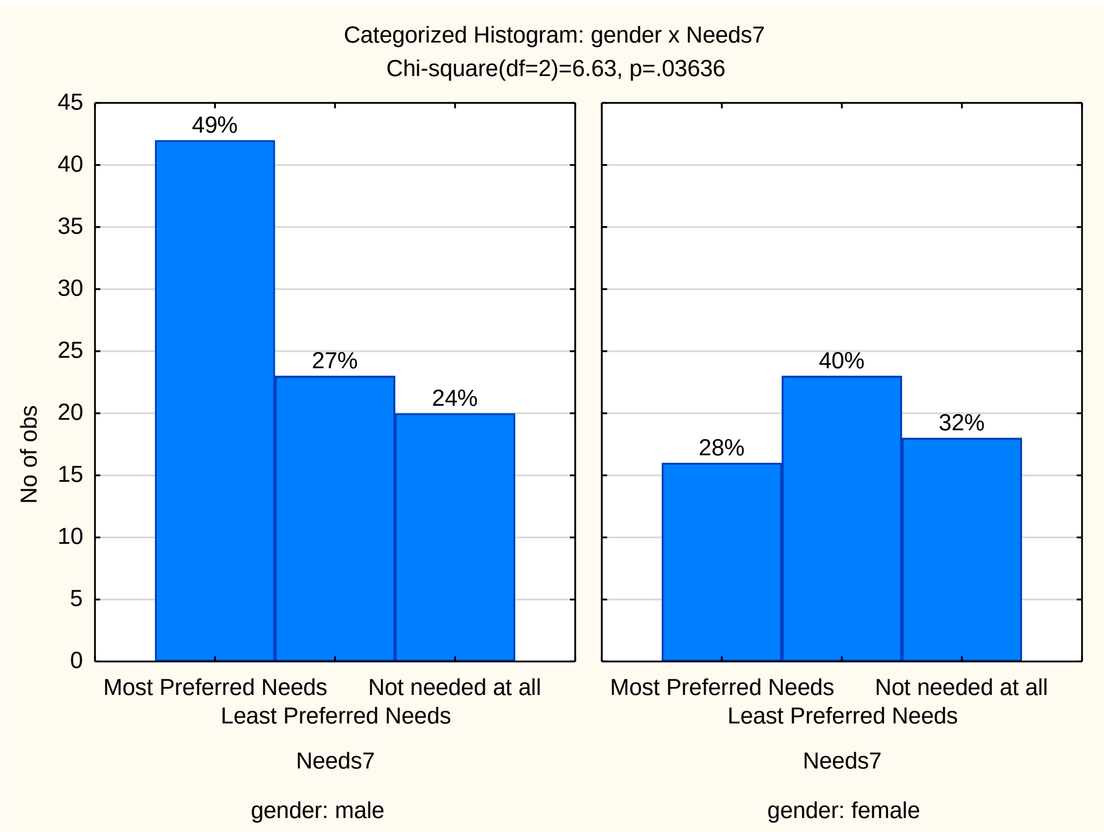


Figure 0.7: Categorized Histogram: gender x Needs7

Table 0.9: gender | Needs8, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.29, p=.19258			
	Needs8 Most Preferred Needs	Needs8 Least Preferred Needs	Needs8 Not needed at all	Row Totals
male	36	27	22	85
Row %	42.35%	31.76%	25.88%	
female	20	14	23	57
Row %	35.09%	24.56%	40.35%	
Totals	56	41	45	142

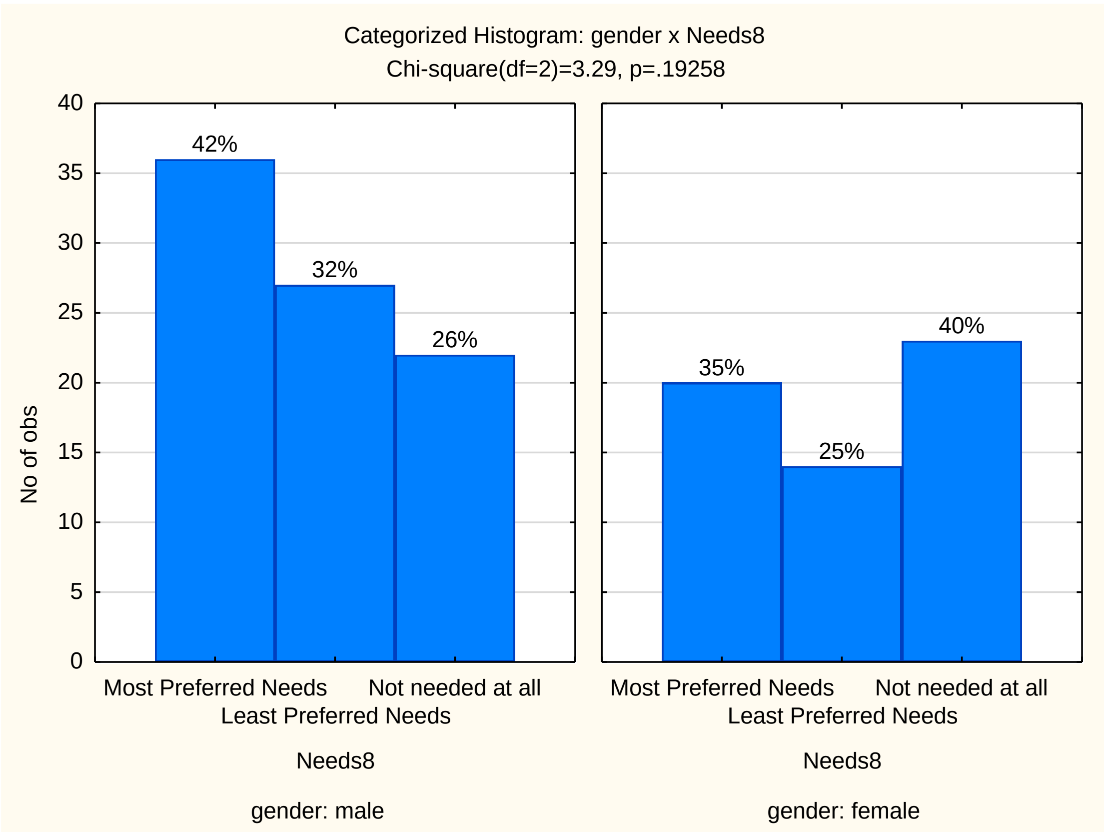


Figure 0.8: Categorized Histogram: gender x Needs8

Table 0.10: gender | Needs9, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.36, p=.18599			
	Needs9 Most Preferred Needs	Needs9 Least Preferred Needs	Needs9 Not needed at all	Row Totals
male	34	25	26	85
Row %	40.00%	29.41%	30.59%	
female	17	14	26	57
Row %	29.82%	24.56%	45.61%	
Totals	51	39	52	142

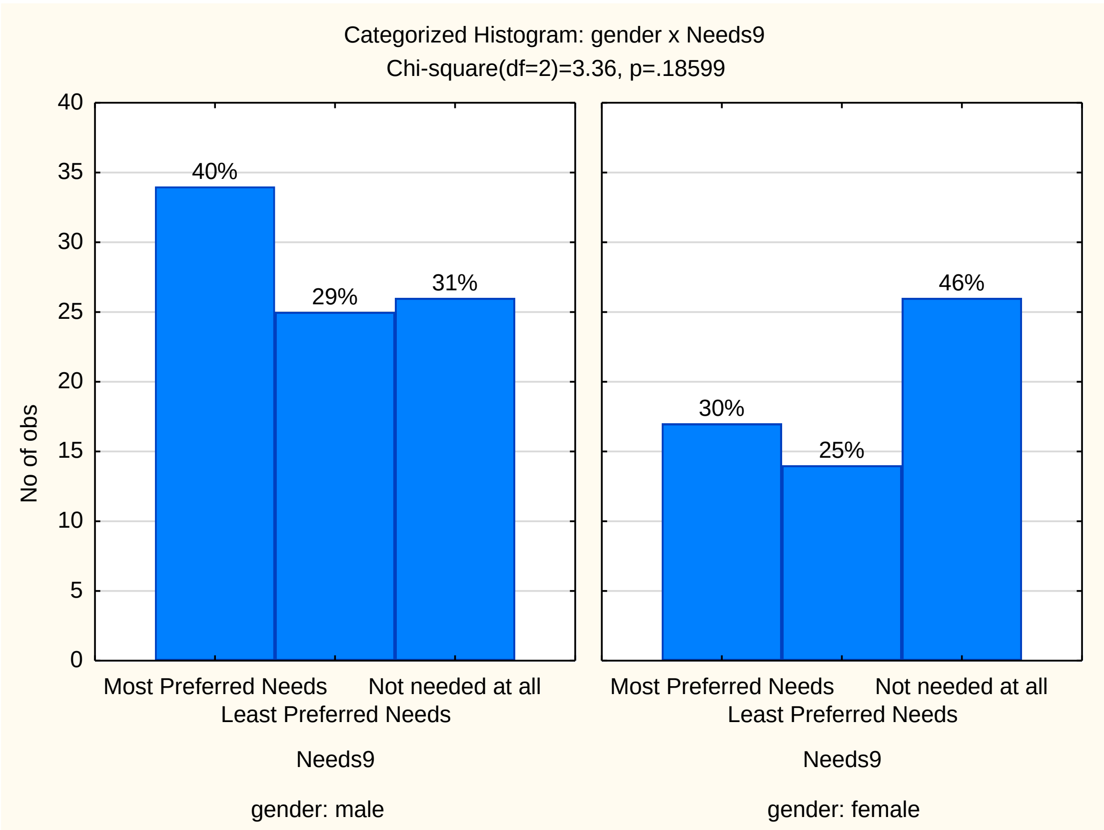


Figure 0.9: Categorized Histogram: gender x Needs9

Table 0.11: gender | Needs10, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.56, p=.16880			
	Needs10 Most Preferred Needs	Needs10 Least Preferred Needs	Needs10 Not needed at all	Row Totals
male	36	24	25	85
Row %	42.35%	28.24%	29.41%	
female	16	17	24	57
Row %	28.07%	29.82%	42.11%	
Totals	52	41	49	142

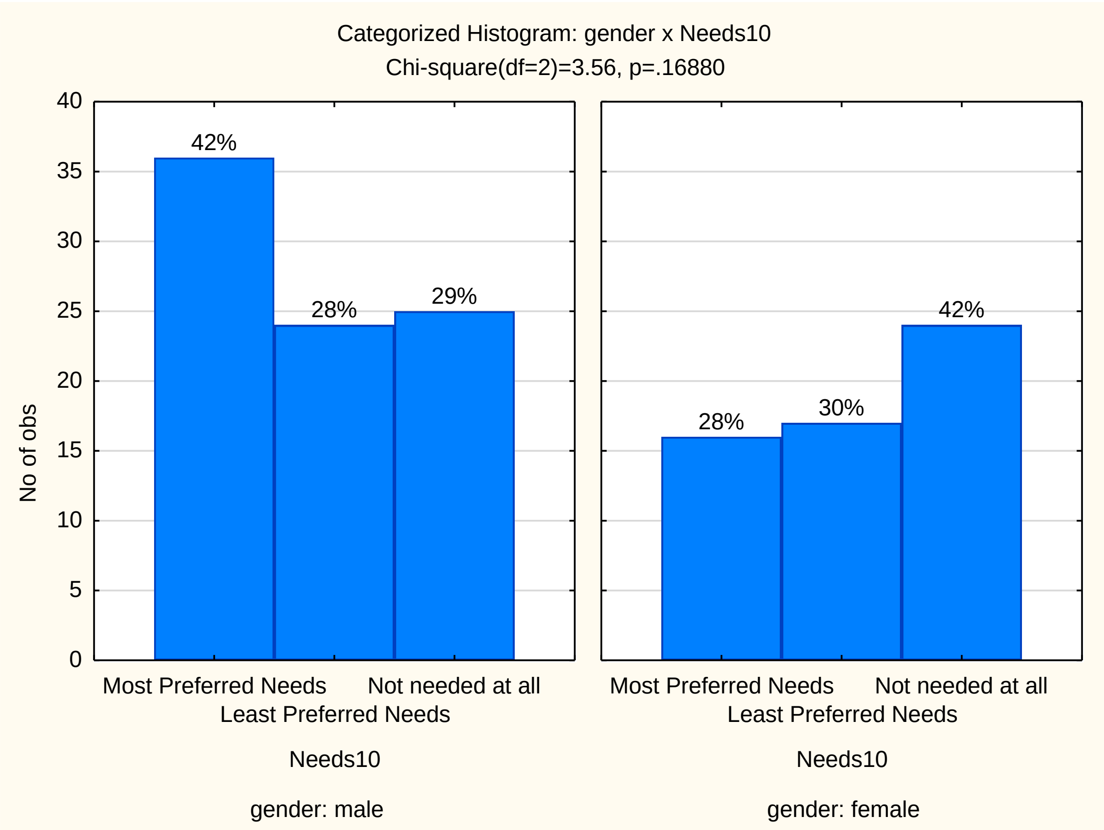


Figure 0.10: Categorized Histogram: gender x Needs10

Table 0.12: gender | Needs11, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=2.91, p=.23382			
	Needs11 Most Preferred Needs	Needs11 Least Preferred Needs	Needs11 Not needed at all	Row Totals
male	51	25	9	85
Row %	60.00%	29.41%	10.59%	
female	30	15	12	57
Row %	52.63%	26.32%	21.05%	
Totals	81	40	21	142

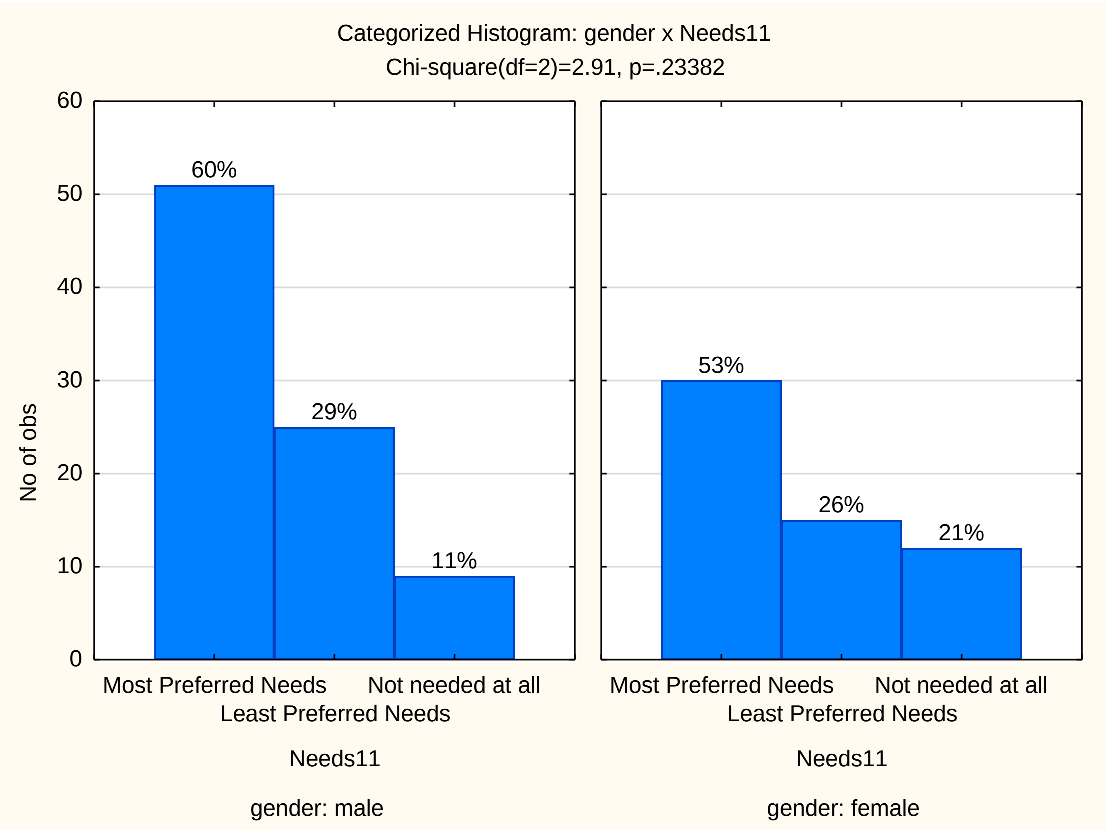


Figure 0.11: Categorized Histogram: gender x Needs11

Table 0.13: gender | Needs12, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=1.31, p=.52073			
	Needs12 Most Preferred Needs	Needs12 Least Preferred Needs	Needs12 Not needed at all	Row Totals
male	33	18	34	85
Row %	38.82%	21.18%	40.00%	
female	17	15	25	57
Row %	29.82%	26.32%	43.86%	
Totals	50	33	59	142

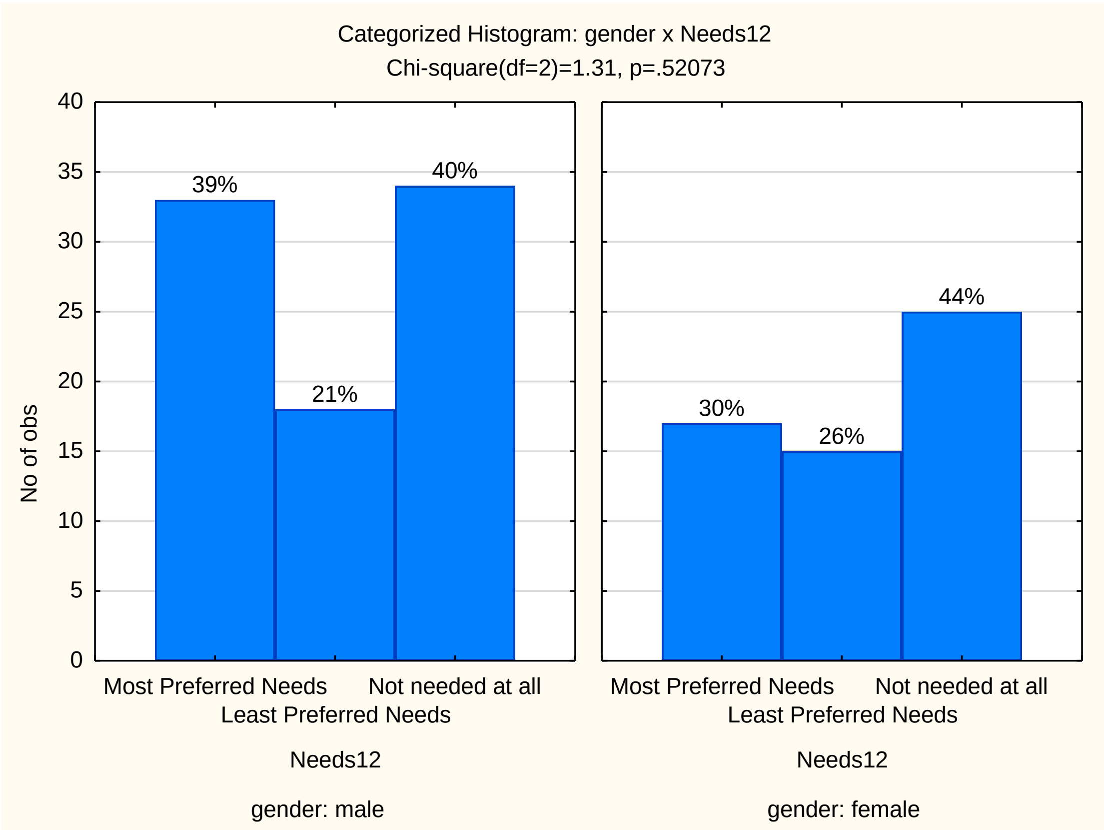


Figure 0.12: Categorized Histogram: gender x Needs12

Table 0.14: gender | Needs13, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=3.17, p=.20513			
	Needs13 Most Preferred Needs	Needs13 Least Preferred Needs	Needs13 Not needed at all	Row Totals
male	47	28	10	85
Row %	55.29%	32.94%	11.76%	
female	34	12	11	57
Row %	59.65%	21.05%	19.30%	
Totals	81	40	21	142

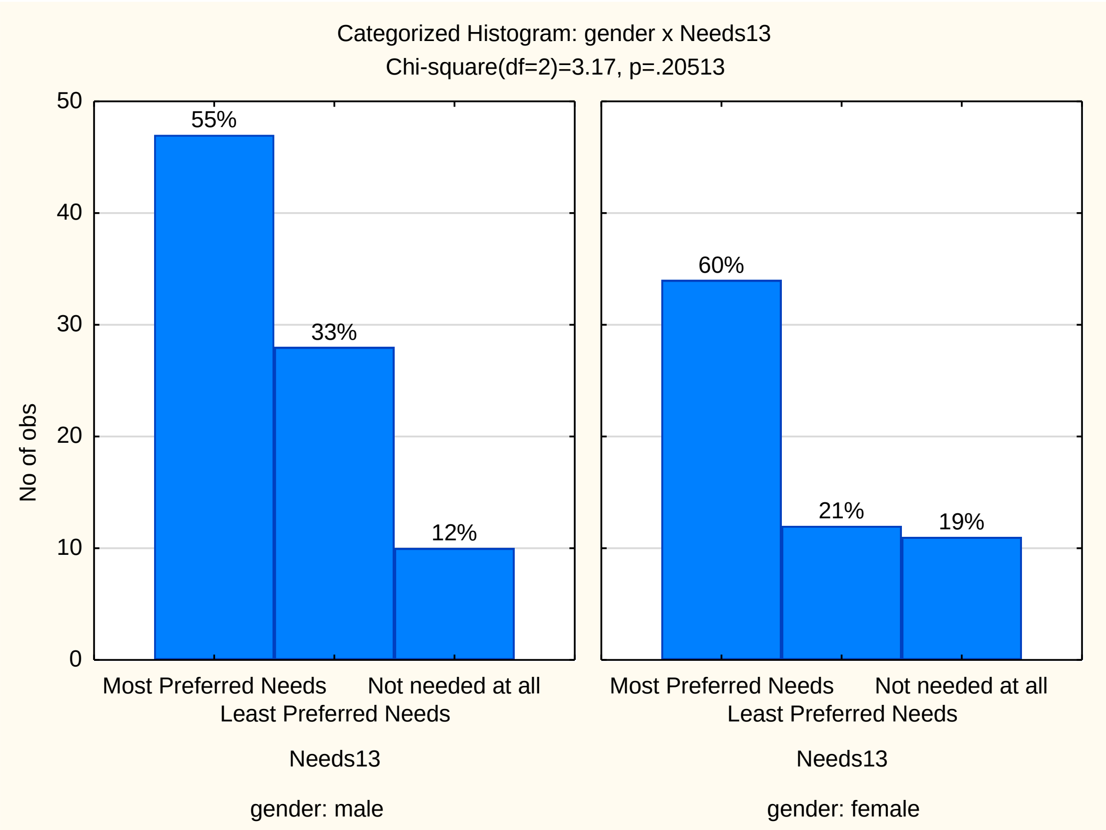


Figure 0.13: Categorized Histogram: gender x Needs13

Table 0.15: gender | Needs14, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Needs14 Most Preferred Needs	Needs14 Least Preferred Needs	Needs14 Not needed at all	Row Totals
	Marked cells have counts > 10. Chi-square(df=2)=3.56, p=.16899			
male	51	28	6	85
Row %	60.00%	32.94%	7.06%	
female	27	21	9	57
Row %	47.37%	36.84%	15.79%	
Totals	78	49	15	142

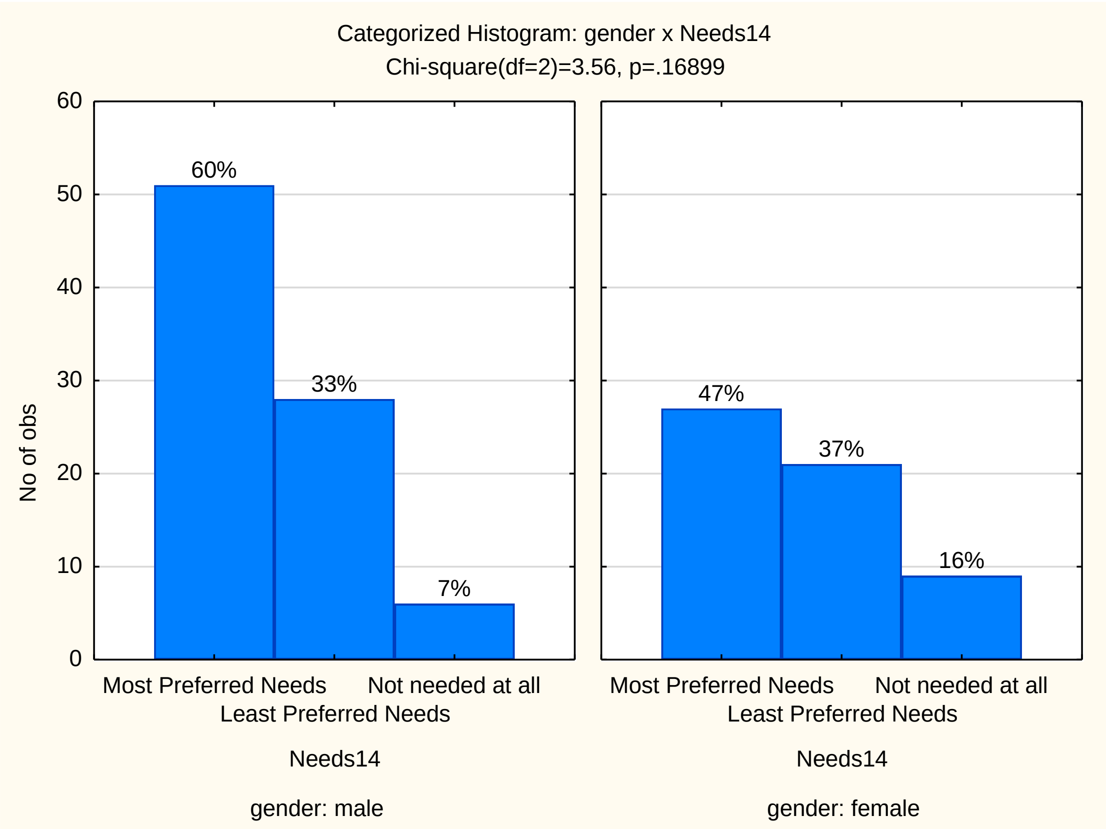


Figure 0.14: Categorized Histogram: gender x Needs14

Table 0.16: gender | Needs15, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=0.53, p=.76644			
	Needs15 Most Preferred Needs	Needs15 Least Preferred Needs	Needs15 Not needed at all	Row Totals
male	42	28	15	85
Row %	49.41%	32.94%	17.65%	
female	25	22	10	57
Row %	43.86%	38.60%	17.54%	
Totals	67	50	25	142

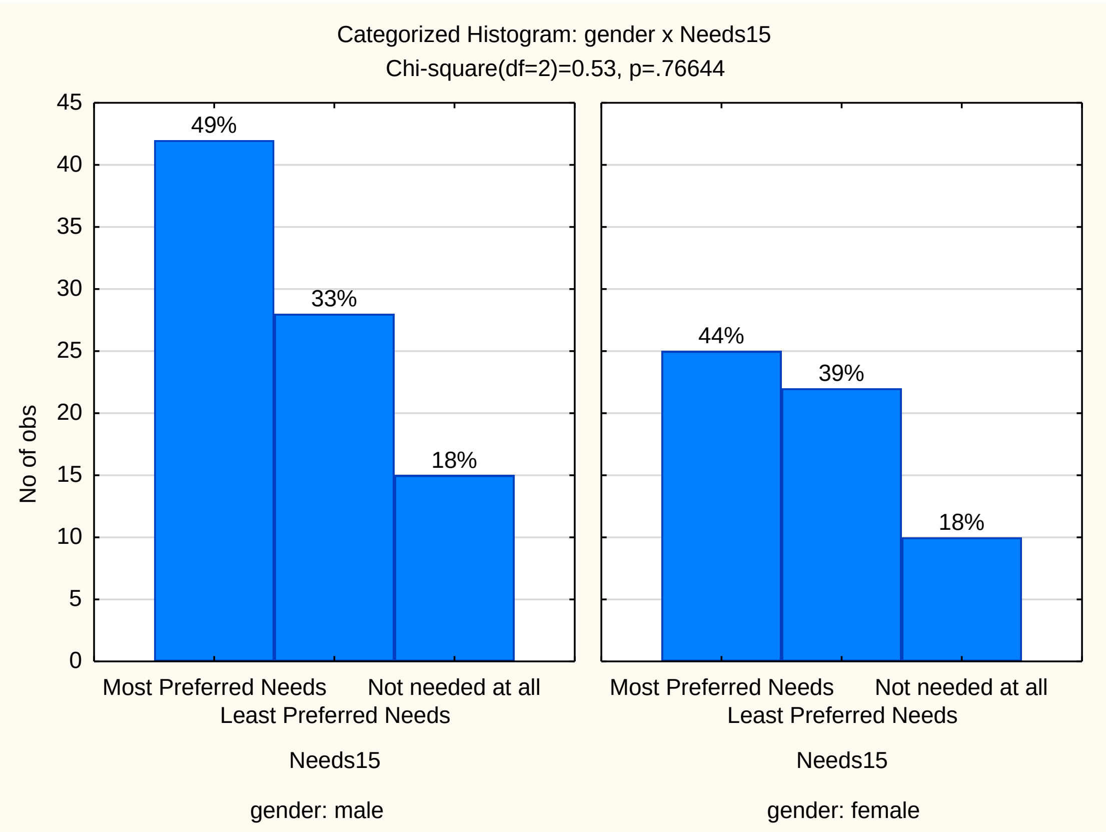


Figure 0.15: Categorized Histogram: gender x Needs15

Table 0.17: gender | Needs16, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Needs16 Most Preferred Needs	Needs16 Least Preferred Needs	Needs16 Not needed at all	Row Totals
	Marked cells have counts > 10. Chi-square(df=2)=3.04, p=.21900			
male	63	16	6	85
Row %	74.12%	18.82%	7.06%	
female	36	18	3	57
Row %	63.16%	31.58%	5.26%	
Totals	99	34	9	142

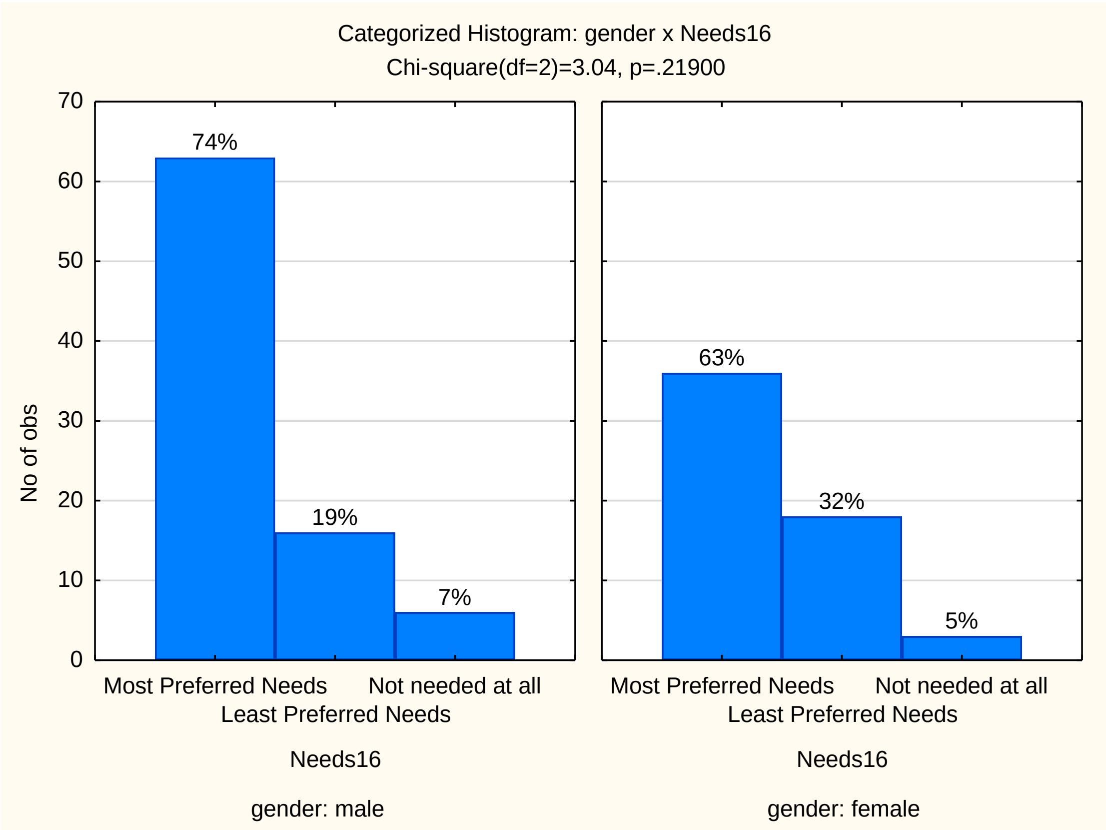


Figure 0.16: Categorized Histogram: gender x Needs16

Table 0.18: gender | Needs17, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=6.39, p=.04096			
	Needs17 Most Preferred Needs	Needs17 Least Preferred Needs	Needs17 Not needed at all	Row Totals
male	50	33	2	85
Row %	58.82%	38.82%	2.35%	
female	37	14	6	57
Row %	64.91%	24.56%	10.53%	
Totals	87	47	8	142

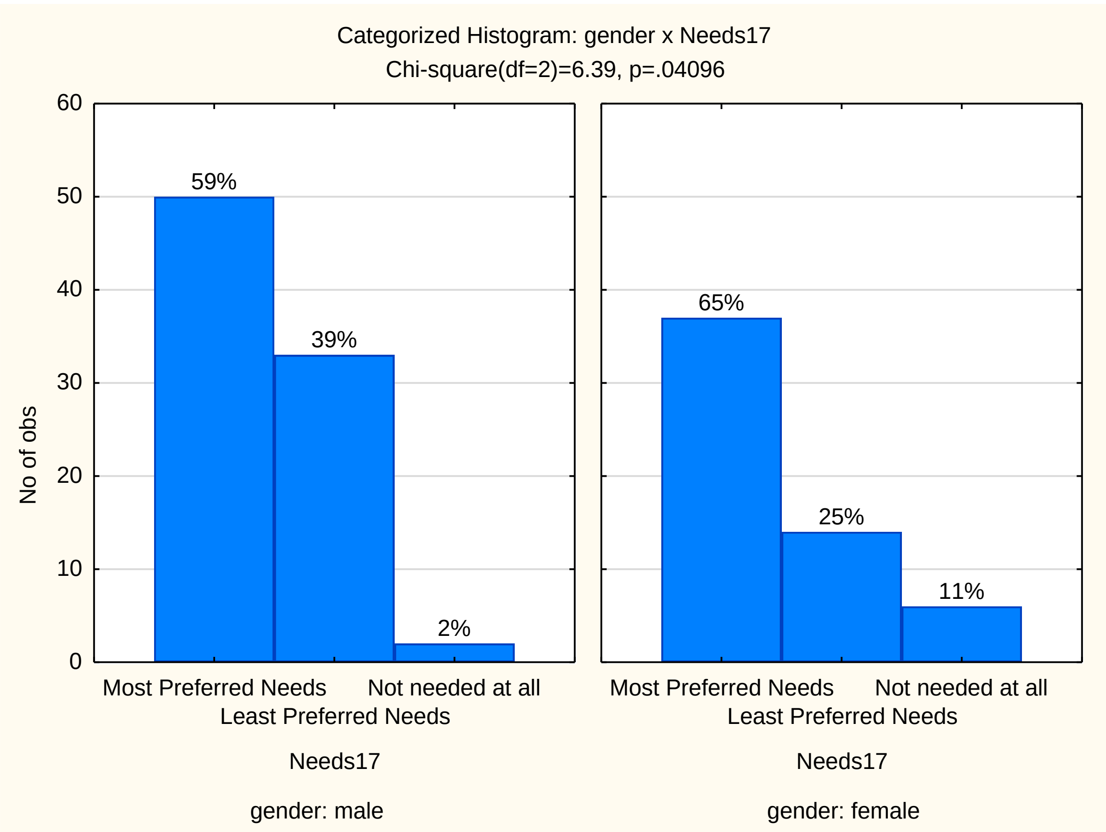


Figure 0.17: Categorized Histogram: gender x Needs17

Table 0.19: gender | Needs18, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=0.98, p=.61350			
	Needs18 Most Preferred Needs	Needs18 Least Preferred Needs	Needs18 Not needed at all	Row Totals
male	56	25	4	85
Row %	65.88%	29.41%	4.71%	
female	35	17	5	57
Row %	61.40%	29.82%	8.77%	
Totals	91	42	9	142

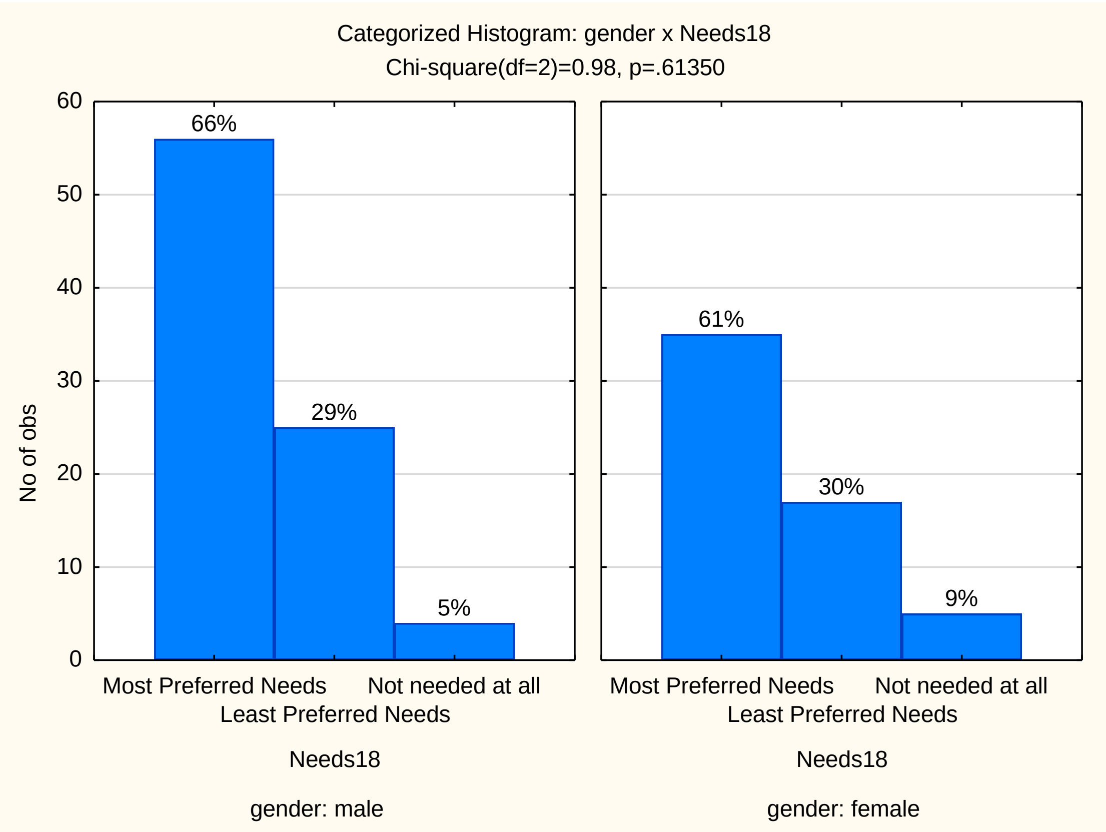


Figure 0.18: Categorized Histogram: gender x Needs18

Table 0.20: gender | Needs19, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=0.49, p=.78352			
	Needs19 Most Preferred Needs	Needs19 Least Preferred Needs	Needs19 Not needed at all	Row Totals
male	68	11	5	84
Row %	80.95%	13.10%	5.95%	
female	48	7	2	57
Row %	84.21%	12.28%	3.51%	
Totals	116	18	7	141

