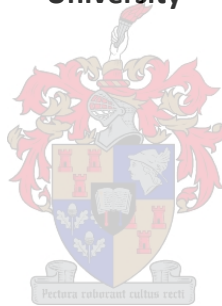# ELABORATION AND EMPIRICAL EVALUATION OF THE DE GOEDE LEARNING POTENTIAL STRUCTURAL MODEL

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Thesis presented in partial fulfilment of the requirements for the degree of Master of Commerce in the Faculty of Economic and Management Sciences at Stellenbosch University

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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 sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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ABSTRACT

As a direct result of having segregated amenities and public services during the Apartheid era where Black individuals were provided with services inferior to those of White individuals, the country is currently challenged by serious and debilitating issues such as a skills shortage across most industry sectors, high unemployment and poverty rates, and inequality in terms of income distribution as well as in terms of racial representation in the workforce. The country is furthermore facing social problems such as high crime rates and high incidence of HIV/AIDS. A discussion is put forward that these challenges are the consequence of a larger problem. The larger problem being the fact that knowledge, skills and abilities are not uniformly distributed across all races. The situation is that in the past, and still now, White South Africans have greater access to skills development and educational opportunities. It is this fundamental cause that must be addressed to in order to create a sustainable solution to the challenges described above. It is therefore argued that a means to overcome the challenges the country faces as a result of Apartheid is through skills development – specifically affirmative action skills development. Affirmative action skills development will entail giving previously disadvantaged Black individuals access to skills development and educational opportunities as to equip them with the currently deficit skills, knowledge, and abilities. It is proposed that affirmative action skills development is one of the most effective mechanisms through which the aforementioned problems facing the country might be alleviated.

A need was therefore identified for Industrial Psychology researchers to assist organisations to identify the individuals who would gain maximum benefit from such affirmative action skills development opportunities. To achieve this, an understanding is required of the factors that determine whether or not a learner will be successful if entered into an affirmative action skills development opportunity. Some studies have already been conducted regarding this need. One such study was conducted by de Goede (2007).

The primary objective of this study consequently was to expand on De Goede's (2007) learning potential structural model. Non-cognitive factors were added to the De Goede (2007) learning potential structural model in order to gain a deeper understanding of the complexity underlying learning and the determinants of learning performance. A subset of the hypothesised learning potential structural model was then empirically evaluated. The measurement model was found to have a good fit. However, the first analysis of the structural model failed to produce a good fit to the data. The analysis of the standardised residuals for the structural model suggested the addition of paths to the existing structural would probably improve the fit of the model. Modification indices calculated as part of the structural equation modeling pointed out specific additions to the existing model that would improve the fit. The model was subsequently modified by both adding additional paths. Furthermore, when considering the modification of an initially proposed

structural model, the question should not only be whether any additional paths should be added, but should also include the question whether any of the existing paths should be removed. To this end the unstandardised beta and gamma matrices were examined and it pointed to insignificant paths that could be removed. The model was subsequently also modified by removing insignificant paths. The final revised structural model was found to fit the data well. All paths contained in the final model were empirically corroborated.

The practical implications of the learning potential structural model on HR and organisations are discussed. Suggestions for future research are made by indicating how the model can be further elaborated. The limitations of the study are also discussed.

OPSOMMING

'n Resultaat van Apartheid is dat Suid Afrika dringende uitdagings in die gesig staar soos byvoorbeeld lae vaardigheidsvlakke, hoë vlakke van werkloosheid en armoede, en ongelykheid in terme van inkomste en verteenwordiging in die werksmag. Suid Afrika het onder meer ook die uitdagings van hoë vlakke van misdaad en HIV/VIGS.

Hierdie tesis stel voor dat die bogenoemde uitdagings simptome is van 'n groter probleem, naamlik gebrekkige opleiding en ontwikkeling van vaardighede van Swart Suid Afrikaners. Dit is hierdie gebrek aan vaardighede wat aangespreek moet word om 'n volhoubare oplossing tot die bogenoemde uitdagings te vind. Die argument word gestel dat 'n oplossing gevind sal word in regstellende ontwikkeling. Regstellende ontwikkeling behels om voorheen benadeelde Swart Suid Afrikaners toegang te gee tot opleidings en ontwikkelingsgeleenthede. Dit word gestel dat regstellende ontwikkeling die meganisme is waardeur die land se uitdagings aangespreek moet word.

'n Behoefte is dus geïdentifiseer vir Bedryfsielkundiges om navorsing te doen aangaande die eienskappe van studente wat sal bepaal of hulle suksesvol, al dan nie, sal wees tydens versnelde regstellende ontwikkeling. 'n Soortgelyke studie is reeds onderneem deur de Goede (2007).

Die primêre doelwit van hierdie studie was gevolglik om De Goede (2007) se leerpotensiaal-strukturele model uit te brei. Nie-kognitiewe faktore is tot De Goede (2007) se model toegegevoeg om 'n meer indringende begrip van die kompleksiteit onderliggend aan leer en die determinante van leerprestasie te verkry. 'n Subversameling van die voorgestelde leerpotensiaal-strukturele model is vervolgens empiries geëvalueer. Dit is gevind dat die metingsmodel die data goed pas. Met die eerste analise van die strukturele model is goeie passing nie verkry nie. 'n Ondersoek na die gestandardiseerde residue het getoon dat die toevoeging van addisionele bane tot die bestaande strukturele model waarskynlik die passing van die model sou verbeter. Modifikasie-indekse bereken as deel van die strukturele vergelykingsmodellering het spesifieke bane uitgewys wat die passing van die model sou verbeter indien dit bygevoeg word tot die bestaande model. Die strukturele model is dus aangepas deur addisionele bane by te voeg tot die bestaande model. Die strukturele model is ook aangepas deur bane te verwyder wat nie statisties beduidend was nie. Die bevinding was dat die hersiene model die data goed pas. Alle bane in die finale model is empiries bevestig.

Die praktiese implikasies van hierdie studie vir menslike hulpbronbestuurders en organisasies word bespreek. Voorstelle vir toekomstige navorsing is gemaak deur aan te dui hoe die model verder uitgebrei kan word.

ACKNOWLEDGEMENTS

I am afraid that my words might not be able to fully express the depths of gratitude and appreciation I have towards my study leader, Prof. Callie Theron, for his immense contribution towards this thesis. His dedication and excellence was evident in every point of contact. His knowledge and insight steered the project towards completion when I did not know which way to go while his patient and supportive manner motivated me when I felt like giving up. He is a role-model and a mentor and I feel privileged to have had the opportunity to work with him over the past three years.

My parents have been my solace, support and encouragement and without them I can easily say this thesis would never have reached completion. I therefore dedicate my thesis to them as an expression of the immense appreciation I have for all they have done for me and for their contribution towards this accomplishment. I cannot thank you enough. I hope that one day I will also be able to dedicate my PHD to you.

Mom - your kind, warm, and comforting presence constantly gave me renewed strength. The almost daily phone calls and your patience in listening to my frustrations carried me through. And of course, thank you for the hours spent behind the computer assisting me with the write-up.

Dad – with your strong presence and logical thinking you have been my rock. Your advice and guidance has been invaluable. All I can say is that the phrase "September" will forever be remembered and that over the past few years you have acted as a motivator like no other. I thank you for pushing me even when I resisted being pushed; you knew what was best for me.

If I were to mention each person individually who has contributed towards the success of this thesis, the length of my acknowledgements might match the length of my thesis. Each small act of encouragement, patience and support was greatly appreciated and never went unnoticed. To all my family, friends, co-workers and housemates, it is a blessing to have you in my life and you have each in your own way contributed towards the completion of this thesis.

Furthermore, I also need to extend my gratitude towards my employer for their support in my journey and having made this process all the easier for me.

Lastly, I extend my gratitude and thanks to the three schools participating in the study. The willingness, efficiency and professionalism of the principals and teachers directly involved was remarkable.

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CHAPTER 1

ARGUING THE NECESSITY OF THE STUDY

1.1 THE CONTEXT OF THE STUDY

Apartheid was a system of legal racial segregation enforced by the National Party government of South Africa between 1948 and 1993, under which the rights of the majority 'non-White' inhabitants of South Africa were curtailed and minority rule by white South Africans was maintained. Under this system, the government segregated amenities and public services and provided Black South Africans with services inferior to those of White South Africans. For example, education was segregated by means of the 1953 Bantu Education Act, which crafted a separate system of education for Black students and denied them access to the education and other developmental opportunities that White student were afforded. Subsequently, the Apartheid regime crafted an unequal and divided society (Cameron, 2003; Gibson, 2004).

In the later years of Apartheid the country faced an array of problems such as having one of the lowest economic growth rates in the world, the increased occurrence of often violent civil unrest by Black South Africans, and facing international boycotts including trade embargos and being banned from international sporting events (Gibson, 2004; Luth, 2003; Sayed, 2008). These catalysts finally led to Apartheid being dismantled in a series of negotiations from 1990 to 1993, culminating in democratic elections in 1994. This led to the election of a new government and the abolishment of Apartheid (Cameron, 2003; Gibson, 2004).

The newly elected government embarked on an elaborate process geared towards the redistribution of economic, social, cultural and political power and resources in order to rectify the inequalities of Apartheid (Cameron, 2003). In the years since the abolishment of Apartheid significant progress was made towards transforming the unequal society, and considerable achievements have been managed in many respects. According to the third edition of the Development Indicators publication (Republic of South Africa, 2009) inflation has fallen from a high of over 20% in 1986 to a low 3.7% in January 2011. Gross Domestic Product (GDP) increased from 3.2% in 1994 to 5.4% in 2006. Foreign direct investment increased dramatically between 1994 and 2008. Government debt as a percentage of GDP decreased from 47% 1994 to a low of 22.6% in 2008. According to the same report, the country has also broadened access to social services. The percentage of households with access to water infrastructure above or equal to the Reconstruction and Development Programme (RDP) standard increased from 61.7% in 1994 to 91.8% in March 2009. As of March 2009, more

than 10 million households (77%) had access to sanitation compared to about 5 million (50%) in 1994. The estimated number of households with access to electricity has increased from 4.5 million (50.9%) in 1994 to 9.1 million (73%) in 2008 (Republic of South Africa, 2009).

Despite these notable achievements and the strides that have been made towards the redress of the South African society, challenges still remain. As a direct consequence of Apartheid where Black South Africans were denied access to education and developmental opportunities only a small minority of South Africans, mostly Whites, are educated and possess valuable skills, knowledge and abilities that they currently utilise in the marketplace. The average White South African is educated, employed, earns a decent salary and lives in relative comfort. On the other hand the majority of the South African population, mostly Black individuals, is in most part uneducated and do not possess skills, knowledge and abilities that they can offer the marketplace. As a result, the average Black South African is unable to find gainful employment, earns no or only a subsistence wage, and lives in relative poverty. The challenges South Africa faces therefore include the shortage of critical skills in the marketplace, high unemployment and poverty, inequality in terms of income distribution and representation in the workforce and other social challenges such as a high crime rate and an increasing dependence on social assistance grants. The following section will discuss each of these challenges in more detail. However, when commencing with this discussion it is important to understand that these challenges are not occurring in isolation from each other but rather that they are complexly causally interconnected. Each of these challenges influences each other and also has in common the factors that cause and exasperate them. A penetrating understanding of the need for urgent action lies in particular in appreciating this complex interplay between the various challenges.