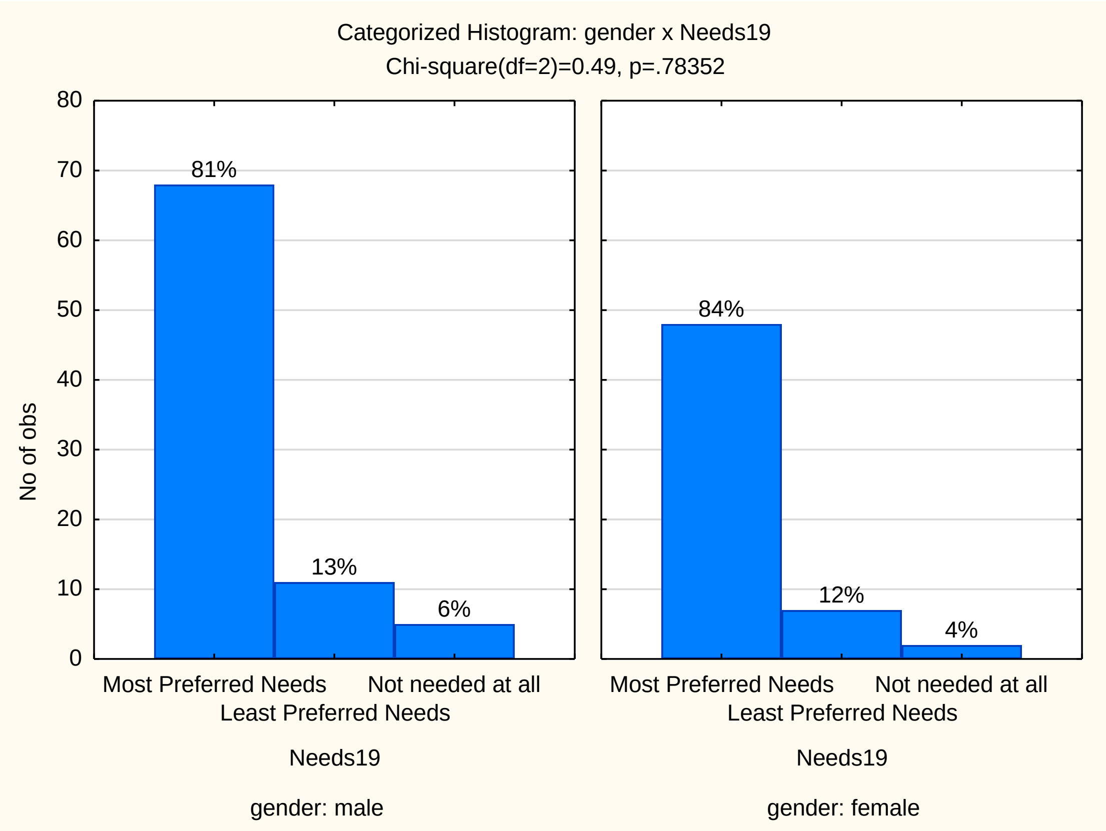


Figure 0.19: Categorized Histogram: gender x Needs19

Table 0.21: gender | Needs20, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

gender	Marked cells have counts > 10. Chi-square(df=2)=1.14, p=.56540			
	Needs20 Most Preferred Needs	Needs20 Least Preferred Needs	Needs20 Not needed at all	Row Totals
male	42	11	32	85
Row %	49.41%	12.94%	37.65%	
female	23	9	25	57
Row %	40.35%	15.79%	43.86%	
Totals	65	20	57	142

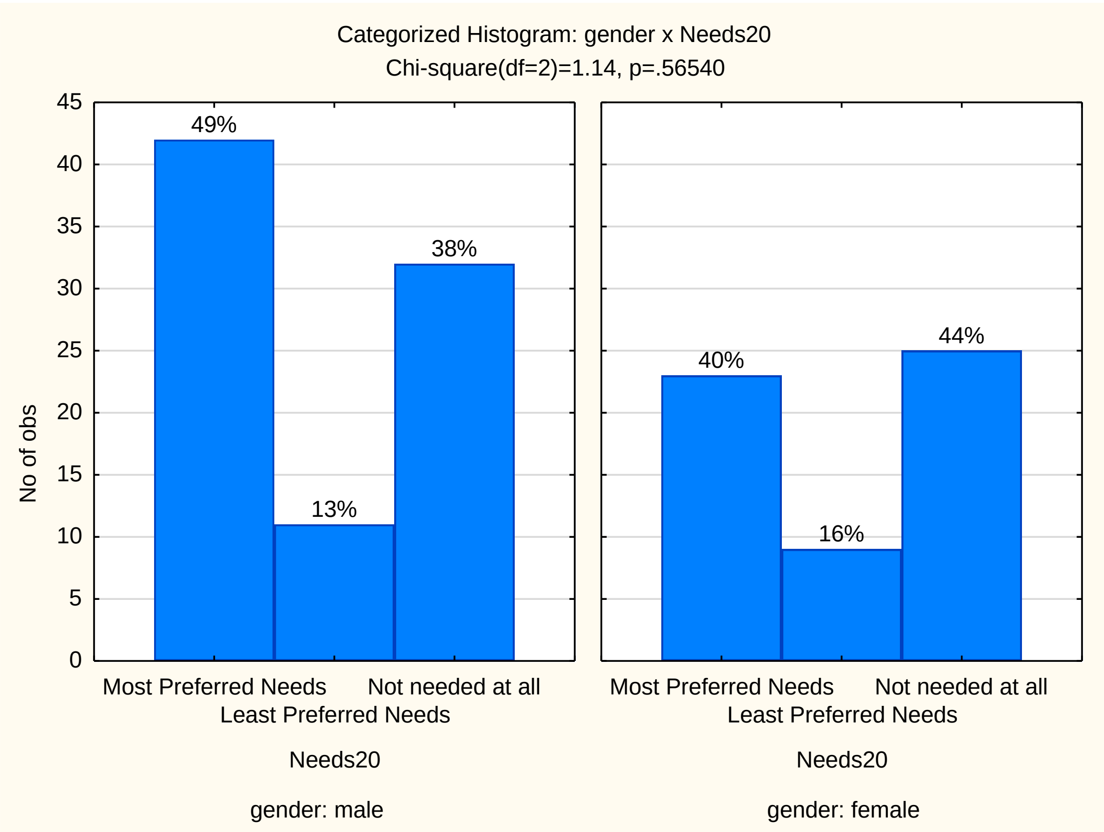


Figure 0.20: Categorized Histogram: gender x Needs20

1. *Teaching experience | Needs: Observed Frequencies (**H_0 =2**)*

Table 0.22: teaching experience | Needs1, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=4.66, p=.32417			
	Needs1 Most Preferred Needs	Needs1 Least Preferred Needs	Needs1 Not needed at all	Row Totals
0 – 10	32	13	0	45
Row %	71.11%	28.89%	0.00%	
11 – 15	27	6	2	35
Row %	77.14%	17.14%	5.71%	
15 and more	45	15	2	62
Row %	72.58%	24.19%	3.23%	
Totals	104	34	4	142

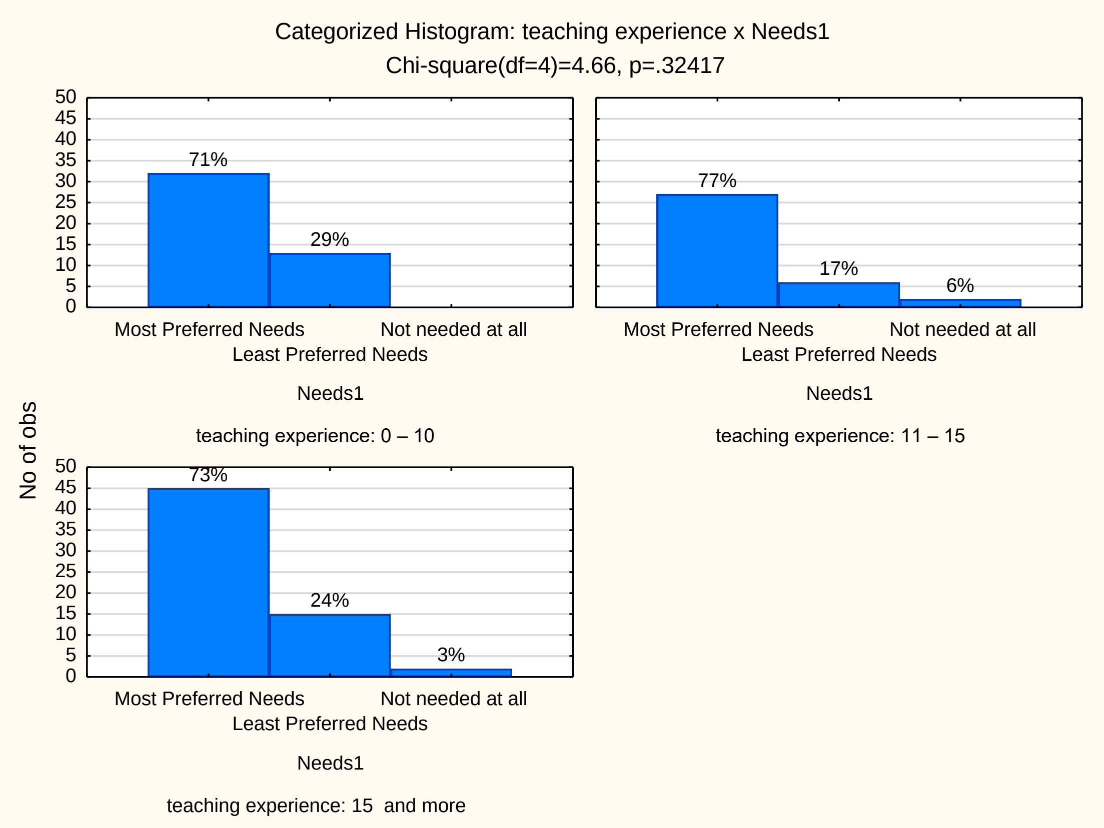


Figure 0.21: Categorized Histogram: teaching experience x Needs1

Table 0.23: teaching experience | Needs2, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=1.63, p=.80359			
	Needs2 Most Preferred Needs	Needs2 Least Preferred Needs	Needs2 Not needed at all	Row Totals
0 – 10	23	18	4	45
Row %	51.11%	40.00%	8.89%	
11 – 15	14	17	4	35
Row %	40.00%	48.57%	11.43%	
15 and more	32	23	7	62
Row %	51.61%	37.10%	11.29%	
Totals	69	58	15	142

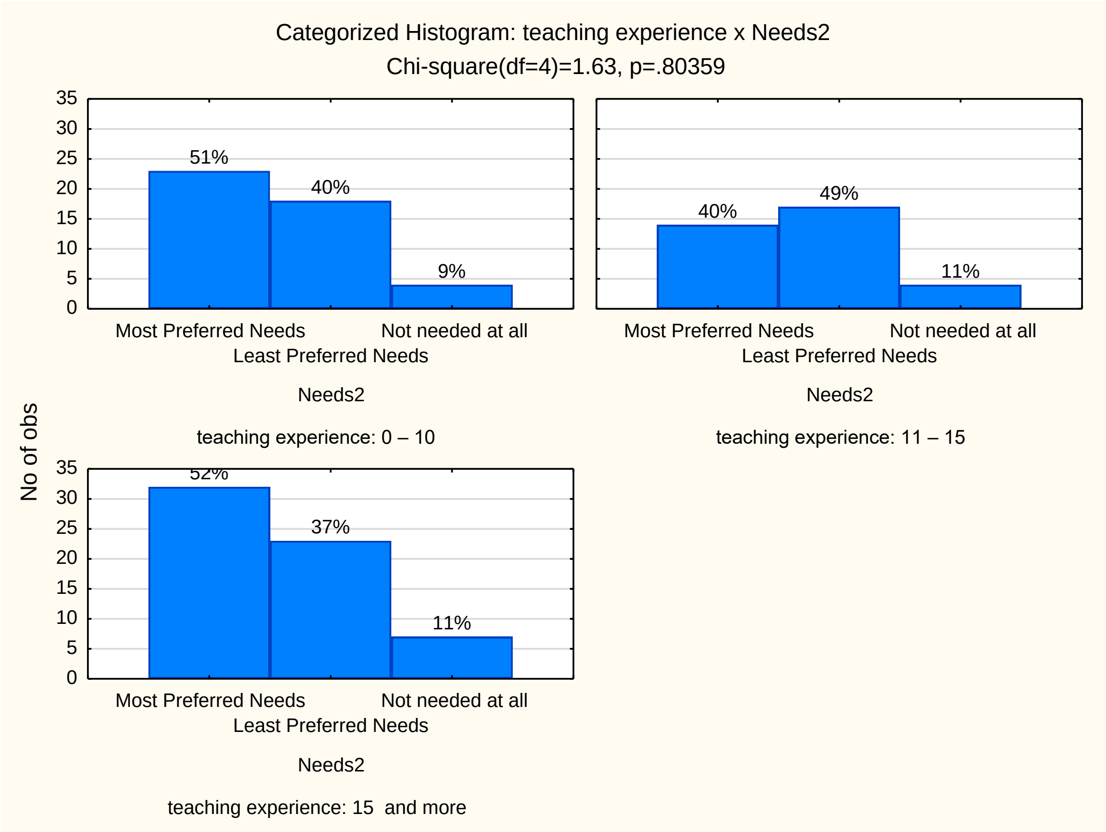


Figure 0.22: Categorized Histogram: teaching experience x Needs2

Table 0.24: teaching experience | Needs3, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=1.43, p=.83941			
	Needs3 Most Preferred Needs	Needs3 Least Preferred Needs	Needs3 Not needed at all	Row Totals
0 – 10	30	13	2	45
Row %	66.67%	28.89%	4.44%	
11 – 15	19	14	2	35
Row %	54.29%	40.00%	5.71%	
15 and more	38	20	4	62
Row %	61.29%	32.26%	6.45%	
Totals	87	47	8	142

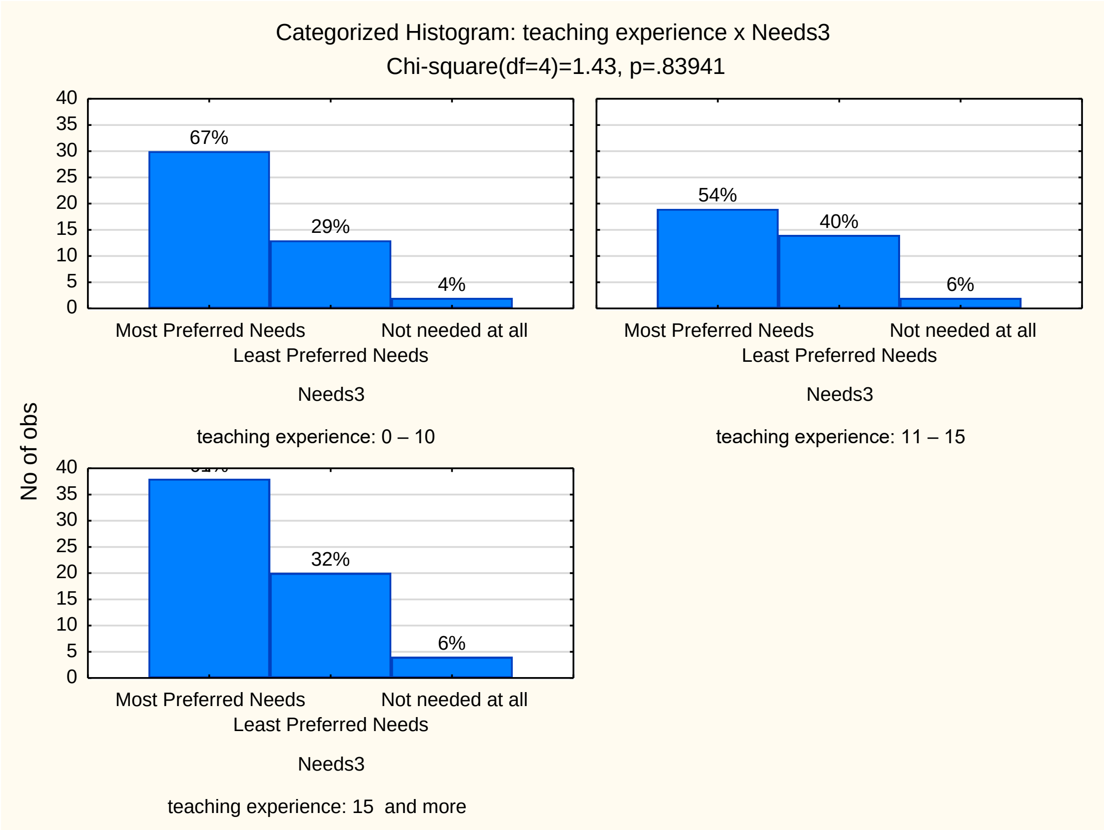


Figure 0.23: Categorized Histogram: teaching experience x Needs3

Table 0.25: teaching experience | Needs4, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=1.33, p=.85578			
	Needs4 Most Preferred Needs	Needs4 Least Preferred Needs	Needs4 Not needed at all	Row Totals
0 – 10	25	14	6	45
Row %	55.56%	31.11%	13.33%	
11 – 15	19	13	3	35
Row %	54.29%	37.14%	8.57%	
15 and more	38	19	5	62
Row %	61.29%	30.65%	8.06%	
Totals	82	46	14	142

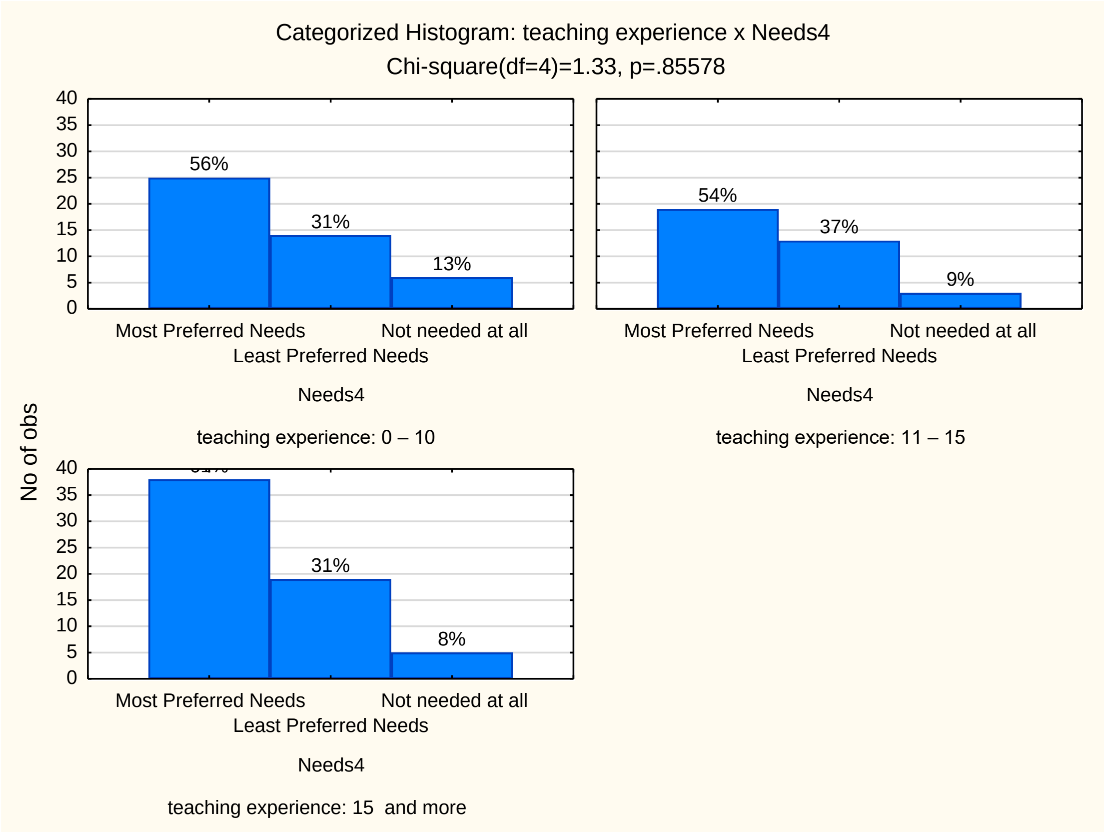


Figure 0.24: Categorized Histogram: teaching experience x Needs4

Table 0.26: teaching experience | Needs5, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=4.64, p=.32615			
	Needs5 Most Preferred Needs	Needs5 Least Preferred Needs	Needs5 Not needed at all	Row Totals
0 – 10	35	9	1	45
Row %	77.78%	20.00%	2.22%	
11 – 15	24	8	3	35
Row %	68.57%	22.86%	8.57%	
15 and more	38	18	6	62
Row %	61.29%	29.03%	9.68%	
Totals	97	35	10	142

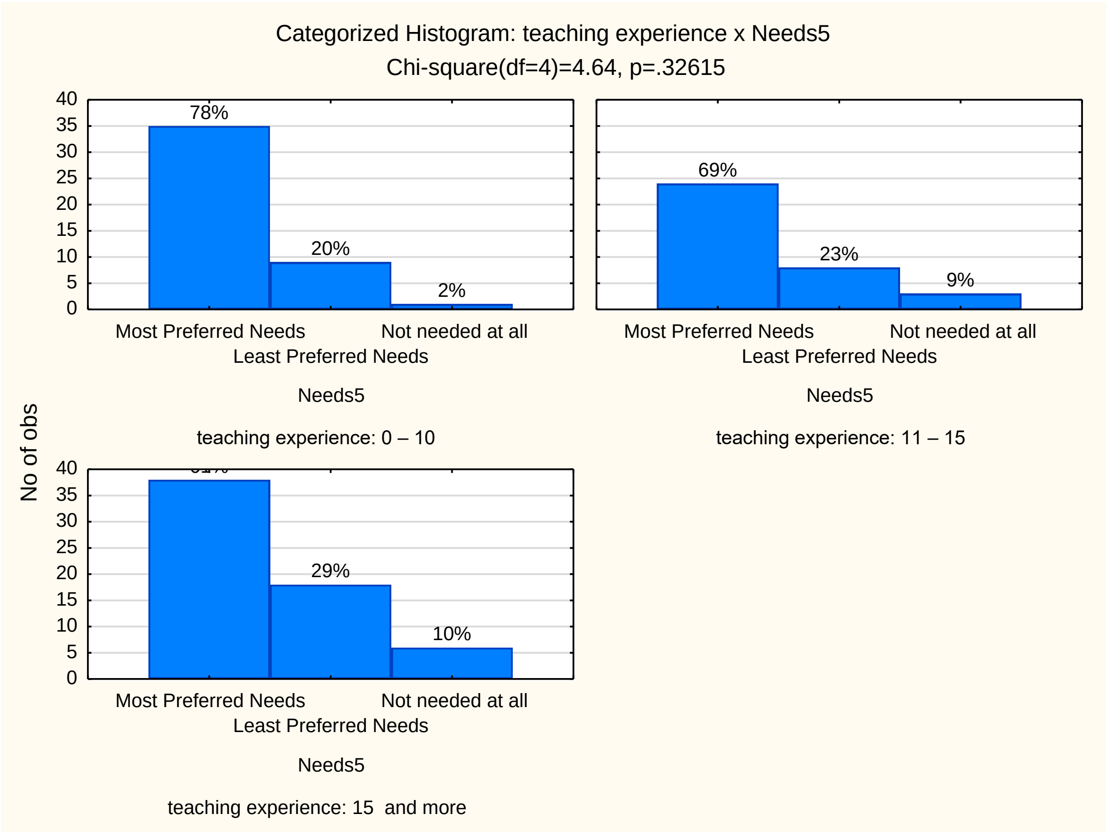


Figure 0.25: Categorized Histogram: teaching experience x Needs5

Table 0.27: teaching experience | Needs6, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=11.55, p=.02101			
	Needs6 Most Preferred Needs	Needs6 Least Preferred Needs	Needs6 Not needed at all	Row Totals
0 – 10	27	12	6	45
Row %	60.00%	26.67%	13.33%	
11 – 15	11	13	11	35
Row %	31.43%	37.14%	31.43%	
15 and more	22	30	10	62
Row %	35.48%	48.39%	16.13%	
Totals	60	55	27	142

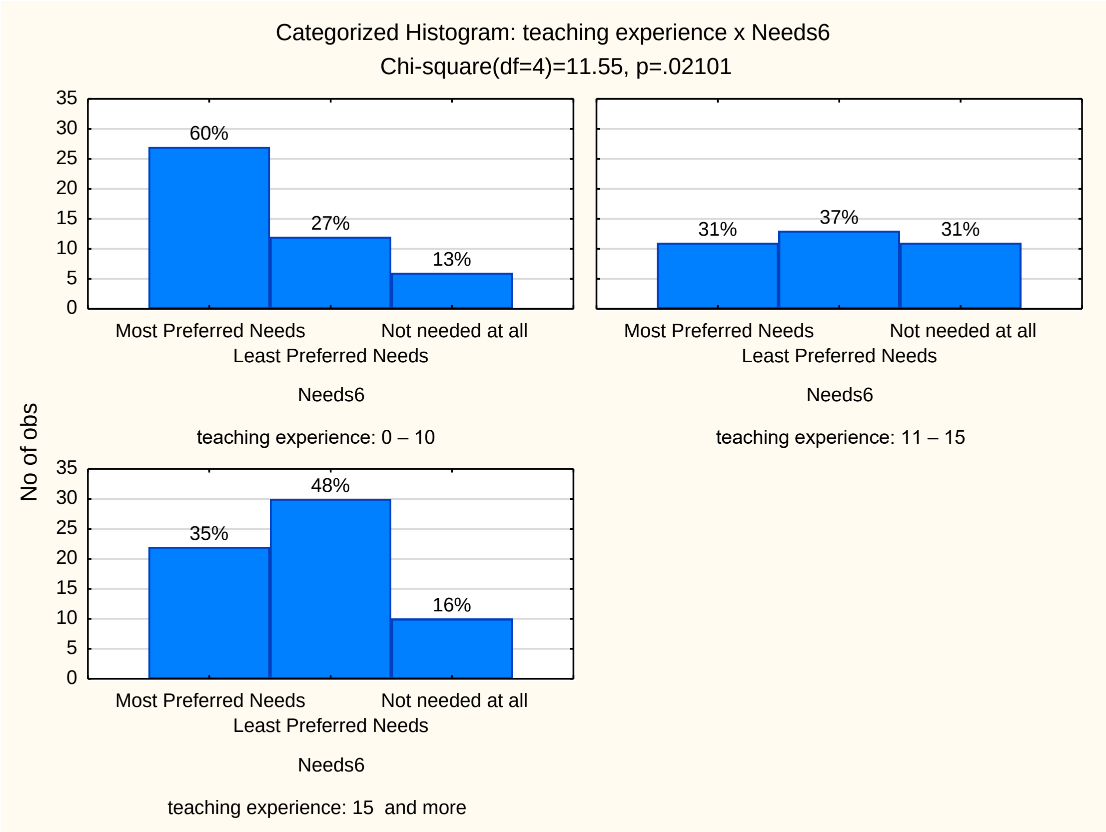


Figure 0.26: Categorized Histogram: teaching experience x Needs6

Table 0.28: teaching experience | Needs7, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=12.24, p=.01567			
	Needs7 Most Preferred Needs	Needs7 Least Preferred Needs	Needs7 Not needed at all	Row Totals
0 – 10	26	13	6	45
Row %	57.78%	28.89%	13.33%	
11 – 15	9	11	15	35
Row %	25.71%	31.43%	42.86%	
15 and more	23	22	17	62
Row %	37.10%	35.48%	27.42%	
Totals	58	46	38	142

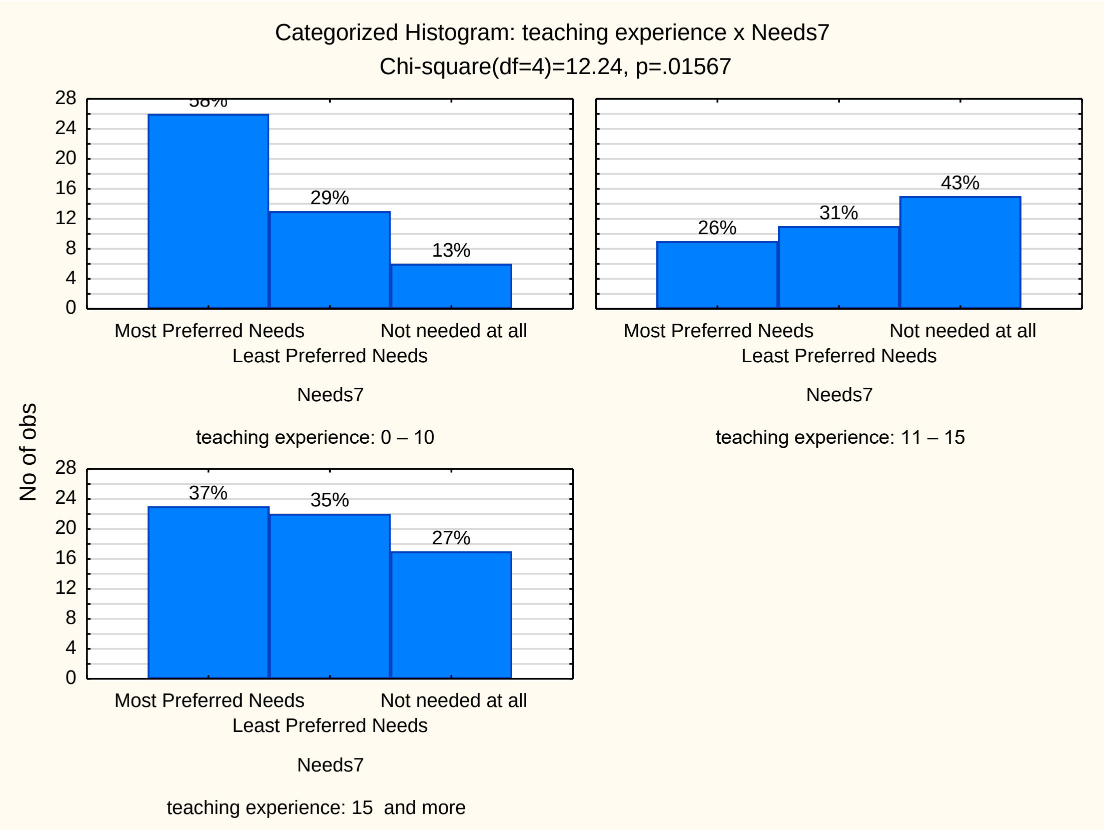


Figure 0.27: Categorized Histogram: teaching experience x Needs7

Table 0.29: teaching experience | Needs8, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=4.70, p=.31894			
	Needs8 Most Preferred Needs	Needs8 Least Preferred Needs	Needs8 Not needed at all	Row Totals
0 – 10	20	15	10	45
Row %	44.44%	33.33%	22.22%	
11 – 15	10	10	15	35
Row %	28.57%	28.57%	42.86%	
15 and more	26	16	20	62
Row %	41.94%	25.81%	32.26%	
Totals	56	41	45	142

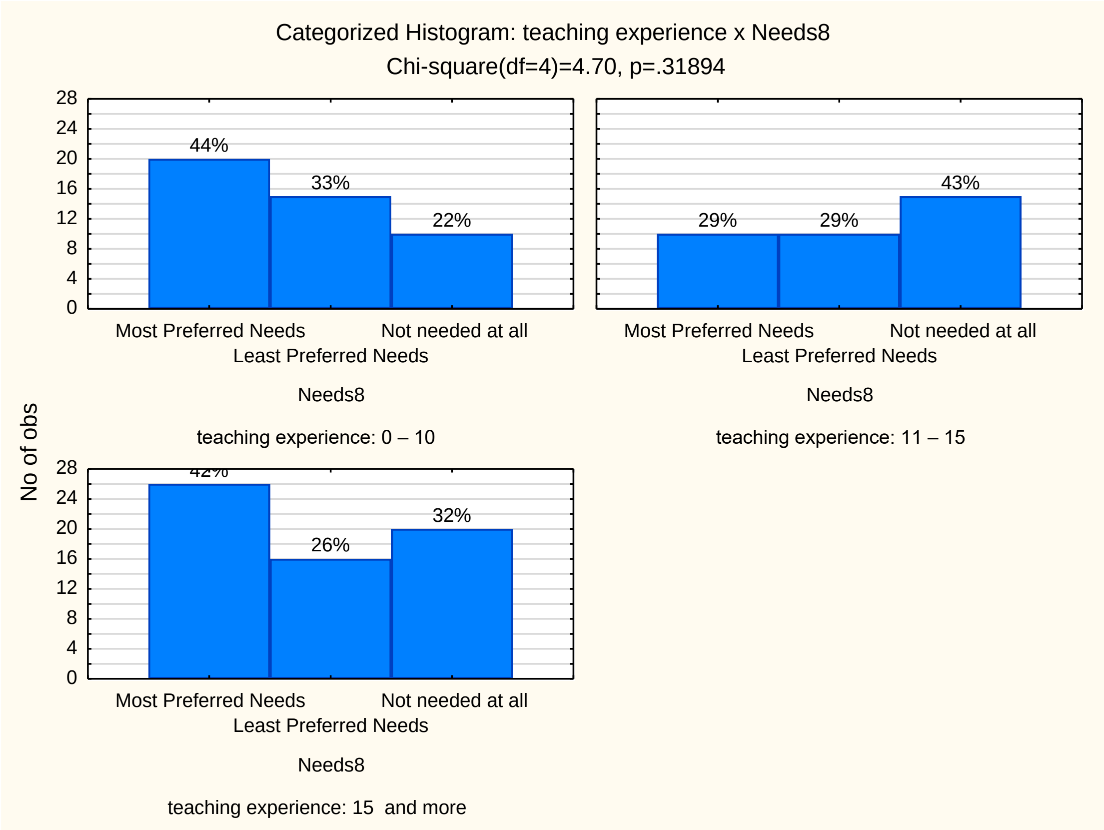


Figure 0.28: Categorized Histogram: teaching experience x Needs8

Table 0.30: teaching experience | Needs9, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Needs9 Most Preferred Needs	Needs9 Least Preferred Needs	Needs9 Not needed at all	Row Totals
	Marked cells have counts > 10. Chi-square(df=4)=9.73, p=.04522			
0 – 10	20	13	12	45
Row %	44.44%	28.89%	26.67%	
11 – 15	6	13	16	35
Row %	17.14%	37.14%	45.71%	
15 and more	25	13	24	62
Row %	40.32%	20.97%	38.71%	
Totals	51	39	52	142

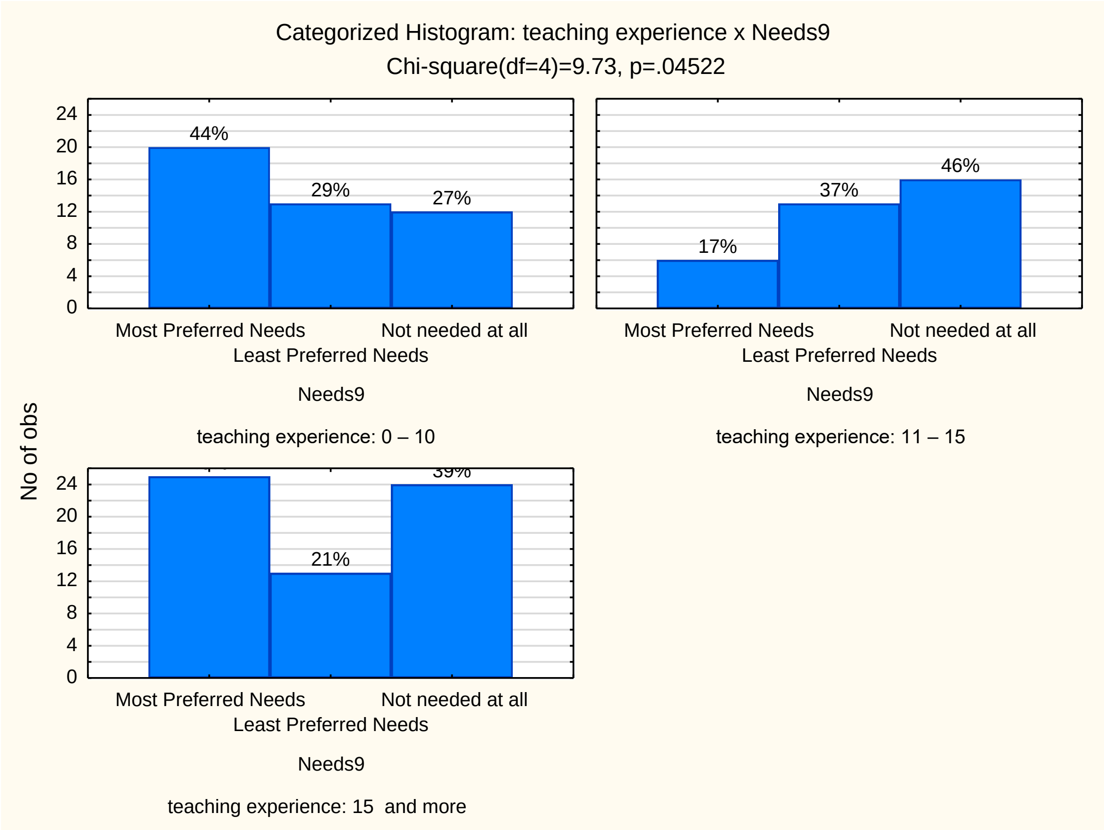


Figure 0.29: Categorized Histogram: teaching experience x Needs9

Table 0.31: teaching experience | Needs10, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=9.85, p=.04303			
	Needs10 Most Preferred Needs	Needs10 Least Preferred Needs	Needs10 Not needed at all	Row Totals
0 – 10	20	15	10	45
Row %	44.44%	33.33%	22.22%	
11 – 15	7	13	15	35
Row %	20.00%	37.14%	42.86%	
15 and more	25	13	24	62
Row %	40.32%	20.97%	38.71%	
Totals	52	41	49	142

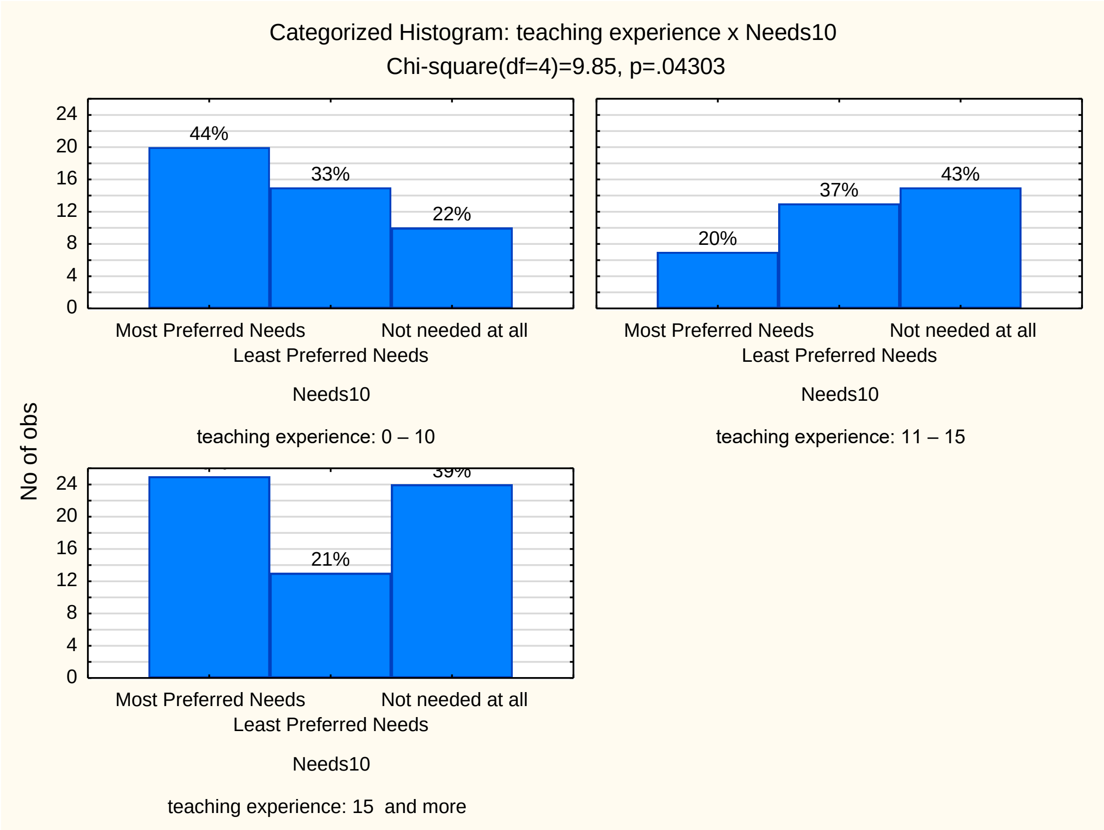


Figure 0.30: Categorized Histogram: teaching experience x Needs10

Table 0.32: teaching experience | Needs11, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=3.26, p=.51580			
	Needs11 Most Preferred Needs	Needs11 Least Preferred Needs	Needs11 Not needed at all	Row Totals
0 – 10	28	13	4	45
Row %	62.22%	28.89%	8.89%	
11 – 15	18	12	5	35
Row %	51.43%	34.29%	14.29%	
15 and more	35	15	12	62
Row %	56.45%	24.19%	19.35%	
Totals	81	40	21	142

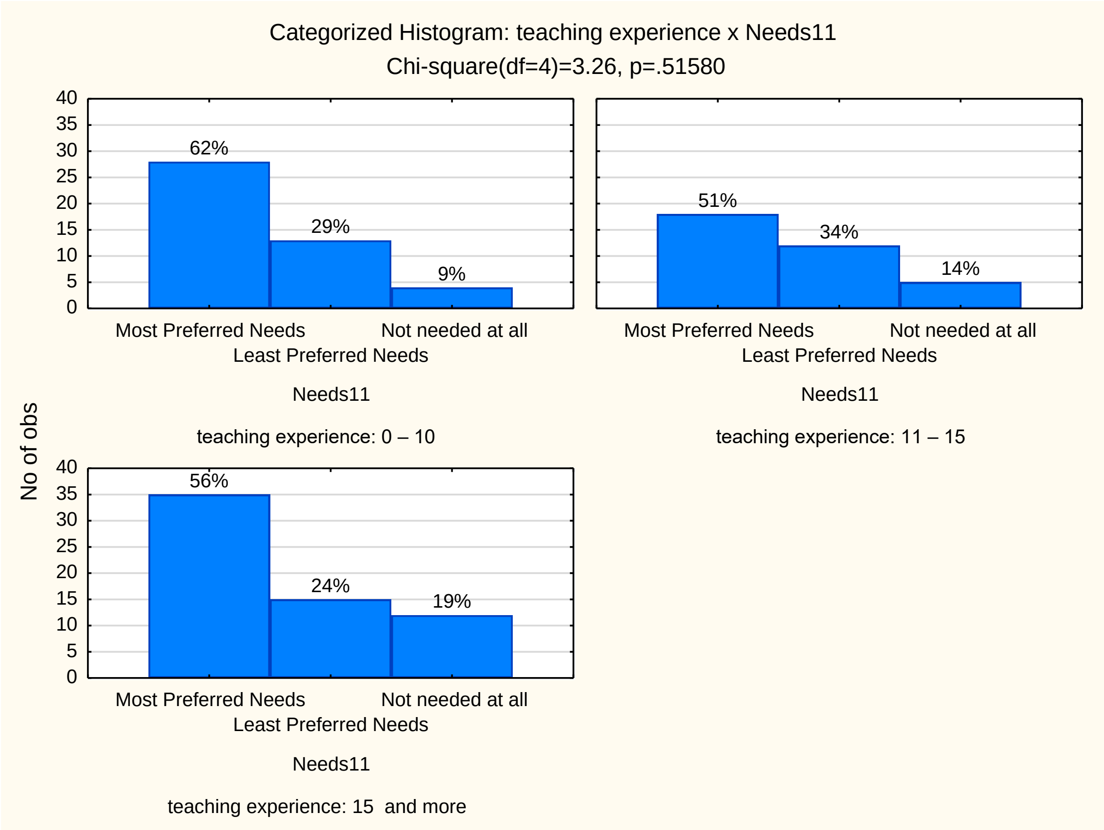


Figure 0.31: Categorized Histogram: teaching experience x Needs11

Table 0.33: teaching experience | Needs12, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=6.81, p=.14631			
	Needs12 Most Preferred Needs	Needs12 Least Preferred Needs	Needs12 Not needed at all	Row Totals
0 – 10	19	11	15	45
Row %	42.22%	24.44%	33.33%	
11 – 15	8	6	21	35
Row %	22.86%	17.14%	60.00%	
15 and more	23	16	23	62
Row %	37.10%	25.81%	37.10%	
Totals	50	33	59	142

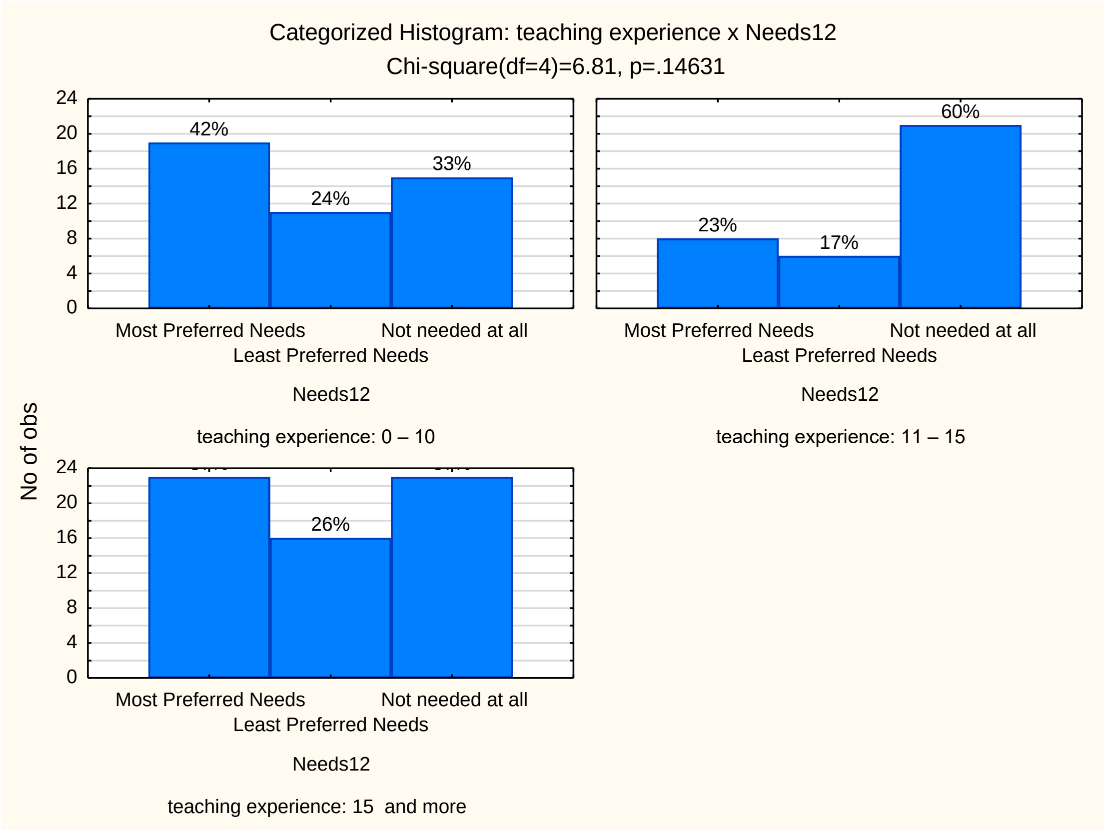


Figure 0.32: Categorized Histogram: teaching experience x Needs12

Table 0.34: teaching experience | Needs13, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=5.72, p=.22106			
	Needs13 Most Preferred Needs	Needs13 Least Preferred Needs	Needs13 Not needed at all	Row Totals
0 – 10	29	12	4	45
Row %	64.44%	26.67%	8.89%	
11 – 15	15	11	9	35
Row %	42.86%	31.43%	25.71%	
15 and more	37	17	8	62
Row %	59.68%	27.42%	12.90%	
Totals	81	40	21	142

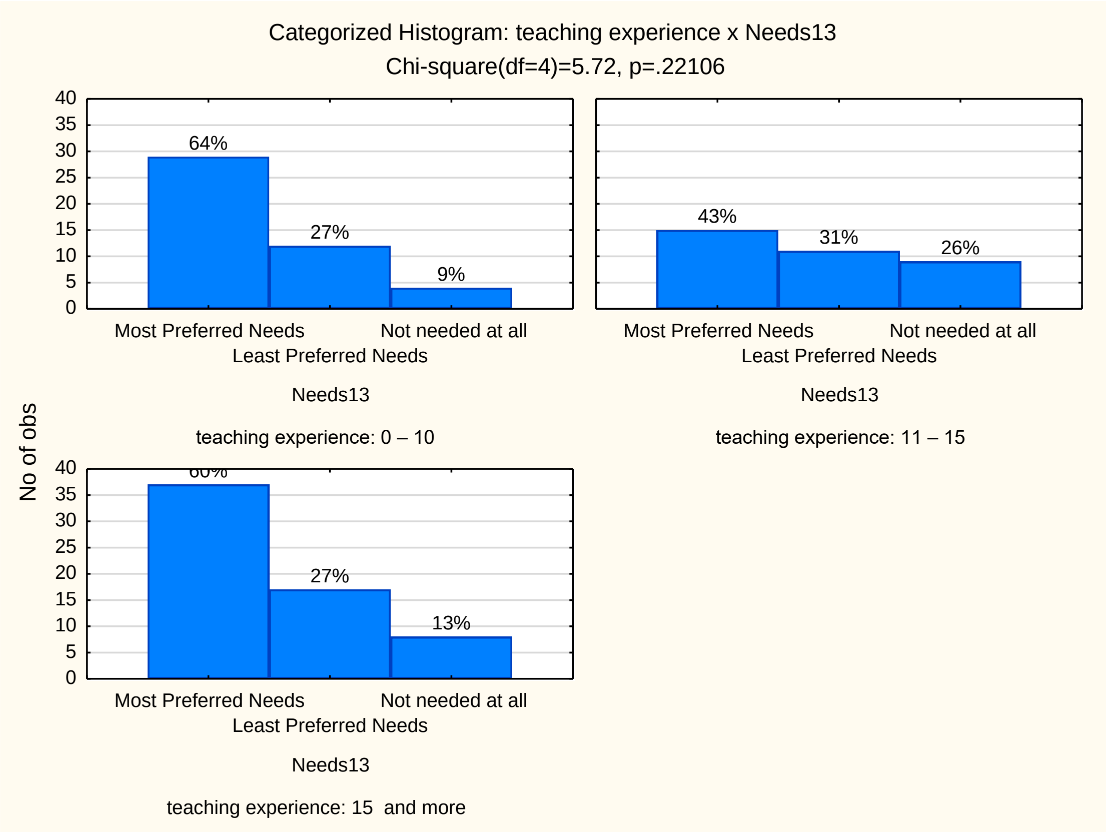


Figure 0.33: Categorized Histogram: teaching experience x Needs13

Table 0.35: teaching experience | Needs14, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=5.16, p=.27139			
	Needs14 Most Preferred Needs	Needs14 Least Preferred Needs	Needs14 Not needed at all	Row Totals
0 – 10	28	15	2	45
Row %	62.22%	33.33%	4.44%	
11 – 15	15	15	5	35
Row %	42.86%	42.86%	14.29%	
15 and more	35	19	8	62
Row %	56.45%	30.65%	12.90%	
Totals	78	49	15	142

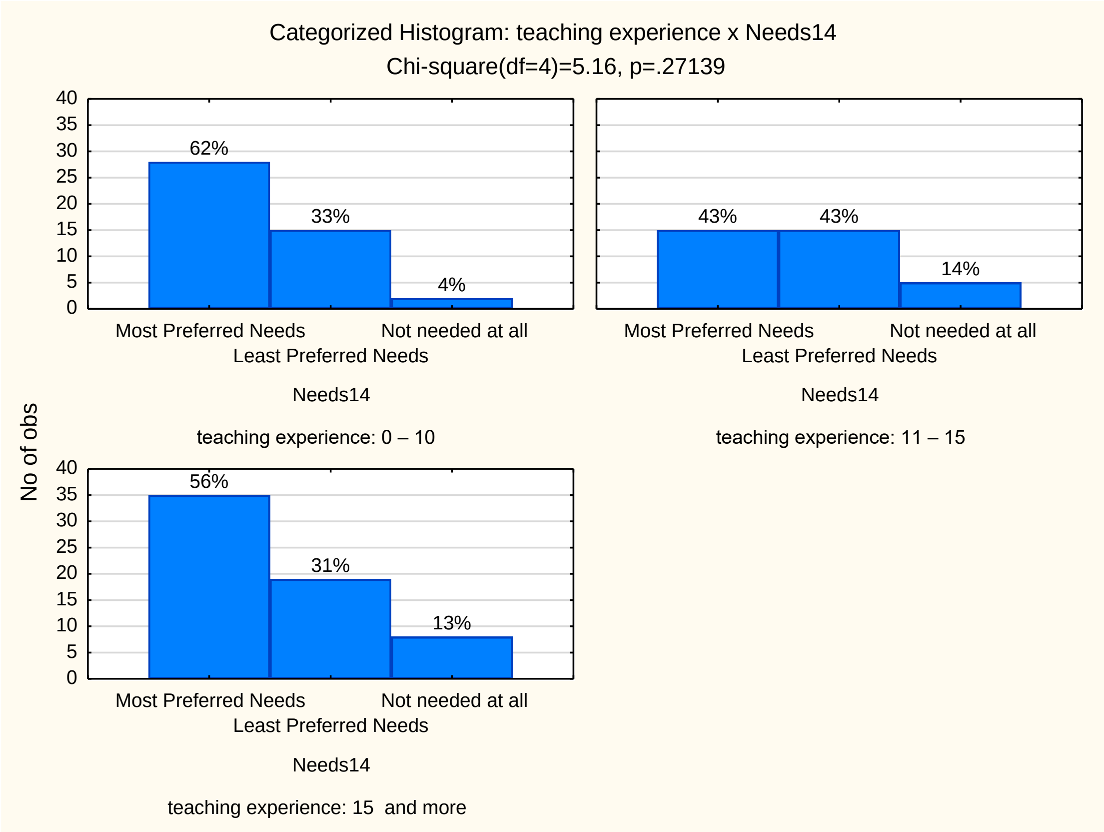


Figure 0.34: Categorized Histogram: teaching experience x Needs14

Table 0.36: teaching experience | Needs15, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=8.51, p=.07461			
	Needs15 Most Preferred Needs	Needs15 Least Preferred Needs	Needs15 Not needed at all	Row Totals
0 – 10	25	16	4	45
Row %	55.56%	35.56%	8.89%	
11 – 15	12	17	6	35
Row %	34.29%	48.57%	17.14%	
15 and more	30	17	15	62
Row %	48.39%	27.42%	24.19%	
Totals	67	50	25	142

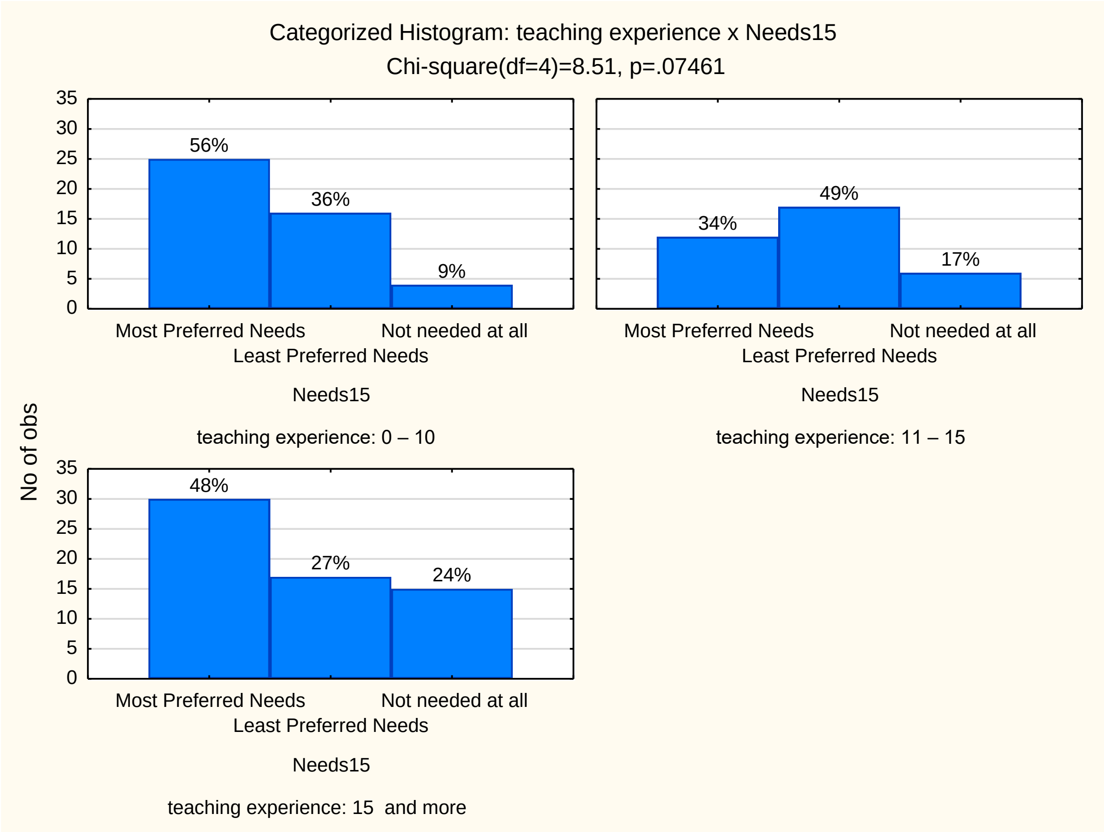


Figure 0.35: Categorized Histogram: teaching experience x Needs15

Table 0.37: teaching experience | Needs16, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=10.91, p=.02756			
	Needs16 Most Preferred Needs	Needs16 Least Preferred Needs	Needs16 Not needed at all	Row Totals
0 – 10	31	14	0	45
Row %	68.89%	31.11%	0.00%	
11 – 15	21	10	4	35
Row %	60.00%	28.57%	11.43%	
15 and more	47	10	5	62
Row %	75.81%	16.13%	8.06%	
Totals	99	34	9	142

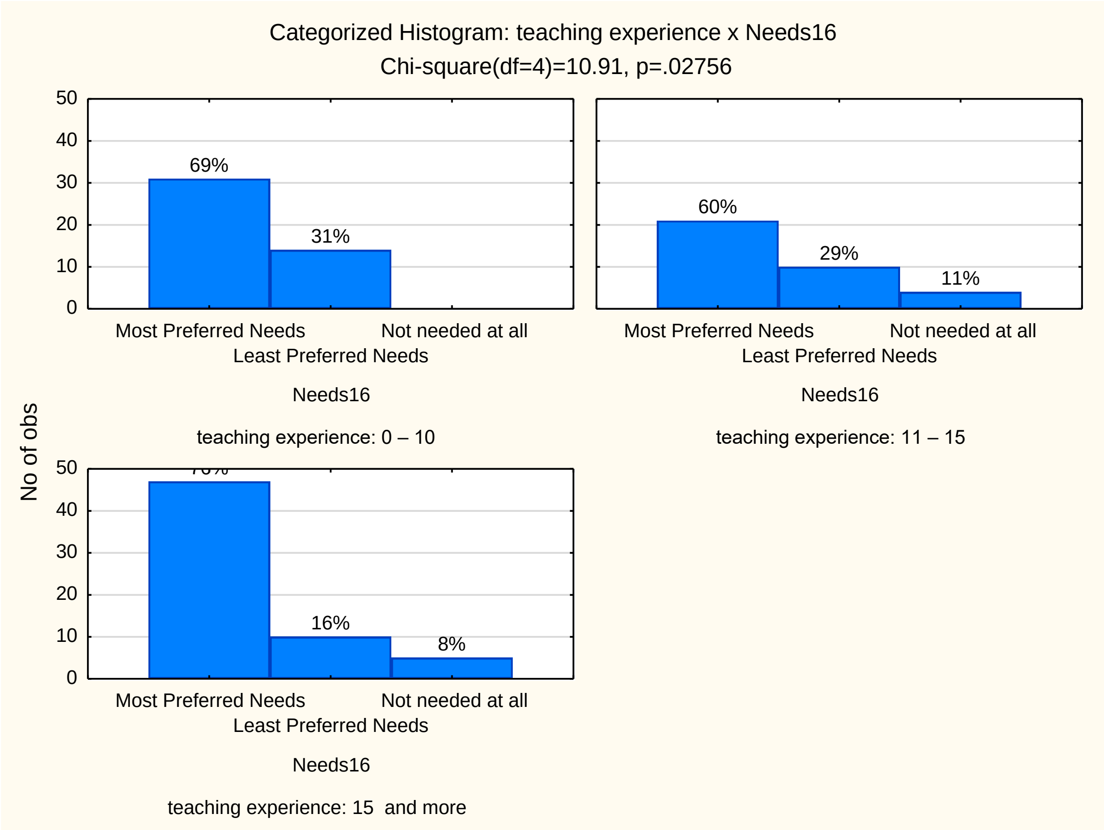


Figure 0.36: Categorized Histogram: teaching experience x Needs16

Table 0.38: teaching experience | Needs17, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=3.58, p=.46654			
	Needs17 Most Preferred Needs	Needs17 Least Preferred Needs	Needs17 Not needed at all	Row Totals
0 – 10	30	13	2	45
Row %	66.67%	28.89%	4.44%	
11 – 15	17	16	2	35
Row %	48.57%	45.71%	5.71%	
15 and more	40	18	4	62
Row %	64.52%	29.03%	6.45%	
Totals	87	47	8	142

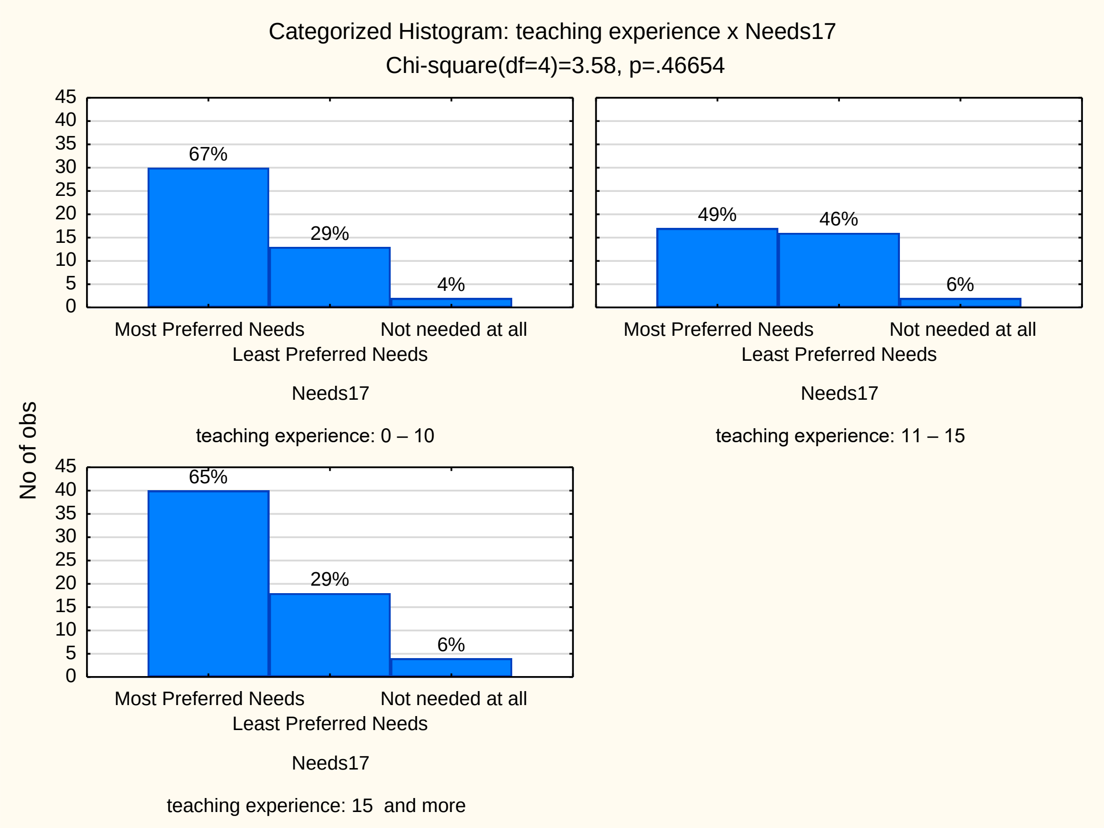


Figure 0.37: Categorized Histogram: teaching experience x Needs17

Table 0.39: teaching experience | Needs18, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=13.24, p=.01016			
	Needs18 Most Preferred Needs	Needs18 Least Preferred Needs	Needs18 Not needed at all	Row Totals
0 – 10	35	10	0	45
Row %	77.78%	22.22%	0.00%	
11 – 15	16	15	4	35
Row %	45.71%	42.86%	11.43%	
15 and more	40	17	5	62
Row %	64.52%	27.42%	8.06%	
Totals	91	42	9	142

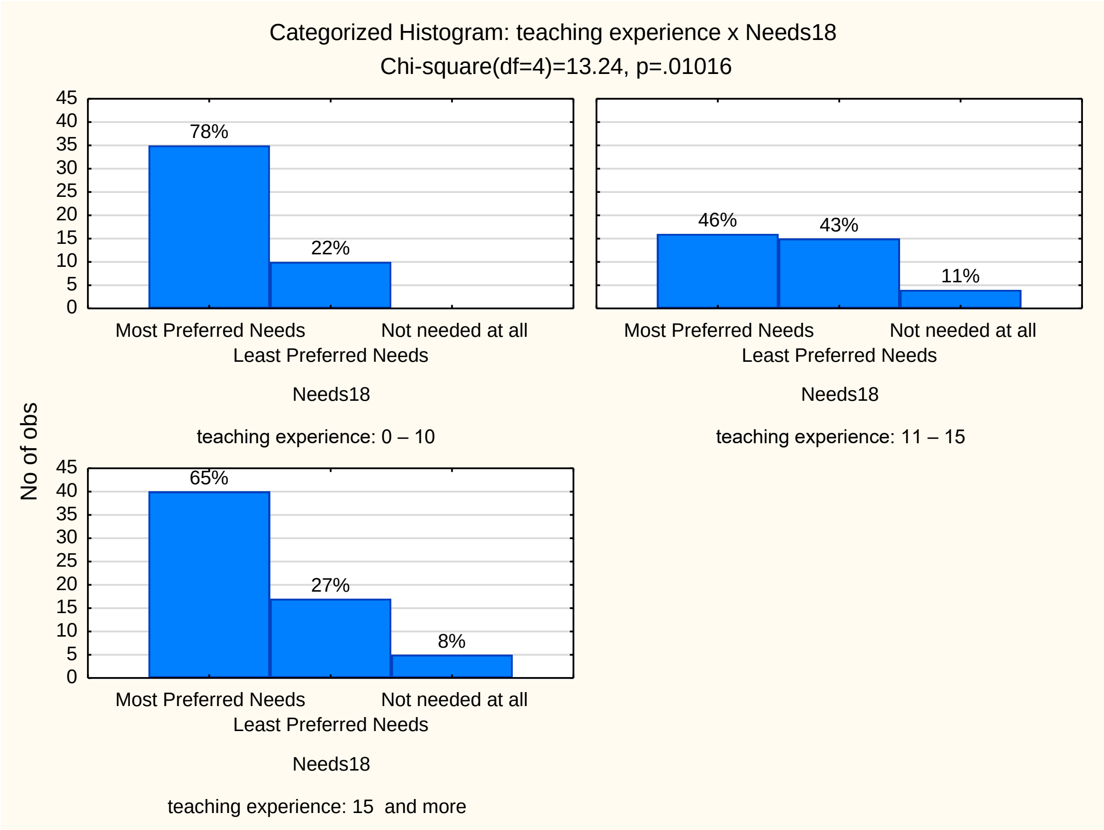


Figure 0.38: Categorized Histogram: teaching experience x Needs18

Table 0.40: teaching experience | Needs19, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=2.60, p=.62647			
	Needs19 Most Preferred Needs	Needs19 Least Preferred Needs	Needs19 Not needed at all	Row Totals
0 – 10	38	5	1	44
Row %	86.36%	11.36%	2.27%	
11 – 15	26	6	3	35
Row %	74.29%	17.14%	8.57%	
15 and more	52	7	3	62
Row %	83.87%	11.29%	4.84%	
Totals	116	18	7	141

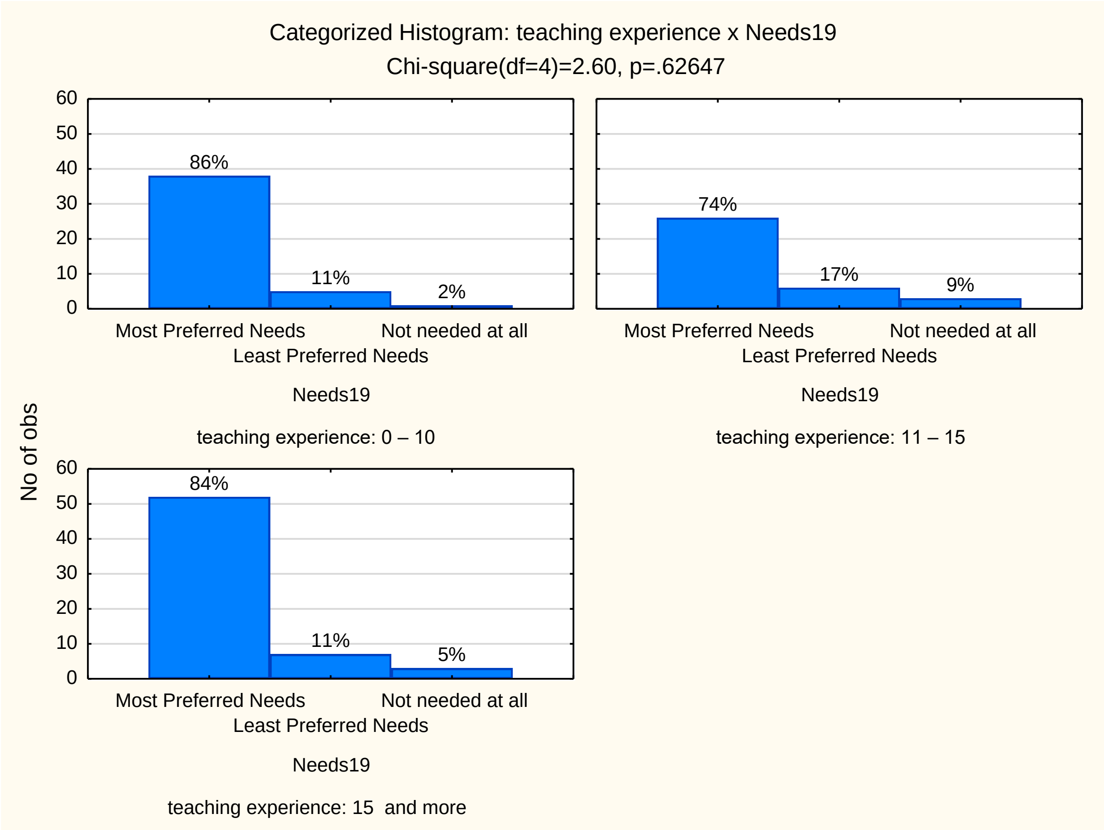


Figure 0.39: Categorized Histogram: teaching experience x Needs19

Table 0.41: teaching experience | Needs20, 2-Way Summary Table: Observed Frequencies (Spreadsheet107 in Results.stw)

teaching experience	Marked cells have counts > 10. Chi-square(df=4)=16.30, p=.00264			
	Needs20 Most Preferred Needs	Needs20 Least Preferred Needs	Needs20 Not needed at all	Row Totals
0 – 10	23	9	13	45
Row %	51.11%	20.00%	28.89%	
11 – 15	9	2	24	35
Row %	25.71%	5.71%	68.57%	
15 and more	33	9	20	62
Row %	53.23%	14.52%	32.26%	
Totals	65	20	57	142

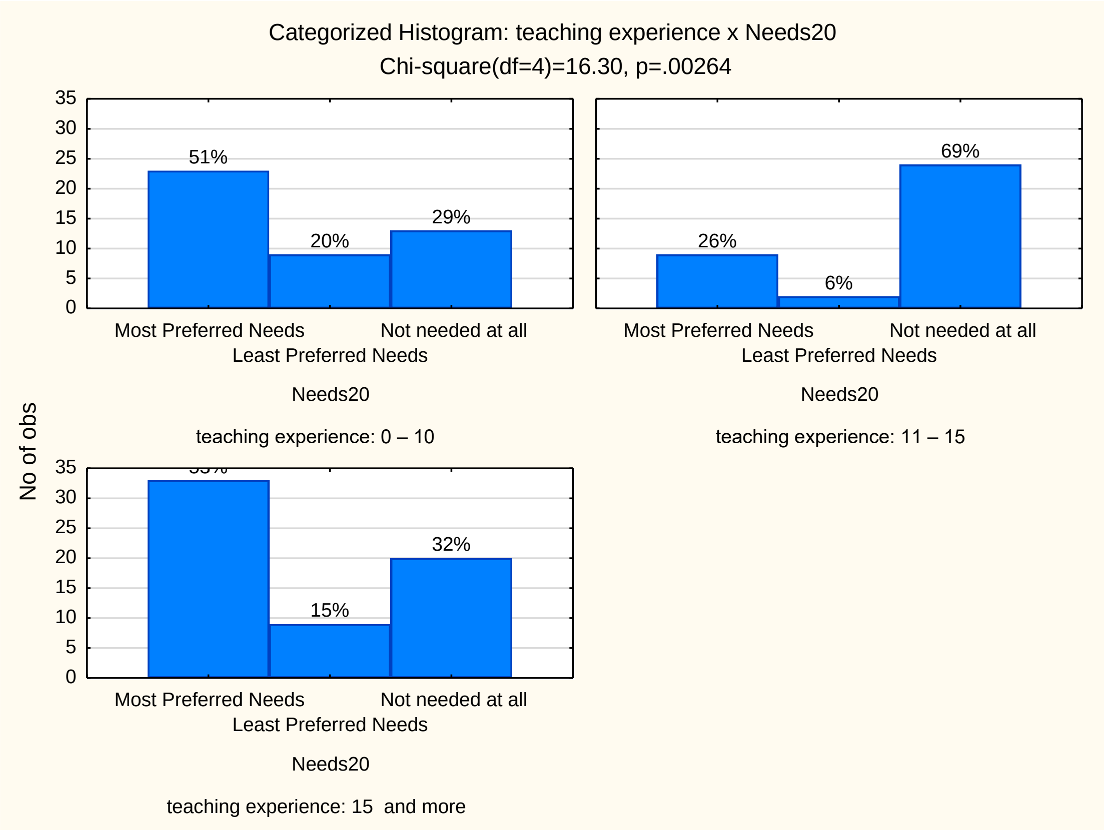


Figure 0.40: Categorized Histogram: teaching experience x Needs20

5. Appendix E: ANOVA (spreadsheet107 in results.STW)

1. *Competencies | gender, gender; LS Means* (**H0 3)**

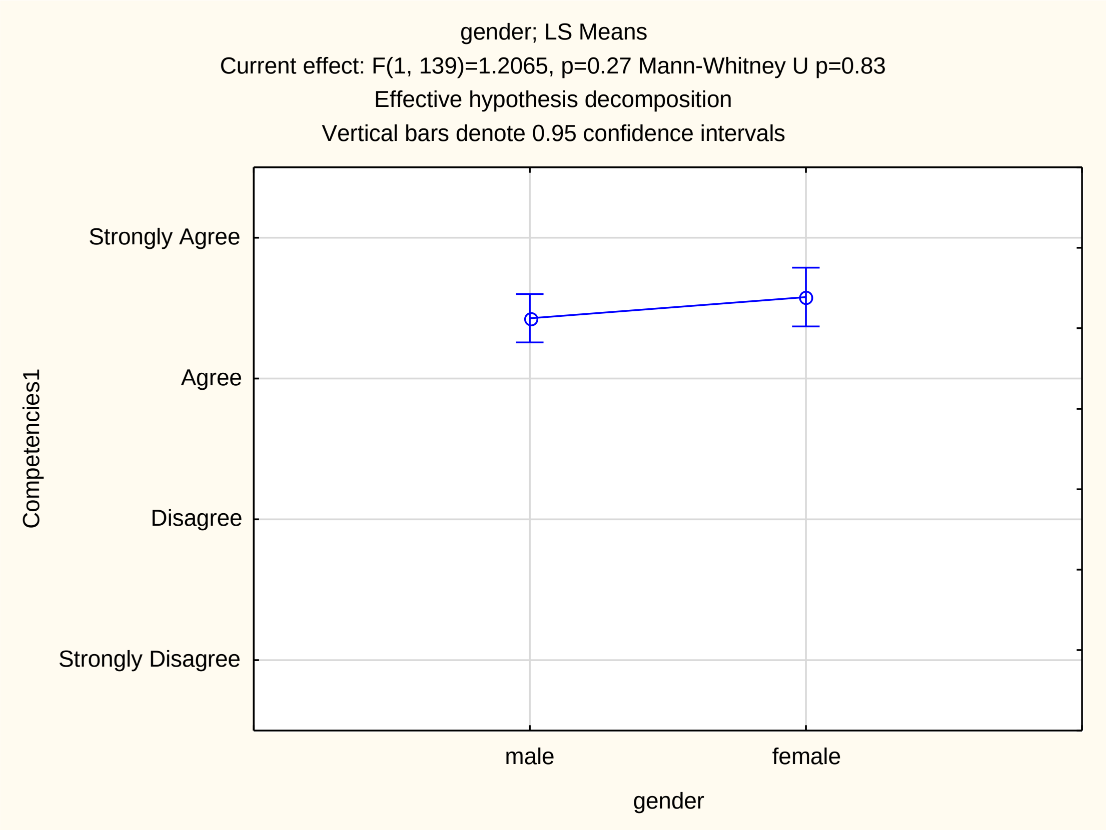


Figure 0.41: Competencies1 | gender, gender; LS Means

Table 0.42: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies1 Mean	Competencies1 Std.Dev.
Total		141	3.49	0.80
gender	male	84	3.43	0.91
gender	female	57	3.58	0.60