1.2   CHALLENGES IN CURRENT SOUTH AFRICA

1.2.1   Skills shortage

South Africa is experiencing a skills shortage where the marketplace demand for certain skills exceeds the supply thereof (Akoojee, Gewer & McGrath, 2005; JIPSA, 2007; Pillay, 2003; Sebusi, 2007; Solidarity, 2008). According to the literature, skills shortages have been identified in the following occupations: Technicians, engineers, managers, accountants and auditors, medical practitioners, artisans and teachers.

The severity of the skills shortage is made clear in a report released by Trade Union Solidarity in 2008 detailing the skills shortage per sector. According to the report, it is estimated that South Africa is experiencing a 40%

shortage of artisans. Consequently, certain companies are forced to import artisans from other countries in a bid to meet their staffing requirements. Moreover, South Africa is currently only producing half the number of engineering graduates that are required to meet the demands for those skills. Furthermore, it was estimated that South Africa needs 21 000 new teachers each year, but that only 5 000 were being produced. Other examples include findings by the Human Sciences Research Council that there is a shortage of between 350 000 and 500 000 qualified people to fill managerial and technical positions and that there is a shortfall of about 100 000 with the skills needed to develop, build, and manage the IT systems required to support economic growth (Solidarity, 2008).

The skills shortage in the country is furthermore compounded by the current state of the primary and secondary education systems in the country. It can be argued that flaws in the primary and secondary education systems are contributing towards the skills shortage. This is exemplified by the following facts. A matric pass rate of 68.8% was celebrated at the end of 2010 and boasted a 7.2% increase from the 2009 results. There results seemed cautiously optimistic, however the percentage of pupils who achieved a 40% pass in mathematics, physical science and accounting was a shocking 30.9%, 29.7% and 35.3% respectively (Tackling SA's skills shortage, 2011).The mediocre pass rate in these three gateway subjects has huge implications. As was stated above, the country is currently experiencing a shortage of skills in occupations such as engineering, medicine, commerce and IT. For a school leaver to pursue a career in those occupations, it is a prerequisite to have passed mathematics and science in matric. School leavers wishing to pursue a career in finance, accounting or auditing require accounting as subject at matric level. Therefore, not only is there currently a shortage of skills in the identified occupations, the secondary education sector is also not producing enough school leavers who are eligible for further studies in those fields. It consequently does not seem likely that the skills shortage will be alleviated in the near future. It was also stated above that a shortage of skilled teachers exist. One can only contemplate the effects that a shortage of teachers may have on future pass rates in these three subjects.

Furthermore a different perspective on the matric pass rate, as per Sebusi (2007), warrants discussion. Econometrix (Pty) Ltd, an economics analysis company in Johannesburg, compiled data from Statistics SA, on the number of mathematics matriculants the country is able to produce. The research comprised following a group of pupils from when they started their school career till then they matriculated 12 years later. According to the research, about 1.7 million pupils started their schooling (grade 1) in 1995. Of this number, only 529 000 made it to the matriculation exam in the appropriate year (2006). Of the pupils who wrote matric exams, only about 352 000 passed matric. From the group that passed matric, only about 86 000 managed to obtain

university exemption. Expressing this in percentages, of the original group only 31% reached matric exams, 21% passed matric, and only 5% managed to obtain university exemption. Each year as matriculation exam papers are marked and the results made available, heartening statistics are released that a matric pass rate of between 60-70% has been achieved. What is seldom considered is the fact that the 60-70% is a percentage expressed as the number pupils who passed matric out of the number of pupils who wrote the matric exams. No consideration is given to the matric pass rate expressing the number of pupils who passed matric as a percentage of the number of pupils who were supposed to be in matric that year given the year that they started grade 1. This latter percentage is the above stated 21%. The figures above paint a different and vastly bleaker picture than what is generally publicised. Of all pupils who enter into primary education, only approximately 21% will matriculate and only approximately 5% will manage to obtain university exemption. This again raises concern regarding the number of school leavers that the secondary education sector is producing that will be eligible for further studies in the occupations that have been identified as scarce skills.

According to Sebusi (2007) the severity of the skills shortage cannot accurately be described without including in the argument the issue of losing professionals through emigration. Not only is South Africa currently not producing enough skilled individuals to alleviate the current skills shortage, but it is actually losing skilled professionals who are choosing to leave the country to go live and work abroad. Reasons stated for the occurrence of emigration include the high crime rate, retrenchments, and the fact that White South Africans do not have confidence in a Black government. According to Crush in 2006 (as cited in Sebusi, 2007), South Africa has lost 118 000 skilled professionals between 1999 and 2006 due to emigration and that the country is experiencing a net outflow of professionals. In other words, more skilled professionals are leaving the country than what skilled foreign nationals are entering the country. It is admitted that the emergence of the global marketplace has made the movement of people across countries more commonplace, however in a country such as South Africa where a severe skills shortage is being experienced and the education system is currently not producing enough educated individual to alleviate it, the so-called 'brain drain' further adds to the severity of the challenge.

Also extremely relevant to the issue of a skills shortage, is the effect of HIV/AIDS. One of the most serious public health problems facing South Africa is the HIV/AIDS epidemic. The magnitude of the problem is demonstrated in the following statistics:

- 10.6% of the total South African population is infected with HIV.
- An average of one in six working age (15-49) adults is infected with HIV.
- 1700 new HIV infections occur every day.

- Between 354 000 and 383 000 AIDS deaths occur annually.

(Bolton, 2008; Department of Labour, undated; Rosen, Vincent, MacLeod, Fox, Thea & Simon, 2003)

Although HIV/AIDS receives much attention as a serious health problem challenging South Africa, little explicit consideration is given to the effects of the disease on other relevant issues such as the skills shortage. According to Akoojee et al. (2005) and Bolton (2008) the high prevalence rate of HIV/AIDS is a major contributor towards the current skills shortage experienced in South Africa. This is due to the high mortality rate of the disease. Once an individual is infected with the HIV virus, it is likely that individual will die within eight to ten years if not receiving anti-retroviral treatment (Rosen et al., 2003). Therefore, HIV/AIDS has the potential to reduce the availability of skilled labour supply through AIDS deaths.

A study conducted by the Bureau of Economic Research in 2001 (as cited in Vass, 2003) found an inverse relationship between skills level and HIV/AIDS prevalence. Although higher HIV/AIDS prevalence levels are projected for lower skilled and lower paid workers, compared with higher skilled and better paid workers, it does not detract from the fact that HIV/AIDS severely affects all skills categories. According to projections by Abt Associates Inc and AIDS Research Unit Metropolitan Life Ltd in 2001 (as cited in Vass, 2003), in the year 2015 the HIV prevalence rate for highly skilled workers is projected to be at 18.3%. This is in comparison to 25.4 % for skilled workers and 27.6% for semi- and unskilled workers. The high projected prevalence rate among highly skilled and skilled workers further evidences the potential of HIV/AIDS to reduce the availability of skilled labour supply through AIDS deaths.

A relevant example of the detrimental effect of the skills shortage is made evident in the recent wave of 'service delivery protests'. During the period January – June 2009, a total of 26 protests were recorded and many of the protests have been marked by exceptionally high levels of violence and vandalism. One of the reasons cited that hamper the ability of Local Government to provide essential services to their communities include a lack of capacity and requisite skills. There are simply not enough skilled individuals to do the required jobs. As a result, these municipalities cannot meet their required performance standards hence impacting adversely on the delivery of services. For example, insufficient engineers has meant that the infrastructure for water and sanitation services has deteriorated badly over the years, leaving many communities with poor water quality, inadequate access to clean water and inadequate access to sanitation services. In addition, the lack of experienced staff with the requisite project management and financial skills, has meant that many municipalities are unable to properly manage and budget for their projects, leaving budgets unspent and

projects urgently needed to uplift the lives of the poor, uncompleted (IDASA, 2010; Republic of South Africa, 2009b).

A further macro-level example of the detrimental effect of the skills shortage in South Africa is the fact that the skills shortage has been identified as one of the major threats towards achieving a sustainable GDP growth. Economic growth is essential for job creation, increased consumer and investor confidence, and an increased standard of living for citizens of the country. Without sufficient number of skilled individuals to do all the jobs and functions that are required, the country will simply not be able to achieve sustainable economic growth (ASGISA, 2008).

Having denied Black South Africans access to education and developmental opportunities during Apartheid contributes directly and significantly to the fact that there is a lack of skilled individuals in the country. The millions of previously disadvantaged individuals who were denied access to training and development during Apartheid simply do not possess skills, knowledge and abilities that they can supply the marketplace. The minority of South Africans who were privileged with access to training and developmental opportunities during the Apartheid regime are just not sufficient in number to support the current demand for skills. There consequently is a massive skills shortage in the county where the demand for skills far exceeds the supply thereof.

1.2.2   Unemployment and poverty

South Africa has an alarmingly high unemployment rate. Currently standing at 23% (on the narrow definition of the unemployment rate), South Africa has one of the highest unemployment rates in the world. On the broad definition, which includes 'discouraged work seekers' (i.e. those who are not or no longer actively seeking work) the unemployment rate is even higher standing at around 37% (STATS SA, 2010, p. xi).According to 2006 statistics, there is a clear racial underpinning to the unemployment rate. While approximately 30% of Blacks are unemployed, only 20% of Coloureds and 14% of Indians are unemployed. This can be compared to the mere 4% of Whites who are unemployed (Sebusi, 2007). Considering the racial underpinning of unemployment where the majority of those unemployed are Black South Africans, it can logically be ascribed to being a direct consequence of Apartheid. Moreover, the high unemployment rate goes hand-in-hand with a high poverty rate. According to statistics 75.4% of South African adults earn an income of equal to or less than R4166.67 per month. More severely, 26% of South Africans live below the national poverty line of R515 a month (Bleby, 2010). These figures are indicative that a large portion of South Africans are unemployed, and therefore live in

relative or dire poverty. Considering the racial underpinning of unemployment where the majority of those unemployed are Black South Africans, it is a logical assumption to make that the majority of individuals living in poverty would then also be Black South Africans. These facts seem to support the stance that unemployment and poverty is related to the Apartheid regime, specifically, that the high unemployment and poverty rates among the Black South Africans is a consequence of their previously disadvantaged status during the Apartheid regime.