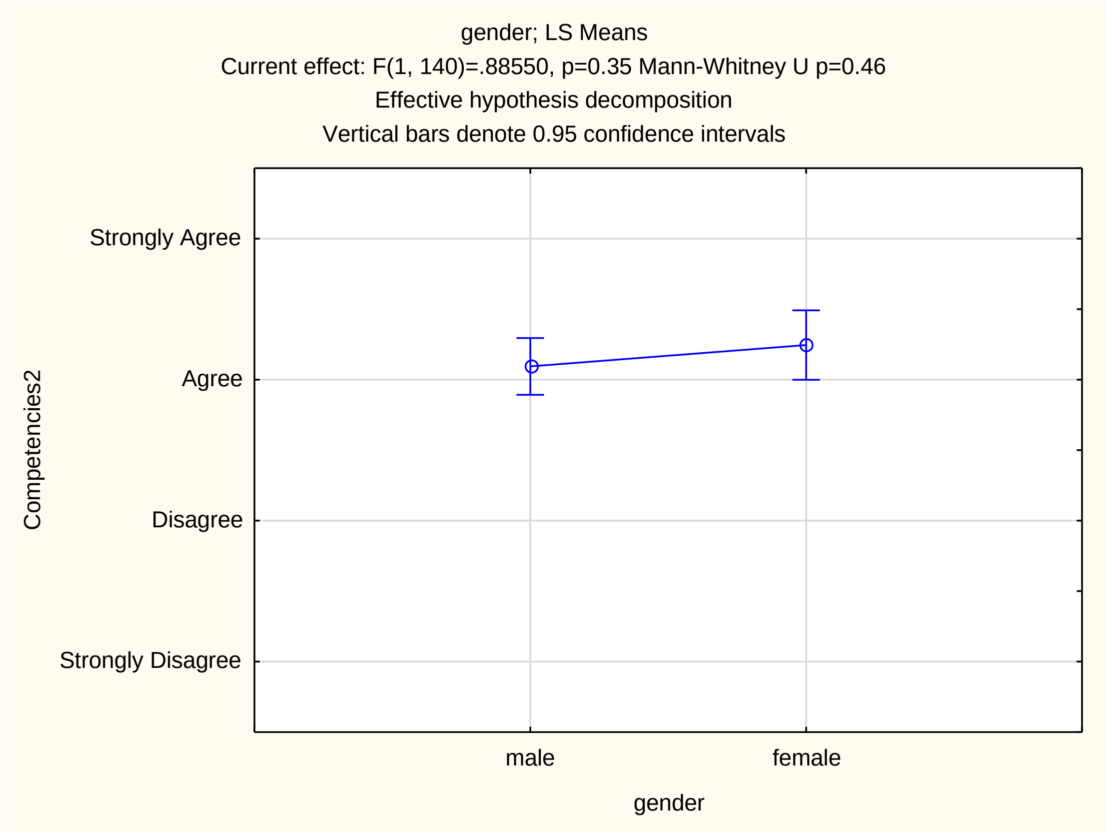


Figure 0.42: Competencies2 | gender, gender; LS Means

Table 0.43: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies2 Mean	Competencies2 Std.Dev.
Total		142	3.15	0.94
gender	male	85	3.09	0.98
gender	female	57	3.25	0.87

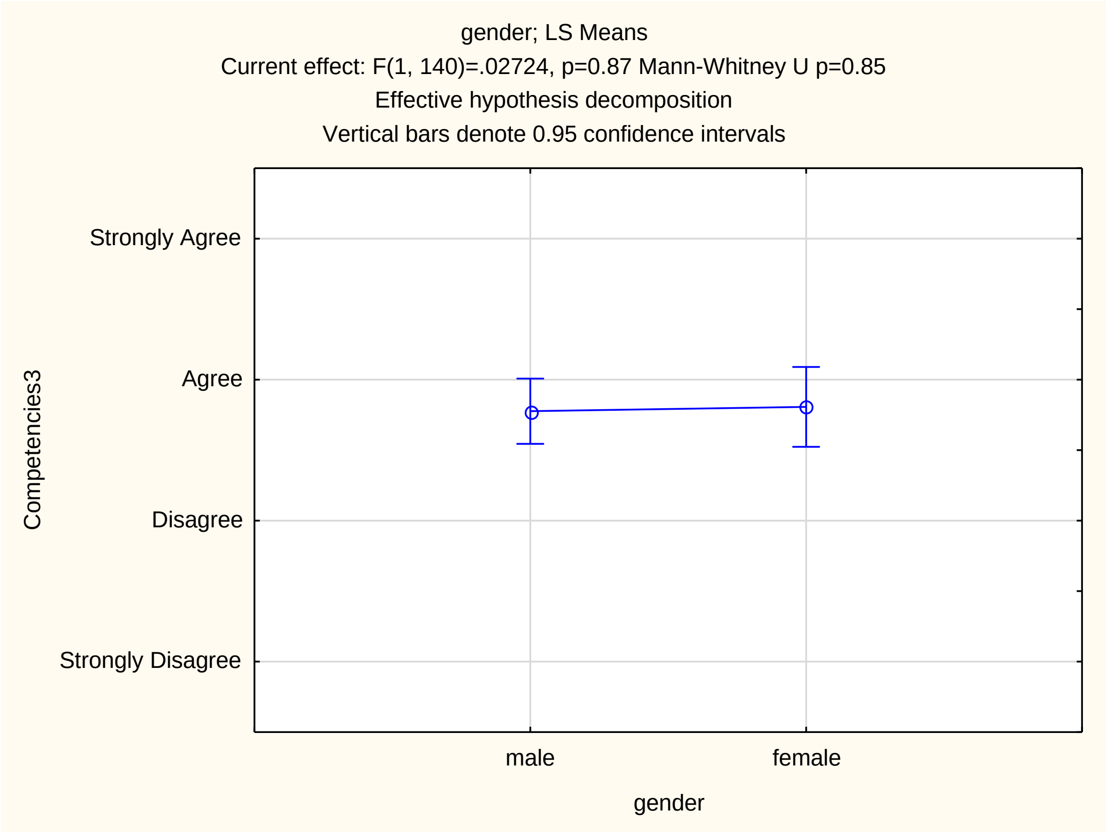


Figure 0.43: Competencies3 | gender, gender; LS Means

Table 0.44: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies3 Mean	Competencies3 Std.Dev.
Total		142	2.79	1.08
gender	male	85	2.78	1.07
gender	female	57	2.81	1.09

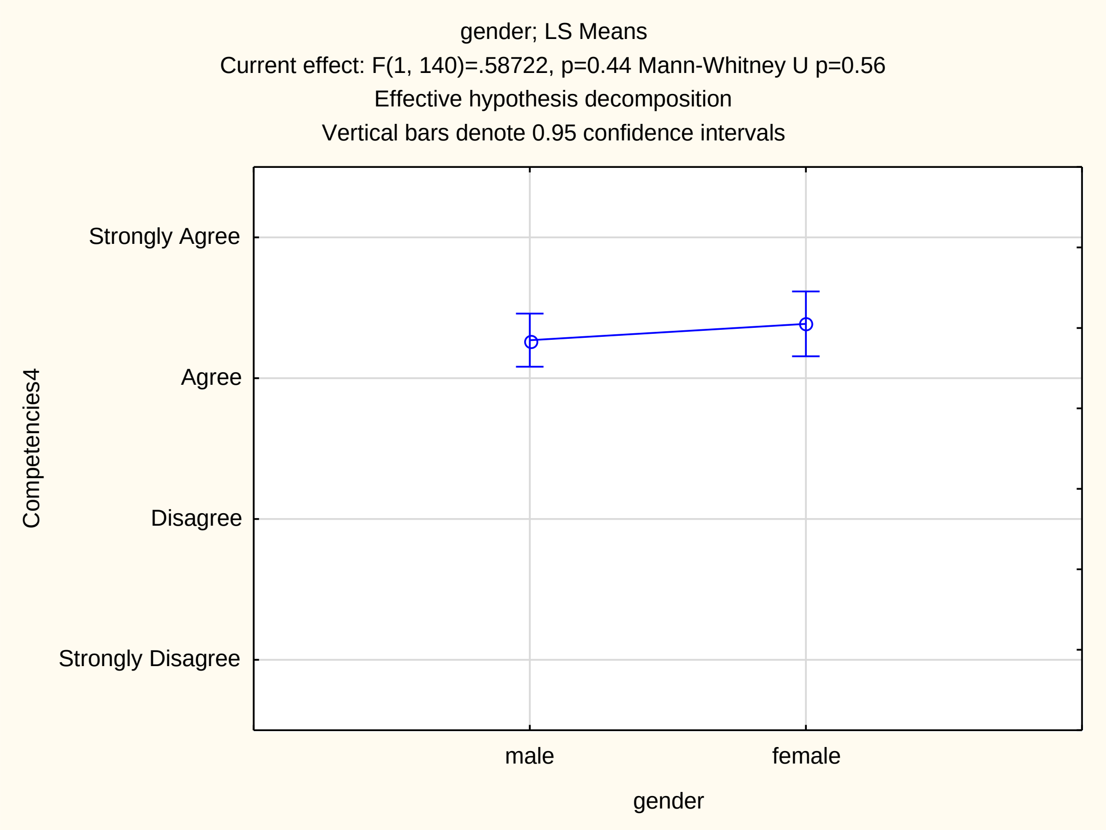


Figure 0.44: Competencies4 | gender, gender; LS Means

Table 0.45: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies4 Mean	Competencies4 Std.Dev.
Total		142	3.32	0.88
gender	male	85	3.27	0.92
gender	female	57	3.39	0.82

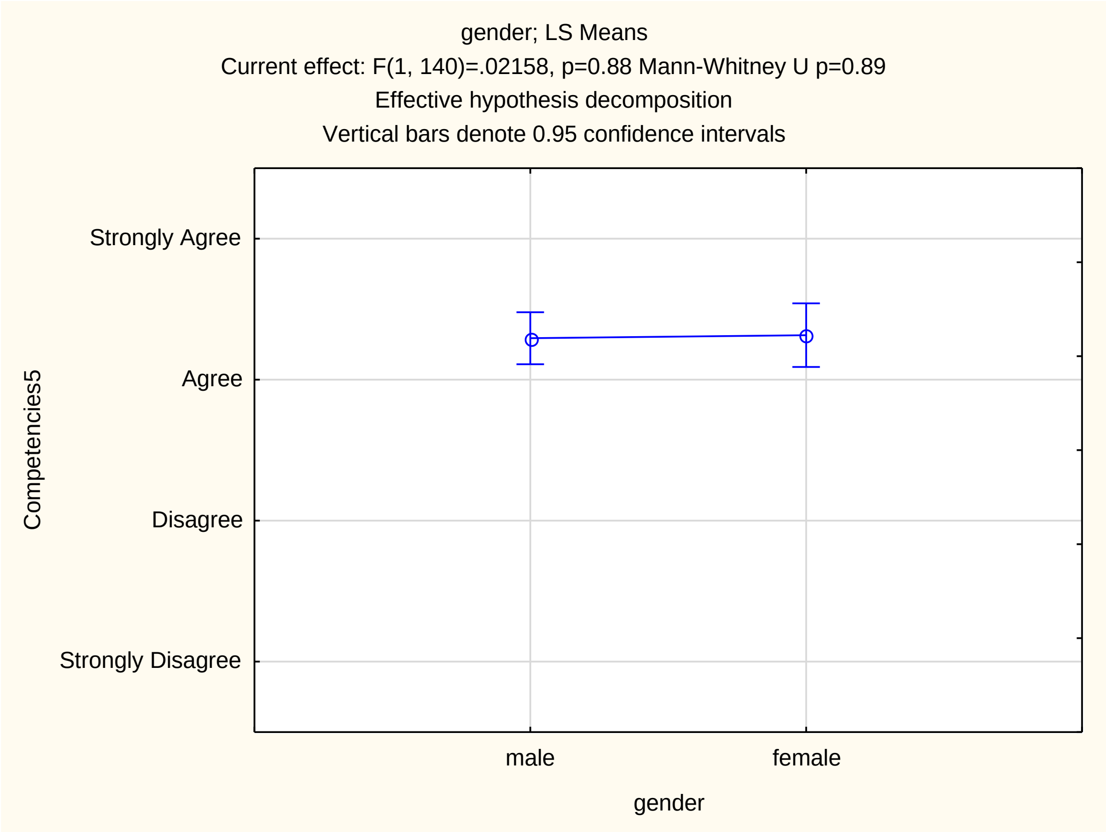


Figure 0.45: Competencies5 | gender, gender; LS Means

Table 0.46: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies5 Mean	Competencies5 Std.Dev.
Total		142	3.30	0.86
gender	male	85	3.29	0.90
gender	female	57	3.32	0.81

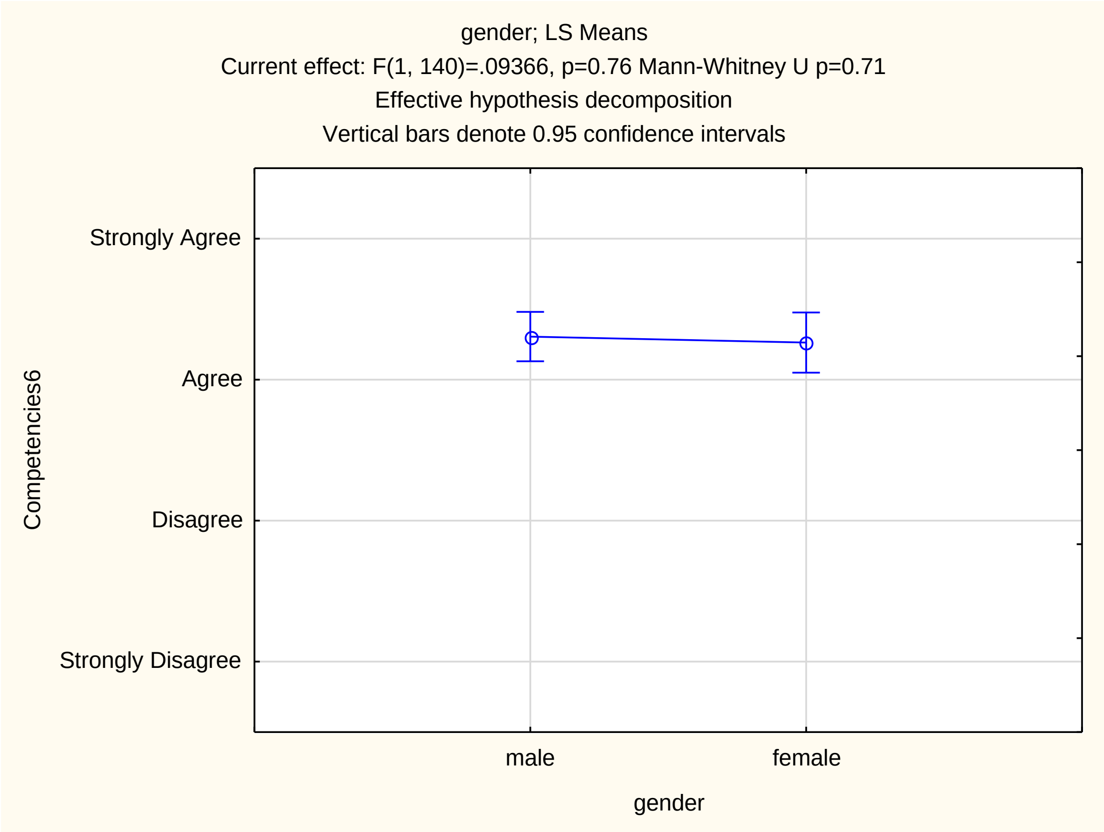


Figure 0.46: Competencies6 | gender, gender; LS Means

Table 0.47: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies6 Mean	Competencies6 Std.Dev.
Total		142	3.29	0.81
gender	male	85	3.31	0.82
gender	female	57	3.26	0.81

Figure 0.47: Competencies7 | gender, gender; LS Means

Table 0.48: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies7 Mean	Competencies7 Std.Dev.
Total		142	3.32	0.86
gender	male	85	3.32	0.83
gender	female	57	3.32	0.91

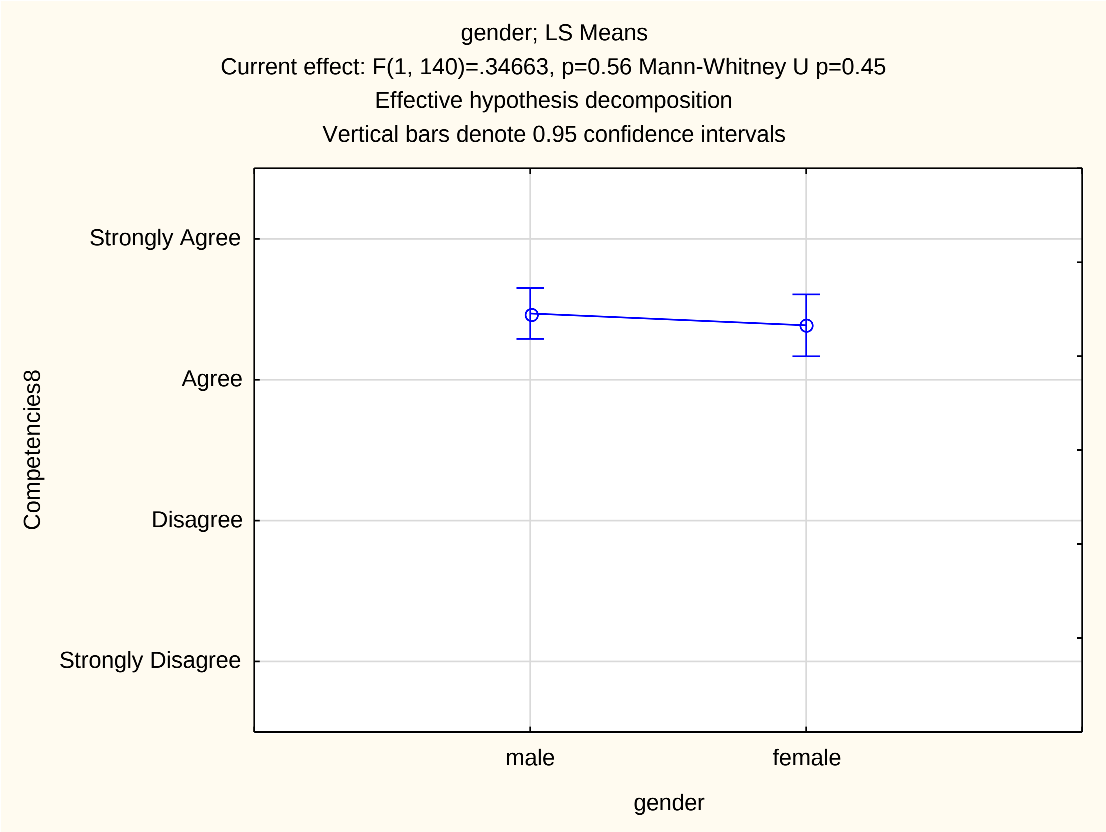


Figure 0.48: Competencies8 | gender, gender; LS Means

Table 0.49: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies8 Mean	Competencies8 Std.Dev.
Total		142	3.44	0.84
gender	male	85	3.47	0.84
gender	female	57	3.39	0.84

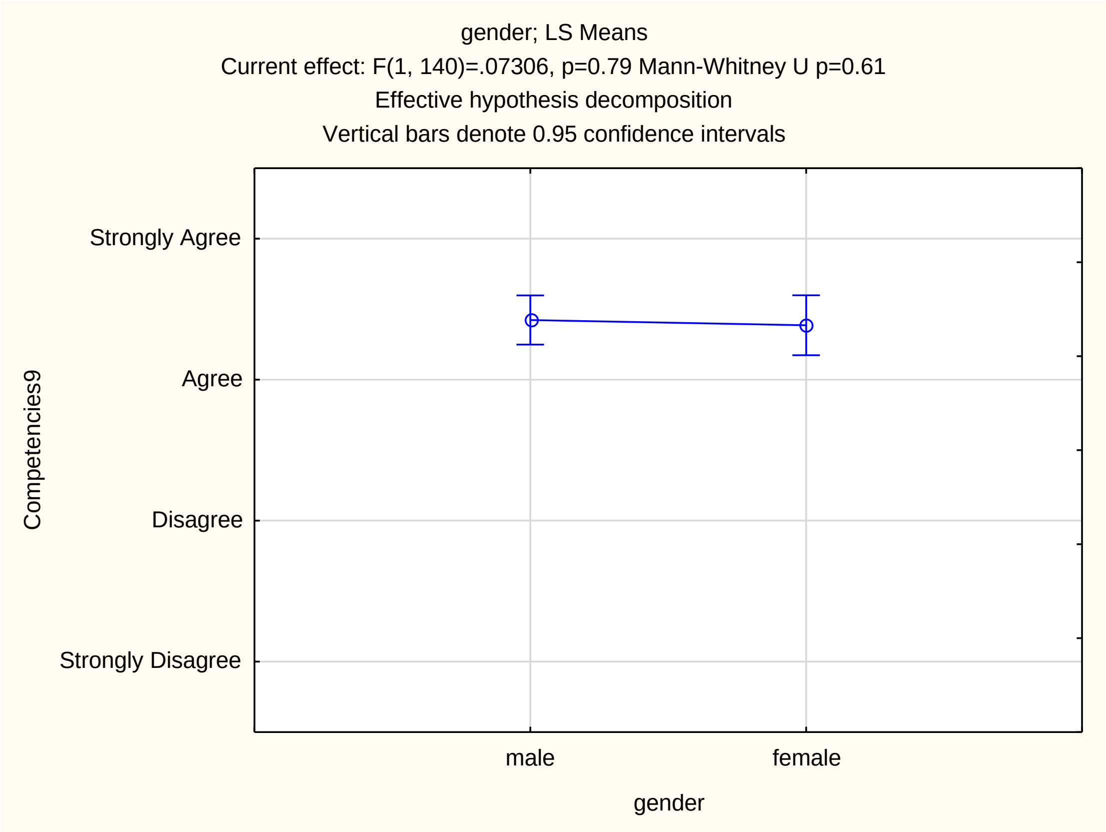


Figure 0.49: Competencies9 | gender, gender; LS Means

Table 0.50: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies9 Mean	Competencies9 Std.Dev.
Total		142	3.41	0.81
gender	male	85	3.42	0.84
gender	female	57	3.39	0.77

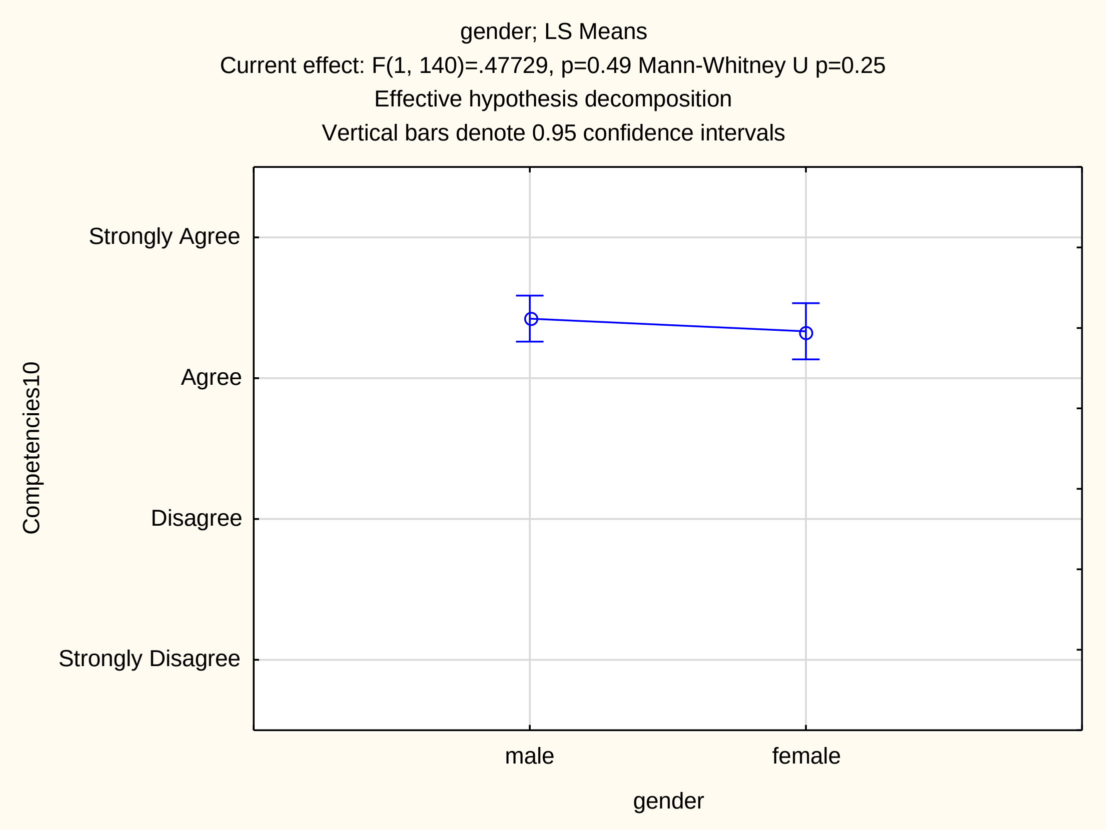


Figure 0.50: Competencies10 | gender, gender; LS Means

Table 0.51: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies10 Mean	Competencies10 Std.Dev.
Total		142	3.39	0.76
gender	male	85	3.42	0.81
gender	female	57	3.33	0.69

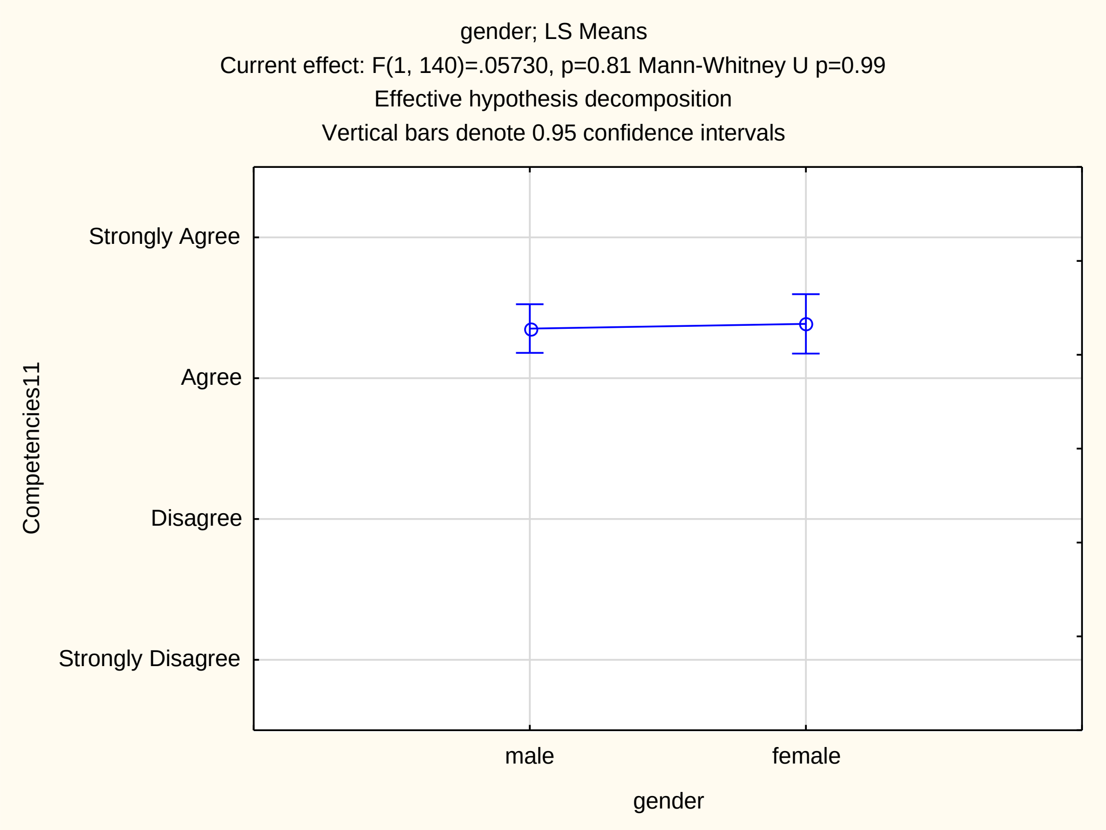


Figure 0.51: Competencies11 | gender, gender; LS Means

Table 0.52: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies11 Mean	Competencies11 Std.Dev.
Total		142	3.37	0.80
gender	male	85	3.35	0.84
gender	female	57	3.39	0.75

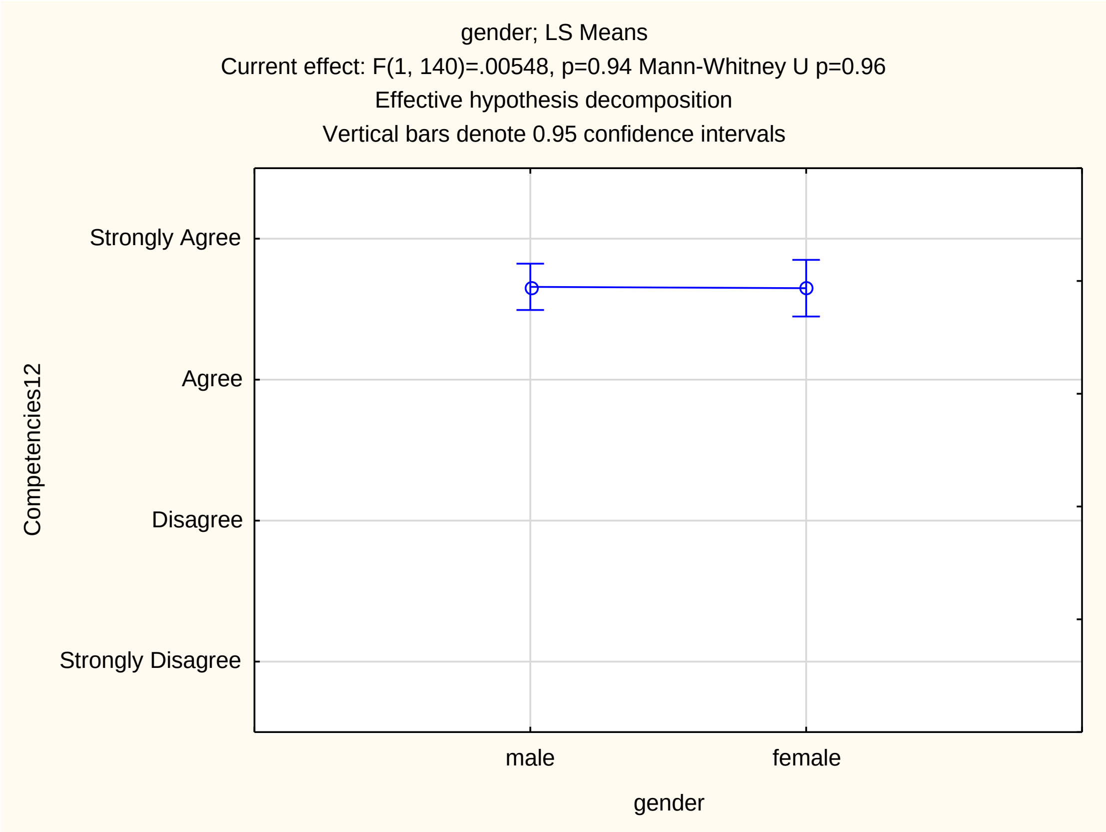


Figure 0.52: Competencies12 | gender, gender; LS Means

Table 0.53: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies12 Mean	Competencies12 Std.Dev.
Total		142	3.65	0.76
gender	male	85	3.66	0.76
gender	female	57	3.65	0.77

2. *Competencies1 | teaching experience; LS Means* (**H_0 =4)**

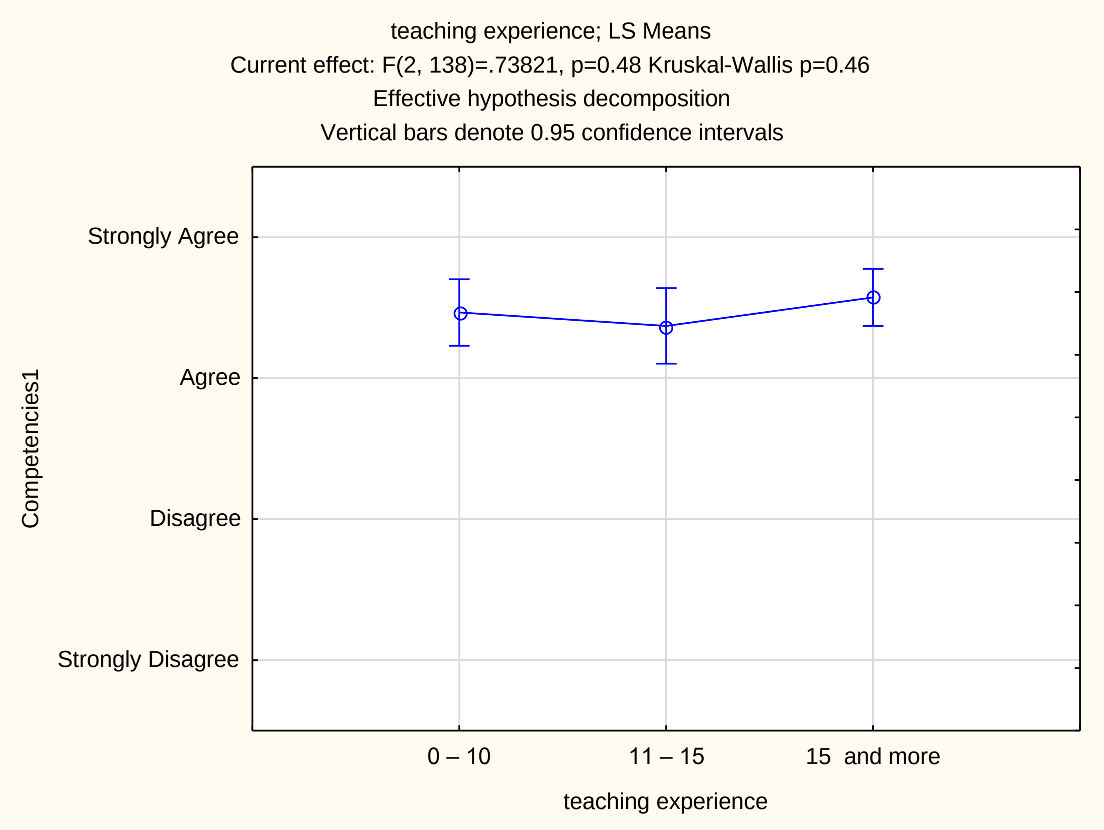


Figure 0.53: Competencies1 | teaching experience, teaching experience; LS Means,

Table 0.54: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies1 Mean	Competencies1 Std.Dev.
Total		141	3.49	0.80
teaching experience	0 – 10	45	3.47	0.84
teaching experience	11 – 15	35	3.37	0.88
teaching experience	15 and more	61	3.57	0.72

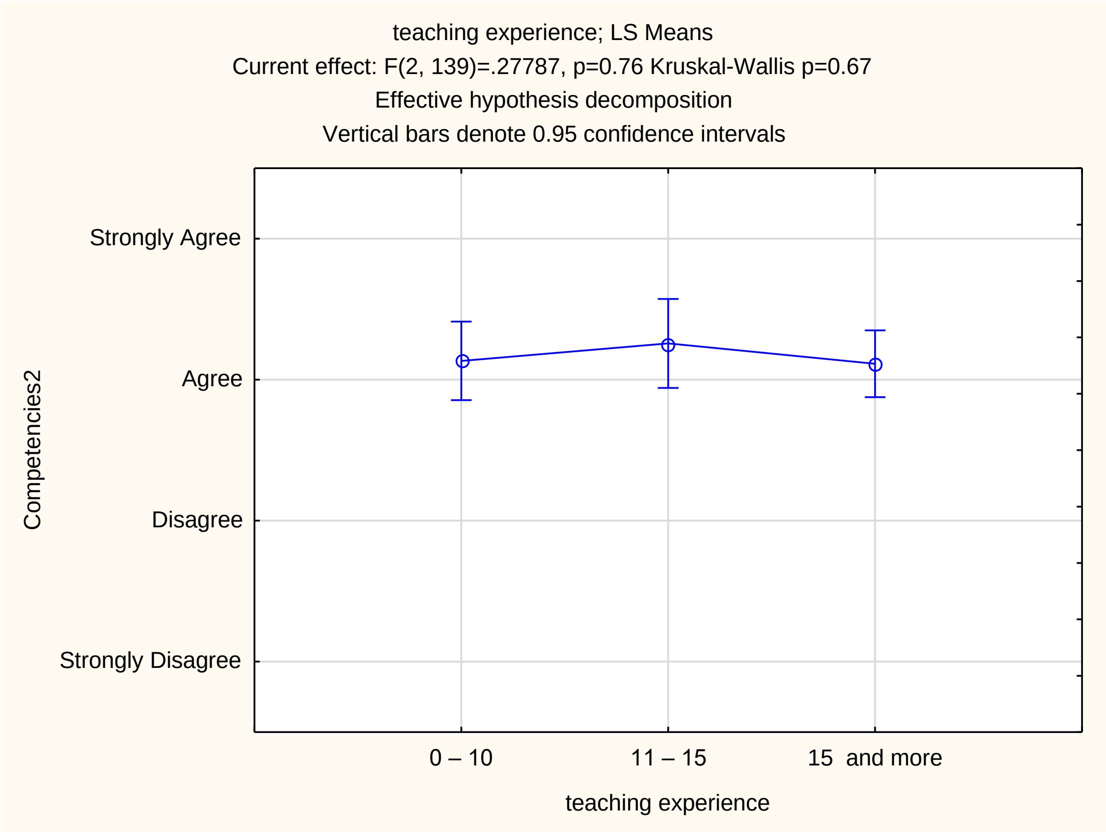


Figure 0.54: Competencies2 | teaching experience, teaching experience; LS Means

Table 0.55: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies2 Mean	Competencies2 Std.Dev.
Total		142	3.15	0.94
teaching experience	0 – 10	45	3.13	0.89
teaching experience	11 – 15	35	3.26	0.95
teaching experience	15 and more	62	3.11	0.98

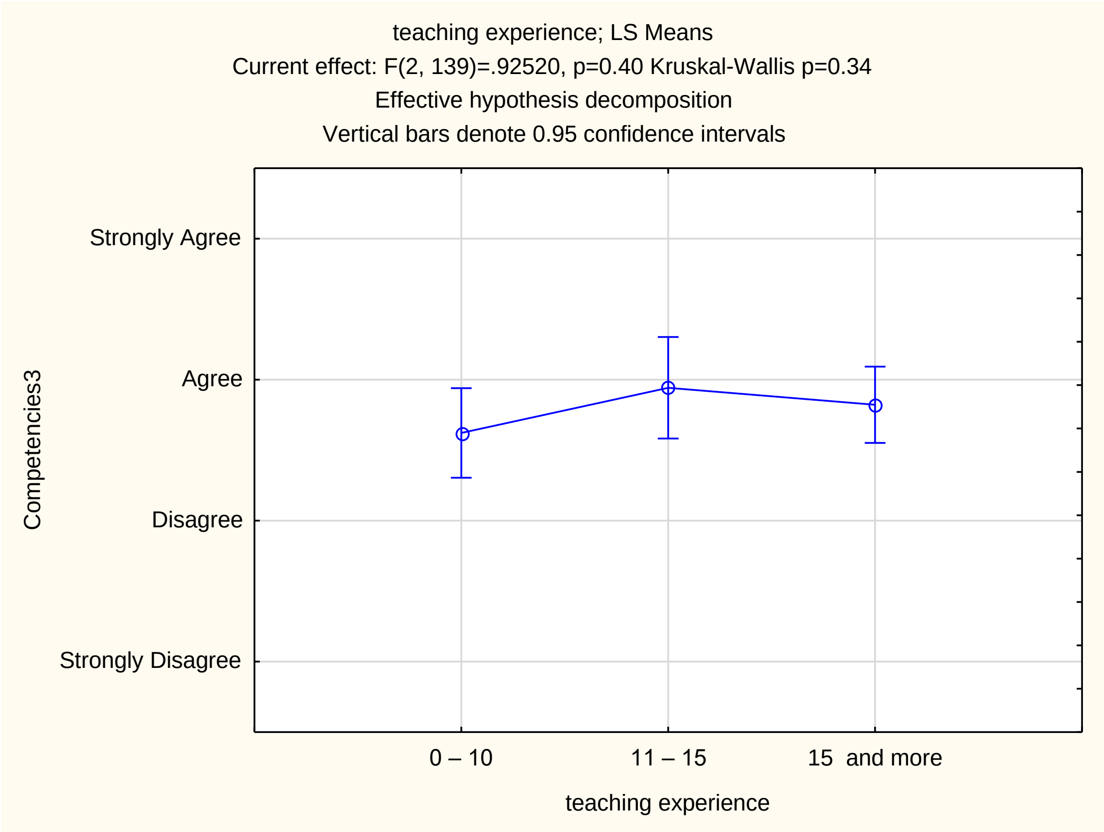


Figure 0.55: Competencies3 | teaching experience, teaching experience; LS Means

Table 0.56: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies3 Mean	Competencies3 Std.Dev.
Total		142	2.79	1.08
teaching experience	0 – 10	45	2.62	1.05
teaching experience	11 – 15	35	2.94	1.06
teaching experience	15 and more	62	2.82	1.11

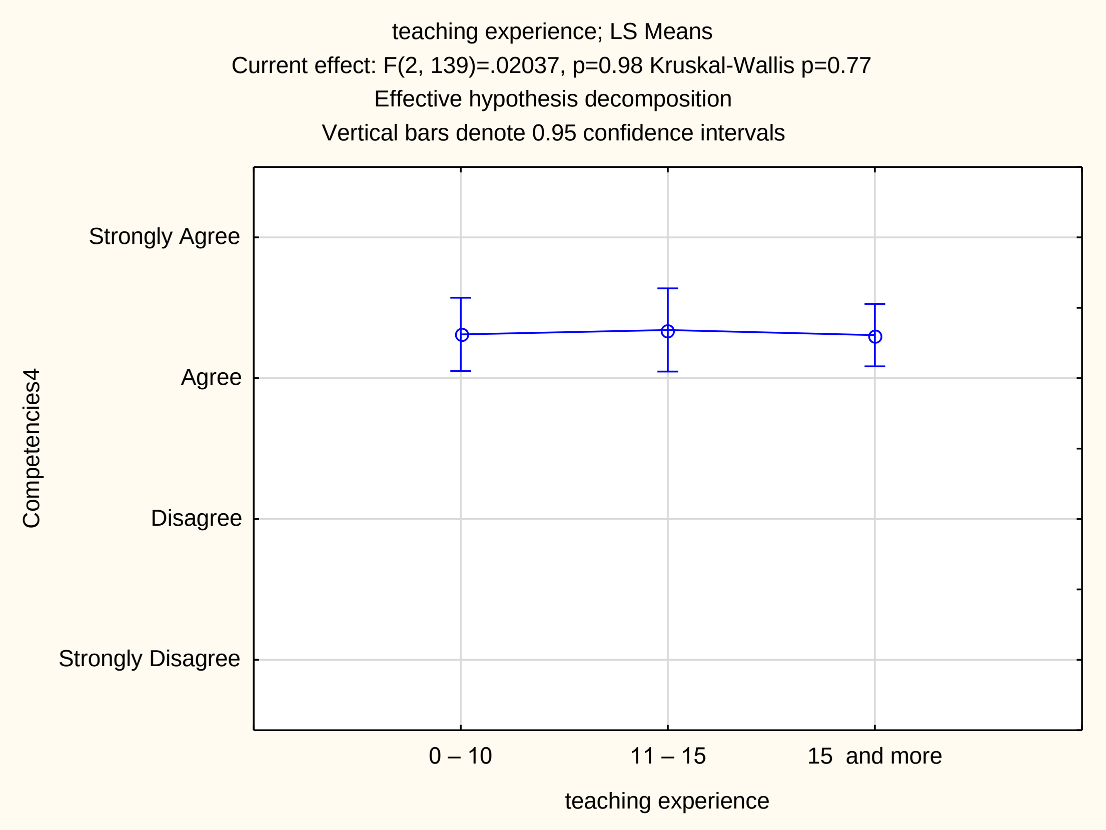


Figure 0.56: Competencies4 | teaching experience, teaching experience; LS Means

Table 0.57: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies4 Mean	Competencies4 Std.Dev.
Total		142	3.32	0.88
teaching experience	0 – 10	45	3.31	1.00
teaching experience	11 – 15	35	3.34	0.87
teaching experience	15 and more	62	3.31	0.80

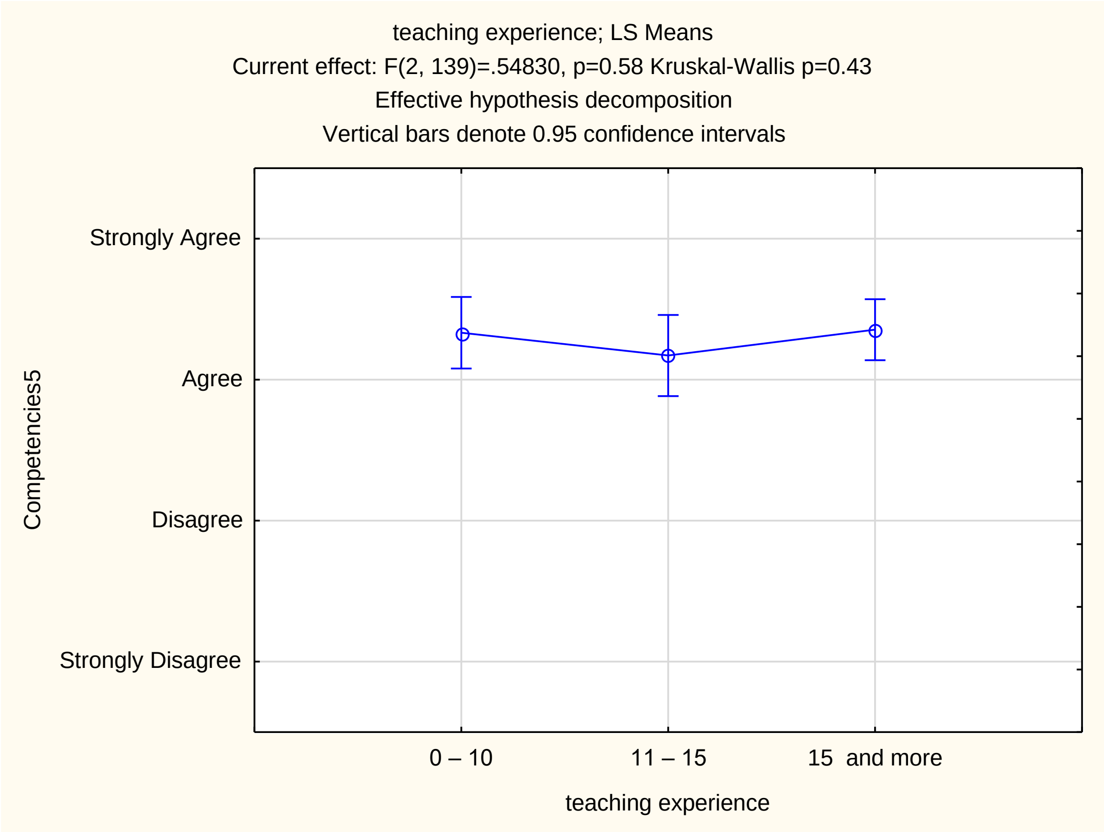


Figure 0.57: Competencies5 | teaching experience, teaching experience; LS Means

Table 0.58: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies5 Mean	Competencies5 Std.Dev.
Total		142	3.30	0.86
teaching experience	0 – 10	45	3.33	0.95
teaching experience	11 – 15	35	3.17	0.89
teaching experience	15 and more	62	3.35	0.77

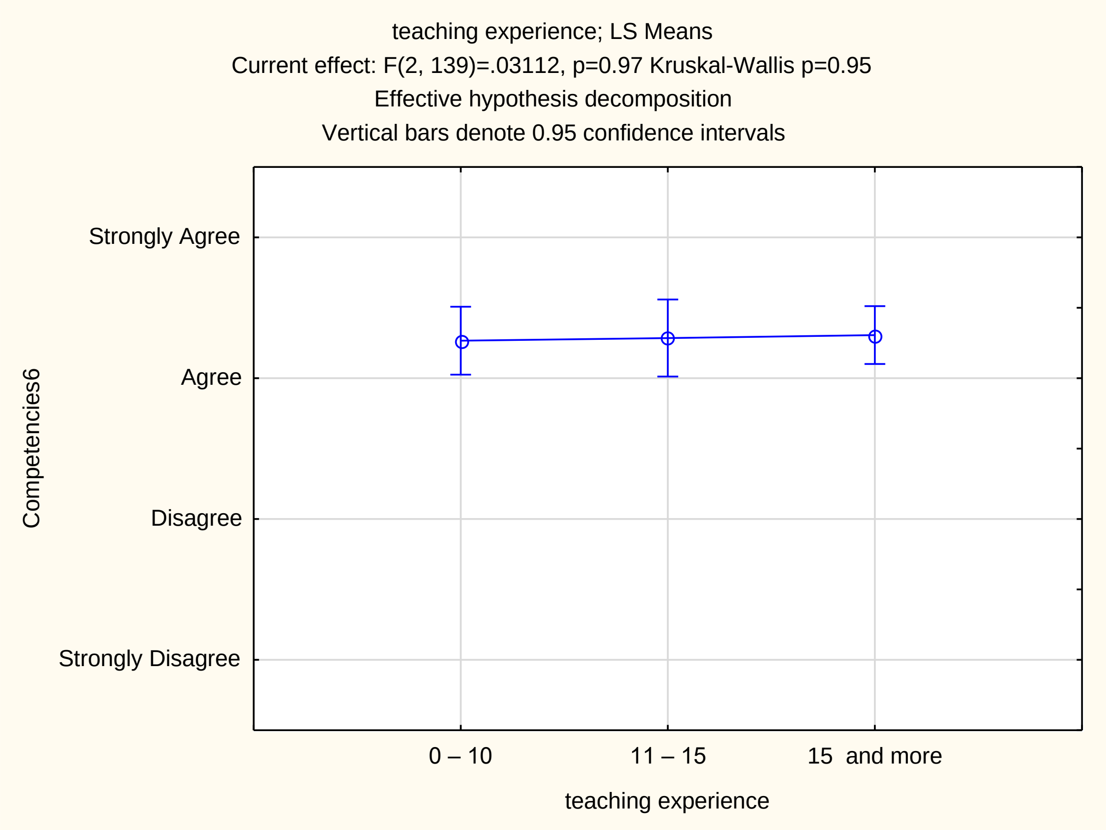


Figure 0.58: Competencies6 | teaching experience, teaching experience; LS Means

Table 0.59: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies6 Mean	Competencies6 Std.Dev.
Total		142	3.29	0.81
teaching experience	0 – 10	45	3.27	0.89
teaching experience	11 – 15	35	3.29	0.75
teaching experience	15 and more	62	3.31	0.80

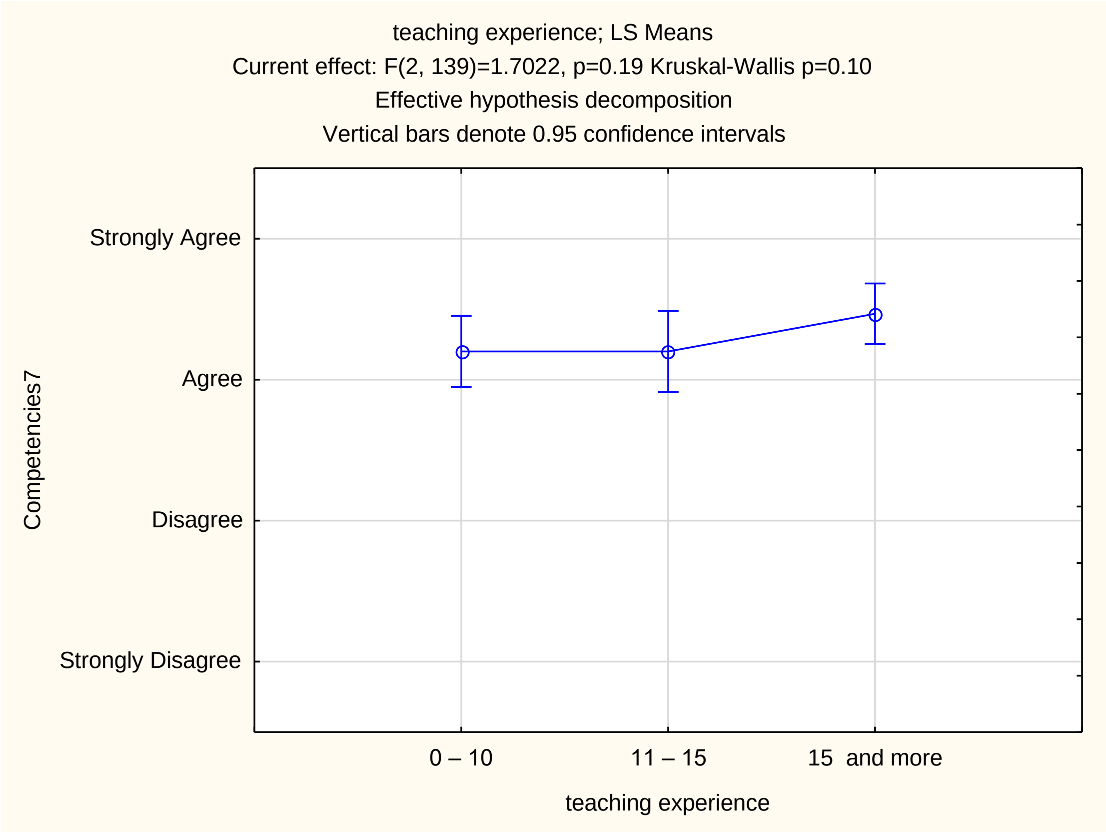


Figure 0.59: Competencies7 | teaching experience, teaching experience; LS Means

Table 0.60: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies7 Mean	Competencies7 Std.Dev.
Total		142	3.32	0.86
teaching experience	0 – 10	45	3.20	1.01
teaching experience	11 – 15	35	3.20	0.76
teaching experience	15 and more	62	3.47	0.78

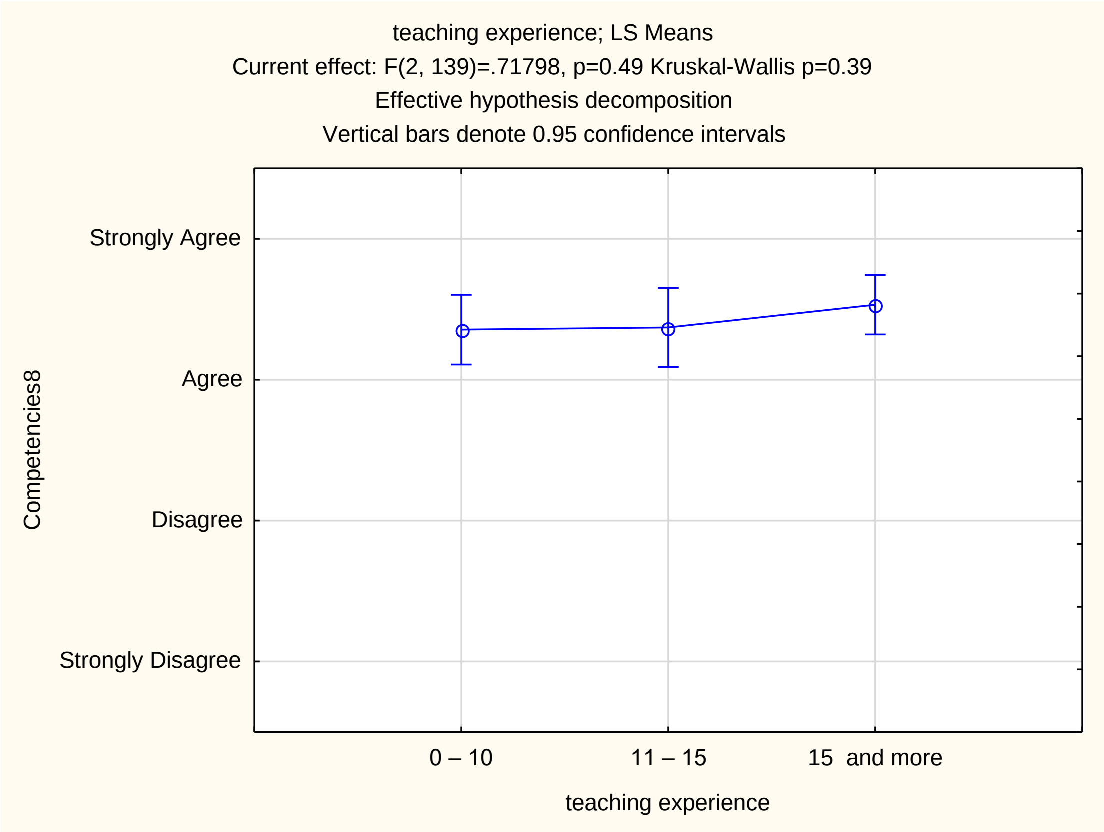


Figure 0.60: Competencies8 | teaching experience, teaching experience; LS Means

Table 0.61: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies8 Mean	Competencies8 Std.Dev.
Total		142	3.44	0.84
teaching experience	0 – 10	45	3.36	0.98
teaching experience	11 – 15	35	3.37	0.77
teaching experience	15 and more	62	3.53	0.76

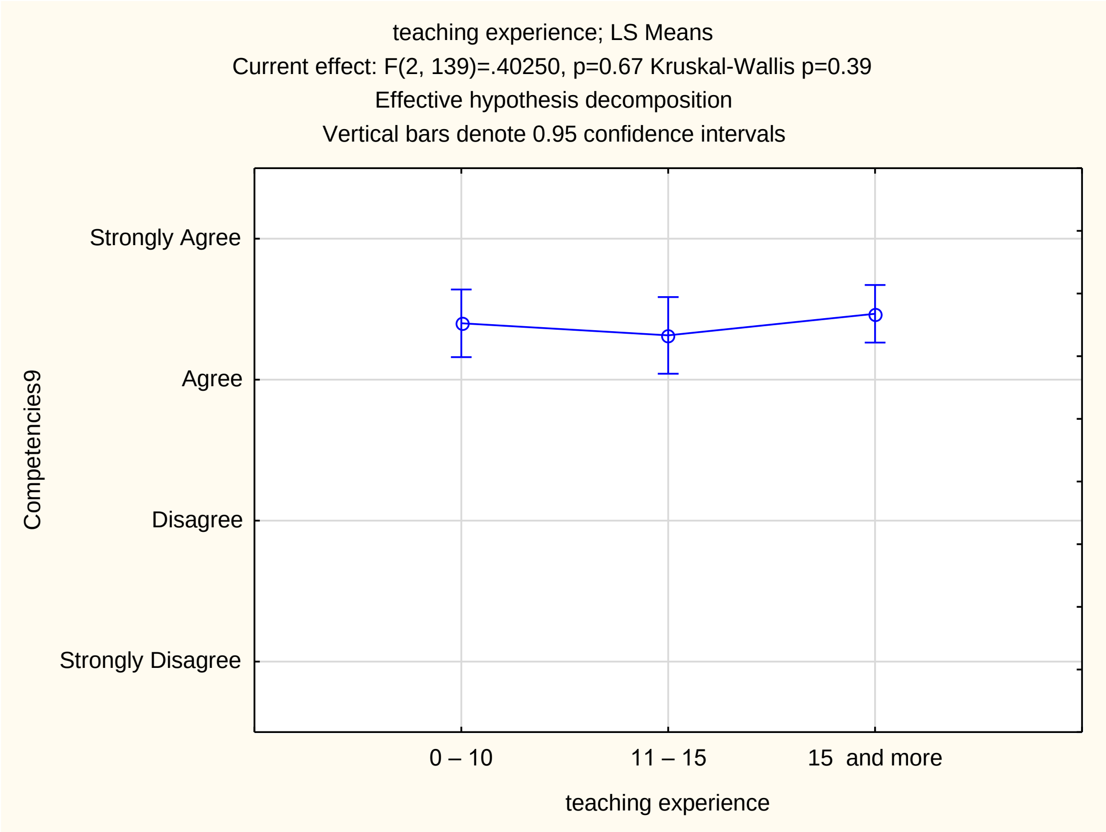


Figure 0.61: Competencies9 | teaching experience, teaching experience; LS Means

Table 0.62: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies9 Mean	Competencies9 Std.Dev.
Total		142	3.41	0.81
teaching experience	0 – 10	45	3.40	0.94
teaching experience	11 – 15	35	3.31	0.76
teaching experience	15 and more	62	3.47	0.74

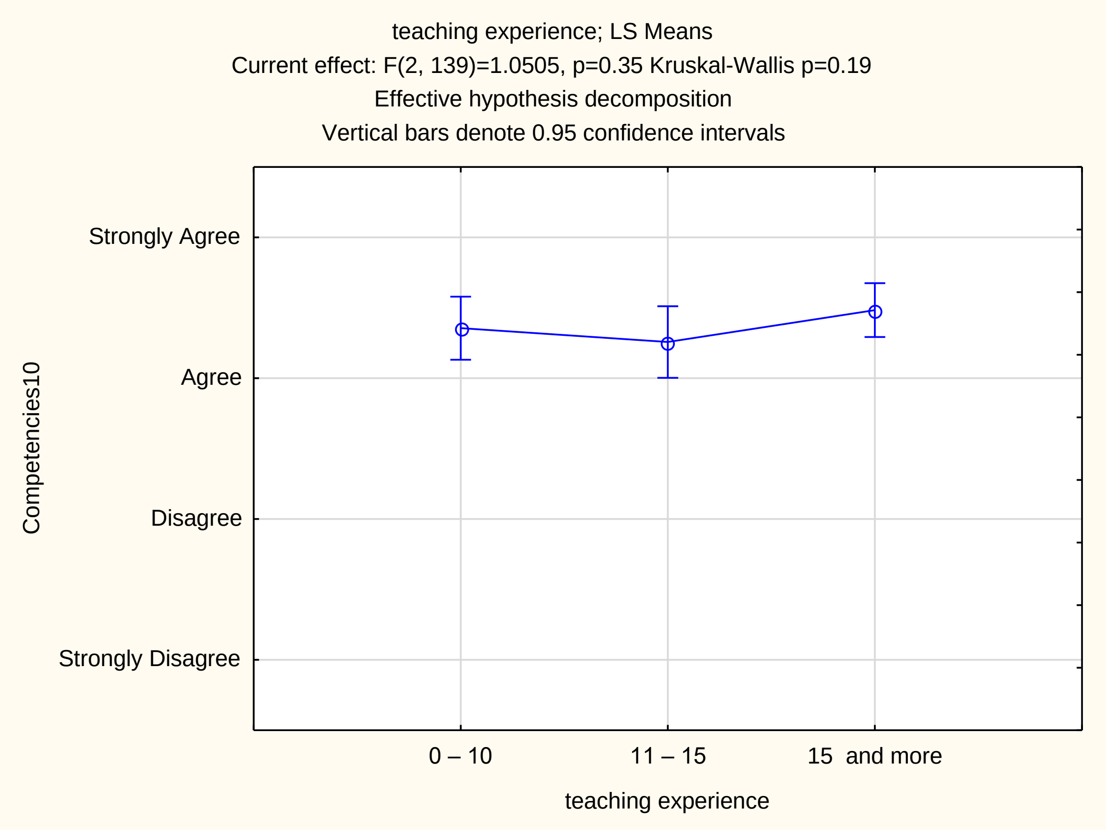


Figure 0.62: Competencies10 | teaching experience, teaching experience; LS Means

Table 0.63: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies10 Mean	Competencies10 Std.Dev.
Total		142	3.39	0.76
teaching experience	0 – 10	45	3.36	0.86
teaching experience	11 – 15	35	3.26	0.70
teaching experience	15 and more	62	3.48	0.72

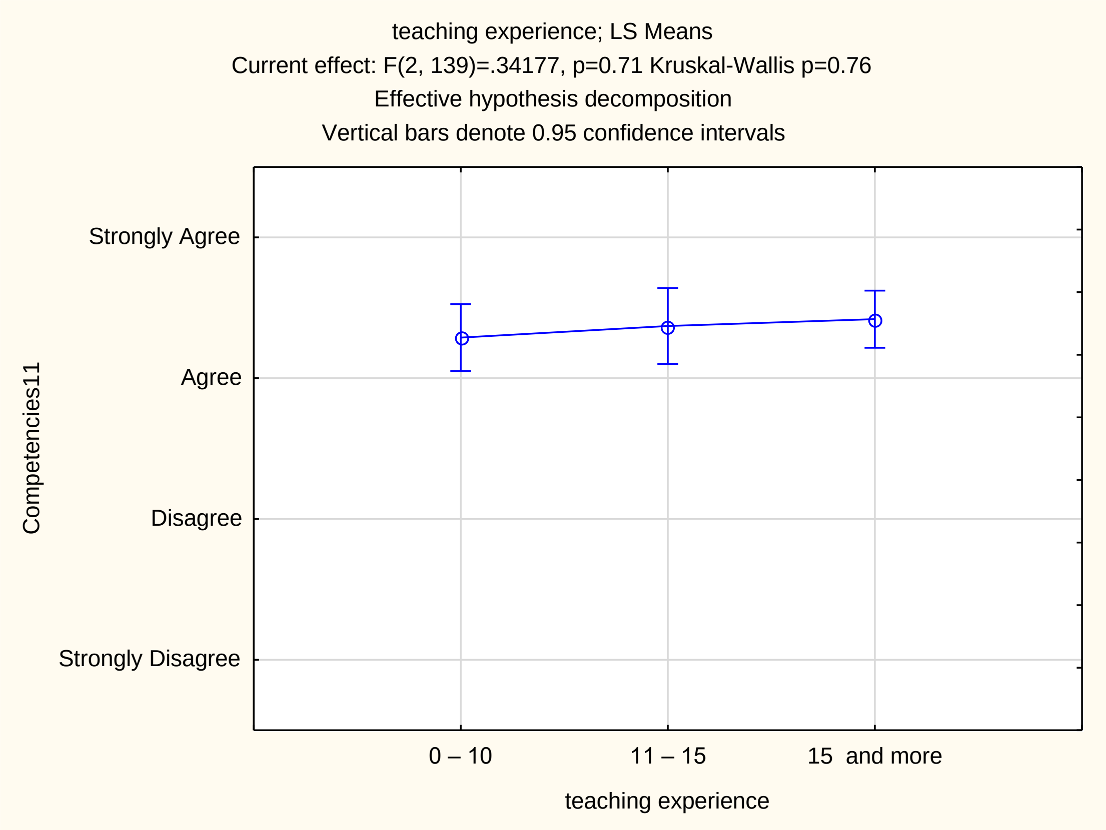


Figure 0.63: Competencies11 | teaching experience, teaching experience; LS Means

Table 0.64: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies11 Mean	Competencies11 Std.Dev.
Total		142	3.37	0.80
teaching experience	0 – 10	45	3.29	0.92
teaching experience	11 – 15	35	3.37	0.69
teaching experience	15 and more	62	3.42	0.78

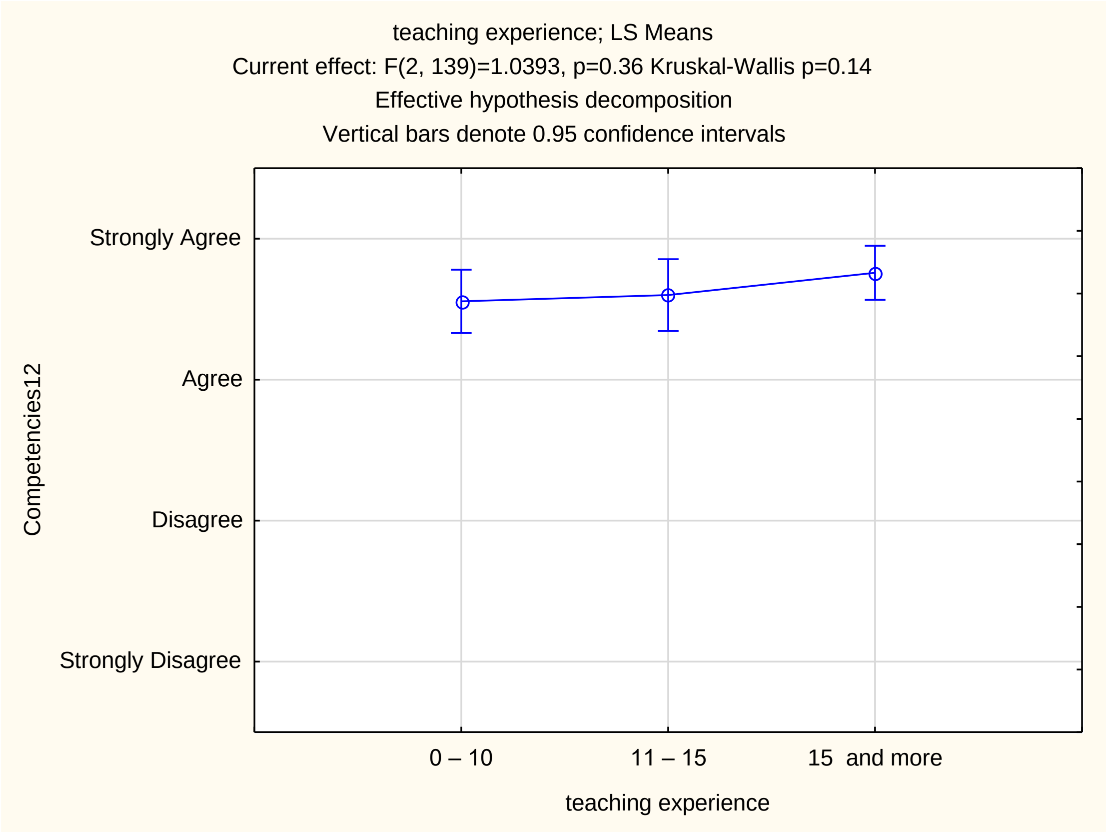


Figure 0.64: Competencies12 | teaching experience, teaching experience; LS Means

Table 0.65: Descriptive Statistics (Spreadsheet107 in Results.stw)

Effect	Descriptive Statistics (Spreadsheet107 in Results.stw)			
	Level of Factor	N	Competencies12 Mean	Competencies12 Std.Dev.
Total		142	3.65	0.76
teaching experience	0 – 10	45	3.56	0.89
teaching experience	11 – 15	35	3.60	0.69
teaching experience	15 and more	62	3.76	0.69

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6. Appendix F: Consent to participate in research

STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

Improving Teaching and Learning in the Zambezi Region, Namibia: The Perceived Competencies and Needs of Secondary School Agricultural Science Teachers

You are asked to participate in a research study conducted by:

MASHEBE PERCY MASHEBE - National Diploma in Agriculture (UNAM); HED, BED Honors (NWU); MSA, MDM (UFS); from the Curriculum Studies Department of the Faculty of Education; at Stellenbosch University. Results will contribute to the writing of a PhD thesis or dissertation, research paper and publication of scholarly journal articles. You were selected as a possible participant in this study because you are a secondary Agricultural Science teacher in the Zambezi region.

PURPOSE OF THE STUDY

The main aim of this study is to determine the perceived competencies and needs of Agricultural Science teachers in the Zambezi region Namibia.

PROCEDURES

If you agree to participate in this study, you are requested to do the following things:

- Respond to semi-structured interviews
- Complete a self-administered questionnaire
- The completion of the semi-structured interviews and/or questionnaire will unlikely to take more than one hour of your time.

POTENTIAL RISKS AND DISCOMFORT

There are no risks associated to this study. By participating in this study, you are guaranteed that not potential for negative effects or risk of harm that include discomfort, inconvenience, psychological stress, stigmatisation and what so ever. Care shall be taken to eliminate all potential risks.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

As you are selected to participate in this study, you will get the opportunity to positively and honestly express your personal views and opinions on this interesting issue (Improving teaching and learning in the Zambezi region, Namibia: the perceived competencies and needs of secondary Agricultural Science teachers), which is of regional and nation interest. By participating in this study, you will contribute significantly to the regional and national development in the area of improving teaching and learning in secondary schools. You are guaranteed that the aspect of confidentiality will be treated at a high level and you are assured that your names and other credentials will not be taken.

PAYMENT FOR PARTICIPATION

Your participation in this study is voluntary and you will not receive any form of payments what so ever, however, your participation will be acknowledged in terms of the time and efforts that you will put in.

CONFIDENTIALITY

The data that will be collected either voice recording or with the questionnaires, will not be disclosed to any person without your written permission. The storage of the data (voice recording and/ or completed questionnaires will be safely stored in a place that is only accessible by the researcher. The password of the recording device will not be shared with any person and will only be known by the researcher.

The data that will be collected for this study can only be identified with you and shall remain confidential and will only be disclosed with your written permission or a the law permits. The degree of confidentiality will be maintained by means of safe storage of the interview (voice recorded) and questionnaires to ensure that they do not leak to any person. At the conclusion of the study, the documents and the devises will be destroyed or safely kept in a place where there is no possibility of being leaked. No personal date will be required for this study and only in the form of descriptive and discussions, so that when the results of the study are published they will not be identified by any of the participants.

PARTICIPATION AND WITHDRAWAL

You may withdraw your agreement at any time and discontinue participating in the study without fear of any kind and no penalty shall be imposed on your withdrawal. You are not renouncing your rights in any form by participating in this study.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact me: MASHEBE PERCY MASHEBE, PhD learner and researcher at Stellenbosch University, Department of Curriculum Studies,

Faculty of Education

Cell: +264811443360 or +264813030666

E-mail: pmashebe@gmail.com

Or my promoter

Prof Lesley Le Grange

Tel: +27218082280,

Fax: +27218082295

E-mail:llg@sun.ac.za).

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to [*me/the subject/the participant]* by [*name of relevant person]* in [*Afrikaans/English/Xhosa/other]* and [*I am/the subject is/the participant is]* in command of this language or it was satisfactorily translated to [*me/him/her*]. [*I/the participant/the subject]* was given the opportunity to ask questions and these questions were answered to *[my/his/her]* satisfaction.

[I hereby consent voluntarily to participate in this study/I hereby consent that the subject/participant may participate in this study.] I have been given a copy of this form.

____

Name of Subject/Participant

____

Name of Legal Representative (if applicable)

______________________________________ _____________

Signature of Subject/Participant or Legal Representative **Date**

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to __________________ [*name of the subject/participant]* and/or [his/her] representative ____________________ [*name of the representative]*. *[H*e/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [*Afrikaans/*English/*Xhosa/*Other*] and [*no translator was used/this conversation was translated into* ___________ by ______________________].

Mashebe Percy Mashebe____________ _____________

Signature of Investigator Date

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7. Appendix G: Consent form for the teacher's questionnaire

STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

IMPROVING TEACHING AND LEARNING IN THE ZAMBEZI REGION, NAMIBIA: THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY SCHOOL AGRICULTURAL SCIENCE TEACHERS

You are asked to participate in a research study conducted by:

MASHEBE PERCY MASHEBE - National Diploma in Agriculture (UNAM); HED, BED Honours (NWU); MSA, MDM (UFS); from the Curriculum Studies Department of the Faculty of Education; at Stellenbosch University. Results will contribute to the writing of a PhD thesis or dissertation, research paper and publication of scholarly journal articles. You were selected as a possible participant in this study because you are a secondary Agricultural Science teacher in the Zambezi region.

PURPOSE OF THE STUDY

The study is designed to determine the perceived competencies and needs of Agricultural Science teachers in the Zambezi region Namibia.

PROCEDURES

If you volunteer to participate in this study, I would ask you to do the following things:

Complete a questionnaire on Improving Teaching and Learning in the Zambezi Region, Namibia: The Perceived Competencies and Needs of Secondary Agricultural Science Teachers. This will be done after describing the purpose of the study to you. The aim of the questionnaire: to collect quantitative data on the teachers' perceived competencies in teaching and conducting practical experiments in Agricultural Science, agricultural teachers' qualifications, and teaching methods and availability of teaching and learning resources in secondary schools.

The questionnaire shall, with your permission, be administered to you personally by the researcher. The generated information will be transcribed and coded so that during the writing process your identity is masked. On the other hand, the coding shall enable me to differentiate you from the other participants in this study. You are assured that the information will be kept strictly confidential and a high degree of anonymity will be guaranteed. You will be permitted to withdraw from completing the questionnaire as you may wish at any time and will not be forced to disclose information that you do not want to share with me for the purpose of this study. You will not be forced to provide responses to the questions items in the questionnaire that you feel uncomfortable. The questionnaire shall be presented in English, however, you will be allowed to respond in the language that you prefer. The questionnaire shall be administered once and the duration of shall be within 30 to 45 minutes and shall be conducted in a place deemed comfortable by and to you.

POTENTIAL RISKS AND DISCOMFORTS

This study has the potential to benefit you as a participant in the sense that the results of the study may well provide you with valuable information needed for effective teaching of Agricultural Science. The study will also benefit you in a way that it could bring to the fore some perspectives and challenges that Agricultural Science teachers in secondary schools in the Zambezi region were not aware of in the teaching of Agricultural Science.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

This study has the potential to benefit you as a participant in the sense that the results of the study may well provide you with valuable information needed for effective teaching of Agricultural Science. The study will also benefit you in a way that it could bring to the fore some perspectives and challenges that Agricultural Science teachers in secondary schools in the Zambezi region were not aware of in the teaching of Agricultural Science.