The severity of unemployment and poverty situation in South Africa is further exemplified by the high rate of dependence on social assistance grants. In 2009, 27% of South Africans (13 million people) were reported to be receiving social assistance grants. This figure has increased to nearly 31% of South Africans (15 million people) receiving social assistance grants in 2011 (Ndlangisa, 2011). Social assistance grants form part of the government's plan to eradicate poverty. The idea of providing financial relief to the poorest of the poor who are unable to provide for themselves and their families with a decent standard of living cannot be faulted. However, it should be considered that 75.4% of South African adults (36.75 million people) earn an income of R50 000 or less per annum (Bleby, 2010). This amount falls below the personal income tax threshold of R54 200 per annum (SARS, 2010). Consequently, only approximately 25% of South Africans (12.25 million people) pay personal income tax. A great imbalance exists between the number of personal income tax payers (25%) and the number of recipients of social assistance grants (31%). This brings into question the feasibility of such a massive expenditure on social assistance grants[1]. It is debatable whether it can be sustainable in the long term and whether it ultimately contributes towards economic growth, if a significantly larger portion of individuals are receiving social assistance grants than the portion of individuals who are paying personal income tax and therefore contributing towards the national coffer. Further bringing into question the feasibility of such a high dependence on grants is the fact that 15% of the 2009 national budget was spent on social welfare (R13.2 billion). This is the 2nd largest budget expenditure after health and education (24.8 billion). Such a large expenditure on social welfare means there are considerably less funds available for projects such as transport (R6.4 billion), infrastructure development such as building power stations to stabilize the supply of electricity to the private sector (R1 billion), and industrial development and small business development (R1.6 billion) including giving increased assistance in the form of loans to small businesses. Instead of spending funds on national development which will be to the advantage of the business community and ultimately contribute

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[1] It should, however, be acknowledged that its not only the number of people paying income tax and the number of people not paying income tax but that are receiving social security grants but also the magnitude of the tax paid and grants received that affect the sustainability.

towards sustained economic growth, the spending focus is rather on social welfare and providing a subsistence living to citizens in the form of welfare grants.

Another consequence of unemployment and poverty manifests in South Africa's extremely high crime rates. Unemployment, poverty and the subsequent harsh living conditions in the informal settlements are often cited as facilitators of the high crime rate (CSVR, 2010[2]). South Africa has the second highest rate of murders in the world. Each day an average of nearly 50 people are murdered in South Africa. To benchmark this against murder rates in other countries, the world average number of murders is 8 per 100 000 population. South Africa reported almost 30 homicides per 100 000 population (Geneva Declaration, 2008). According to a survey for the period 1998–2000 compiled by the United Nations, South Africa was reported as having the highest number of reported rapes and assaults per capita. Furthermore, South Africa has one of the top 10 highest rates of robberies in the world (United Nations, 2002). Further compounding the problem is the fact that violent crime in South Africa is on the increase. According to SAPS (2010), sexual offences against women increased by 19.8% from the 2008/2009 period to the 2009/2010 period, sexual offences against children increased by 36.1%, murder of children increased by 14.5%. Robberies against businesses increased by 4.4% and robberies at residential premises increased by 1.9% Theft out of motor vehicles increased by 8.9%. In all subcategories of robberies, only 18.4% of cases actually concluded in arrests being made. The above makes an argument towards the facts that individuals, as well as businesses are severely affected by the high crimes rates of the country.

The above discussion and statistics clearly posits that unemployment and poverty does not only affect the individuals living in that situation, but also indirectly affect all South African individuals as well as businesses through its consequences, such as increased national spending on social welfare and the manifestation of high crime rates.

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[2] It is thereby not suggested that crime is not complexly determined and that unemployment and poverty are only two latent variables in an n extensive nomological network of determinants.

1.2.3   Inequality and income distribution

South Africa has the most unequal income distribution in the world. Support for this statement can be found in the Gini coefficient for South Africa of 0,666[3] which is indicative of the great inequality between the rich and the poor in the country. South Africa has now even overtaken Brazil as the country with the widest gap between rich and poor in the world (Pressly, 2009; Republic of South Africa, 2009). The massive inequality can be quantified. The income of the richest 20% of South Africans equates 70.0% of total income. This is versus the income of the poorest 20% of South Africans which equates a mere 4.6% of total income. The income inequality has a clear racial underpinning. The mean per capita income for a White individual is R8 141.15 per month. This is compared to the mean per capita income for a Black individual of R845.83 per month (Republic of South Africa, 2009).

It should however be noted that although there is a glaring inter-group income disparity between Black and White South Africans, there is also an increasing intra-group divide between rich Blacks and poor Blacks that is also contributing towards the increasing Gini coefficient. According to Landman, Bhorat, van der Berg and van Aard (2003), there has been a recent shift where the main driver of inequality currently in SA is no longer the Black/White divide, but rather the intra-group divide between rich Blacks and poor Blacks. This is the result of certain African households dramatically improving their position, while other African households are not any better off than what they had been during the Apartheid regime. A reason for this phenomenon may be attributed to an unintended consequence of certain imperatives (such as the Black Economic Empowerment initiatives) geared towards the redistribution of economic, social, cultural and political power. According to Alexander (2006), these imperatives are not benefitting and developing the masses of poor and disadvantaged Black South Africans who most require the assistance. Instead, they are rather only benefitting a small handful of aspirant and influential Blacks. Such imperatives are only making a small portion of rich Blacks even richer while the poorest of the poor receive no assistance or development.

The clear racial underpinning where Black South Africans are at the lower end of the income scale again alludes to the fact that the inequality of income distribution is a consequence of Apartheid disadvantaging Black individuals.

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[3] Inequality in a society is measured by the Gini coefficient, which can vary between "0" and "1". The closer to 1, the more unequal a society, and the closer to 0 the more equal a society. The Gini coefficient measures the distribution of the national income.

1.2.4   Inequality of racial representation in the workforce

When the new government came into power after the 1994 democratic elections, policies and practices were implemented in an effort to redress the inequalities of Apartheid. These included legislation such as the Employment Equity Act (EEA) and initiatives such as affirmative action (AA) and Black Economic Empowerment (BEE) (Alexander, 2006). However now 17 years into democracy, there is strong criticism towards these redress measures and whether or not they are effective in bringing about the transformation they were designed to affect. Jimmy Manyi, in his then capacity as the Chairperson of the Commission for Employment Equity, emphasised in the annual report of the Commission for Employment Equity his impatience with the marginal progress that has been made ten years after of the promulgation of the EEA (Commission for Employment Equity, 2009). Statistics from the same report show that the national labour market is still very much racialised. White South Africans are predominantly located in middle to high end occupations while Black South Africans remain at the lowest end of the labour market. This is illustrated by the fact that 72.8% of top management positions are comprised of Whites as opposed to only a mere 13.6% of top management positions that are held by Blacks. Also disconcerting is the fact that recruitment and promotion rates in top management positions also still continue to be much higher for Whites than the other groups. Seemingly Whites are still being favoured for higher and more sought-after positions now in a time of supposed transformation. When reaching the lower levels comprising unskilled and manual labour, the majority percentage of positions are held by Blacks, while only a fractional percentage of positions are held by Whites (Commission for Employment Equity, 2009).

Given the slow pace of transformation, stronger penalties are being called for if companies are not complying with the EEA. According to Jimmy Manyi, the laws are too forgiving and he calls for more prosecutions for non-compliance and fines of up to 10% of the company's annual turnover (Williams, 2009). Furthermore, in the Employment Equity Commission 2009/10 report, Labour Minister Membathisi Mdladlana, added that the law should be changed to make it a criminal offence for companies to fail to comply with the Employment Equity Act. He proposed that the Labour Department be empowered to issue spot fines to non-compliant firms. Mdladlana is quoted as saying "if the traffic police can give you a ticket on the spot for speeding, why can't our department immediately give you a fine if you are found to be not complying with the law?"Another proposal was made by the then ANC Youth League Leader Julius Malema for the government to start awarding tenders based on a company's employment equity status (Sibanyoni, 2010). It is evident companies are being placed under severe pressure to either comply with the EEA or face the possibility of prosecution, having to pay debilitating fines or losing lucrative tenders.

Given the call for strong actions, the question is raised why companies are not implementing employment equity in their workforce. The answer to this question relates back to the skills shortage. Having denied Black South Africans access to education and developmental opportunities during Apartheid directly contributes to the fact that there is a lack of skilled individuals in the country. Specifically relevant to the context of racial inequality in the workforce, there is a lack of *skilled* Black individuals in South Africa. Companies are being placed under increasingly pressure to implement employment equity measures in terms of workforce composition, yet the pool of individuals who firstly have the skills, knowledge and abilities to do the middle- to high end jobs and secondly meet the racial classification criteria of being previously disadvantaged are completely insufficient in number. As a result, companies are unable to meet their employment equity requirements due to the fact that there are simply not enough Black individuals with the necessary skills, knowledge and abilities. However although the argument is put forward that there is a shortage of skilled Black individuals in South Africa, it should be taken into consideration that this may not be the only reason for the slow process of demographic transformation.

At the same time it is possible that there still exists a resistance against the transformation of business, due to prejudices towards Black South Africans and a perceived threat to the positional status and power experienced by White South Afircans. So although the upskilling of Black South Africans is clearly a critical issue, one cannot completely ignore the prejudices that exist and the resistance that is experienced in regards to transformation in business. It, however, seems unlikely that a resistance against transformation can be the primary and fundamental reason for the latest Commission for Employment Equity statistics.

1.2.5   Global competitiveness

The Global Competitiveness Index is released by the World Economic Forum and is an assessment of national competitiveness providing a mirror image of a nation's economic environment and its ability to achieve sustained levels of prosperity and growth. The Global Competitiveness Report 2009-2010 ranked South Africa 45th during a comparison of 133 economies worldwide. The Global Competitiveness Index furthermore provides a holistic overview of the factors that are critical to driving productivity and competitiveness and groups them into 12 pillars. Of particular relevance is the 4th and 5th pillars respectively labeled 'Health and Primary Education' and 'Higher Education and Training'. For 'Health and Primary Education' pillar South Africa was ranked a dire 125 out of 133 while thankfully faring better on the 'Higher Education and Training' pillar where South Africa was ranked 65 out of 133. Furthermore, the Global Competitiveness Index indicated that the inadequately educated workforce was cited as the 2nd most problematic factor for doing business in South

Africa (World Economic Forum, 2009). The foregoing discussion therefore posits that South Africa's ability to effectively compete in the global marketplace and to achieve sustained levels of prosperity and growth is directly and severely affected by the consequences of Apartheid. Due to the fact that the majority of the South African population only had limited access to developmental and educational opportunities during Apartheid, these individuals now do not possess the required skills, knowledge and abilities to contribute towards achieving increased GDP.