PAYMENT FOR PARTICIPATION

Your participation in this study is voluntary and you will not receive any form of payments what so ever, however, your participation will be acknowledged in terms of the time and efforts that you will put in.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of means of safe storage and restricted access to information as well as the use of codes and pseudonym (for example the use of names such as respondent 'A' respondent 'B', etc.) when particular reference is made concerning participant, their institutions (schools) and any other individual associated with institutions (schools). For that reason, you should be assured that your personal identity and that of your institution (school) including the issues that you have contributed in this study shall remain strictly confidential.

Confidentiality shall be maintained even with regard to the documents containing the transcripts of the interviews. The possibility of leaking the information shall be maintained to zero and access to the data shall be restricted to me only. The information shall be kept in a lockable place, with the key to lockable facility only accessible to me. Computerized data shall be managed through a secret password, only known by me. It is also important to acknowledge that the data that will be collected shall be needed by my supervisor, in such case it would be handed over to them with the highest degree of confidentiality. My supervisor understand the ethical aspects of the Stellenbosch University and the rules related to confidentiality and shall adhere to the code of confidentiality at all possible times.

You have all the right to access your taped-recoded interviews and in case in your view, certain information are cannot be disclosed, the right is highly reserved for you in this regard. On the other hand, you and I might have to work together and assess the necessity and significance of using such information in the study.

I must mention that since this study is more educational in nature, the process of thesis writing and journal articles as well as journal publication in international accredited journals shall be part of the study, therefore, without doubt the information generated through your participation for this study shall be used. In such case, the information shall be presented in a confidential and codified manner. During the writing process, some of your statements shall be quoted directly; such statements shall not in any way identify you. The aspect of codes and pseudonyms shall be maintained throughout the study.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer and remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so. [*If appropriate, describe the anticipated circumstances under which the subject's participation may be terminated by the investigator without regard to the subject's consent.*]

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact me: MASHEBE PERCY MASHEBE, PhD learner and researcher at Stellenbosch University, Department of Curriculum Studies,

Faculty of Education

Cell: +264811443360 or +264813030666

E-mail: pmashebe@gmail.com

Or my promoter

Prof Lesley Le Grange

Tel: +27218082280,

Fax: +27218082295

E-mail:llg@sun.ac.za).

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to [*me/the subject/the participant]* by [*name of relevant person]* in [*Afrikaans/English/Xhosa/other]* and [*I am/the subject is/the participant is]* in command of this language or it was satisfactorily translated to [*me/him/her*]. [*I/the participant/the subject]* was given the opportunity to ask questions and these questions were answered to *[my/his/her]* satisfaction.

[I hereby consent voluntarily to participate in this study/I hereby consent that the subject/participant may participate in this study.] I have been given a copy of this form.

____

Name of Subject/Participant

____

Name of Legal Representative (if applicable)

_______________________________________ ______________

Signature of Subject/Participant or Legal Representative Date

IGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to ___________________ [*name of the subject/participant]* and/or [his/her] representative _____________________ [*name of the representative]*. *[H*e/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [*Afrikaans/*English/*Xhosa/*Other*] and [*no translator was used/this conversation was translated into* ____________ by ________________________].

Mashebe Percy Mashebe_______________________ _______________

Signature of Investigator **Date**

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8. Appendix H: Consent form for the follow-up interview guides

STELLENBOSCH UNIVERSITY

CONSENT TO PARTICIPATE IN RESEARCH

IMPROVING TEACHING AND LEARNING IN THE ZAMBEZI REGION, NAMIBIA: THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY SCHOOL AGRICULTURAL SCIENCE TEACHERS

You are asked to participate in a research study conducted by:

MASHEBE PERCY MASHEBE - National Diploma in Agriculture (UNAM); HED, BED Honours (NWU); MSA, MDM (UFS); from the Curriculum Studies Department of the Faculty of Education; at Stellenbosch University. Results will contribute to the writing of a PhD thesis or dissertation, research paper and publication of scholarly journal articles. You were selected as a possible participant in this study because you are a secondary Agricultural Science teacher in the Zambezi region.

PURPOSE OF THE STUDY

The study is designed to determine the perceived competencies and needs of Agricultural Science teachers in the Zambezi region Namibia.

PROCEDURES

If you volunteer to participate in this study, I would ask you to do the following things:

To allow me to conduct a one-on-one interview with you. This will be done after describing the purpose of the study to you. The aim of the follow-up interview: is to collect additional qualitative data and to assist in validating information from the teachers' questionnaire.

The follow-up interview shall, with your permission, be audio recorded in order to facilitate the comprehension and analysis of the information generated during our interaction. The generated information will be transcribed and coded so that during the writing process your identity is masked. On the other hand, the coding shall enable me to differentiate you from the other participants in this study. You are assured that the information will be kept strictly confidential and a high degree of anonymity will be guaranteed. You will be permitted to withdraw the interview as you wish at any time and will not be forced to disclose information that you do not want to share with me for the purpose of this study. You will not be forced to provide responses to the questions that you feel uncomfortable. The follow-up interview shall be conducted in English, however, you will be allowed to respond in the language that you prefer. The interview shall be conducted once and the duration of the interview shall be within 30 to 45 minutes and shall be conducted in a place deemed comfortable by and to you.

POTENTIAL RISKS AND DISCOMFORTS

Be assured that there are no risks associated with this study. It is important to acknowledge that the interview process might make you feel somehow uncomfortable in the beginning. However, be assured that there is no need to panic since my interaction with you shall be professional with no margin for harm. My intension is not to make you feel uncomfortable and in the same direction, you are requested to be truthful. You are at liberty to choose the time and venue that is more appropriate to and be assured that the interview shall be terminated if you feel necessary to do so or upon your understanding that you feel unconformable to proceed with it.

POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

This study has the potential to benefit you as a participant in the sense that the results of the study may well provide you with valuable information needed for effective teaching of Agricultural Science. The study will also benefit you in a way that it could bring to the fore some perspectives and challenges that Agricultural Science teachers in secondary schools in the Zambezi region were not aware of in the teaching of Agricultural Science.

PAYMENT FOR PARTICIPATION

Your participation in this study is voluntary and you will not receive any form of payments what so ever, however, your participation will be acknowledged in terms of the time and efforts that you will put in.

CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of means of safe storage and restricted access to information as well as the use of codes and pseudonym (for example the use of names such as respondent 'A' respondent 'B', etc.) when particular reference is made concerning participant, their institutions (schools) and any other individual associated with institutions (schools). For that reason, you should be assured that your personal identity and that of your institution (school) including the issues that you have contributed in this study should remain strictly confidential.

Confidentiality shall be maintained even with regard to the documents containing the transcripts of the interviews. The possibility of leaking the information shall be maintained to zero and access to the data shall be restricted to me only. The information shall be kept in a lockable place, with the key to lockable facility only accessible to me. Computerized data shall be managed through a secret password, only known by me. It is also important to acknowledge that the data that will be collected shall be needed by my supervisor, in such case it would be handed over to them with the highest degree of confidentiality. My supervisor understand the ethical aspects of the Stellenbosch University and the rules related to confidentiality and shall adhere to the code of confidentiality at all possible times.

You have all the right to access your taped-recoded interviews and in case in your view, certain information are cannot be disclosed, the right is highly reserved for you in this regard. On the other hand, you and I might have to work together and assess the necessity and significance of using such information in the study.

I must mention that since this study is more educational in nature, the process of thesis writing and journal articles as well as journal publication in international accredited journals shall be part of the study, therefore, without doubt the information generated through your participation for this study shall be used. In such case, the information shall be presented in a confidential and codified manner. During the writing process, some of your statements shall be quoted directly; such statements shall not in any way identify you. The aspect of codes and pseudonyms shall be maintained throughout the study.

PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer and remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact me: MASHEBE PERCY MASHEBE, PhD learner and researcher at Stellenbosch University, Department of Curriculum Studies,

Faculty of Education

Cell: +264811443360 or +264813030666

E-mail: pmashebe@gmail.com

Or my promoter

Prof Lesley Le Grange

Tel: +27218082280,

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E-mail:llg@sun.ac.za).

RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Ms Maléne Fouché [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to [*me/the subject/the participant]* by [*name of relevant person]* in [*Afrikaans/English/Xhosa/other]* and [*I am/the subject is/the participant is]* in command of this language or it was satisfactorily translated to [*me/him/her*]. [*I/the participant/the subject]* was given the opportunity to ask questions and these questions were answered to *[my/his/her]* satisfaction.

[I hereby consent voluntarily to participate in this study/I hereby consent that the subject/participant may participate in this study.] I have been given a copy of this form.

____

Name of Subject/Participant

____

Name of Legal Representative (if applicable)

____________________________________ ____________

Signature of Subject/Participant or Legal Representative **Date**

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to __________________ [*name of the subject/participant]* and/or [his/her] representative ____________________ [*name of the representative]*. *[H*e/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in [*Afrikaans/*English/*Xhosa/*other*] and [*no translator was used/this conversation was translated into* ___________ by ________________________].

Mashebe Percy Mashebe__________________ ______________

Signature of Investigator **Date**

9. Appendix I: Request permission letter

01 March 2017

To: Mr. Austin Samumpwa

The Regional Education Director

Zambezi Region

Dear Sir

Ref: Request for permission to conduct a Research

I am writing this letter to request your permission to allow me to conduct a PhD research in all combined and senior secondary schools in the Zambezi region offering Agricultural Science as a school subject. I am a PhD learner at Stellenbosch University in South Africa.

The research title is "*Improving teaching and learning in the Zambezi region, Namibia: The perceived competencies and needs of secondary Agricultural Science teachers*".

Research Hypotheses

The aim of the study is to measure Agricultural Science teachers' competencies and needs with the aim of making recommendations for improving Agricultural Science teacher education. The following null hypotheses will be tested:

$\mathbf{H_1}$: There is no significant difference between the perceived competencies of male and female Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_2}$: There is no significant difference between the perceived competencies of less experienced (less than three years of teaching experience) and experienced (three years and more of teaching) Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_3}$: There is no significant difference between the perceived needs of male and female Agricultural Science teachers in the Zambezi region, Namibia.

$\mathbf{H_4}$: There is no significant different between the perceived needs of less experienced (less than three years of teaching) and experienced (more than three years of teaching) agricultural Agricultural Science teachers in the Zambezi region, Namibia.

In vew of the above outlined hypotheses, I wish to start the data collection immediately your approval is granted. The envisaged results of this study will be of benefit to the region in improving teaching and learning of Agricultural Science and other related school subjects.

Thank you for your support.

____

Mr. Percy Mashebe

Learner number: 20670192

+264662626113 or 0853030666 or 0813030666

10. Appendix J: Permission letter from the ministry of education

REPUBLIC OF NAMIBIA

ZAMBEZI REGIONAL COUNCIL
Directorate of Education, Arts and Culture

Tel: 066/261902/931 | Ngoma Road | Private Bag 5006
Fax: 066/253187 | Govt Building | Katima Mulilo, Namibia

Enquiries: Ms **Violet Nchindo**
Reference No:

TO MR PERCY MASHEBE
UNAM
KATIMA MULILO

RE: PERMISSION TO CONDUCT A RESEARCH IN IMPROVING TEACHING AND LEARNING IN COMBINED AND SENIOR SECONDARY SCHOOLS- ZAMBEZI REGION

You letter dated 1st of March 2017 requesting as per above has reference.

Permission is hereby granted for you to conduct research within schools as indicated in your letter.

However, be advised not to interrupt the teaching and learning at those schools you intend visiting.

Inspectors of Circuits and Principals will therefore, be informed of your programme so that they may expect you within the stipulated dates.

Counting on your understanding and cooperation in this regards.

Thank you,

MINISTRY OF EDUCATION ARTS & CULTURE
Zambezi Regional Directorate
2017 -03- 08
Private Bag 5006 - Katima Mulilo

MR A M SAMUPWA
REGIONAL DIRECTOR OF EDUCATION, ARTS AND CULTURE

11. Appendix K: Approval letter SUN

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Approved with Stipulations
New Application

16-May-2017
Mashebe, Percy PM
Private Bag 19063
Matieland
Stellenbosch, WC

Proposal #: SU-HSD-004352

Title: **IMPROVING TEACHING AND LEARNING IN THE ZAMBEZI REGION, NAMIBIA: THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY AGRICULTURAL SCIENCE TEACHERS**

Dear Mr Percy Mashebe,

Your **New Application** received on **25-Apr-2017**, was reviewed
Please note the following information about your approved research proposal:

Proposal Approval Period: **16-May-2017 -15-May-2020**

The following stipulations are relevant to the approval of your project and must be adhered to:
The DESC had made comments to which it is not clear whether the researcher has responded or not. The researcher is requested to confirm whether he has responded to these comments:

1. **More detail on the sampling procedure and sampling size is necessary.**
2. **The questionnaire would greatly benefit from proper language and format editing. In question 6, the response needs to be temporary, NOT temporally. In some of the questions the answer category is only marked as "option" – a more detailed answer description would enable respondents to know what is expected of them. In question 16.6, the "Other related activities" may be too vague, and it might help to add a "Please specify" option here. All questions need to be provided with instructions to respondents.**
3. **In the interview questions, most questions are phrased in such a way that a yes/no response will be elicited, and then respondents are asked to explain their response. A more open-ended phrasing right from the start might elicit more rich data.**

Please provide a letter of response to all the points raised IN ADDITION to HIGHLIGHTING or using the TRACK CHANGES function to indicate ALL the corrections/amendments of ALL DOCUMENTS clearly in order to allow rapid scrutiny and appraisal.

Please take note of the general Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

Please remember to use your **proposal number** (**SU-HSD-004352**) on any documents or correspondence with the REC concerning your research.

proposal.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Also note that a progress report should be submitted to the Committee before the approval period has expired if a continuation is required. The Committee will then consider the continuation of the project for a further year (if necessary).

This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki and the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health). Annually a number of projects may be selected randomly for an external audit.

National Health Research Ethics Committee (NHREC) registration number REC-050411-032.

We wish you the best as you conduct your research.

If you have any questions or need further help, please contact the REC office at 218089183.

Included Documents:
DESC Report
REC: Humanities New Application

Sincerely,

Clarissa Graham
REC Coordinator
Research Ethics Committee: Human Research (Humanities)

Investigator Responsibilities

Protection of Human Research Participants

Some of the general responsibilities investigators have when conducting research involving human participants are listed below:

1 Conducting the Research. You are responsible for making sure that the research is conducted according to the REC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research. You must also ensure that the research is conducted within the standards of your field of research.

2 Participant Enrollment. You may not recruit or enroll participants prior to the REC approval date or after the expiration date of REC approval. All recruitment materials for any form of media must be approved by the REC prior to their use. If you need to recruit more participants than was noted in your REC approval letter, you must submit an amendment requesting an increase in the number of participants.

3 Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the REC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least five (5) years.

4 Continuing Review. The REC must review and approve all REC-approved research proposals at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period.** Prior to the date on which the REC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in REC approval does not occur.** If REC approval of your research lapses, you must stop new participant enrollment, and contact the REC office immediately.

5 Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the REC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written REC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

6 Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research related injuries, occurring at this institution or at other performance sites must be reported to Malene Fouch within five **(5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch Universtiy Research Ethics Committee Standard Operating Procedures. All reportable events should be submitted to the REC using the Serious Adverse Event Report Form.

7 Research Record Keeping. You must keep the following research related records, at a minimum, in a secure location for a minimum of five years: the REC approved research proposal and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the REC.

8 Provision of Counselling or emergency support. When a dedicated counsellor or psychologist provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

9 Final reports. When you have completed (no further participant enrollment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the REC.

10 On-Site Evaluations, Inspections, or Audits. If you are notified that your research will be reviewed or audited by the sponsor or any other external agency or any internal group, you must inform the REC immediately of the impending audit/evaluation.

12. Appendix L: Extracts of the transcripts of the different research participants

Keys: Agricultural Science Teacher – AGRICULTURAL SCIENCE TEACHER, CS – COMBINED SCHOOL, SS – SENIOR SECONDARY SCHOOL

1. P1'S transcript

School: CS1

Interviewer: Yes, good morning **P1**

P1: Good morning **Mr.**

Interviewer: Yes, thank you very much for time and for accepting to be interviewed.

P1: My pleasure.

Interviewer: Thanks, as I briefed you earlier, am Interviewer from Stellenbosch University and am doing a PhD in the department of curriculum studies and focusing on improving teaching and learning of Agricultural Science Teachers of agriculture in the Zambezi region. In fact, we look at the perceived competencies and perceived needs of agricultural science Agricultural Science Teachers. Now to waste no time, eeh I have got few sets of questions that I have that I want you to give me your knowledge about and it have to be from yourself, yes. So the first one is, how many years of teaching experience do you have?
Mr Simasiku: I have 5 years teaching experience.

Interviewer: Ok, the second one is what motivated you to teach agricultural science at combined school in the Zambezi region?

P1: Aaah, with the subject agriculture, we know agriculture is the back-borne of the country. So, I saw the need of educating the citizens that in future they can do something in agriculture to make sure there is food in the country and also to provide employment for other citizens. Therefore, on the secondary level those are people which are near the work force and who have a better understanding.

Interviewer: Ok thank you. Other than agricultural science, which other subjects are you teaching at school?

P1: I also do social science subjects but that is on a minor level, which is not on the school grade level. I also give social studies on the above upper grade, I mean lower grades.

Interviewer: Now which lower grades are those? May you be specific?

P1: The lower grades I teach 5, 6 and 7 but still on the same school I can also, I will teach life science.

Interviewer: Ok, thank you. Do you feel that you are competent enough to teach agricultural science?

P1: Honestly I am.

Interviewer: Ok, explain what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learner's achievement than less experienced agricultural science Agricultural Science Teachers in a similar teaching context:

P1: With the experienced agricultural science Agricultural Science Teachers, they have a know-how of both theory and practical, but with the unexperienced Agricultural Science Teachers, they would not do much. So I would realize with the experienced Agricultural Science Teachers in their side of content.

Interviewer: Ok thanks. In your view, how do you think that Agricultural Science Teachers do better as they gradually got the necessary teaching experience?

P1: Yes, teaching is done in everyday life, you get experience every day. In fact, you are graduating everyday as you teach the subject. So the more you teach, the time you spend on the subject you will become knowledgeable and more equipped to subject content.

Interviewer: All right thank you. What are your views about perceptions that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in either teaching agricultural science as a school subject in combined or secondary school?

P1: The competency is more less the same but you find that agriculture is a, it is competency subject that have the theory and practical, so with the male yes they can do both, male and female they can do both well in the theory but it come to practicals you will find that now male become more competent than female, because female can't do work than men do.

Interviewer: Ok, in your view what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a school subject?

P1: Aaah, you have to have the knowledge of the subject first then once you have the knowledge of the subject that's when you can evaluate on what you have taught your learners and based on the evaluation giving them work, that's where assessment can come in.

Interviewer: Mmmh, in what way did the agriculture training you underwent helped you to make you a complete Agricultural Science Teacher in agricultural science?

P1: Oooh, that training I underwent covered everything that am facing now in the work force where both the theory and content knowledge was given to me, it is what am using to teach.

Interviewer: Ok, thanks, now the second set of questions we will look at the needs of you as an agricultural science Agricultural Science Teacher. What are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effectively; you are an effective agricultural science Agricultural Science Teacher?

P1: Aaah, there are many needs in this subject as I have mentioned that it's the content and practical subject, aah, mostly what is done is theory in classes and less practical is done and also there are no workshops conducted whereas different ideas from different Agricultural Science Teachers, stakeholders can come together and share these things, so we need workshops for agricultural components, for practical and others would be, and also tools that can be used in the subject for practicals.

Interviewer: So generally, that is what you need?

P1: Yes, for practical part, we need workshops, rooms and also the tools.

Interviewer: Ok, thank you. In your view how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teacher differ from the perceived needs of experienced agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum?

P1: Aaah, the experienced Agricultural Science Teachers the deliver accordingly and they are able to notice where they are doing it wrong and where they should do it right, but with the unexperienced Agricultural Science Teachers they keep on doing the same mistakes and same mistakes. By mistakes, I mean not doing it right. So, that also you will find that it mostly comes as the results of learners not performing well, it's because of the unexperienced Agricultural Science Teachers compared to experienced Agricultural Science Teachers.

Interviewer: So now what do you say about their needs, eeeh?

P1: Their needs, they should just be brought in in workshops and even for short trainings also to put them in line with the changes in the subject.

Interviewer: Ok, now in what way do the perceived needs of male agricultural science Agricultural Science Teachers differs from the perceived needs of the female agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum in schools?

P1: Aaah, like I have said there is a differences on the needs between the female and male is just mostly on the practical part, the practical component would require more efforts which is done by male Agricultural Science Teachers and for female, less efforts.

Interviewer: Ok, thank you. What leadership qualities do you think you need to teach agricultural science, you need, to teach agricultural science as a school subject to ensure the continuation of its reputation in your school?

P1: Aaah, the leadership style which is there is that colleagues just have to focus even if they feel irritated in the subject just need to focus unless if something becomes personal but focus is what can make this subject improve.

Interviewer: Ok, thank you very much. Eeeh, the last question is what changes do you think you need to bring to the teaching of agricultural science in your teaching career?

P1: Aaah, just enhancing on the practical part, the practical component is mostly not done in learning and teaching. So bringing more practicals would really help for our pre-receivers which are learners to understand more about this subject, practical part because mostly what is delivered is theory.

Interviewer: Ok

P1: Yes, even some of the projects given, are given in a practical way but are not conducted in that manner, so I would suggest bringing practicals efficiently as theory is given.

Interviewer: Good, thank you very much **P1.**

P1: you are welcome sir.

Interviewer: Thanks, mmmh.

2. P2's Transcript

School: CS2

Interviewer: Good morning **P2**

P2 : Good morning sir

Interviewer: Yes, thank you very much. I am Interviewer Percy from Stellenbosch University am currently doing my PhD in the department of Curriculum studies. The topic am focusing on is improving teaching and learning in the Zambezi region of Namibia and the perceived competencies and needs of secondary agricultural science teachers. So we have got got a set of questions that am going to ask you and the one that are related to the perceived needs and the others ones that are related to perceived competencies. So, to begin with, the first question is, how many years of teaching experience do you have?

P2 : I have 15 years teaching experience

Interviewer: Good, thank you very much. What motivated you to teach agricultural science at combined school?

P2: Thank you very much. There is a call of me teaching agriculture at combined school. I find that the performance of our grade 10 learners, grade 9 learners were not pleasing, so I feel that I would improve the education in terms of teaching agriculture because I would focus on the practical activities, thank you.

Interviewer: Thanks, other than agricultural science which other school subjects are you teaching at your school?

P2: Pardon

Interviewer: Apart from, other than agricultural science which other school subjects are you teaching at your school?

P2: Good, am able to teach Life science grade 8-10

Interviewer: Ok thank you. Do you feel that you are competent enough to teach agricultural science?

P2: Yes quite sure, because am a very qualified teacher who was trained for 3 years and also continued with my further studies with the same faculties.

Interviewer: Ok thank you very much. Explain what experienced agricultural science teachers do more effectively in nurturing learners achievement than the less experienced agricultural science teachers in a similar teaching context?

P2: Ok thank you very much. An experienced teacher for Agriculture in order to enhance better education to his/her learners must conduct or should always conduct the experiment and must also continue looking or going back into the examiner's report in order to know the weakness of the previous and then by doing that and you should continue with the research because today's modern knowledge so that you shouldn't be left behind.

Interviewer: Ok, in relation to experienced and less experienced, now if I can repeat that question for you to elaborate more.

P2: The experienced teacher for agriculture in order to achieve the best, number one is to give more topic task, he has to assess classwork, he has to assess homework regularly and also including the topic task. This experienced teacher will be able to determine either learners have mastered the basic competency of that specific topic, that will make him move or her move into the next topic and then a less experienced teacher just concentrate only on the topic task. Sometimes it’s rare for them to give topic task or topic tasks should also explain or meet the standard of the required basic competency because if a teacher is able to calculate the amount of work given to a learner in relation to the amount of marks so that will give a clear guidance to the teacher in order to improve the results. That's the difference between experienced one and unexperienced one but more again you will find that experienced one know how the learner normally answer the question at the end of the year then you emphasize into that one but for the person who is less experienced will just be giving test not looking forward what made the learner fail previously, if I may stop there, thank you.

Interviewer: ok, in your view, if I can trouble you a bit, what do you mean by topic task?

P2: a topic task is an activity that cover the basic topic competency of a taught topic not only that one, you also summarize the question , you should always also include the practical activities in that topic task, all the basic competencies looking into the domains one, domains two and three, the less difficult question and the medium difficult question must all be covered into a topic task.

Interviewer: Ok thank you in your view how do you think that teachers do better as they gradually gain the necessary teaching experience?

P2: Once more again?

Interviewer: In your view how do you think that teachers do better as they gradually gain the necessary teaching experience?

P2: Ok thank you very much, they may do better if they are involved into educational set work on national, starting from the region, the school if teachers are engaged into the series of activities that happens within their subject they can also do better in future but if these teachers are left aside, they are not involved, they always receive the question paper at the end, teacher will remain not performing very well because they are not exposed.

Interviewer: Ok, thank you, what are your view about the perception that male agricultural science teachers are more competent than the female agricultural science teacher in teaching agriculture as a school subject in either combined or secondary school?

P2: Thank you very much, with me I don't value that one that the male teachers are more competent than the female teachers because it depends on the attitudes, if a female teacher is more interested into teaching that subject may perform very well, like in my case I can challenge that am more competent than the male teachers because am able to follow my syllabus, my scheme of work, I give myself time, I thank my learners, I ask them question, I give them extra work, so not necessarily that the male counterpart are the more competent no, it depends on an individual.

Interviewer: Ok, thank you very much, now the other question is, in your view what are the qualities that of a competent teacher in the assessment of learners in agriculture science as a school subject?

P2: Ok, a competitive teacher should be able to plan his or her own activities from the beginning of the year, a competent teacher should be able to interpret the syllabus in terms of the basic competency, a competent teacher should be able to give enough work and this work must be controlled time and again and again a competent teacher should be able to give feedback as required, if I may stop there, but one can still go ahead.

Interviewer: Thank you very much, in what way did the agricultural training you underwent helped you to make you a competent teacher in agricultural science?

P2: ok thank you very much, the training that I took that helped me to become a competent teacher which was BETD, so we were exposed to different colleges whereas the activities that we were conducting in terms of the experiments, most of the experiments which are being given into the syllabus from grade 8 to 10 we were exposed to them we were able to conduct them, and then would follow and see the results of either what is being written in the textbooks is how the experiment result can be, so the college that gave us this knowledge, I feel that myself it's the college because if I compare myself with these newly graduated learners, we are not the same because them they are just taught theory than practical, so practical you learn more, you gain more skills as you keep on proceeding with your subject.

Interviewer: Thank you very much, so the next section of our discussion here is related to the perceived needs of you as an agricultural science teacher, what are your needs as an agricultural science teacher that will ensure that you are effective in teaching the subject?

P2: Thank you, the needs of a teacher in order to continue teaching, in order to achieve the required target of the subject, number one the preparation you need to develop preparation, not only that one, you need time, you may have time which is slotted on the time table but you still need extra time where as you should continuously seeing these learners in order to help them again an agriculture teacher would need more charts and cocky pens where as you don't have the facilities where you can project your lessons, so at least if charts are there you will be able to speed up with your work, not only that one. You still need to use more papers because in every lesson you need to give an individual activity and if it is controlled properly and more quality then you will be able to progress. Not only that one, you still need the charts though I have mentioned the charts, cock pens, you still need the examiner's report, the examiner's report of the previous 3 years at least you will be able to analyze at least what you have been asked, and then do you understand the domain being used to understand, do you understand the commanding words being used in the question paper, if you do understand those should drive you towards achieving the targets. So you will also need the syllabus next to you, you also need different resource books because in agriculture you don't need to use one specific textbook but you need more, also you need to google time and again, you go on internet, check what is the latest in that specific topic that can make you a best teacher, thank you sir.

Interviewer: thank you, in your view how do you think that the perceived need of less experienced agricultural science teachers differ from the perceived needs of experienced agricultural science teachers with regard to the implementation of agricultural science curriculum?

P2: I don't know if I understand you very well, they differ because the perceived one will need more orientation into teaching the subject. We still need more meetings, more workshops, mini workshops of which time cannot be given to those perceived ones unless if the school is able to provide small group where they can discuss, where they can share different knowledge into a specific topic that can help, otherwise there is a wide difference between the two.

Interviewer: Ok, so there is a very big difference between the two, the less experienced teachers and the experienced?

P2: Yes sir

Interviewer: Do you still need to add more on that?

P2: Yes, just to add more as I have said in the previous question where I said the less perceived ones are not exposed. The examination is a broad thing whereas teachers who are going for marking grade 7 you will be more experienced than before and then these other teachers who are teaching agriculture they are not fully qualified. Maybe they are teaching agriculture because of their interest, you know once you teach a subject because you are interested to it, it might happen that you cannot interpret very well the basic competency so in order to improve that, they need to be sent for workshops, they need to be sent for extra training. On Job training must be given to them and then also peer caution should always be effective at that particular school that will narrow the difference between.

Interviewer: Thank you. Now in what way do the perceived needs of male agricultural science teachers differ from the perceived needs of female agricultural science teachers with regard to the implementation of agricultural science curriculum in schools?

P2: Ok, thank you. Though both somewhere they can tie but they differ in terms of time slot. You find that the female have more time into the learners compared to the male ones. The male ones, pardon me there sorry. The female ones, I feel that they have more time into their work than the male counterpart. Why do I say so, I say so because you find that males they have many things into their mind. Some of the male counterparts, they are not yet married so they look into the girls as their wives. That's why we have this relationship that happens between teachers and learners. So I feel that the female counterpart is better than the male.

Interviewer: Ok

P2: Yes

Interviewer: So it means, you mean the needs of the female teachers and the needs of the male teachers are different?

P2: Yes, they differ.

Interviewer: Ok, do you need to add more a bit on that one if you want?

P2: No

Interviewer: Thank you very much, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure that the continuation of its reputation in your school?

P2: Repeat that.

Interviewer: What leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its reputation in the school?

P2: Thank you very much. In terms of leadership agricultural teachers, they need more, they need all the leadership styles or qualities. Number one, they should know how to handle discipline because not all learners that you will find in their class are well disciplined, how they are going to handle that. So they need that quality, the skills to handle such kind of behavior.

You find that there are some other learners who are not able to listen to a teacher more especially if they find that this teacher is more of their a bit size, 2 years difference between the teacher and the learner, so a teacher must be qualified to handle such type of behaviors not only that one, a teacher should be able to stand for the truth because not all the teachers are 100% correct to the subject, no. Remember these learners are also exposed from where they are coming from, so if you are the teacher you say I have the sole knowledge, then there is always disagreement between the learners and teachers. So the best way is, a teacher should be able to compromise, a teacher should also be able to listen to what the other learners are talking or give time to the learners to debate on issues that can help a teacher to develop also. Let's not say that learners are totally empty, no, so they should have the skill of handling the learners. Learners they come from different societies, so without proper qualities of a teacher, you won't handle, you will run away from the class, I don't know if I have answered you there.

Interviewer: Thank you very much. What changes do you think you need to bring in teaching of agricultural science in your teaching career?

P2: Ok thank you. If it was me, the first thing I will look at is the laboratory for agriculture whereas all the equipment should stored and all the schools where there is agriculture should have a proper garden which is well monitored whereas learners take more roles than the teachers. The teacher should just give you information and let the learner practice what they learn into the different phase. Not only that one, learners should be exposed like in grade 10, grade 8, they have introduced conservancy, let's not talk conservancy in the class, take the learners go out there and expose themselves, so that they should know that this is the conservancy. They should interview parents, see what they are benefiting from the conservancy. From doing so, we look at the ministry of agriculture, the side of water supply whereas because agriculture we have a chapter whereas we talk about water technology or water supply. So these learners we can't talk about the elbow in the class, will they find an elbow in the class? No, we expose them outside there where they can't go and interview the people who knows this is an elbow, what's the difference between an elbow and a reducer that can help also. So if it was me then I could slot or I could just have an action plan from the beginning of the year, from this day to this day learners will do this and from this to this you will be able to do this but it depends on the facilities, do we have enough time, do we have facilities to conduct that?

Interviewer: Thank you very much for your valuable time.

P2: Thank you sir, call back again.

Interviewer: Thank you.

3. P3's transcript

School: CS3

Interviewer: Yes good morning **P3**

P3 : Good morning sir

Interviewer: I am a learner at Stellenbosch University, am registered for a PhD in curriculum studies focusing in agricultural science as a school subject and also more precisely on improving teaching and learning of agriculture. Looking at the perceived competencies and needs of secondary school agricultural science Agricultural Science Teachers. So, in fact am requesting you to be as open as you can to give the information as you can so that the report that will be written will able to capture the needs of Agricultural Science Teachers, yes. So, I have got 2 parts of the questions, the first part is the perceived competencies and the second part is related to the needs of the Agricultural Science Teachers. So, to begin with, how many years of teaching experience do you have?

P3 : This is the 25th year in the profession of teaching, mmh even though when I started I started teaching primary which was Grade 4 to 7 then as from 1996 it's when I started teaching at junior secondary school, junior secondary phase from Grade 8 to 10.

Interviewer: Now what motivated you to teach agricultural science at combined or secondary school?

P3 : Eeeh that is my specialization in agriculture.

Interviewer: Mmmmh

P3 : The reason why am teaching it at a school level it is because I specialized in it.

Interviewer: Yes

P3 : Yes

Interviewer: Eeeh, P3 tell me, other than agricultural science which other subjects are you teaching at your school?

P3 : Eeeh this year am just teaching agriculture but for the previous years I remember 2 years back I was also teaching geography grade 8-10.

Interviewer: Oh ok.

P3 : Yes

Interviewer: Do you feel that you are competent enough to teach Agricultural science?

P3 : Yes I feel so because eeh, through experience I was able to produce learners those who could also pursue the field of agriculture at tertiary level, so I feel am very competent.

Interviewer: Yes, thank you P3 . Explain what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learner's achievement than less experienced agricultural science Agricultural Science Teachers in a similar teaching context?

P3 : What I have realized so far is that an experienced Agricultural Science Teacher is that he can condense the syllabus, an inexperienced Agricultural Science Teacher he might be wondering, he might be touching here and there without knowing exactly what are the needs of the syllabus, in case of an experienced Agricultural Science Teacher you will find that by heart he can even outline what are the needs of the syllabus, the basic competencies and everything. So when he refers to the syllabus of the scheme of work he just does that for the sake maybe he might forget something otherwise everything is there and is even also well vested with the knowledge. What is needed is just to implement that knowledge.

Interviewer: Yes, in your view, how do you think that Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P3 : Yah, that is the issue because when you start teaching the subject you are also learning. There are certain things that you did not know so as time goes on, you start to learn. From learning you can even device your own aspects that you can use in the subject so gradually experience will help you to learn more and also to add more on what you have so that is the difference that I see. So when you start at least you are not very much well vested with the knowledge than when you are experienced because you increase day by day knowledge wise.

Interviewer: Yes, thanks. What are your views about the perception that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary schools?

P3 : Yah, that might true even though it is not true because what I have realized so far even in our region you will find that on rating wise you will find that the female Agricultural Science Teacher there are the ones which are doing good even though the perception might be true in sense that you find that this subject is very practical it needs a lot of physic so the male Agricultural Science Teachers that forms part of their lives so in case of the female Agricultural Science Teachers maybe some are not even interested. In some of the fields like handling cattle, like raising chicken, things like those you will find particularly male Agricultural Science Teachers maybe interested but with the female Agricultural Science Teachers you will find there are, they might be some hiccups here and there but the reality what I have realized is that the performance between both sexes male and female there are just the same. Yes, that is what am realizing in the region.

Interviewer: Yes, in your view what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a school subject?

P3 : Yes the quality there when it comes to qualities I might say agriculture is a practical subject. So being a practical subject the first thing that the Agricultural Science Teacher should know is that you should be able to combine the 2 theory and practice together so that at least learners do not only learn theoretically, what they learn theoretically at least they should be able to do them or take them into practice. This is the thing I have realized that the two that cannot be separated (bell rings) learners need the knowledge. Learners need the skills also to apply the knowledge that they have gained so in other words they have to do a lot of practice then when it comes to skills, a Agricultural Science Teacher here should be very initiative, should be able to compile some worksheets from the theory that can be implemented practically so that at least there is cohesion between the two so that ability should be there. The ability to draw or to compile worksheets so that the two can work together, maybe let me end there.... (Laughter).

Interviewer: Thank you, in what way did the agricultural training you underwent helped to make you a competent Agricultural Science Teacher in agricultural science?

P3: Aaah, for sure I underwent a training but when you undergo a training you will not learn a lot of things. I remember at the training you will find there is a lot of theory, the practical is less. So, nevertheless at least we learnt something on practical side which is helping us also to implement or to do a lot of practice on different topics. The knowledge that we gained at least it is able to help us to be able to compile worksheets to be able to plan projects, to be able to plan practicals. I think the training has helped us very much.

Interviewer: Thank you, the second section of our discussion relates to the perceived needs of agricultural science Agricultural Science Teachers. What are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P3 : Yes, for sure the first need, we need the learning materials and those are very much common in schools but our most highest challenge is the resources, the tools that we also for such a school level we need to have agricultural tools, ones for crop farming other ones also for animal farming all these aspects we need to have them but you will find that in our schools we have the learning materials yes but when it comes to these other resources like the tools, we have to struggle because the school do not have of funds so the few tools that you have with so many learners. Anyway it is good but it was better that we could have enough so that each one can do the training at the same time rather than just one hoe for 10learners, (Interviewee laughs) maybe let me end there.

Interviewer: Ok

P3: Mmmh..

Interviewer: Thanks, in your view how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from the perceived needs of experienced agricultural science Agricultural Science Teachers with regards to the implementation of the agricultural science curriculum?

P3: Yes, that might be true because if someone is experienced at least he knows his needs because he has been teaching the learners and realized that when I handle this topic I need A, B, C, D, so he can be even in a better position to acquire some or even to improvise because he has an experience and he knows that this is a need. In case of a less experienced Agricultural Science Teacher, he still has to less what are the needs that should be there as he is teaching and has to divide the plan about how to get them so it is going to take him sometime to cope up because he is still have to find out first from the learning material what are the needs and the needs also you need to plan how the needs so you still have about 1 to 2 steps. In case of an experienced Agricultural Science Teacher, he knows exactly his needs so the only way is to just get them. It is far of yes when it comes to what, to planning and also getting the needs.

Interviewer: Ok thanks, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its repetition in your school?

P3: Yes for sure that is very true, one as I have indicated earlier, agriculture is not just classroom bound subject you have to go out, so that is a basic need on itself. So, there is such a need that or there is a need for a Agricultural Science Teacher to have the skill of applying theoretical and practical approach to the subject so that one I think it helps much because a learner when he finishes school when he is out in the field he just needs the knowledge that has to use in the field. The main emphasis, the main work is in the field not in class. Yes, so those qualities it is a great need that you should be able to correlate the two, the theoretical and the practical knowledge.