1.3   TOWARDS SOLVING THE IDENTIFIED CHALLENGES

The preceding section has served to provide an overview of the prevalent challenges that South Africa is currently experiencing as a consequence of Apartheid. As a direct results of having segregated amenities and public services and providing Black individuals with services inferior to those of White individuals, the country is currently challenged by serious and debilitating issues such as a skills shortage across most industry sectors, high unemployment and poverty rates, and inequality in terms of income distribution as well as in terms of racial representation in the workforce. However it seems as if the current government and the private sector's focus is too heavily on addressing the symptoms described above instead of addressing the real root cause. Making lofty promises of job creation, poverty alleviation, building houses for deserving citizens, and so forth, can somehow be likened to treating a gunshot wound by putting a plaster on it. It is a case of merely addressing the symptoms of a much larger problem that is being ignored. This larger problem is constituted by the fact that knowledge, skills and abilities are not uniformly distributed across all races. The situation is rather that in the past, and still now, White South Africans have greater access to skills development and educational opportunities.   It is this fundamental cause that must be addressed to in order to create a sustainable solution to the challenges described above. It is therefore argued that a means to overcome the challenges the country faces as a result of Apartheid is through skills development – specifically affirmative action skills development. Affirmative action skills development will entail giving previously disadvantaged Black individuals access to skills development and educational opportunities as to equip them with the currently deficit skills, knowledge, and abilities. It is proposed that affirmative action skills development is one of the most effective mechanisms through which the aforementioned problems facing the country might be alleviated. The following section will offer a description of how affirmative action skills development can assist in resolving the challenges.

As was discussed in the foregoing section, South Africa is experiencing a skills shortage where the demand of certain skills exceeds the supply thereof. In other words, there are not enough suitably skilled individuals available in the marketplace to do all the jobs that organisations have on offer. Having denied Black South

Africans access to education and developmental opportunities during Apartheid contributes significantly to the fact that there is a lack of skilled individuals in the country. The minority of South Africans who were privileged enough to have access to training and developmental opportunities during the Apartheid regime are just not sufficient in number to support the current demand for skills. The millions of previously disadvantaged individuals who were denied access to training and development during Apartheid simply do not possess the knowledge, skills and abilities required by employers. Furthermore, due to the skills shortage, South Africa is also challenged by high rates of unemployment and poverty. Previously disadvantaged Black South Africans are unable to find employment, due to the fact that they do not possess the knowledge, skills, and abilities that employers require. As consequence of their inability to find employment, these individuals live in dire poverty conditions. The foregoing two considerations relating firstly to the skills shortage and secondly to the high levels of unemployment and poverty, evidences that South Africa is in a rather paradoxical position. It is an alarming realisation that on the one had there is a high unemployment-and poverty rate with thousands of hopeful people desperately, and mostly unsuccessfully, looking for work, and on the other hand the marketplace has available many lucrative, well-paying jobs and is unable to find suitably skilled individuals to fill the positions. This situation has the potential for perfect symbiosis. However in the face of inaction, the challenges the country faces will persist.

A direct means to alleviate the skills shortage, as well as the high unemployment and poverty rates will be the implementation of affirmative action skill development opportunities that will equip those previously disadvantaged individuals with the skills, knowledge and abilities that are sought after in the marketplace. This will also directly allow these individuals to find employment and earn a decent living wage thereby uplifting them from conditions of poverty. Although social assistance grants has brought much-needed relief for the most poverty stricken South Africans, receiving a marginal social assistance grant is not the (long-term) means to rise above current dire circumstances. Lasting progress in the battle against poverty and its manifestations can only be achieved by means of providing education and skills development as to achieve the self-reliance that stems from employment opportunities and decent wages (Teffo, 2008; Woolard, & Leibbrandt, 1999). Empowerment through skills development is essential. This is a fact that is seemingly accepted and acknowledged by the South African government. In his 2011 state of the nation address, President Zuma stated that government was building a developmental state and not a welfare state. The President stated that social grants should only be a short term tool enabling beneficiaries of these grants to become self-supporting in the long run (Ndlangisa, 2011). Therefore, education and skills development is required to empower the disadvantaged individuals currently unemployed, living in poverty and reliant on social assistance grants to become equipped with the skills and abilities required to obtain meaningful employment and earn a decent

wage. It is only through this process that such a large percentage of South Africans will become self-reliant and no longer need social assistance grants to survive thereby allowing the availability of more funds to be spent on national development projects.

The argument that affirmative action skills development will lead to higher employment rates is supported by the fact that the unemployment rate is disproportionate and varies from 'near zero' among highly skilled workers to more than 50% among unskilled and semi-skilled workers (Woolard & Woolard, 2006). Furthermore, the argument that skills development is a driver for poverty eradication is also supported. According to the literature (Department of Higher Education and Training, 2010; Sayed, 2008; Teffo, 2008; Woolard & Leibbrandt, 1999), persons with low levels of educational attainment are much more likely to be poor than well-educated ones. Poverty affects 66.3% of individuals with no schooling and 59.9% of individuals who had not completed primary schooling. By contrast, poverty is rare among those who have obtained a post-matric certificate or diploma/degree: in these groups the poverty rates are 4.6% and 1.2%, respectively (Bleby, 2010). The relationship between poverty and level of education is attributed to the mediating effect of employment status whereby educated and skilled individuals are more likely to be employed and earning a decent salary or wage, therefore not living in poverty.

The implementation of affirmative action skills development opportunities for previously disadvantaged Black South African will address the challenge of inequality in workforce representation. Currently White individuals are still more prevalently found in the middle- to higher end of the job hierarchy, while Black individuals are holding jobs at the lowest end of the job hierarchy. Although the private sector is being placed under increased pressure to comply with the employment equity legislation, transformation is slow. It is frequently cited that non-compliance to the employment equity requirements is due to the fact that there is a shortage of suitable qualified Black individuals with the skills, knowledge and abilities to do the middle- to higher end jobs. In this situation, companies who are desperate to appease the Commission may be tempted to window-dress and give senior titles to Blacks who do not possess the necessary skills, knowledge and abilities to do the job (Luth, 2003). However, window dressing simply does not make good business sense. Companies are in business for a profit and cannot do this if their employees are unfit for the job. The issue of unequal representation in the workforce, and the possibility that there is not enough Black individuals with the skills, knowledge and abilities to fill positions at the top end of the job hierarchy, can only be addressed in an intellectually honest fashion through affirmative action skills development. It may feel like an effective quick-fix to the problem to place individuals in positions simply based on their racial classification. However, taking that action and placing an unqualified individual in a position is not the answer. Rather, action should be taken in the form of

implementing affirmative action skills development opportunities in order to equip previously disadvantaged Black individuals with the skills, knowledge and abilities they require to allow them to competently fill those positions thereby restoring equality in racial representation in the workforce.

Furthermore, the implementation of affirmative action skills development opportunities will also alleviate the inequality of income distribution. Currently the South African society is extremely unequal in terms of income distribution. White individuals and a handful of Black individuals are at the high-middle end of the income hierarchy while the majority of the South African population, the Black previously disadvantaged group, is at the lower end of the income hierarchy. In order to affect a significant decrease in the Gini coefficient those currently excluded from the formal economy need to be empowered through skills development and training opportunities with the skills, knowledge, and abilities they require to productively participate in the economy (Pressly, 2009, Bleby, 2010)**.** Affording skills development- and educational opportunities to the disadvantaged poorest of the poor will increase the likelihood that these individuals will find meaningful employment and earn a decent wage. When the number of individuals at the bottom of the income hierarchy decrease, and there is a shift towards more individuals falling in the middle regions of the income hierarchy, it will subsequently contribute to the income distribution becoming less unequal, and to a declining Gini coefficient.

The implementation of affirmative action skills development opportunities will also indirectly contribute towards the alleviation of challenges such as the high crime rates and high incidence of HIV/AIDS. CSVR (2009) cites certain prominent factors that contribute towards the high levels of crime in South Africa. The mechanisms through which each of the factors affect crime prevalence is complex and beyond the scope of this thesis and therefore cannot be discussed in detail. The factors will therefore just briefly be cited as the extreme inequality as result of Apartheid, poverty and the subsequent poor conditions in the informal settlements, and the development of a consumer economy from which a large majority of South Africans are excluded due to their limited financial resources. Similarly, Vass (2003) positively correlates South Africa's high HIV/AIDS prevalence to high poverty rates and lower-socio-economic status. It is therefore argued that affirmative action skills development opportunities can indirectly assist in the alleviation of high rates of crime and HIV/AIDS through the mechanism of increased employment, poverty alleviation and redressing inequalities of the past.

Furthermore, affirmative skills development can also contribute on a macro level towards achieving sustainable economic growth. The Global Competitiveness Index 2009-2010 ranked South Africa 45th during a comparison of 133 economies worldwide and indicated that both the primary- and higher education sectors are prominently responsible for South Africa's lack of ability to achieve economic growth and prosperity. The

report made it obvious that sustainable GDP growth is seriously hampered by the fact that such as large population group within the country is unskilled and uneducated. An increased focus on affirmative action skills development is urgently required as to equip individuals with the skills, knowledge and abilities they require to effectively participate in the workforce and subsequently support economic growth. This will have a reciprocal effect. Economic growth and development has been identified as an essential for job creation and subsequent increased employment opportunities (JIPSA, 2007). As job creation is stimulated and employment increases, so can poverty rates and the dependence on welfare grants decrease and other social problem such as crime rates and HIV/AIDS prevalence be alleviated.

The final argument towards the necessity of affirmative action skills development goes beyond business considerations or even alleviation of economic or social challenges and rather takes the moral standpoint that contributing towards the Millennium Development Goals (MDGs) such as the eradication of hunger and poverty, achieving universal primary education, promoting gender equality, reducing child mortality and combating diseases such as HIV/AIDS and malaria are worthy of support simply because it is morally the right thing to do. National initiatives such as ASGISA and JIPSA regard economic growth and development as the most powerful tool available to realise the MDG's. They list, amongst others, the removal of skills shortages with respect to engineers and scientists, the development of managerial staff, and the development of a skilled and educated labour force as prerequisites for economic growth and development and subsequent meeting of the MDG's. The above argument again explicates the importance of affirmative development initiatives aimed at skills development in order to address the severe challenges that the country is facing (ASGISA, 2008; JIPSA, 2007).

It is by no means implied that the need for affirmative action skills development has gone unacknowledged thus far by government. In fact, it is recognised that government is currently placing skills development high on their agenda. In fact, government's commitment to promoting skills development is well demonstrated in the following. Certain pieces of vital legislation were promulgated, including the South African Qualifications Authority Act No 58, 1995, the Skills Development Act No 97, 1998 and the Skills Development Levies Act No 9, 1999. Systems and structures were put into place. Twenty five Sector Education and Training Authorities (SETAs) were introduced which are responsible for overseeing the training and skills development in specific national economic sectors. The South African Qualification Authority (SAQA) and Education and Training Quality Assurance (ETQA) were also established as the central 'quality authority' to all education and training in South Africa. The National Qualifications Framework (NQF) was devised, which aims to provide a unified system for all education and training qualifications in South Africa by means of classifying all education and

training qualifications on a scale of eight levels. Education and training was also re-designed according to the Outcomes-based Education and Training (OBET). The learnership programme was introduced as a form of outcomes-based education and training. A learnership is a structured workplace learning programme that leads to a person achieving a qualification, registered by the South African Qualifications Authority (SAQA) and related to an occupation. National strategies and initiatives were introduced, such as the Human Resource Development (HRD) Strategy, the National Skills Development Strategy (NSD), and ASGISA and JIPSA (Meyer, Mabaso, Lancaster & Nenungwi, 2004; Mummenthey, 2008). Government is also investing financially in skills development. The biggest portion of the national budget is allocated to education and training. In 2011, R189.5 billion of the budget was allocated towards education and training. This sees an increase from R165.1 billion in 2010 and R140.4 billion in 2009. Furthermore, between the years of 2006 and 2008 over R1.5 billion was spent by government to revitalise the approximate 50 Further Education and Training (FET) colleges. As additional financial investment, the government's National Student Financial Aid Scheme provides bursaries to many needy students. In 2009, just over R3 billion rand was spent on student loans and bursaries (NSFAS, 2010).