Interviewer: Ok, so lastly P3 can you tell me what changes do you think you need to do or to bring to the teaching of agricultural science in your teaching career? (There is noise in the back ground.

P3: Yah the only need the way I see it is on the planning section as a school and agriculture as a department at the school it should be well resourced. Well-resourced in terms of learning material, in terms of all the tools which should be used in the subject example an agriculture Agricultural Science Teacher apart from the learning material should have his own store room at least where he has to keep all the tools that he can use when there is a need and also one aspect. The other change is that most of the practicals that we do in schools, you will find that there is no worksheets. So a worksheet in other words is also a pre-requisite because it is going to equip learners that they can carry out those activities at their own even if a Agricultural Science Teacher is there is just there maybe to assist here and there. As it isles indicated there is a great need at least to teach Agricultural Science Teachers on what, compiling worksheets for practicals as well as a need also to have a room full of all the equipments and that room should just be controlled by that person. Yes, because you will find the forks, the spade, the whatever they get lost maybe when they are mixed up with the other departments in the school. So maybe that is the only aspect which I have seen there is a great need on it devising some worksheets so that learners at least can carry out some experiments, the practicals, the projects on their own. Then furthermore should we have a room vested with all the tools and implements that we need for practical activities. Furthermore also, maybe also to upgrade our science kits because with agriculture sometimes we need to test soil, we need to test whatever so all those aspects also, So our science kits for agriculture science kits should also be available so that we not just talk about soil particles but learners should see them using the magnifying glass using whatever form if they are practicals they have to be beakers testing A, B, C the things like those, maybe they can help. These are the things that I feel maybe they have to be there in schools just to boost the performance of this subject in schools.

Interviewer: Thank you for your valuable time P3 .

P3: Thank you sir.

4. P4's transcript

School: CS4

Interviewer: Eeh, good morning **P4**

P4: Good morning sir

Interviewer: Yes, Eeeh I am a learner from the University Stellenbosch, Eeeh, I am doing my PhD at that that institution. Eeeh so I am here to collect information related to the perceived competence Agricultural Science Teachers agricultural science Agricultural Science Teachers and their needs. So I am requesting you to be as open as much possible so that you can give the information as as you can. Eeeh you may feel free, the information will be kept as confidential as possible and it will only be known by me the Interviewer and you the interview. So to begin with, eeeh I may you tell, how many years of teaching experience do you have?

P4: 35 years' teaching experience, yes.

Interviewer: What motivated you to teach agricultural science at combined and or secondary school?

P4: I think during my time when I was still schooling, I had the desire to become an agriculturalist. So then practically I found it withhold to agriculture so that I may be able to give knowledge to my learners so that they may be able to do agriculture as well even at home. Thank you.

Interviewer: Other than agriculture, which other school subject are you teaching at your school?

P4: I am teaching Life Science as, though this year I have given it to someone. I also able to teach biology, because it is in line with agriculture. Yes,

Interviewer: Ok, do you feel that you are competent enough to teach agricultural science.

P4: Veery much, competent become I am doing very good in agriculture at my school. From wherever, I taught they always perceive very well.

Interviewer: Ok, eeeh P4 , can you explain what experienced agricultural Agricultural Science Teachers do more effectively in nurturing learner achievements than less experienced Agricultural Science Teachers in a similar context?

P4: Yes you would find that experienced Agricultural Science Teachers they have knowledge on the lesson not theoretically buy as well as practically because in agriculture we believe that learners learn more if they see, hear and touch things by themselves and feel the. If they do not touch the soil they do not crop crops so there is no way they will be able to learn agriculture very well. Less experienced Agricultural Science Teachers they just go on teaching the syllabi as well as the textbook just in the class by the situation but when it comes to outside situation they do not do anything.

Interviewer: Hmmm Ok, in your view how do think that Agricultural Science Teachers do better when they gradually gain the necessary experience?

P4: Yes because learning has does not have an end, as years comes on, as you are busy learning you will find that you will learn a lot of experiences from different learners and different Agricultural Science Teachers that you come across.

Interviewer: Ok, now what are your views about the perception that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary schools?

P4: Yes, this is a, you find that when it comes to practicals eeeh unlike for now we were laying the pipeline for the garden and community hostel you would find that the ladies they are not aware on these connections, the different connections that is done in agriculture with male because they are hard work they are able to learn and to connect, do the connections by themselves.

Interviewer: Ok, in your views what are the qualities a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a school subject?

P4: Eeeh the competent Agricultural Science Teacher will be able to design a worksheets that will be able to guide the learners when they are doing practicals for assessment, so that at least you look at whether the learners understand the questionnaire on the worksheets, they are able to fill it to follow the instructions as well as do the practicals that they are being told or instructed by the worksheet.

P4: Yes sir

Interviewer: so eeeh in what way did the agriculture training you underwent helpd to make you to become a competent teaches in agricultural science?

P4: Eeeh, well when I was doing my HED with the University of South Africa, cell ring, eeeh wee did practicals because we went to Pretoria where we were doing these practical activities. So I was very much motivated, though up until to now I am still failing to makeup a greenhouse, but the were I saw it that side I was able to make it, but due to financial constrains I failed, but to some extent when I was still doing Life Science I did the practical one on the greenhouse that we did with plastic papers etc but it worked effectively so that how I was motivated with agriculture.

Interviewer: Ok, thank you very much, the second component of our discussion, is/are related to the perceived needs of agricultural science Agricultural Science Teachers in the Zambezi region. The first question also goes as follows: what are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P4: So our needs eeeh, are some of the chemicals that are used in practical activities, because you would will find that we do not have laboratories at/in our schools. Even in town we do not have laboratories where we can take our learners so that at least they do some of the activities that they do not see at school that we do not have, that maybe they could learn it outside there, so as I was doing BED with VISTA University, there were/there are kits that they use to give us which is written SOMASET educational. So these kits were fully equipped with the practical that I can do in Agriculture, because it is kit that you can do even in the bush area, you will be able to test for example the soil pH of the soil with your learners you can able to do it, and some of the activities whether you indicating know the universal indicators so that the learners can able to see them, so but in our region we do not have these kits, if we could have them learners could really learn and enjoy agriculture. Thank you.

Interviewer: Yes, in your view how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from the perceived needs of experienced agricultural science Agricultural Science Teachers with regard to the implementation of agricultural science curriculum?

P4: Eeeh hopefully I think that the experienced Agricultural Science Teacher, you know even when some resources are not there he will be to use his experience to get resources, but with an unexperienced Agricultural Science Teacher since he is still struggling and know which subject or textbook can be used so he will struggle to get the necessary information that he may be able to use in order to support the teaching and learning situation to go through successfully. Thank you.

Interviewer: Ok, in what way do you the perceived needs of male agricultural science Agricultural Science Teacher differs from the perceived needs of female agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum in schools?

P4: Well I think in this regard you would find that s teaching concerned, eeeh the qualities of a male and female they will look the same even in the delivery but will just only differ on activities. Because some in the practical activities, some of the work that can be done by a male, a female cannot do it, otherwise with the teaching and learning situation, both they can do the work effectively. Thank you.

Interviewer: Ok, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its reputation in your school?

P4: Eeeh, I think since I said that education never gets old or does not end in life, eeh it is good to have sometimes you know the workshops you they are very important in order to retrieve something that you wanted to forget so you will be able to learning from others. Eeeh this peer coaching also as well is very important so that at least you pair with your colleague so sometimes he does the teaching and you listen to him and you also do the demonstration he listen then you advice here and there, so that is why it is very important.

Interviewer: Ok, now eehh if I can make a follow up there, what qualities do you need/what leadership qualities do you specifically need.

P4: So with the leadership, with the leadership, we need motivation in the way that as a Agricultural Science Teacher at least if eeh you are inspired by your work mates so that you work hand in hand with others, so you will have good qualities, secondly you must be an exemplary, eeh when you give an activity you to make some follow ups to see that this activity is adhered to or when you, you know you give someone to do the work for you while you were absent when you come back you should find that at least see to it that the work is completed thoroughly or not, so you have to do the monitoring activities as well.

Interviewer: Ok, thank you very much. The last question is what changes do think you need to bring to the teaching of agricultural science in your teaching career?

P4: Eeeh I think the changes that I was looking at is to try and do more practicals because these practicals are helpful in the sense that even when a learners does not complete grade 10 and then so when he that learner is at home he will be able to survive because agriculture is a practical subject so when the skills we teach the skills to learners how to grow the crops under horticulture so that learner will be able to survive even when he is not working he is at home he can also do self-employment, because of these practicals activities that learnt from school.

Interviewer: Ok, thank you very much for you valuable time P4

P4: Thanks a lot (Laughter)

5. P5's transcript

School: CS5

Interviewer: Eeeh good morning **P5**

P5: Good morning sir.

Interviewer: Yes, I am an Interviewer from Stellenbosch University, I am currently doing my PhD with the University of Stellenbosch and I am here to collect information with regard to eeeh improving teaching and learning in the Zambezi region. More particularly the perceived needs and competencies for agricultural science Agricultural Science Teachers.

P5: Hmmm

Interviewer: So we have set of questions that we are going to go through and they are divided into two sections. The first section talks about the perceived competencies and the second set talks about the perceived needs, perceived needs of Agricultural Science Teachers. So eeeh you have to be very free in expressing your views and speak as you can to give the information that is needed. So to begin with, eeeh, how many years of teaching experience do you have?

P5: I have been teaching for 7 years now.

Interviewer: Ok

P5: Yes sir

Interviewer: the second question goes as follow: What motivated you to agricultural science at combined school and or secondary school?

P5: What motivated me most is the the the (stammering) when I look at the background of our region, we lack more agriculturalist more especially extension officers in our region and also as the backbone of the country I saw it important, it is better for me to take agriculture so that some of the learners they may become extension officers and so on and so on.

Interviewer: Ok, thanks, other than agricultural science, which school subject are you teach at your school?

P5: I am currently teaching 4-7 English.

Interviewer: Do feel that you are competent enough to teach agricultural science?

P5: With the few knowledge that I am having, I feel that I am competent because with all the skills that I got from college, I feel there is nothing wrong with teaching agriculture, I am competent.

Interviewer: Ok, eeeh may you explain eeeh what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learners' achievements than less experienced agricultural science Agricultural Science Teachers in a similar teaching context?

P5: Aaah, the experienced Agricultural Science Teachers always do they impart more knowledge and eeeh practical activities because agriculture is not only in class, it is both practical and aaah theory so. Unexperienced Agricultural Science Teacher will concentrate in both categories which is eem practical and theory, while inexperience Agricultural Science Teacher will concentrate on theory because he lacks maybe understanding or maybe know how.

Interviewer: Ok, in your view what do you think Agricultural Science Teachers do better as the gradually gain the necessary teaching experience?

P5: For Agricultural Science Teacher to do better amah to improve more they must always go to for refresher courses as it used to be called before ever time as we are living in the world of change many things are changing, so we need to be updated and acquire new knowledge as the world is round we need to change also every time and then.

Interviewers: Ok, now so how do you think Agricultural Science Teachers do better as they gradually gain the necessary experience?

P5: What I think, maybe I am not getting the question well!

Interviewer: What am saying is that (Repeating) in your view how do you think Agricultural Science Teachers do better as gradually gain experience? You know when you epee some other people are saying eee when you get experience you will be able to do this and this and this.

P5: Yeah with experience, you find that more Agricultural Science Teachers they do better because they have the vast knowledge of the previous knowledge, and they will do better because they improve from what they have learnt and add more from what they are going to encounter in the future and with the experience that they are having. Somebody who is having more experience is better than that one who is coming right away from school, because he have ways and means how to teach more especially as we know in class learners are not the same so the one with experience will teach learners to understand all of them despite of their differences. Hmm.

Interviewer: Ok, what are you views about perceptions that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary school?

P5: For me I do not see there is a difference there because it just depends to the commitment of the two, if aa female Agricultural Science Teacher is more committed I think it will be she will teach better than a male Agricultural Science Teacher, but for male Agricultural Science Teachers they are more competent yes because they also do practicals more efficiently effectively than the female Agricultural Science Teachers, because the female Agricultural Science Teachers they will be afraid of doing other practical activities than the male Agricultural Science Teachers.

Interviewer: Ok, in your views what are qualities of a competent Agricultural Science Teacher in assessment of learners in agricultural science as as a school subject?

P5: Aaah the qualities of an agricultural science Agricultural Science Teacher a qualified one must assess across the board first of all must be assess the practical part, the theory part and the understanding of the learners. Do they understand what you have taught them or they don't if they don't how do you do it, you do remedial classes and so on.

Interviewer: Ok thanks, in what way did the agricultural training you underwent helped to make you a competent Agricultural Science Teacher in agricultural science?

P5: I think the agricultural training that I went through helped me a lot not only in class but outside class also. In class it helped me to impart more knowledge to the learners both in practical and theory and to understand that agriculture is the backbone of the country and give best out of myself so that the learners can understand so that when they finish with their schools not all of them are going to be in offices and with the experienced lecturers that I I had that time, I think I got a lot of ex knowledge.

Interviewer: Thanks you, the second section of our discussion relates to the perceived needs of agricultural science Agricultural Science Teachers in the Zambezi region to which you are part of, eeeh, what are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject.

P5: Alright, as I have already said that we need workshops every time, workshops to improve here and there, we will need aaah tools that we can use, because most of the schools in the region don't have tools, even when we teach, we just teach theory, we also need aah, eeeh, excursions like going out to see for the learners to see what you are teaching them in class. For example when you go to Sancinga LDC they must experience what is a bardizor when you are castrating a bull and so on so those things are not happening in our schools. So we need those practical activities to happen in our schools. Maybe we could also have a small farm like small piggery or small chicken farm that we can have on a school basis so that the learners can learn from the experiences by seeing and touching learners learn better than just hearing it.

Interviewer: Ok, in your view how do you think the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from the needs of experienced agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum?

P5: I think the Agricultural Science Teacher with experience will go an extra mile to look for more teaching aids like other activities if maybe, for example he is teaching about cattle aah, aah, identification he may take his or her learners to the kraal that nearby, but the one who is not experienced will not waste his time to out and those extra activities. For example I use to see with my experienced colleagues here who is more experienced than I, she use to take her learners out to the LDC center to learn other tools and to go to this, for conservation purposes use to the one of the conservancies to show the learners what they learn in class, so with the other one who is not experienced will not was time on that. He will take that part as your time wasting and will just concentrate on theory, so I need, I think they are not the same.

Interviewer: Ok thanks, in what way do the perceived needs of a male agricultural science

Agricultural Science Teacher differ from perceived needs of female agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum in schools?

P5: For me I don't see that they differ much, because just depend to the commitment of the two, if the fee the male Agricultural Science Teacher is not committed than the female Agricultural Science Teacher she he may do wonders, but we are seeing around here or what we are experiencing the female Agricultural Science Teachers are doing better than the male Agricultural Science Teachers, because they are more committed these days, because we are all equal as we are teaching about that one in agriculture eeh gender shouldn't be a barrier in our classes or our schools because female Agricultural Science Teachers are now more committed than male Agricultural Science Teachers these days.

Interviewer: Thank you very much, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its reputation in the school?

P5: Hmmm, I thank yah, I don't know if I am going to answer it correctly, but I think you need to be, to be given more, how can I put it? We need to be given more extra eeh administration activities so that we may acquire that knowledge of administering activities without fear or favoritism of anything and following the the (stammering) school rules, I don't know if I answered it correctly.

Interviewer: Thank very much, now the last one Lubasi (Kasaya Combined School) 5 , what changes do you think you need to bring to the teaching of agricultural science in your career?

P5: For me to teach effectively or to bring a good change we need to have more equipments in schools and agriculture should be taught across the curriculum, because as the backbone of every country each and every one must know the basic of agriculture, so for us to have that to bring a big change in the community or classroom or in the curriculum of agriculture in must be taught across the curriculum.

Interviewer: Thank you very much for your time.

P5: I don't know if I answered correctly

Interviewer: Laughter

6. P6's transcript

School: CS6

Interviewer: Mukela (Kuma Combined School) 6 good morning.

P6: Good morning sir.

Interviewer: I am Interviewer Percy from Stellenbosch University in South Africa, am conducting a study on improving teaching and learning in the Zambezi region. Looking at the competencies and perceived needs of secondary agricultural science Agricultural Science Teachers. So the study in fact is for a PhD programme and under the department of curriculum at the Stellenbosch University. So there are 2 sections that we are going to discuss. The first part we will look at the perceived competencies and the second part we will look at the perceived needs of agricultural science Agricultural Science Teachers. Now to begin with, how many years of teaching experience do you have?

P6: I'm having 26 years in teaching.

Interviewer: Ok, thank you very much. What motivated you to teach agricultural science at combined or secondary school?

P6: When I came here first when we have grade 8, we were not having enough Agricultural Science Teachers so it was just volunteering at which subject do you want to teach then we were saying, I would like to teach agriculture and others would say I want teach History whatever, whatever then because I have gone with the University of Vista, then I was specializing i agriculture and that's why I decided that it's better to take agriculture because I could have some knowledge on it that I can inspire with the learners.

Interviewer: Ok, other than agricultural science which other schools subjects are you teaching at your school?

P6: Currently now, I'm a life skill Agricultural Science Teacher, am teaching life skills from grade 4-10 then I decided that I have to teach agriculture in grade 10 only. Even though am having my predecessor Mr Maswahu, but I decided that let me take for grade 10 only because

I was having a lot of experience then I was achieving more marks so it was a high performance on that subject.

Interviewer: Ok, do you feel that you are competent enough to teach agricultural science?

P6: Very much because am always number one concerning on the regional level because I have to take number one. I always get 100% in agriculture and my symbols doesn't mean D, sometimes gets 13 As, 7 As, 6 As and the last part the learners used to get D and can be only one learner get a D.

Interviewer: Explain what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learners achievement than the less experienced agricultural science Agricultural Science Teachers in a similar teaching context?

P6: Yes, currently when you are teaching agriculture it doesn't mean that you only teach in the class, you need to go outside because it needs a practical work where learners learners have to touch, where learners have to feel and do that practical work. Once you guide them, learners have to follow that guideline and then you watch them how they are doing it through practical things, you will find that learners learn more than in theory.

Interviewer: Ok now in relation to the experienced and less experienced Agricultural Science Teachers?

P6: Less experienced Agricultural Science Teachers you will find that most of them instead of doing practical things. A topic can be a practical a practical work but you will find them teaching in the class, unless you tell them that this topic doesn't mean that you have to teach it in the class, you should go outside, for example when you are teaching about examples of soil you cannot even send learners to bring the types of soil, you will just say sandy, loamy, clay and it’s better for the learners to go outside and get some samples of sandy, loamy and clay then the learners can know when you are making soil profile. Learners should know the layers of the soil.You cannot just say we have three layers of soil unless you go and dig, you go outside the school garden, you dig a hole then you can see those layers, then you can say this is a sub soil and this is a top soil. Even though you cannot see the underground but learners should see the layers of the soil that's the problem I have seen from some other Agricultural Science Teachers.

Interviewer: Ok, in you view how do you think that Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P6: Mmmh

Interviewer: In you view how do you think that Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P6: Agricultural Science Teachers can do better if you are committed, hardworking and then you like that work, you like to teach. If you are not interested in teaching, or you don't like that subject. I don't think you will manage to do it because if you are not committed you will never make your learners to pass because you need to have more time with the learners and you need to show them where they are lacking, you need to give more examples, practical work and you need to give questions which needs critical thinking, it's now when you can see that your learners can make it, for example in revision you need to revise all the old question papers when it's time for revision, you revise with them, you ask questions you tackle everything even to show drawing from the textbooks because you need to tell them this drawing will come in the examination, you will see this drawing don't just answer it according to how you know it, you need to study the diagram is when you can answer the questions.

Interviewer: Ok, what are your views about the perceptions that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary school?

P6: Male Agricultural Science Teachers are more competent? I disagree with that one (interviewee laughs) yes are more competent but I disagree with it because since we started according to our, these years, you will find that most of the Agricultural Science Teachers who are competent who are performing they are ladies. If it's a male you only find two, so it's okay but it's not that gender what equality but what am seeing now, things have changed, most Agricultural Science Teachers who are performing very well in agriculture, they are female Agricultural Science Teachers.

Interviewer: In your view, what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a school subject?

P6: First of all that Agricultural Science Teacher should be a dedicated Agricultural Science Teacher, a committed Agricultural Science Teacher, a hard working Agricultural Science Teacher and you should love that subject and then you have more time with learners and you should show learners, should encourage learners motivating them, inspiring them where possible.

Interviewer: Ok, thank you. In what way did the agricultural training you underwent helped to make youa competent Agricultural Science Teacher in agricultural science?

P6: We went a lot of workshops whereby we learnt how to make worksheets, you can design your own worksheet by formulating answers and questions whatever, then it helped us to guide us how we can teach agriculture even though from the past I was not so competent but later I decided that let me change and see if I have to be committed. I spend my time with learners, during weekends I cannot go to my home, I have to stay with them doing those things which I have omitted and then also this marking, external marking for grade 10 examination. It also helped because they have to guide us how we can mark learners, maybe from the first I was just marking. Marking favoring learners is a problem, once you favor a learner, that I have to give this learner even if the answer is wrong or the answer is not straight forward you just mark. So, am very strict in marking even if there is a slight mistake I never mark that thing because am training that child to write the correct answer in the external examination and that thing has improved my results.

Interviewer: Ok thanks, so the second part of our discussion relates to the needs of agricultural science Agricultural Science Teachers in the Zambezi region of which you are part of that. What are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P6: Sometimes you need to be promoted especially when you are performing very well, a way of motivating other Agricultural Science Teachers that if I do this then I will be promoted and the other thing is this time is a challenge because there is no money, you can write a budget that I need these tools so that my learners should know them. You cannot just especially when it comes to farming technology, they need to see those things. You need to buy them when you put a budget from the school they say there is no money. Unless you take the learners outside the school then you go to another place for example for excursion or going to a breeding scheme. I always take my learners to the breeding scheme so that they can see different types of animals. Even though we have got one type of animal but there are many things which they are having there. You can find that there are having different tools that they are using on a farming and then they learnt about what animal because when you have to take those learners it means you will cover three topics there, beef cattle, animal production and farming technology and they are having varieties of tools which they can touch and see and they know when they come back. It's like I have to teach them theory but when you go outside they have to do it practically that is the goodness of it. The need is Agricultural Science Teachers should not just leave their learners in the class, they should take out their learners for field work and experience other things instead of just teaching them in the class because once they go outside they will learn more from what they have seen.

Interviewer: Ok, so just to make a follow-up on that one you touched on issues as you have indicated, do you think are those only needs that you need for you to teach effectively?

P6: Yes but the other thing is sometimes if you need to teach well, you should have, you need to prepare thoroughly. You should not just take a textbook and going to the class. When you go to the class at least you have prepared thoroughly by writing a preparation and you from the syllabus not from the text book because the textbook will misguide you and when you go to class to refer when you are teaching so that you cannot go along that talking different things then you should have materials which you should use to the classroom. Either you can write a teaching aid or which describes that thing which you are going to teach learners it can be easy for them. Since you are not having these overhead projectors and other things but sometimes when you write on a chart, then you show them it’s easy for them and then you must have enough textbooks and enough materials.

Interviewer: Thank you, in your views how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from the perceived needs of experienced agricultural science Agricultural Science Teachers with regards to the implementation of the agricultural science curriculum?

P6: That one it will depend on the experience the novice Agricultural Science Teacher who is not experienced with other things. Since himself or herself is still learning from that subject, it will take time to know what to do. Sometimes you can prepare thoroughly but you will find that there is something lacking, at the end of learners are failing when you ask, they say maybe that topic I don't know it. Some Agricultural Science Teachers are shy to say something like if he is failing to teach that other topic cannot even say that here I cannot teach this subject because it is very difficult for me, he will just do it on his own and at the end learners will fail. These inexperienced Agricultural Science Teachers, they must ask from those who have more knowledge or who have experience on that subject, how they are teaching that subject it is when they can learn and they can change. If they cannot ask they will stay with that problem. It can take even 10 years, the Agricultural Science Teacher is not performing it is because that Agricultural Science Teacher did not visit the sister school for help, did not ask the subject advisory to come and help, did not ask even the management how he can be helped. So you will find that they have to differ, but those who have experience they know, even teaching they know that this question is always coming in the examination then they have to say don't forget this question. Even the way of dealing with those learners they are differ.

Interviewer: Ok thanks, in what way do the perceived needs of male agricultural science Agricultural Science Teachers differs from the perceived needs of female agricultural science Agricultural Science Teachers with regard to the implementation of agricultural science curriculum in schools, are the need of males and females differ?

P6: They are not differ, they cannot be different they are just the same, it's just a matter of the way of teaching otherwise everything is just the same. It's just a matter of teaching maybe a male Agricultural Science Teacher because he can use many methods of teaching or a female is also having methods of teaching. But what I have seen, there is no difference it will depend on the Agricultural Science Teacher, how he has to teach, the way he has to teach in the class because sometimes we differ in methodology, Sometimes maybe, the Agricultural Science Teacher is just using teaching what, this Agricultural Science Teacher centered approach, sometimes the other one will mix those methodology then it’s how maybe they can differ.

Interviewer: Ok

P6: Because you can be a given the topic then you present that same topic you will find that the way someone is going to express it is not the way you are going to do it.

Interviewer: Ok, so in terms of needs, what do you need to teach are they different?

P6: Yes, sometimes maybe you will need different things to use for teaching and that other one also will need different things for teaching, otherwise according to my understanding, I can say that they differ slightly. Sometimes you just work in groups, you will need to ask each other, for example these other agricultural Agricultural Science Teachers, these experienced ones. If there is a problem, you will find that they have to phone and ask that I cannot understand this question, how do you teach it?, you see, it’s like we are helping each other, so I don't think they differ because we are helping each other.

Interviewer: Ok

P6: Its only that maybe inexperienced, those novice Agricultural Science Teachers, sometimes they are the ones who are....I don't know whether it is shyness or whatever, why they are not asking but these experienced one you will find that if am stuck with something, I will call someone either from, even at Iseke and sometimes I even call from our circuit, then we can explain it then I can understand then we have to do it. For example this holiday, we were having these people from Singalamwe, learners from Singalamwe and Agricultural Science Teachers were here because their Agricultural Science Teacher did not understand, not understanding but he cannot explain nicely to the learners, the learners were not understanding him. He was a male Agricultural Science Teacher and when he came here I told him that you need to take these learners to the breeding scheme so that they can see better. And then another thing you need to draw if its drawing of a male reproductive system, don't just teach from without , make a drawing there and you will label it, then you indicate to the learners, you see, he was a male Agricultural Science Teacher but he came to a female Agricultural Science Teacher to seek for help.

Interviewer: Ok

P6: Yes

Interviewer: Now, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its reputation in the school?

P6: Mmmh, repeat.

Interviewer: What leadership qualities do you think you need to teach agricultural science in order to ensure that its reputation continues?

P6: You need to be a hard worker, good example from the subject. You need to be a dedicated person, a humble one, a loyal person and then you need to have more time with the learners, from that, respect, you will find that you can make it, even to help those learners who cannot make it in the class.

Interviewer: Ok, finally what changes do you think you need to bring to the teaching of agricultural science in your teaching career?

P6: What am seeing is, for example now, we are having a problems of not attending more workshops since there is no money in the government, you will find that those Agricultural Science Teachers who are not experienced they are facing a lot of problems, they cannot design a worksheet. They don't know how to teach topic task, how to write, when they design a worksheet, to write a topic task, that thing the worksheet you will find that it is very difficult for them to understand it, that's what I have experienced. You will find that most of the Agricultural Science Teachers are still going back to the old system, whereby they just write a topic task like a topic test and to design a worksheet, it is difficult for them, they won't design a worksheet even in the workshop where we went last time, Mr Tabale asked about how can you design a worksheet. It was difficult for the Agricultural Science Teachers to understand that thing. That thing I even told Mr Tabale that next time when we will make a workshop, just call for that thing so that Agricultural Science Teachers should be practically, they should know how to design a worksheet. You will find that maybe marks they are coming from without, when you ask where did you get these six, the Agricultural Science Teacher they don't know how to explain where did I get that six marks out of ten whatever, they are still using the old system, so it’s better sometimes we need to go for further workshops even though there is no money but we can make it on a cluster level.

Interviewer: Thank you for your valuable time **P6**

7. P7’s transcript

School: CS7

Interviewer: Good morning **P7**

P7: Good morning sir.

Interviewer: I am Interviewer from Stellenbosch University am conducting a study on improving learning and teaching in the Zambezi region.

P7: Ok

Interviewer: More precisely on the perceived competencies and needs of agricultural science Agricultural Science Teachers so we have got few sets of questions that we are going to discuss. The first one is we will look at the perceived competencies and secondly we will look at the perceived needs, so to begin with, how many years of teaching experience do you have?

P7: I am having 22 years now.

Interviewer: 22years of teaching experience?

P7: Yes

Interviewer: Ok, what motivated you to teach agricultural science at combined and secondary school?

P7: Ok, even though in my teaching I did my college at Ongwediva, I was forced to do pre-voc because my specialization in Grade 12, I didn't get the good marks, I found it very difficult but at the college I studied agriculture because most of the things done there is practical and it is the thing which is also done in Namibia and it is one which can improve the living standard of people within the community then that's why I was forced to do Agriculture as a profession.

Interviewer: Ok, what other than agricultural science, which other school subjects are you teaching at your school?

P7: Now am teaching Natural science from Grade 4 -6 and also elementary agriculture from Grade 5 to Grade 7.

Interviewer: Ok, do you feel that you are competent enough to teach agricultural science?

P7: Yes, am competent enough because now I have 5 certificates in Grade 10, every year I get a certificate.

Interviewer: Explain what experienced agricultural science Agricultural Science Teachers do in nurturing learners achievement than less experienced agricultural Agricultural Science Teachers do in a similar teaching context?

P7: Ok, as an experienced Agricultural Science Teacher, the more you study the content, the more you are enriched when you are doing it every day, you are getting used to it and then you cannot do away with it. Sometimes, you will see that from 1995 when I started teaching agriculture up to 2017, the content has not changed is still the same. I am more enriched with the content now. Basic competency, the competency is changed instead of saying explain they say describe so it is similar.

Interviewer: What is it now that you are more doing now than the less experienced ones?

P7: Am more doing it in assessments, assessing agriculture than the less experienced Agricultural Science Teachers, you find that there are not doing it practically the way it should be, they only use to assess concerning quality, perseverance and so on, not looking at the skill but the content itself. But when you assess the learners, you should look at the skills especially in practical activities.

Interviewer: Ok, in your view how do you think Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P7: When Agricultural Science Teacher continue doing that they are gaining more, you do well in that.

Interviewer: Ok, what are your views on perception that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary school?

P7: I don't think the males are doing better, in my teaching experience, I have realized that female are doing better than male, you will find that males are ignoring, they ignore practical work. Female are trying their level best in practicals because they feel they are inferior, they are not having power to do that. But the work for agriculture is for both male and female. Even in teaching, I have realized that female are improving than male.

Interviewer: Ok, in your views, what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agriculture as a school subject?

P7: A competent Agricultural Science Teacher you will find that is assessing, whenever ought to see that the learners acquire the basic competency. Then in every lesson, the learner should be assessed to see that they have acquired basic competencies that is a competent Agricultural Science Teacher. Then you find that a competent Agricultural Science Teacher when teaching agriculture should not be able to ignore some of the basic competencies especially practical part because most of the Agricultural Science Teachers ignore practical and just take theory part, but agriculture is a practical subject. A competent Agricultural Science Teacher should know that agriculture is more practical.

Interviewer: Ok, what did the training you underwent helped you to be a competent Agricultural Science Teacher in agricultural science?

P7: I don’t think I underwent a training, the only training I did is at college where I did my B.E.T.D and the refresher course we always go for.

Interviewer: So how did they help you to be so competent?

P7: Refresher course helped me a lot, when you are with other Agricultural Science Teachers, you learn from them in that way you learn more. Even our advisory Agricultural Science Teacher used to advise us that we should do, before you forget everything you should practice that thing then you catch up.

Interviewer: Ok, the second part of our discussion relates to the perceived needs of agriculture science Agricultural Science Teachers in the Zambezi region of which you are part of, what are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P7: Ok, my needs here at the school are so many even though I arrived last year. There was no garden, this year I tried to make a garden but no equipment which can use, even these simple equipment for hand tools we do not have enough. Also water as it is from Namwater, you find that some days there is no water, also is a problem. Another part that am teaching in Grade 9 which is farm building we need things like cement. I am trying to improvise, you find that even this UPE or USE, the money we use to get from the government is not enough. We don’t have tools for handling animals so that learners can see for themselves, even animals itself unless we go to a nearest kraal since we are working within the community and do it but the tools we do not have. Even in agriculture community farmers don’t have those tools. What I used to do I borrow somewhere especially a sledge and needles we borrow from those who are having, that is the thing we always do. We also do things like building, last year we were lucky enough because they were building a clinic, we just went there and find tools for building. Everything we did was okay and this year for building I just went there and borrowed and done it her as you can see the surrounding on our flag it is us who did it, we just picked those bricks, there are many things we need in schools.

Interviewer: Ok, in your view, how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from experienced agricultural science Agricultural Science Teachers with regard to the implementation of agricultural science curriculum?

P7: I don't know but they should differ unless they go for this refresher course and know what they can have especially in teaching agriculture if they are employed , without any guidance they will not know what is going on within agriculture as a subject, maybe they will not teach the syllabus. Sometimes even this improvisation I don't think they can do it because it needs to have experience so that I can know that I need this to do it, I think this is the difference.

Interviewer: Now what way do the perceived needs of male agricultural science Agricultural Science Teachers differ from the perceived needs of the female agricultural science Agricultural Science Teachers with regard to the implementation of agricultural science curriculum in schools?

P7: Ok, the male even in agriculture activities you find that the male can do better because it needs man-power. Even though we are not using tractor that they can drive a tractor, the only difference is commitment, male Agricultural Science Teacher if committed differ from a female Agricultural Science Teacher. If they do not commit then there is no difference. Commitment is needed there.

Interviewer: Now what leadership qualities you need to teach agricultural science as a school subject to ensure the continuous repetition in the school?

P7: Leadership concerning teaching agriculture?

Interviewer: Yes

P7: Under leadership there I think as agriculture Agricultural Science Teacher, as it is compulsory that every school should have a garden in Namibia that one is a concern because it minds with the coffers of the school. If there is no money in the coffers then I don't think gardening can be implemented at the school. It is better for leadership to look at that concerning money for agriculture. Therefore gardening so that everything can be done there, even just keep poultry because it is easy so long there is money in the coffers of the school then they can make that but this one needs finance.

Interviewer: In yourself as an agricultural science Agricultural Science Teacher, what qualities to teach agricultural science effectively?

P7: I don't know, sometimes maybe can say qualities is better for a Agricultural Science Teacher who is teaching agriculture should be very active, not slow or lazy Agricultural Science Teacher, to be lazy you cannot teach agriculture because it needs to be out of the class and there again on the qualities you find that the Agricultural Science Teacher teaching agriculture should have some worksheets always to go with which can guide you because you cannot use a chalkboard always. The other quality is that the Agricultural Science Teacher should be committed during after school hours because it needs more time. You cannot finish within 40 minutes, you need more time. Even after school the Agricultural Science Teacher should be with the learners to finish up with some of the practicals.

Interviewer: In conclusion, what changes do you think you need to bring to the teaching of agricultural science in your teaching career?

P7: The changes here as we are learning agriculture is the thing which bring economy in Namibia especially to learners. They find it as if some learners, the curriculum should include farming activities so that the learners can know that when they grow up they should have their own farms. Then in each school even though gardening is there but they should include other for example animal husbandry. The schools within Namibia cannot do it without fence, it needs to be fenced so that there is protection, that is part of security and also you find that the other thing which should be included in agriculture is that they bring tools in schools. Like I still remember, in natural science as a subject, there was time when it was brought many equipment. Also in agriculture they can do the same, they can bring the equipment which we cannot buy in the shops, those equipment should be available at the schools so that Agricultural Science Teachers teaching this subject should have those tools already available. For example fixing the tap, water installation in Grade 10 also that thing is important I don't know to those schools which do not have taps from the pipes, how they teach it because it is a problem unless you are having that so that you can fix the taps. The learners should know that, also that one should be brought in within the school.

Interviewer: Ok, thank you for your valuable time Interviewer 7.

P7: Thanks

8. P8's transcript

School: SS1

Interviewer: Good afternoon **P8**

P8: Good afternoon sir.

Interviewer: Yes, thanks. I am a learner at Stellenbosch University, am pursuing a PhD in curriculum studies, more particularly in education but focusing on agricultural science, so the topic that am studying is improving teaching and learning in the Zambezi region. Looking at the perceived competencies and needs of secondary agricultural science Agricultural Science Teachers.

So we have got set of questions we discuss. I would like to ask you to be as open as you can to avail the information that is needed. Yes, I would like also to inform you that the information mentioned will be treated as confidential as possible, so it's just between me and you. Yes, so to begin with, how many years of teaching experience do you have?

P8: Now am having 23 years of teaching experience.

Interviewer: Ok thanks, what motivated you to teach agricultural science at secondary school?

P8: After completing my national diploma in agriculture, we were not absolved in agriculture itself, so which means we decided to join the teaching profession, obviously that's how I entered this teaching profession and then I was teaching from Grade 8-12.

Interviewer: Ok, other than agriculture science which other subjects are you teaching at your school?

P8: I'm teaching life science grade 8-9.

Interviewer: Ok

P8: Yes

Interviewer: Do you feel that you are competent enough to teach agricultural science?

P8: Very much, even though at first I was not having a teaching estology but after some few years, 3 years, when I did further studies then I got my teaching estology which means now am fit, am happy with the experience that am having.

Interviewer: Ok, explain what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learners achievement than less experienced agricultural science Agricultural Science Teachers in a similar teaching context?

P8: What I have observed in agriculture is agriculture is a practical subject so it means that learners have to know more about practicals, theory is there, first you can teach in theory but later on you should take them outside so that they can do practical. What they are doing they are doing it by hand, some of the other topics are more practical like for example if you are in teaching land preparation for growing maize. You can teach it theory but you need to go to the garden with some garden tools to show them how they should do it. So obviously I will say agriculture is a practical subject which means whenever it is taught, practicals should not be left out for them to understand.

Interviewer: Ok, in your view, how do you think that Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P8: What I have seen is, through my experience what I have observed you find that Agricultural Science Teachers are doing better in agriculture since the results of agriculture in Zambezi region is improving from year to year. you find that maybe last year we were on 40%, the following year you go to, now we are almost at eughty something percent in grade 12 which means it’s an improvement, we are improving.

Interviewer: Ok, what are your views about the perception that male agricultural Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary school?

P8: What I have observed or what I have learned you find that female Agricultural Science Teachers, I don't know whether they are afraid or they don't just want to teach agriculture maybe they are afraid of the practical part of it since themselves they need to be clean , agriculture you don't need to be a clean person. Even though you are a Agricultural Science Teacher you should wear smart, presentable but in some other cases where I have said about practicals you need to go and show the learners how you are doing things. For example, if you are inseminating a cow, you should go direct and inseminate the cow yourself which means you don't need to be so very clean. So female Agricultural Science Teachers themselves they are reluctant in doing that and most of them when they are finishing grade 12 when they go to University, you find that it is too difficult for them to do the line of agriculture.