In additional it must be stressed that in order for an increased urgency for the implementation of affirmative action skills development opportunities to lead to the desired outcomes, it will require close collaboration between the government and the private sector. It is unrealistic for the private sector to sit back with folded arms waiting for government to address and resolve this enormous task. Arguably, government does not have at their disposal the extent of resources that is required for this task, including human resources, facilities, equipment, time, and expertise. Rather the private sector must contribute the vast resources at their disposal and be directly involved in offering affirmative action skills development opportunities to deserving candidates within their organisations. Here the point might be raised why the private sector should deviate from their missions to assist government to alleviate the country's social issues. Education, poverty, housing, and welfare are part of the core functions of government. Businesses in the private sector exist to produce goods or deliver services with the primary goal of making a profit; not to assist government in the execution of their functions. However, the foregoing discussion clearly delineated firstly how a lack of education is directly affecting the business sector through a skills shortage and secondly how social issues such unemployment and poverty can affect businesses by means of increased crime rates and decreased spending on economic development. Not only is it vital in order to ensure success for the private sector to be directly involved in the increased implementation of affirmative action skills development instead of placing the task on government's doorstep; it is also in the private sector's best interest to be involved as inaction means the current negative *status quo* will persist to their detriment. Admittedly, government is currently succeeding at gaining the assistance of the private sector, especially large corporations such as Woolworths, Discovery, Old Mutual, Microsoft South

Africa, Nedbank, Edcon, Metropolitan, and Liberty who are all active participants in offering affirmative action skills development opportunities to candidates. However, stronger commitment and more active participation is required from the private sector. It is therefore proposed that affirmative action skills development opportunities offered in collaboration between government and the private sector is one of the most effective mechanisms through which the challenges riddling the country can be addressed.

1.3.1   Factors threatening to derail attempts to address the identified challenges

Although government has placed a strong emphasis on skills development and is taking steps to further the cause, it seems that there are some issues that need to be resolved. Specifically, concerns seem to exist regarding the learners who actually participate in the skills development opportunities. A review of media reports (Freeman, 2005; Letsoalo, 2007a; Letsoalo, 2007b; Ncana, 2010; Stokes, 2009) generally reveal that skills development is hampered by challenges such as a mismatch between learner expectations and the actual learnership programme, high absenteeism and turnover among learners, a high dismissal rate of learners, learners displaying poor attitudes and a lack of respect, and learners having a sense of entitlement leading to a poor work ethic. For example, in 2007 the Department of Labour's implementation report on skills development stated that almost 80% of learners registered for SETA learnerships did not complete their training (Letsoalo, 2007a; Letsoalo, 2007b). Others (Alexander, 2006) give examples of skills development programmes where up to 90% of learners did not complete their training. Furthermore it has been reported that learners feel dissatisfaction regarding the too-low wage that they receive, regardless of the fact that it is a training opportunity and that they are actually being remunerated to learn. Learner dissatisfaction has also been reported about the fact that they do not enjoy the same benefits as the permanent employees (Letsoalo, 2007a; Ncana, 2010).

Although there may be many underlying factors contributing towards the dissatisfaction and poor performance of learners, a frequently cited reason for the poor performance of learners is the poor recruitment and selection of learners into the skills development programmes (Letsoalo, 2007a). Although substantiating evidence is lacking, the concern exists that many companies often just throw money at their learnership programme, hastily recruiting learners to fill the requisite slots, without carefully selecting the most deserving[4] learners for the programme. This may have the consequence that some learners will prematurely drop out of the programme without having obtained any significant skills that can be used to find gainful employment.

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[4] It is acknowledged that the term deserving could be interpreted differently either in terms of the severity of the disadvantagement that was suffered or in terms of the level to which the individual could progress through mediated assistance.

Similarly, the organisation that offered the programme is left with a skills gap without sufficiently skilled employees to do the required jobs. On a macro level, affirmative action candidates who enter skills development programmes but do not actually acquire the currently deficit skills, knowledge and abilities are still unable to contribute towards economic growth and the subsequent alleviation of social challenges that was discussed at the onset of this chapter.

1.3.2   On the need for a learning potential structural model

When one places oneself in the shoes of a human resources practitioner of any given organisation who is in the initial stages of recruiting for a skills development intervention, and one considers the fact that there are millions of disadvantaged Black individuals who require access to skills development opportunities, but that the organisations can only accommodate a select few individuals at that specific time, one can become completely overwhelmed by the enormity of the task that lies ahead. As the purpose of an affirmative skills development opportunity is to impart skills onto individuals who have no or only very limited skills, the realisation settles in that the pool of available candidates to recruit from consists of millions of individuals all with almost identical skills, knowledge, and abilities – near zero. Traditional recruitment and selection procedures consisting of perusing CV's for educational attainments, previous work experience, and perhaps administering a formal aptitude test are not relevant. The human resources practitioners responsible for selecting the learners for the programme might then come to believe that recruiting for a skills development opportunity is more of a process of randomly sheparding desperately unemployed individuals into the learnership programme than of a meticulous process of matching each applicant to the requirements of the 'position' and selecting the most suitable applicants. Considering the above discussion regarding the low completion rate of learnerships and the negative comments of learners in the programmes, this method of random selection or selection based on irrelevant criteria is clearly not the ideal approach. The concern exists that the learners who are currently selected into skills development opportunities are in fact not the most suitable candidates for the programmes.[5] This poses a problem. Organisations invest in skills development interventions as an investment in future skills. As private sector organisations in the free market economy exist with the purpose to make a profit, it is therefore essential to ensure maximum return on investment[6]. To achieve maximum return on investment organisations must be able to select from the enormous pool of affirmative action candidates, the

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[5] This diagnosis for the problems outlined earlier should, however, be offered with some circumspection. The failure to achieve the desired results with the existing affirmative action development programmes could also be attributable to the poor management of malleable factors that affect learning performance.

[6] This argument in essence, however, also applies to not-for-profit organisations. These organisations also bear the responsibility to ensure maximum returns on their limit resources that are invested.

candidates who are the best match for the programme and the organisation, who will complete the programme, and then be suitable to be permanently employed at the organisation and be able to offer their newly gained skills to the benefit of the organisation. This stands in contrast to filling slots with candidates who merely applied for the position as they had no other options at that point in time and needed the stipend, who are likely to drop out of the programme when they lose interest or receive an offer for a higher wage elsewhere. Hence a need exists for organisations to be able to identify those individuals who show the greatest potential to be successful in a skills development programme.

In order for organisations to be able to identify the individuals who would gain maximum benefit from such development opportunities, they must be empowered with relevant predictors according to which all applicants for skills development opportunities should be assessed and subsequently seemed suitable or not. In order to determine these predictors, an understanding is required of the factors that determine whether or not a learner will be successful if entered into an affirmative action skills development opportunity. It here becomes the duty of human behaviour researchers to study the subject area and gain an understanding of the factors that influence whether or not the individual will be successful when placed in an affirmative action skills development programme[7].

It must however be noted that although effective selection as described above is critically important, it is not enough to ensure successful affirmative development. Other person-centered characteristics and situational characteristics, not necessarily predisposed to control via selection, also affect learning performance. Effective selection is therefore not sufficient to ensure that all the candidates in the affirmative action intervention will achieve success. HR's attempts at ensuring successful affirmative development should therefore extend beyond selection. The nature and content of these additional HR interventions, however, also have to be informed by the identity of the specific latent variables that determine learning performance and the manner in which they combine to determine the level of performance that is achieved by specific learners. The development of a learning performance structural model is therefore not only required for selection purposes, but also for other HR interventions that will assist in ensuring the success of affirmative action development interventions.

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[7] It is thereby not implied that an understanding of the determinants of learning performance only have relevance for human resource interventions aimed at optimizing the learning persormance of learners on an affirmative development programme. The same nomological network of latent variables also operates to affect the learning performance of learners on any other development programme. Although this study is motivated and justified by the need for affirmative development, the insights developed in this study can be used to inform human resources interventions aimed at optimizing learning performance in any development programme.

Some studies have already been conducted regarding this need to be able to identify the most suitable affirmative action candidates for skills development opportunities. One such study was conducted by De Goede (2007). In a similar trend to this thesis, De Goede identified the need for an increased focus on affirmative action skills development and to develop the ability to identify individuals who would most likely be successful when placed in skills development opportunities. In order to address this need, De Goede conducted research based on the work of Taylor (1989, 1992, 1994, 1997) on the concept of learning potential. Learning potential can be defined as the degree to which an individual possesses the attributes required to succeed at a learning task. While this definition of learning potential implies the inclusionon of the full spectrum of attributes that will influence success at a learning task Taylor, however, had a narrow interpretation of this definition and focused solely on the attribute of cognitive ability. Based upon his cognitive ability perspective, Taylor subsequently developed a measure of learning potential (the APIL-B test battery) that was claimed to assess an individual's potential to learn independent of the influence of verbal ability, cultural meanings and educational qualifications. Furthermore, Taylor claims that this learning potential measure is especially suited for application in the educational arena and will help identify candidates who are likely to master new cognitively demanding material in a formal educational or training context. De Goede (2007) recognised that such a measure that is able to assess potential to learn in a training context independent of previous opportunities and education is vitally relevant in the South African context where the majority of the population was restricted access to developmental opportunities in the past and is currently at a great disadvantage in terms of skills, knowledge and abilities. As De Goede wanted to identify which individuals are most likely to be successful during affirmative action skills development, he needed to uncover the factors that influence whether or not an individual will be successful during affirmative action skills development. To achieve this, De Goede sought to explicate the structural model underlying the APIL-B test battery to therefore uncover the nomological network of variables that collectively constitute the learning potential construct according to the APIL-B test battery. Based upon Taylor's definition of learning potential, the study conducted by De Goede (2007) included only cognitive ability variables. It however seems highly unlikely that cognitive ability would be the only attribute that influences success at a learning task. The nomological network of variables underpinning the construct of learning potential is vast and consists of a multitude of richly interwoven variables that affect success at learning. The nomological network of variables should be imagined as a massive structure of densely entangled variables that collectively and in collaboration affect success at a learning task. In such a vast and rich structure, it seems unlikely that cognitive ability is the only determinant of learning. De Goede (2007) supports this stance. During his recommendations for future research, De Goede stated the need to investigate other variables, apart from cognitive ability, that may also account for differences in learning performance. He admitted that it is extremely unlikely that differences in learning performance can be attributed to differences

in cognitive ability only. Warranted by De Goede's own admissions, this study will elaborate on the work of De Goede with the purpose of expanding De Goede's learning potential model and identifying additional variables, other than cognitive ability, that also account for differences in learning potential. The logic behind expanding upon De Goede's model, as opposed to embarking on an independent study from scratch, is due to the characteristics of the nomological network of variables that constitute learning potential. It is firstly the vastness and secondly the complexity of the nomological network that makes it virtually impossible for any one researcher to be able to gain a complete and accurate understanding of this nomological network of variables, and the interrelationships between the variables, without an immense and seemingly impossible investment in terms of time and energy. The task of completely unfolding the learning potential nomological network is too enormous for any one researcher to achieve success. The only practically feasible manner in which a comprehensive learning potential model that closely approximates reality can be developed, is by means of a collaborated effort and a shared investment of resources from various researchers who build upon each other's research results. It is to this end that this study will elaborate on the learning potential model of De Goede (2007) in order to come another step closer to the development of a comprehensive model of learning potential that closely approximates reality. The purpose of this study is therefore to develop and test a learning potential model that elaborates upon the model as developed by De Goede (2007) that explicates the variables, in addition to cognitive ability, that collectively and in collaboration constitute learning potential.

1.4   RESEARCH OBJECTIVES

More specifically, the objectives of the study are:
- To expand and/or modify the learning potential structural model as explicated by De Goede (2007) by identifying additional learning competencies and additional learning competency potential latent variables neglected by the De Goede (2007) model
- Developing an elaborated theoretical structural model that explicates the nature of the causal relationships between learning competency potential, learning competencies and outcomes
- To empirically test the elaborated proposed structural model

CHAPTER 2

LITERATURE STUDY

2.1   INTRODUCTION

Chapter 1 discussed various prominent challenges that South Africa is currently facing such as poverty, unemployment, skills shortages, crime, and inequality. It was cited that the reason for these challenges can directly or indirectly be attributed to the consequences of the racial segregation of services of the Apartheid regime; specifically it can be attributed to the Apartheid segregation of education and training where Black South Africans were denied access to education and developmental opportunities of a high standard. As a result, the majority of previously disadvantaged individuals currently do not possess the knowledge, skills and abilities that are needed in the marketplace and are thus unable to secure gainful employment. As a consequence there are many social problems such as poverty, high levels of crime, inequality between racial groups, and high prevalence of diseases such as HIV/AIDS. It was proposed that the mechanism to overcome the described challenges in an intellectually honest and sustainable manner is by means of implementing affirmative action skills development opportunities where previously disadvantaged individuals are given the opportunity to be equipped with the currently deficit knowledge, skills and abilities. The manner in which affirmative action skills development opportunities can alleviate each of the challenges was also discussed. It was furthermore argued that in order to gain maximum return on investment from the implementation of affirmative action skills development interventions, it is pivotal to ensure that the candidates who partake in the interventions are suitable and able to gain maximum benefit from the interventions. However, in order to select the best candidates for the interventions, it firstly requires an understanding of the factors that influence whether or not the individual will be successful when placed in an affirmative action skills development programme. The need was stated for human behaviour researchers to attend to this subject area and uncover the factors that influence whether an individual will gain maximum benefit from a learning opportunity. One such researcher, De Goede (2007), has made some progress in this regard having developed a learning potential structural model, based on the work of Taylor's APIL-B test battery, a learning potential measure (1989, 1992, 1994). The De Goede model, however, solely included cognitive ability as determinant of learning performance. As it seems unlikely that cognitive ability could be the sole determinant of learning performance, a need consequently exists to modify the De Goede learning potential structural model and to elaborate the model by expanding the number of learning competencies that constitute learning and by adding non-cognitive determinants of learning performance. This study will therefore be elaborating on the De Goede learning

potential structural model by adding additional, non-cognitive determinants of learning performance to the existing learning performance structural model.

In this chapter, the De Goede (2007) learning potential structural model will firstly be discussed in some detail. Secondly, each additional core construct relevant to this study that will be added to the existing learning potential structural model will be discussed, as well as the structural relationships existing between these constructs.

2.2   THE DE GOEDE (2007) LEARNING POTENTIAL STRUCTURAL MODEL

It is important to firstly have a basic understanding of the De Goede (2007) learning potential structural model in order to explain the proposed van Heerden-De Goede learning potential structural model.

De Goede (2007) based his learning potential research on the work of Taylor's APIL-B test battery, a learning potential measure (1989, 1992, 1994). In order to explicate the structural model underlying the APIL-B test battery, De Goede utilised the principle of competency modeling. According to the principle of competency modeling, affirmative action skills development interventions are undertaken in order for learners to achieve specific results or learning outcomes (i.e., the attainment of currently deficit skills, knowledge, and abilities). Learners will only be able to achieve these results or learning outcomes if they display certain learning behaviours in the classroom (i.e. learning competencies). Whether or not learners will display the behaviours required to achieve the desired results of learning outcomes depends on the presence or absence or certain person-centered characteristics (i.e. learning competency potential latent variables), some of which are relatively easily malleable (attainments) whilst others are more difficult to modify (dispositions).

Therefore, the question subsequently arose as to what the learning behaviours are that will allow one learner to be more successful than another learner in an affirmative action skills development intervention. In other words, what learning competencies contribute towards differences in learning outcomes between individuals? To find answers to these questions, De Goede (2007) referred back to the work of Taylor (1989, 1992, 1994, 1997) who stated that (a) *transfer of knowledge* and (b) *automatisation* of transferred insight are the two learning competencies that are required in order for a learner to achieve the desired results or learning outcomes. *Transfer of knowledge* and *automatisation* will be discussed below as cited in De Goede (2007) and De Goede and Theron (2010).

2.2.1   Learning competencies

2.2.1.1 Transfer of knowledge

Transfer of knowledge can be described as a process through which the skills, knowledge and abilities that an individual already possess contribute to the development of new skills, knowledge and abilities. *Transfer* is the process through which crystallised abilities develop from the confrontation between fluid intelligence and novel stimuli. *Transfer* is the application of that which an individual already knows to novel problems. Transfer can also be described as the effect previously learned behaviour has on the performance of new learning tasks. *Transfer* can therefore be described as the adaptation of knowledge and skill to address problems somewhat different from those already encountered. *Transfer* allows for an already learned task to make it easier and achievable to learn a new task or solve an intellectually more challenging subsequent novel problem. It is therefore argued that transfer is a fundamental aspect of learning and cognitive development. It would seem as if they argue that individuals who are able to show superior learning performance would be those who are able to transfer existing insights onto novel problems better. Relating knowledge transfer to an educational and training situation, a good student is one who is able to apply the knowledge that he or she has acquired from prior learning to different but similar or related problems. A large part of academic learning is therefore the *transfer* of existing knowledge and skills on to novel learning material in an attempt to create meaningful structure in the learning material.

Considering the above discussion of the construct, it seems reasonable to argue that an individual would have to be able to *transfer* if he/she is to function successfully in an educational or training and development environment. Furthermore, it makes sense that *transfer of knowledge* was added by De Goede (2007) to the learning potential structural model as a critical learning competency.

2.2.1.2 Automatisation

Learning tasks are not concluded once sense has been made out of novel stimuli. Once sense has been made of the novel stimulus, *automatisation* should subsequently take place by integrating the achieved insight into the learner's knowledge base. The newly derived insight subsequently becomes part of the existing skills, knowledge and abilities. This newly derived skills, knowledge and abilities would then form part of the already existing cognitive platform from which subsequent *transfer* occurs. If *automatisation* did not take place, the stimulus will remain a novel problem to be solved via *transfer* every time it is encountered.

In other words, when a learner faces a novel learning task, he or she would first attempt to find a way of coping with the problem by "scanning" the already existing base of skills, knowledge and abilities. If a way of coping with a similar problem has been automated before then, the individual would use a learned response with the new problem in a similar manner. However, if no directly applicable skills, knowledge and abilities exist, the individual would then cope with the task by transferring existing relevant, but not directly applicable skills, knowledge and abilities onto a solution of the novel problem. Once the task is mastered the individual can add what has been learned to his or her already existing pool of skills, knowledge and abilities, thus, elaborating it. Once an individual is then again faced with a novel task he or she can now apply learned knowledge from a more elaborate pool of skills, knowledge and abilities, because of the addition of what has been learned, to master the new task.

The construct, *automatisation*, described above again seems to be an important dimension of learning and makes sense to be included by De Goede (2007) in the learning potential structural model.

2.2.2   Learning competency potentials

Moreover, whether a learner can successfully *transfer* existing knowledge onto novel problems and successfully utilise *automatisation* is not a random occurrence. Performance on these two competencies is dependent on a complex nomological network of person-centered characteristics (learning competency potential). De Goede (2007) again drew on the work of Taylor (1989, 1992, 1994, 1997) who hypothesized that the person-centered characteristics that affect the competencies discussed above are (a*) the capacity to form abstract concepts* and (b) *information processing efficiency*. These two competency potentials will be discussed below as cited in De Goede (2007) and De Goede and Theron (2010).

2.2.2.1 Abstract thinking capacity

The construct of *abstract thinking capacity* can best be described by referring to Cattell's (as cited in De Goede and Theron, 2010) proposed two-factor model of intelligence consisting of Gf and Gc. Cattell (1971) proposed that Spearman's general intelligence factor (g) is in fact not a unitary factor, but that it is made up of two distinct factors namely fluid- (Gf) and crystallised (Gc) intelligence. It could be argued that Cattell's Gf is probably very similar to Spearman's g, while Gc is the same as the "group factors" or "primary abilities" of which Eysenck speaks (Nunnally, 1978).   The two-factor model of fluid- and crystallised intelligence as

proposed by Cattell, taken in conjunction with the learning competency of *transfer*, offers an explanation as to why differences in abilities between individuals exist.

According to Cattell (1971), G*f* is a fundamental, innate intelligence and can be applied to all kinds of novel problem solving. G*f* is related to how well an individual perceives complex relations, forms concepts and engages in abstract reasoning. G*f* is applied in the development of new abilities and in the acquisition of new knowledge. Importantly, G*f* is relatively independent of experience and education. On the other hand, G*c* refers to the acquired abilities and knowledge which arise from education and exposure to developmental opportunities. G*c* would include acquired abilities such as verbal and numerical comprehension. *Abstract thinking capacity* is therefore likened to G*f*.

Following the above discussion of the construct, it would certainly seem as if an individual's *abstract reasoning capacity* plays an important role in learning. Therefore, an individual's level of fluid intelligence or *abstract reasoning capacity* would (as a dispositional learning competency potential) either contribute or inhibit the individual's capacity to make sense of the learning task allowing the learning and acquisition of new knowledge, skills and abilities (via *transfer*).