Interviewer: Ok, in your view what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a school subject?

P8: A competent Agricultural Science Teacher is a Agricultural Science Teacher who should be able to understand the learners themselves and should also know how to deliver the messages or information to the learners, and the other thing that the experienced Agricultural Science Teacher should have is I may say there are many just like you should also know your syllabus, you should know the content of the subject, especially the content of the subject and how to deliver message or the approach of yourself to the subject, how you should approach the learners.

Interviewer: Ok. In what way did the agricultural training you underwent helped to make you a competent Agricultural Science Teacher in agricultural science?

P8: I may say I did my diploma at the Polytechnic of Namibia, even though theory was too much. We have got alot of content of agriculture, theoretically we were not that much because the institution was not having the area of practicals, but we were taken to Neudam for some other practicals. Which means at the Polytechnic of Namibia, I think the content part of the course itself agriculture we were given to the fullest possible use. So which means I may say that theoretically and practically am above average.

Interviewer: Ok thank you. The second section of our discussion relates to the perceived needs of agricultural science Agricultural Science Teachers in the Zambezi region of which you are part of that. What are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P8: I will give an example of our school. This one is a senior secondary school. So you will find that we don't have enough space or some other facilities which are closely related to agriculture. For an example, we were supposed to have animal units or sometimes even a garden, a very big garden where learners can go and do their practicals. As I have said that agriculture is a practical subject, so there is a need that we need to have all the material needed, equipment that are needed to do agriculture. There are some other topics in grade 12 which are more advanced, for example we have said about insemination. When we talk about insemination in grade 12 it is too difficult for them to understand what artificial insemination is. But if we could have facilities that we can go and do it practically, I think it could be easier for them even if when they pass grade 12, they could be easy to pass. The challenging that we are facing here it is the material, the practical aspect of the subject itself is not up to its level.

Interviewer: In your views, how do you think that the perceived needs of less experienced agricultural science Agricultural Science Teachers differ from the perceived needs of experienced agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum?

P8: That question I may understand it in this way. If someone is less experienced, it means that he doesn't have more knowledge, is not knowledgeable in that particular course. So maybe what is needed to him is either to be given a refresher course or workshops just to lift him up , but with the experienced Agricultural Science Teachers I think with them they will also need a refresher course but not as much as the inexperienced one because they are already in the system. To them what they need is changing of technology. Some of the technologies that we are now using, they were not there in the past so we need to know something like computer, how to put data or information in the computer about agriculture itself.

Interviewer: Thank you. In what way do you, do the perceived needs of a male agricultural science Agricultural Science teachers differ from the perceived needs of a female agricultural science Agricultural Science Teacher with regard to the implementation of agricultural science curriculum in schools?

P8: I don't think there is any difference between the two because it can be a female or a male but the teaching approach will be the same. The subject content you are getting from the higher institution is just the same, whether female or male. Maybe the only difference will come to the handling methods, how you are handling sometimes the equipments. Let me say a plough, a male will handle it differ compared to a female. Maybe that's where they are going to differ, but in terms of knowledge, knowledgeability all of them are equipped with knowledge, they are just the same.

Interviewer: Ok thanks. What leadership qualities do you think you need to teach agricultural science as a school subject to ensure that the continuation of its reputation in the school is adhered to?

P8: Management has got some factors, you must first plan. If you are a manager you need to plan and implement and control and evaluate. So let's say if am a manager of a certain farm at a school level or a manager, head of department for agriculture, I should put some plans in that department am heading and most important thing is to control and also give feedbacks or evaluate whether am I in the good track or am out of the curriculum or not.

Interviewer: Ok, in conclusion what changes do you think you need to bring to the teaching of agricultural science in your teaching career?

P8: Like in other regions, you will find that some agriculture schools are almost separate from these other schools. You find that there are specific schools only for agriculture where they are only cartering in agriculture from grade 8 up to grade 12. So I think maybe in Zambezi region we should have schools of that nature, so that maybe it can work hand in hand with the Universities. Even Universities will know that learners who are producing from this schools there are more of agriculture, then they can be taken to agricultural colleges or agriculture higher institutions because agriculture doesn't mean that you only know the content. From secondary level, you need to know everything, how to farm, how to grow, how to keep chickens, all these things you need to know them while you are still here. When you reach at the tertiary institution is just the repetition, you just add the advanced knowledge of it.

Interviewer: Ok, thank you for your valuable time **P8**

P8: Thank you sir.

Interviewer: Thanks

9. P9's transcript

School: SS2

Interviewer: Good morning **P9**

P9: Good morning Interviewer.

Interviewer: Thank you very much, am Interviewer as you have rightly said, eeh am a learner at Stellenbosch University in South Africa.

P9: Ok

Interviewer: I'm currently doing my PhD in education, more precisely focusing on agricultural science education.

P9: Ok

Interviewer: Looking at the improving teaching and learning agricultural science. Yes, so you are very free to answer the questions you have to express as much as you can so that we can able to get the actual data that is required to support the project.

So the questions that we have here are divided into 2 sets, they are one that are able to look at the perceived competencies and the other set looks at the perceived needs of Agricultural Science Teachers.

So to begin with, how many years of teaching experience do you have?

P9: Mmmmh, 17 years so far.

Interviewer: 17 years of teaching experience?

P9: Yes.

Interviewer: Thank you very much. What motivated you to teach agricultural science at combined school or secondary school?

P9: I did my Agricultural Science Teacher's Diploma in the phases of 8-10 and before I did that diploma I also did agriculture at grade what, senior secondary then that motivated me to do agriculture in school and then qualifying to teach the junior phase.

Interviewer: Ok, thank you very much. Other than agricultural science, which other school subjects are you teaching at your school?

P9: **C**urrently am only focusing on agriculture but I can still teach Life science 8-10 and Biology 11 and 12.

Interviewer: Ok, thank you very much. Do you feel that you are competent enough to teach agricultural science?

P9: Yes

Interviewer: Thank you. Explain what experienced agricultural science Agricultural Science Teachers do more effectively in nurturing learners achievement than less experienced agricultural science Agricultural Science Teachers in a similar teaching context?

P9: Mmmh, how will I explain this one? When you are more experienced.

Interviewer: Yes

P9: You have more knowledge and normally the challenges that you have faced you have already came up with the solutions during years. So as an experienced Agricultural Science Teacher is more easier for a Agricultural Science Teacher to tackle such problems than an inexperienced one.

Interviewer: Thank you: In your view, how do you think that Agricultural Science Teachers do better as they gradually gain the necessary experience?

P9: You may ask again

Interviewer: In your view, how do you think that Agricultural Science Teachers do always, do something better when the have gradually gained some experience?

P9: How do Agricultural Science Teachers do better or what?

Interviewer: In your view.

P9: In my view.

Interviewer: Yes, how do you think, yes, that Agricultural Science Teachers do better when they gradually gain some experience.

P9: You will find that, when I first start they will be some challenges that I will meet along the way but as time goes by I come back to teach the same let's say the syllabus or the same grade the other year then such challenges that I faced previously I may be able to have came with some solutions then now I will be implementing, I will change from how I tackled it previously to another way, to a better way.

Interviewer: Ok, what are your views about the perception that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary schools?

P9: Mmmh, you mean to say the male Agricultural Science Teachers they do better than the female ones?

Interviewer: Yes, what is your perception?

P9: Mmmmh

Interviewer: Because, let me repeat the question, what are your views about the perception that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers?

P9: I really don't know, but to my (interviewee laughs) to my view I might say maybe they like they might sacrifice more of their time of their free time than the female ones. Because you will find that female one instead some most of them, they might not sacrifice their spare time because of other duties that they have at home and in the society again. So for males it’s always easier, they can go home, let's say that the Agricultural Science Teacher has a wife at home, you go home you have your meals prepared, then you can always come back there is nothing that can be, they won't be some chores, much chores that you do at home than just to come back at work and then redo those other things at work so, maybe.

Interviewer: Ok, in your views, what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science?

P9: Of a competent Agricultural Science Teacher, qualities?

Interviewer: Yes

P9: Mmmmh, Just following the...... qualities may include what, what will I say now, of a competent Agricultural Science Teacher, trying to listen, cover the work in time let's say the work or syllabus, you cover it in time, do much revisions, you do the practicals, follow the criterias that are supposed to be followed and all those other staffs.

Interviewer: Ok thank you. In what way did the agriculture training you underwent helped to make you a competent Agricultural Science Teacher in agriculture?

P9: Mmmh..How will I answer this one? Though we did also much what, of the theory part with maybe let's say 60% practicals then that itself prepared us and then we also had like the school based studies where we were sent in schools, we do our practicals in schools and also when it comes to things like crops, we had our field like a young farmer association where we used to like do our practicals, we grow, whatever we produce we sell, so such things, they helped us much to be better agricultural Agricultural Science Teachers that we are today.

Interviewer: Good. The second part of our discussion relates to the perceived needs of agricultural science Agricultural Science Teachers in the Zambezi region of which you are part of that. Now what are your needs as an agricultural science Agricultural Science Teacher that will ensure that you are effective in teaching the subject?

P9: Us as Agricultural Science Teachers?

Interviewer: Yes

P9: Like for Agricultural Science Teachers, we might need training here and there, we might need land where we can do practicals with our learners. We might need equipments and other stuffs or if we could have also even a farm in the region where we could be taking our learners to see some of the implements, because to them an implement they might also refer to it as a tool or whatever. So for them to differentiate at least when they see, so unfortunately they only see them in textbooks, physically to climb on a tractor such things uhm uhm its rare here, so those if such things could be there I think it could also help much.

Interviewer: Thank you very much. In your view how do you think that the perceived needs of less agricultural science Agricultural Science Teacher differ from the perceived needs of experienced agricultural science Agricultural Science Teacher with regard to the implementation of agricultural science curriculum?

P9: For me I will say, the less experienced Agricultural Science Teacher, they also tend to do much better sometimes than the experienced ones, because you will find that for the less experienced Agricultural Science Teacher with other things they try to come up with things like, they improvise, they bring up some teaching aids, they can draw, they can do what, but these experienced Agricultural Science Teachers they don't do those things. They think what they know maybe the learners know whereas the learners don't know. But sometimes you will find that the less experienced Agricultural Science Teachers sometimes they do better.

Interviewer: Ok, thank you very much. In what way do the perceived needs of male agricultural science Agricultural Science Teachers differ from the perceived needs for female agricultural science Agricultural Science Teachers with regard to the implementation of agricultural science curriculum in schools?

P9: The needs?

Interviewer: Yes

P9: How should or how do they differ?

Interviewer: Yes

P9: That one really I don't understand it well but for me all I can say is needs for both of them shouldn't differ because we tackle the same syllabus, then if it's the same syllabus then the needs should be the same isn't it or what?

Interviewer: Yes, we are asking your views.

P9: (Laughing), I thought, okay, alright.

Interviewer: Ok thank you. Now the second last question madam says, what leadership qualities do you think you need to teach agricultural science as a school subject to ensure the continuation of its reputation in the school?

P9: Eeh, one should be motivated, you need to be able to do the work without being pushed by anyone. Then also manage time effectively, just in short.

Interviewer: Thanks, yes the last question says, what changes do you think you need to bring to the teaching of agricultural science in your teaching career?

P9: Mmmh, I think we will need more of, more practicals because currently what we are tuckling more at is a theory part, so at least the theory part even if we tackle it, learners will understand but if they could be more practicals whereas they are involved in doing it themselves then that would help much.

Interviewer: Thank you very much for your valuable time P9: SS.

P9: Thank you Interviewer.

Interviewer: Thanks

P9: Mmmh

10. P10's transcript

School: SS3

Interviewer: Good morning **P10**

P10: Good morning, how are you?

Interviewer: I am alright, Aaha, thank you very much, eeh for availing this opportunity to have interviews with me.

P10: Aaha

Interviewer: I am a learner from Stellenbosch University

P10: Aaha

Interviewer: I am currently doing my PhD…

P10: Aaha

Interviewer: in curriculum studies, eeh…

P10: Aaha

Interviewer: focusing on agricultural science Agricultural Science Teachers…

P10: Aaha

Interviewer: more precisely on improving teaching and learning in agricultural science in the Zambezi region. Looking at the perceived competencies and also the perceived needs of agricultural science Agricultural Science Teachers

P10: Aaha

Interviewer: So be as open as you can in terms of giving of your answers

P10: Aaha

Interviewer: Ye, these are interviews that need your expressions so that we can able to get more data that is needed to compete this particular project

P10: Aaha

Interviewer: so the questions are divided into two sections, the first section is looking at the perceived competencies

P10: Aaha

Interviewer: and the second section is looking at the perceived needs

P10: Aaha

Interviewer: when you talk about perceived, to perceive is to think about something

P10: Aaha

Interviewer: To begin with, how many years of teaching experience do you have?

P10: 26 years

Interviewer: 26 years of teaching experience?

P10: Yes

Interviewer: Thank you very much,

P10: Aaha

Interviewer: What motivated you to teach Agricultural Science at combined and/or secondary school?

P10: The one that motivated me, I have seen that agriculture is too practical and then it can be done even a home, then it can help me to go ahead in farming method and also I can have that skills and knowledge aaa, that is why I am motivated in teaching agriculture.

Interviewer: Ok thank you very much, other than Agricultural Science, which other school subject (s) are you teaching at your school?

P10: Here I am teaching I am only teaching agriculture, in the previous years is when I was teaching Life Science and Natural Science

Interviewer: Ok,

P10: Aaha

Interviewer: Thank you very much, do you feel that you are competent enough to teach Agricultural Science?

P10: Yes I am competent because I can see that I am enjoying the subject and then I have knowledge that subject, aaha

Interviewer: Explain what experienced Agricultural Science Agricultural Science Teachers do more effectively in nurturing learners' achievement than less experienced Agricultural Science Agricultural Science Teachers in a similar teaching context.

P10: Come again!

Interviewer: Explain what experienced Agricultural Science Agricultural Science Teachers do more effectively in nurturing learners' achievement than less experienced Agricultural Science Agricultural Science Teachers in the same context.

P10: In agriculture because agriculture is too practical and then learners, they are learning things that they see and do at home don't have any problem when it comes to agriculture because what they are learning is what they do at home.

Interviewer: Aaha

P10: Aaha, then I don't think they, that is why most of the learners they are interested in agriculture than other subjects where they learning things they don't know, but in agriculture if we talk of animals then they have those animals at home, if we talk of these crop framing they are doing that thing.

Interviewer: Now if I can just try probe a bit there, eeh we are talking about experienced and less experienced Agricultural Science Teacher, (jamming in, Masule (Libula Senior Secondary School) 10 , Ok) how do they do to help the learners to perform in the subject?

P10: The experienced Agricultural Science Teacher and less experienced Agricultural Science Teacher?

Interviewer: Both of them, yes

P10: The experienced Agricultural Science Teacher will help that Agricultural Science Teacher who don't have experience in agriculture in basic competence. If that Agricultural Science Teacher does not understand some of the basic competencies, the experienced Agricultural Science Teacher will help in that so that the Agricultural Science Teacher could understand, because if we come to that paper three some Agricultural Science Teachers they don't know and the experienced Agricultural Science Teacher will help the Agricultural Science Teacher to give him/her same skills how to go ahead with that practical skill.

Interviewer: Thank you very much, in your view, how do you think that Agricultural Science Teachers do better as they gradually gain the necessary teaching experience?

P10: According to my view?

Interviewer: Yes

P10: Hmmm, I don't understand the question

Interviewer: The Interviewer repeated the question!

P10: Yes the do better when they gain experience, like me when I came here I was from a combined school, I wasn't have the knowledge for the senior secondary, then the Agricultural Science Teacher who was having that experience was helping how to go ahead with some of the topic, then now I gained most the experienced, I have the experience that I was not having even if I am teaching in grade 10 now I know than the time when I was based in grade 10 and 8 and 9 only

Interviewer: Ok thank you, what are your views about the perception that male Agricultural Science Agricultural Science Teachers are more competent than female Agricultural Science Agricultural Science Teachers in teaching Agricultural Science as a school subject in either combined or secondary school?

P10: Is that true that male agriculture Agricultural Science Teachers are more competent?

Interviewer: We want to hear your views

P10: I don't think so, I can see that the female are more competent, even though agriculture can be like if genders the male are higher in agriculture but coming to teaching female Agricultural Science Teachers are more competent.

Interviewer: Ok thank you very much, in your view, what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in Agricultural Science as a school subject?

P10: Can you repeat

Interviewer: What are the qualities of a competent Agricultural Science Teacher eeh in the assessment of learners in Agricultural Science as a school subject must purpose?

P10: Now we look at the passing rate, if we can compare in this Zambezi region you can see that agriculture in passing than other subjects, aaha.

Interviewer: Ok, so now what are the qualities of those Agricultural Science Teachers, like yourself as a Agricultural Science Teacher, what are the qualities that makes you to be competent?

P10: The qualities? I can interpret the syllabi, understand the terminology of agriculture, if it comes to the practicals I know the topics that can be under the practical and the topics that under the theory, but even though agriculture is too practical, you can't teach agriculture in class, you will always go outside and you is where can do better than in class.

Interviewer: Ok thank you very much.

Interviewer: In what way did the agricultural training you underwent help to make you a competent Agricultural Science Teacher in Agricultural Science?

P10: Even though theee training I underwent, I wasn't have practicals it was too theory because I did this agriculture through VISTA University, but we were not doing the practical it was based on the theory, but now when I am teaching I have that time of doing the practical with my learners, sometimes I took my learners we go to the Sanchinga breading scheme for dehorning and castration and other things that we always do and then we can also Kalimbeza rice project and aqua aqua aqua fish, and then we are doing those practicals with my learners

Interviewer: Ok

P10: Hmmm

Interviewer: Thank you very much, the second part as I said earlier on relates to the perceived needs of agricultural science Agricultural Science Teachers in the Zambezi region, of which you are part of that. Now, what are your needs as an Agricultural Science Agricultural Science Teacher that will ensure that you're effective in teaching the subject?

P10: The needs, we need tools and apparatus those are some of the things that are lacking, currently now at our school we don't have a garden, we need all those tools which is involved in that, so that we can the practicals better, than doing the theory part only.

Interviewer: Ok

P10: Hmmm

Interviewer: Thank you very much, in your view, how do you think that the perceived needs of less experienced Agricultural Science Agricultural Science Teachers differ from the perceived needs of experienced Agricultural Science Agricultural Science Teachers with regard to the implementation of the Agricultural Science curriculum?

P10: Looking on the Agricultural Science Teacher who is not having experience in agriculture will keep on teaching the theory part only and then the as you can see these is agriculture needs practical part but if that person does not have that experience then it will be difficult for person to teach agriculture. Now even though they are saying that agriculture is very easy, but it is not easy to that person who don't have the experience because there are some of the words or concepts which they don't understand in agriculture. If you are lacking the experience then it will be difficulty for you to go ahead or to teach learners.

Interviewer: Thank you

P10: Hmmm

Interviewer: Eeeh in what way do the perceived needs of male Agricultural Science Agricultural Science Teachers differ from the perceived needs of female Agricultural Science Agricultural Science Teachers with regard to the implementation of the Agricultural Science curriculum in school?

P10: The male Agricultural Science Teachers because they are working with animals and they are involved in other different tools, when for example we talk of that farm structure some of the tools it will be difficulty for a female Agricultural Science Teacher to identify different types of the tools and then coming to the males they know, even coming to the class you can see that the female learners have the difficulty in identifying some of the tools, even that castration when I took my learners to Sachinga, the learners who were active in castrating and dehorning were the male boys males learners, but coming to the female learners it was difficult for them to castrate because they are not aware of doing some of these things at home only the male learners are doing these things. Those are some of the challenges which makes the female learners not to have that knowledge even the teac the female Agricultural Science Teacher, it is difficult for me to do some of the activities as a female than a male, because male are doing it at home.

Interviewer: Ok thank you very much

Interviewer: What leadership qualities do you think you need to teach Agricultural Science as a school subject to ensure the continuation of its reputation in the school is maintained?

P10: I need the leadership which can help me and assist me in everything that I am telling them, Anything that I need, for example if I need the a transport to go somewhere then I should be assisted by the those managers and then also the people who have that knowledge of agriculture, because if someone does not have the knowledge of agriculture it will be difficult for him or her to lead the person who is teaching agriculture.

Interviewer: Thank you very much, the last eeeh question says, what changes do you think you need to bring to the teaching of Agricultural Science in your teaching career?

P10: Hmmmm, the changes that I need, now we should have a transport, because now currently we are stuck with the transport. My learners in grade 10 they never went for any excursion only grade 12 due to transport, because everything in agriculture they will need money, if there is nothing like the transport and other things which can help it will be difficult for me to do some of the practical work, because agriculture is based on practicals. Those are some of the changes we need if we could have enough money we could have our own transport to take our learners in different areas so that they can do their activities their than sitting here without doing anything

Interviewer: Thank you very much for you valuable time **P10**

P10: Hmmm, you are welcome

Interviewer: Thanks

11. P11's transcript

School: SS4

Interviewer: Good morning **P11**

P11: Good morning sir

Interviewer: My name is Percy Mashebe from Stellenbosch University am currently doing my PhD in education in the department of Curriculum studies focusing of agricultural science education. The main topic that am focusing on is improving teaching and learning in the Zambezi region the perceived competencies and needs of secondary agricultural science teachers. So, P11 (Maunga Senior Secondary School) 11 be open as you can to give me the information that you may have, you are free to express yourself. So to begin with, how many years of teaching experience do you have?

P11: 12 years.

Interviewer: 12 years of teaching experience.

P11: Yeah

Interviewer: Ok, thank you very much. What motivated you to teach agricultural science at combined or secondary school?

P11: Through my education where I went through, I learnt alot about agriculture and specifically I did a Diploma in agriculture and the good thing of that diploma is that it covers all, mostly all the components of agriculture and then looking into it I looked at it was easy for me to tackle it if am put in a class to teach. In other words it's like, it looks so easy for me to go with the field.

Interviewer: Ok, thank you.

P11: Yes

Interviewer: Other than agricultural science, which other school subjects are you teaching at your school?

P11: I have been teaching Life science for 4 years grade 10 and currently am teaching Biology grade 11, meaning it's like Biology and Life science, they are more-less related and am teaching Biology because of another qualification which I got at another institution apart from agriculture which I did, I added on B.ED where I majored in Biology and Geography, that's why now am teaching Biology referring to my profession of education.

Interviewer: Thank you. Do you feel that you are competent enough to teach agricultural science?

P11: I feel very competent very very much, looking to what I did from my previous institution and the syllabus am given, when I look into it, it covers mostly the part of Biology as well as agriculture which I did at these two different institutions. So I feel very competent teaching them.

Interviewer: Ok, thank you very much. Explain what experienced agricultural science teachers do more effectively in nurturing learners achievement than the less experienced agricultural science teachers in a similar teaching context?

P11: Can you come along

Interviewer: What am saying is, explain what experienced agricultural science teachers do more effectively in nurturing learners achievement than the less experienced agricultural science teachers in a similar teaching context?

P11: An experienced teacher, one is familiar with the syllabus itself, and is also familiar with the way questions are coming up during examination, and also is familiar with the practical questions which are incorporated in the question papers which also might help the learners to answer some of the questions. unlike a teacher who is not experienced, whereby, one he doesn't know what are the expectations of the examination, what are the expectation of the learners, so in that way if you have some expectations from the learner, it help very much in coming upon with a very good strategy to cover those problems which they are having, in short.

Interviewer: Thank you. In your view how do you think that teachers do better as they gradually gain the necessary experience?

P11: Can you come along again?

Interviewer: Thank you. In your view how do you think that teachers do better, they do the teaching very well as they gradually gain the necessary experience?

P11: Yaah, you know they normally say that, a good teacher is an experienced teacher. As you are more exposed, you are more exposed to the questions, you are more like in my case I go for marking, I know what actually they require, through that experience, you will be able to touch the areas which learners they are having problem, when it comes to teaching.

Interviewer: Ok, thanks. What are your views about the perception that male agricultural science teachers are more competent than female agricultural science teachers in teaching agricultural science as a school subject in either combined or secondary school?

P11: My perception is that, I disagree with that. I disagree with that male teacher are more competent than the female. To my side I feel that female are better, because it's like, female when they are in class, they act like mothers, when they act like mothers they take a class like a home, they bring home into the class and for so doing, and in most cases, female teachers they are free, they are free in communicating with both gender compared to male. For me I disagree with the perception of male being competent compared to female.

Interviewer: Ok, thank you very much. In your view, what are the qualities of a competent teacher in the assessment of learners in agricultural science as a school subject?

P11: What are the?

Interviewer: The qualities of a competent teacher in the assessment of learners in agricultural science as a school subject?

P11: Qualities, one of it is that teachers must have that competency, must have that ability of giving a lot of work to learners. Second, he should have that freedom, the teacher must have that freedom pace in the class whereby the learners and the teachers there is that interaction between teachers and learners. The teacher should pose that in the class, for it to be so that he can know how far, as you know that sometimes evaluation is done within the class. So for you to have that quality, to be a quality teacher, you should evaluate while you are teaching. That is one of the qualities which someone must have, you should sense, you should judge as you are teaching because without judging, you are doing nothing and the other thing is a good teacher should always make use of formative evaluation, because unlike going to summative evaluation whereby he just go on the end results. In other words, products, you just look for the products whereby you don't know if you could have done for instance, if you could have done formative evaluation during the course of the year, you could have known where you were left back. So, in other words am trying to say that a quality teacher should have that skill of giving learner formative evaluation. This can help that teacher more compared to a teacher who is just looking on summative evaluation, I think that is the most, most important thing which most of the school they are failing to do in school and this is one of the contributing factor which is contributing to the failure because you just look at the end. If you could have evaluated the formative assessment during the course of the year, I think this could have helped the teacher to change here and there, change the strategies so that you can cope with the learners. and also a quality teacher should have different teaching strategies and strategies can come in if a teacher is always doing formative evaluation. Through formative evaluation you will be able to know which type of teaching strategy am going to use. If you are just concentrating on summative you will not know whether my learners they did understand or not. So that's why am saying that one of the most quality for being a good teacher, he must be aware of formative assessment so that it can help him to evaluate what he is doing.

Interviewer: Thank you, just to make a follow up on what you said, you said about summative and formative assessments. Can you give a distinction between the two?

P11: Yeah, formative evaluation is a daily activity you do in the class, for instance you can give when you are teaching, you can assess them of what you have just taught, just to judge, just to see how far the learners they have understood the content. And when you come to, I may say that it's just a daily basis activity which you give as you continue with your process of teaching. Then when you talk of summative evaluation, you are concentrating on the product, you just looking on the final result that is when it comes like, in education we talk of the external examination whereby you give and you find out that how far the learners have achieved throughout the year, now you summarize what the learners have done from, let me say from January to December, like now they are sitting for examination, November/December examination that is one example of the summative evaluation.

Interviewer: Thank you. In what way did the agricultural training you underwent helped you to make you a competent teacher in the agricultural science?

P11: Come along

Interviewer: In what way did the agricultural training you underwent helped to make you a competent teacher in agricultural science?

P11: one, most of the content which I received from my college of agriculture, when I compare it to the syllabus what the syllabus require, most of the things have been covered there in the syllabus. In other words I was like revision of what I did at the college. To add on that, in agriculture we were also doing practical work which whereby in agriculture the paper itself in school which they are doing, there is also questions, questions of practical which they say paper 3, they normally do practical work at school you give them the learners they do the practical itself just the same thing we were doing at agriculture on hand. So it's like am just bringing what I did at the college and bring it in the, in school so that learners should have the same knowledge which I acquire, them also they acquire the same knowledge. So in other words it's more less equivalent to what I did and what am doing at school.

Interviewer: Thank you very much. The next component of our section, question relates to the perceived needs of agricultural science teachers in the Zambezi region of which you are part of that. What are your needs as an agricultural science teacher that will ensure that you are effective in teaching the subject?

P11: Eeh, number one with me yes I may say that am lacking some of the practical skill which I may ask if there is that opportunity, they can ask that ok there are some instrument, you just find that in the book it's there but coming into a school they are some materials which are not there. For example let me say you are teaching about Osmosis, and when you are teaching about osmosis we just concentrate on the potato, when it comes to visking tubing, partially permeable membrane those things they are not in the school. And then it becomes difficult for the leaner to understand when you say this is partially, this is a fully permeable this partially permeable it becomes difficult for the learner to understand. So in other word I may say most of the materials specifically in agriculture, what is mostly in schools, you find its most garden tools, that are the most materials you will find in school but the other part which can be incorporated in agriculture in terms of practical they are not there, just to say in general, what is in school is garden tools and I don't the whole syllabus, the syllabus itself just cover a gardening issue. So I think that is one of the thing which they must also combat on it, if they can look, even when they are putting on the syllabus let me say the syllabus it's in place, they must look into it and find out that ok if it's in it, what are the needs should be there, so that this thing should be taught to an extent that the learners understand. Cooperating it, practical and theory so that they can understand but most of the things they are not there, what is there is only garden tools.

Interviewer: Thank you. In your view, how do you think that the perceived needs of less experienced agricultural science teacher differ from the perceived needs of experienced agricultural science teachers with regard to the implementation of agricultural science curriculum?

P11: Yeah, the inexperienced teacher, he/she will need more materials in the sense that he knows the topic where practical will applicable, by knowing all the topics and the practical which are applicable, you will need more materials compared to a teacher who is unexperienced because is just coming across for the first time and he don't know where to use it unless there is someone who is experienced who can help that when you teach this they must be this materials which are needed. Apart from that, he will just teach theory without looking into the practical part of view.

Interviewer: Ok, thank you very much. In what way do the perceived needs of male agricultural science teachers differ from the perceived needs of the female agricultural science teachers with regard to the implementation of agricultural science curriculum in school?

P11: Yaah, my perception there it differ from person to person. I may say there are teachers, on this one I will not say male or female that one depends on the perception, on the interest of the teacher, because some teachers they like to do their teaching based on practical mostly and some teachers they like to go through theory. So that one, I cannot really tell because it differ from teacher to teacher, unless there is someone standing in front of that teacher and say, mind you, you have to teach this one 50%, this one 50%, otherwise if there is no monitoring, it will just depend on how that teacher is capable of doing in that particular course.

Interviewer: Ok, thank you very much. What leadership qualities do you think you need to teach agricultural science as a school subject to ensure that the continuation of reputation in your school?

P11: Mmmh, I think the most thing I will do is just monitoring, that one will help me to go along with it, without monitoring as I said earlier on, it depends to the interest of the teacher, now if it depends to the interest of the teacher meaning some of the things will be left out. So if they are been monitored and you see the evidence that they are there, I think this will help.

Interviewer: Ok, lastly P11 (Maunga Senior Secondary School) 11 , what changes do you think you need to bring to teaching of agricultural science in your teaching career?

P11: Mmmh, the changes, yeah one, it's so difficult to answer that one. Yah the changes that I want if the government itself, you know when you look in the government of Namibia, they are not teaching, they are not training teachers specifically for agriculture in education. The teachers who are teaching agriculture specifically for grade 11-12, they are coming from the institution of agriculture not from education, if education since they know their syllabus, they know the curriculum and then they could train people, having the curriculum which going hand in hand , the program, let me say the program of the institution in education, training teachers for agriculture should go hand in hand with the curriculum of a school which is into existence, so that when they come from there, they know that this is what we are going to put in place and it will be easy for teaching agriculture, unlike the way it is now, teachers, what the education they are doing, the institution of agriculture them they are interest of doing agriculture in general. There are just basing on what they want and education them they want to capture people from the institution of agriculture whereby they don't know what they are doing there which their curriculum have. So it's like its contradicting, and you find even those teachers who are coming from there, they might have some difficult part of it because it is not covered, it was not covered there but it's in the syllabus, so in short am trying to say that they should have a college which offer agriculture learners whom they will use in schools and having the program which is more less the same as the curriculum which is in school.

Interviewer: Thank you P11 (Maunga Senior Secondary School) 11 for your valuable time.

P11: (Laughing), thank you so much.

12. P12 's transcript

School: SS5

Interviewer: Good morning Mr. Singular (Nanzonde Senior Secondary School) 12

P12: Good morning Interviewer

Interviewer: I am Interviewer from Stellenbosch University, currently doing my PhD in education, focusing on improving teaching and learning in the Zambezi region. More precisely looking at the perceived competencies in the needs of the secondary agricultural science Agricultural Science Teachers in the Zambezi region, so you are very free to answer the questions as you may feel to be, as open as you can so that we can be able to give the data needed.

Our question is based on two sets of discussions and the first one is looking at the perceived competencies and the second one is the perceived needs of Agricultural Science Teachers in which you are part of that.

Now to begin with P12 (Nanzonde Senior Secondary School) 12 , how many years of teaching experience do you have?

P12: I am having 15 years teaching.

Interviewer: Thank you, what motivated you to teach agricultural science at combined or secondary school?

P12: There are many reasons but few of them, am qualified to teach the subject, because of the qualification I have in agriculture and therefore there is a need to impart knowledge and transfer it to a Namibian child so that they can build themselves.

Interviewer: Thank you Mr. Singular (Nanzonde Senior Secondary School) 12 , apart from Agricultural science, which other subjects are you teaching at your school?

P12: Am just teaching Agriculture.

Interviewer: Ok

P12: Because it is a big school having many learners so it's just one subject.

Interviewer: Do you feel that you that you are competent enough to teach agricultural science?

P12: Yes, because we are looking at the results, what am producing means a lot, can answer that question.

Interviewer: Explain what experience Agricultural science Agricultural Science Teachers do more effectively in nurturing learners' achievements than less experienced Agricultural science Agricultural Science Teachers in a similar teaching context?

P12: I need to know my learners, their performance so then I can help them as individuals, looking at their achievements and basic needs of these learners.

Interviewer: Ok, in your view how do you think that Agricultural Science Teachers do better as they gradually gain some experience?

P12: Because learning will always continue, it does not stop so for instance the topic I taught this year maybe I did less research, next year I teach the same topic and do more research so am building up.

Interviewer: Ok, what are your views about the perceptions that male agricultural science Agricultural Science Teachers are more competent than female agricultural science Agricultural Science Teachers in teaching agricultural science as a school subject in either combined or secondary school?

P12: They are all the same, having the same understanding maybe went to the same University so they will deliver the same knowledge to learners depending on the understanding of individual Agricultural Science Teachers in the subject.

Interviewer: Ok, in your view what are the qualities of a competent Agricultural Science Teacher in the assessment of learners in agricultural science as a subject?

P12: The Agricultural Science Teacher should understand the subject content, sometimes when he is teaching in the syllabus there is a topic he/she does not understand, she has to find some assistance from others Agricultural Science Teachers, coaching learners, coming together with other agricultural science Agricultural Science Teachers it helps as well.

Interviewer: Ok, thank you! In what way did the Agricultural training you underwent help you to be a competent Agricultural Science Teacher in Agriculture science?

P12: It is the theory and the practical aspect that I acquired during the training because normally we could go for field excursion, understand better what we learnt in class so the practical combined with theory part helps a lot.

Interviewer: Alright! The second part of the discussion relates to the perceived needs of the Agricultural science Agricultural Science Teachers in the Zambezi region of which you are part of it being a senior secondary school Agricultural Science Teacher. P12 (Nanzonde Senior Secondary School) 12 would you tell me, what are your needs as an Agricultural science Agricultural Science Teacher that will ensure that you do your job more effectively in teaching the subject?

P12: There are many needs, we need a syllabus for Agriculture we need practical equipment so that we can prove what we are learning in class, things like the apparatus for taking soil Ph tools we are to use when we prepare things like a plot/garden, we also need things like a water tank because water will not be available during part of the day maybe because the council due to other reasons failed to provide us with water so we need that one as well.

Interviewer: Ok, thank you. In your view how do you think that the perceived needs of the less experienced agricultural Agricultural Science Teachers differ from the perceived needs of the experienced agricultural science Agricultural Science Teachers with regard to the implementation of the agricultural science curriculum?

P12: The experienced Agricultural Science Teacher has gone under trainings or workshops and so have acquired that knowledge. The less experienced Agricultural Science Teacher is starting, he need to o under those workshops so that the knowledge can be acquired, he can be comfortable in the subject.

Interviewer: Ok, in what way do the perceived needs of male agricultural science Agricultural Science Teachers differ from the perceived needs of female agricultural science Agricultural Science Teachers in regard to the implementation of the agricultural science curriculum in school?

P12: The needs are just the same, be it a male or female because the syllabus is the guideline so they can have the same syllabus and therefore the needs will be just the same be it male or female.

Interviewer: Ok, what leadership qualities do you think you need to teach agricultural science as the school subject for the continuation of its repetition in the school?

P12: We need to be consistent in teaching the subject or the topic so that learners can understand, we need consistence or continuous practicals so that learners can understand the topic/subject.

Interviewer: Ok thanks, now P12 (Nanzonde Senior Secondary School) 12 the last one which I believe you should be able to explore, now what changes o you think you need to bring to the teaching of agricultural science in your teaching career?

P12: I need to convince my learners this subject Agriculture, others see it as an easiest subject and at the end of the year may fail the subject. So it is a subject that they should take very serious because if they don’t study they will not pass and also other thing I need to convince my learners that this subject once they take it as one of their subject it should help them in future so that they can understand that from this subject agriculture how does it provide employment in their family ,in the country they need to understand that one and also they need to know this subject agriculture can help them a lot, can put money in their pockets, can bring money, now they need to know that one as well having a small garden can provide as they sell the surplus they get money, they can know and understand that this subject can provide them with food, how the food they eat comes from agriculture they need to know that one. So all these are the changes I need to impart to my learners.

Interviewer: Thank you for your valuable time P12

P12: Great!

Interviewer: Thank you.

13. Appendix M: Certificate of translation from English to Afrikaans (Abstract)

CERTIFICATE OF TRANSLATION

THIS IS TO CERTIFY THAT THE DOCUMENT OF

PERCY MASHEBE

STUDENT NUMBER: 20670197

UNIVERSITY OF STELLENBOSCH

ENTITLED:

ABSTRACT

IMPROVING TEACHING AND LEARNING IN THE ZAMBEZI REGION, NAMIBIA: THE PERCEIVED COMPETENCIES AND NEEDS OF SECONDARY SCHOOL AGRICULTURAL SCIENCE TEACHERS

HAS BEEN PROFESSIONALLY TRANSLATED FROM ENGLISH TO AFRIKAANS.

9/7/2018

DR ELIZABETH SMITH DATE

DIPLOMA IN TRANSLATION: UNISA

BA HONS (ENGLISH): UJ

MA (APPLIED LINGUISTICS): UJ

PHD ADULT EDUCATION AND TRAINING: UJ

14. Appendix N: Letter from the Professional Editing Services

TINO STEFANO

Professional Editing Services

16 Wynand Road

Lakeside, Cape Town 7945

Phone 072 3535176

July 16 2018

To whom it may concern

This letter confirms that I have completed a language edit and proof-reading of **Percy Mashebe's** dissertation "**Improving teaching and learning in the Zambezi region, Namibia: the perceived competencies and needs of secondary school Agricultural Science teachers**".

My editing work focused entirely on the main text and references.

I am a professional editor with 40 years of full-time working experience on South African publications. I have for the past five years offered a freelance service, which includes news media, book and academic paper editing.