2.2.2.2 Information processing capacity

As cited in De Goede (2007) and De Goede and Theron (2010), i*nformation processing capacity* refers to when a learner is faced with a novel, intellectually stimulating task and firstly has to select the most appropriate strategy to follow in order to make sense of the task and secondly, has to execute the selected strategy. In other words, *information processing capacity* essentially refers to the memory capacity to store and retrieve newly gained [via *transfer*] and existing [i.e., automated] information/knowledge. There are three broad domains of *information processing capacity* parameters which may either contribute or impinge on the capacity to solve problems, namely the speed with which information can be processed, the accuracy with which information can be processed, and the cognitive flexibility with which strategies are selected to deal with novel stimuli. In other words, cognitive flexibility refers to the ability of the learner to select appropriate strategies to deal with novel stimuli as opposed to selecting inappropriate strategies to deal with novel stimuli.

In a learning context it would seem as if the individual who can more efficiently and effectively (quickly, accurately and flexibly) process information would be the one who is able to acquire more, learn faster and

perform better. For this reason, it makes sense that De Goede (2007) includes *information processing capacity* as a (dispositional learning competency potential) construct in his structural model.

2.2.3   The De Goede (2007) learning potential structural model

The argument is therefore that differences in skill acquisition (i.e. *learning performance*) between individuals can be explained in terms of four constructs, namely: *abstract reasoning capacity*, *information processing capacity* (speed, accuracy, and flexibility), *transfer of knowledge* and *automatisation*. These four constructs in collaboration explain how differences in intellectual ability account for differences in *learning performance*.

Based upon Taylor's theoretical position and his conceptualisation of how the constructs interact, De Goede (2007) proposed a structural model (shown as Figure 2.1) that depicts the specific paths or hypothesised causal linkages between the constructs that constitute learning potential. According to the model, an individual's capacity to *transfer knowledge* is causally linked to the individual's *abstract reasoning capacity*. Also, that an individual's ability to *automate* is causally linked to the individual's *capacity to process information*. Furthermore, that *transfer of knowledge* and *automatisation* are causally linked to *learning performance*[8].
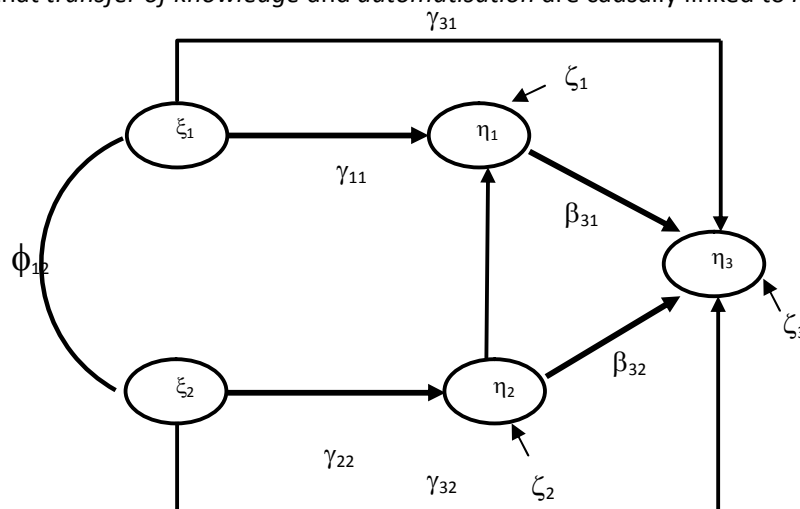
Where:
ξ_1 = *Abstract thinking capacity* η_1 = *Transfer of knowledge*
ξ_2 = *Information processing capacity* η_2 = *Automatisation*
          η_3 = *Learning performance*

Figure 2.1. Graphical portrayal of the De Goede (2007) learning potential structural model. An investigation into the internal structure of the learning potential construct as measured by the APIL test battery by De Goede, J., 2007. Unpublished master's thesis, University of Stellenbosch

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[8] De Goede (2007) and De Goede and Theron (2010) did not distinguish between learning performance in the classroom and learning performance during evaluation. It will, however subsequently be argued that this is a vitally important distinction to make in the elaborated Van Heerden-De Goede leering potential structural model.

2.2.4   Empirical evaluation of the De Goede (2007) learning potential structural model

De Goede (2007) subsequently conducted research on 434 new recruits from the South African Police Service Training College in Philippi, Cape Town in order to obtain empirical proof that the relationships postulated in the learning potential structural model provides a plausible explanation for differences in *learning performance*. *Abstract thinking capacity*, *information processing capacity*, *transfer of knowledge*, and *automatisation* were respectively measured by means of administering sub-tests of the APIL-B test battery. *Learning performance* was determined by two measures used by the South African Police Service (SAPS) in the evaluation of constables in their basic training programme. Scores obtained by entry level constables in the Specific Crimes and Statutory Law modules were used as measures of *learning performance*.

Reasonable model fit was obtained however only limited support for the proposed causal paths was obtained. Support was found for only four of the ten path hypotheses. The relationship postulated between *information processing capacity* (ξ2) and *automatisation* (η2) in the structural model, was corroborated. The direct path that was hypothesized between *information processing capacity* (ξ2) and *learning performance* (η3) was corroborated. The direct path that was hypothesized between *automatisation* (η2) and *transfer of knowledge* (η2) was also supported. Finally support was also found for the indirect effect of *information processing capacity* (ξ2) on *learning performance* (η3), mediated by *automatisation* (η2). The study, however, was unable to corroborate a number of the central hypotheses in Taylor's (1997; 1994; 1992; 1989) stance on learning potential. No support was found for the hypothesised direct linkages between *abstract thinking capacity* (ξ1) and *transfer of knowledge* (η1), between *abstract thinking capacity* (ξ1) and *learning performance* (η3), between *transfer of knowledge* (η1) and *learning performance* (η3) and between *automatisation* (η2) and *learning performance* (η3). The hypothesized indirect effect of *abstract thinking capacity* (ξ1) on *learning performance* (η3) mediated by *automatisation* (η2) was also not corroborated.

De Goede (2007) concluded that the degree of model fit achieved could be described as reasonable and the claim that the specific indicator variables used to reflect the specific latent variables comprising the learning potential structural model did not seem altogether unreasonable. However, De Goede concluded that the success with which at least two of the indicator variables represent the latent variables they were meant to reflect seems limited. Especially the validity of the *learning performance* and *transfer of knowledge* measures seems to have been questionable. To do something about the *transfer of knowledge* measure is not that easy since it forms an integral part of the APIL-B battery. However, the concern was raised that the *learning performance* measure did not really reflect the ability to creatively use newly obtained knowledge in problem

solving (i.e. did not reflect action learning). De Goede (2007) emphasised the need to modify the learning potential structural model based on the findings of his study.

De Goede consequently (2007) posited the need to expand upon his learning potential structural model. The model suggested by de Goede focuses exclusively on cognitive ability as a determinant of *learning performance* and he concluded that it seems extremely unlikely though that cognitive ability would be the sole determinant of *learning performance*. De Goede and Theron (2010) emphasised the need to elaborate the model by expanding the number of learning competencies that constitute learning and by adding non-cognitive determinants of *learning performance* (conceptualized in terms of behaviour and in terms of outcomes). De Goede and Theron (2010) suggested that learning motivation, level of current crystallized abilities (verbal and numerical ability for example), personality (conscientiousness and tenacity for example) and learning self-efficacy seem to be plausible additional determinants of *learning performance*.

In addition it also seems extremely unlikely that the learning behaviour domain only comprises the two learning competencies (*transfer* and *automatisation*) proposed by Taylor (1994). If non-cognitive determinants are to affect *learning performance* they most likely do so through other learning competencies than *transfer* and *automatisation*. Possible additional learning competencies to consider could be time at learning task, organising and planning, self-motivation and self-management of cognition.

De Goede and Theron (2010) argued that the latent variable *learning performance* should be removed from the modified model. The learning competencies already constitute *learning performance*. They argued that consideration should rather be given to the development of a longitudinal explanatory structural model in which provision is made for the level of crystallised abilities at different points in time and the competence in using it in *transfer* at different points in time. A distinction can thereby explicitly be made between academic classroom-learning performance and subsequent action-learning in the work-place. De Goede and Theron (2010) argued that the foregoing line of reasoning seems to suggest that in testing the modified model, the *transfer* and *automatisation* latent variables should be operationalised utilising stimuli from the actual learning task, and not abstract geometrical figures. The logic of the content orientated approach to selection should not be confounded with the psychological process underpinning academic learning performance in the classroom and subsequently action-learning in the workplace.

2.2.5 Discussion on recommendations

De Goede and Theron's (2010) recommendation to delete the *learning performance* latent variable from the future versions of the learning potential model can easily be misunderstood. The point they seem to raise is that the current *learning performance* latent variable should not be seen as conceptually distinct from *learning performance in the classroom*[9]. *Learning performance* behaviourally comprises an array of learning competencies. The current model encapsulates two of these competencies (*transfer* and *automatisation*). Additional learning competencies most likely are involved. These learning competencies constitute *learning performance in the classroom* and those same learning competencies also comprise *learning performance during evaluation*. The same learning competencies in addition also comprise action learning in the workplace.

Although *learning performance in the classroom* and *learning performance during evaluation* comprises essentially the same set of learning competencies the nature of the learning problem differs, the nature of the crystalised ability (or prior learning) that is transferred differs and the nature of the insight being automated differs. In the classroom specific crystalised ability developed through prior learning is transferred onto the novel learning problems comprising the curriculum. The meaningful structure that is found in the learning material in this manner subsequently needs to be automated. De Goede and Theron (2010) used the APIL subtests to measure *transfer* and *automatisation* as dimensions of *learning performance in the classroom*. The APIL purposefully uses essentially meaningless learning material to assess *learning performance* in a simulated learning opportunity so as to ensure that nobody is unfairly advantaged due to prior learning opportunities. These measures can, however, not be considered valid measures of the extent to which *transfer* and *automatisation* takes place in the classroom. Here prior learning does play a role. This seems to be an important oversight by De Goede and Theron (2010) because it is the actual *transfer* that takes place in the classroom and the subsequent *automatisation* of the derived insight that determines the *learning performance during evaluation*. *Learning performance during evaluation* involves *transfer* of the newly derived insight that has been written to a knowledge station in memory onto novel (learning) problems related to but qualitatively distinct from those encounter in the classroom. *Learning performance* is [or ought to be] measured by confronting learners with novel learning problems that they should be able to solve by using the crystalised knowledge/insight that they should have developed through *transfer* in the classroom.

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[9] The term learning performance in the classroom should not be restricted to the activities occurring within the classroom but it also refers to behaviours occurring outside the classroom that are aimed at finding meaningful structure in the learning material and committing that insight to memory.

Operational measures of *transfer* and *automatisation* comprising *learning performance in the classroom*, however, have to be specific to the learning material relevant to the specific training or development procedure utilised in the empirical testing of the learning potential structural model and as dynamic measures they will have to be integrated into the training programme. *Transfer* and *automisation* as learning competencies/behaviour have to be measured by observing these processes in action over time. That means that the extent to which learners solve/make sense of/find structure in novel learning problems/material that they are confronted with in class and how they use the solution to make sense of subsequent problems in class needs to be evaluated. How these insights are automated/written to knowledge stations needs to be evaluated as well. That seems logistically/practically rather challenging. This line of reasoning points to the need to delete *transfer* and *automatisation* from the revised model that is empirically tested as separate latent variables not because they do not belong there but because of the questionable utility of investing significant resources in overcoming the logistical challenges associated with the development and implementation of suitable measures of classroom *transfer* and *automatisation* but with virtually no subsequent practical value (in contrast to the generic APIL measure).

However in order to achieve the desired goal of developing an expanded model of learning potential that is comprehensive, theoretically justifiable and closely approximates reality, it seems required to include both cognitive and non-cognitive factors. Having admitted in the above discussion that the cognitive factors that affect learning, namely *transfer* and *automatisation*, belong in the structural model and are important constructs in the learning potential nomological network, it does not seem right to propose an expanded model where these variables are omitted solely based on the fact that it is difficult to measure these constructs. The current line of reasoning is not yet concerned with the ease and logistical practicality of measuring the proposed model. The current line of reasoning is rather concerned with proposing a comprehensive model of learning potential that includes all the variables that theorising has demanded. This creates the need to include both cognitive and non-cognitive variables. It does not seem justifiable to omit cognitive factors from the model and to propose that cognitive factors do not play a vital role in learning potential, based on the argument that cognitive factors are difficult to measure. Therefore, all the original causal paths hypothesised by De Goede (De Goede, 2007; De Goede & Theron, 2010) are retained in the hypothesised expanded learning potential structural model, as can be seen in Figure 2.1. The proposed expanded learning potential structural model will therefore retain the original model and will suggest additional non-cognitive variables to be added onto the model.

Hypothesis 1: In the proposed learning potential structural model it is hypothesised that *information processing capacity* positively influences *automatisation,* that *automatisation* mediates the impact of *information processing capacity* on *transfer of knowledge,* that *abstract reasoning ability* positively influences *transfer of knowledge,* and that *transfer of knowledge* and *automatisation* positively influences *learning performance during evaluation*

2.3   THE PROPOSED EXPANDED MODEL

In accordance with the approach utilised by De Goede's (2007), the procedure of competency modeling will be utilised when expanding upon the existing learning potential structural model. According to the principle of competency modeling, affirmative action skills development interventions are undertaken in order for learners to achieve specific results or learning outcomes (i.e., the attainment of currently deficit skills, knowledge, and abilities). Learners will only be able to achieve these results or learning outcomes if they display certain learning behaviours (i.e. learning competencies). Whether or not learners will display the learning behaviours required to achieve the desired results or learning outcomes depends on the presence or absence or certain person-centered characteristics (i.e. learning competency potential), some of which are relatively easily malleable (attainments) whilst others are more difficult to modify (dispositions). Situational characteristics also can exert a (main) effect on the level of competence achieved on the learning competencies. In addition, situational characteristics probably moderate the effect of person- centered characteristics on the level of competence achieved on the learning competencies. The contextual latent variables that, either as main effects or in interaction with person characteristics, affect learning performance are subsumed under the term learning competency potential. A comprehensive understanding of the learning competencies and learning outcomes that constitute successful *learning performance* and the competency potential latent variables that determine *learning performance* is therefore required. Non-malleable person-centered learning competency potential latent variables will be the focus of the selection procedure that governs admission to the affirmative development opportunity whereas the malleable person-centered and contextual learning competency potential latent variables will be the focus of post-selection HR interventions aimed at ensuring optimal returns on the investment made in affirmative development.

The question firstly arises what the learning competencies are that allow one individual to be more successful than another in acquiring novel intellectually demanding skills. De Goede (2007), based on the work by Taylor (1989, 1992, 1994), conceptualised and included two competencies that affect learning outcomes in the learning potential structural model, namely *transfer* and *automatisation*. Moreover, these learning

competencies depend on and are expressions of a complex nomological network of person-centered characteristics (learning competency potential). De Goede (2007), again based on the work by Taylor (1989, 1992, 1994), identified two competency potential latent variables that will determine whether learners will display these behaviours, namely *information processing capacity* and *abstract thinking capacity*. The constructs as identified by De Goede, are however solely referring to cognitive ability. As was stated previously, it seems extremely unlikely though that cognitive ability would be the sole determinant of *learning performance*. Individuals probably have to invest numerous cognitive and cognitive resources to succeed in learning. Subjective introspective analysis of one's own success or failure at learning points to a number of non-intellectual factors that contribute to learning. A need therefore exists to identify additional non-cognitive constructs that also acts as determinants of *learning performance*.

The De Goede (2007) learning potential structural model will, in what follows, be expanded upon. Additional learning competencies that constitute *learning performance* and additional learning competency potential latent variables will be identified and integrated into the existing model. The expanded model will include non-cognitive factors that affect *learning performance*. This expanded model will explore the structural relationship between the characteristics of the learner required to exhibit the learning behaviours needed to gain maximum benefit from learning and gain currently deficit knowledge, skills and abilities from it.

2.3.1 Additional learning competencies proposed for inclusion in the expanded learning potential structural model

It seems unlikely that non-cognitive factors will affect the learning competencies *transfer* and *automatisation* directly. The key to the elaboration of the De Goede (2007) learning potential structural model therefore seems to be the identification of additional learning competencies that also constitute learning along with *transfer* and *automatisation.* A central premise of the argument presented here is that learning behaviourally involves more than *transfer* and *automatisation.* The purpose of this section consequently is to identify learning competencies other than *transfer* and *automatisation* that constitute *learning performance* behaviorally and that affect the learning outcomes that are achieved. When reflecting on the learning competencies to be included in the expanded model, it was required to balance the need to be comprehensive (by including all relevant constructs) with the desire to be parsimonious (by omitting constructs that add little incremental value). In the current study, the additional constructs included were selected because they have previously been linked to *learning performance*, have been examined in a number of studies in the learning or training literature, and makes theoretical sense to include in the model.

The first additional construct to be explored for its relevance to *learning performance* is *time cognitively engaged*.

2.3.1.1 Time cognitively engaged

The amount of time that a student spends on learning tasks is frequently cited in the literature to be an important variable affecting academic success (Gettinger & Seibert, 2006; Nonis & Hudson, 2006; Singh, Granville & Dika, 2002). The assumption is that students who spend more time on academic related activities are better performers than students who spend less time on these activities. A student who start preparing for an exam a week in advance is more likely to receive a better exam result that the student who only started preparing two days before the exam due to the simple fact that the first student had more time to prepare than the second student. It is however important to note that it is not just the amount of time spent that determines students' degree of learning, but also how engaged students are during that time in tasks relevant to the curriculum. *Time cognitively engaged* can therefore be defined as the amount of time during which students are actively, successfully, and productively engaged in learning (Gettinger & Seibert, 2006). From this definition of *time cognitively engaged* it becomes clear that this construct consists of two important components working in unison, namely the amount of time spent on learning tasks and the level of engagement with the task. Each of the two components, *time on learning tasks* and *cognitive engagement,* will be given consideration below to best elucidate how their interplay fits into the learning potential structural model via the construct of *time cognitively engaged.*

2.3.1.1.1 Time on learning tasks

It can be ascribed that *time on learning tasks* consists of four components (Gettinger & Seibert, 2006; Nonis & Hudson, 2006): (a) allocated time, (b) time that is actually used for instruction, (c) engaged time, and (d) academic success and productivity.

Allocated time is the amount of time teachers plan to use or allocate for instructional activities. *Allocated time* represents the upper limit of in-class opportunities for students to be engaged in learning. It must be noted that time allocated for instruction include time allocated within school, as well as the variable time students self-allocate to learning outside of school.

Instructional time is the proportion of allocated time that is actually spent on instructional activities.

Engagement rate is the proportion of *instructional time* during which students are engaged in learning, as evidenced by paying attention, completing written work, or interacting with peers about assigned work. *Engaged time* occurs during a portion of *allocated time* when students are paying attention.

The *rate of academic success and productivity* reflects the proportion of *engaged learning time* during which students are performing meaningful and relevant instructional tasks that provide a balance of high and medium success, with more activities targeted at a high-success level.

2.3.1.1.2 Time on learning tasks and learning performance

The logic is therefore that students who spend more *time on learning tasks* have higher achievement than those who spend less time. According to Gettinger and Seibert (2006), *time on learning tasks* is clearly critical to student achievement. Similarly, Nonis and Hudson (2006) and Singh et al. (2002) found that *time on learning tasks* is a strong determinant of academic achievement. Furthermore, researchers have continuously found that additional *instructional time* was crucial for increasing and sustaining achievement gains. Gettinger and Seibert (2006) cite an interesting study that shows the importance of *time on learning tasks*. In the study, a total of 3000 eighth-grade students were taught by the same science teacher using increasingly streamlined versions of the same curriculum. All students were given tests before and after the course of study to assess their knowledge. With a full 12 weeks of instruction, more than 70 percent of students understood the main concepts and demonstrated their knowledge on exams that included multiple-choice questions as well as required written explanations. When less time (six weeks) was allocated to teach the same content, students still performed well on the multiple-choice questions, but their conceptual learning — as demonstrated by their responses on the essay questions — plummeted by half. And when the time allocated to cover the content was reduced to only three weeks, students maintained their performance on the multiple-choice questions, but their conceptual learning fell even further. These results illustrate how reduced time may allow content to be "covered" but not really learned deeply. The reduced time allowed students to only gain a surface understanding of the work, but did not allow them to sufficiently understand and gain insight into the work, therefore negatively affecting the quality of learning that took place.

In any training or instructional environment when wanting to increase academic performance it is important to recognise that increasing the amount of *time on learning tasks* on its own does not lead to substantial achievement gains, the amount of *engaged time* must also be maximised. Although the amount of time teachers allocate (*allocated time*) and use for instruction (*instructional time*), as well as the proportion of time

during which students are engaged (*engagement rate*), are all positively correlated with learning, it is the proportion of *engaged time* that is productive, active and successful that relates most strongly to *learning performance* (Nonis & Hudson, 2006). This makes implicit sense. A student may spend may hours preparing for a test, but if those hours are spent daydreaming, staring at the same page for hours, briefly scanning over the work, or being distracted by other elements such as the television or cellular phone, it is not likely to result in higher test results. On the other hand the student who spends hours preparing for a test by concentrating, expending mental effort, making interpretations, and intensely reading and understanding the work is more likely to learn the material and therefore achieve a better mark. It is therefore not merely the amount of *time on learning tasks*, but how that time is used that is the predictor of *learning performance*.

This study therefore hypothesised that a strong positive relationship exists between *learning performance during evaluation* and *time on learning tasks*. Specifically, it is hypothesised that students who spent more *time on learning tasks* will more likely be successful at *learning performance during evaluation* than their counterparts who spend less *time on learning tasks*. For *transfer* and subsequently *automisation* to successfully take place the learner needs to actively intellectually engage with the novel learning problem for a period of time. The period of time required probably depends on the difficulty level of the problem, the intensity of the intellectual engagement and the level of the *abstract thinking ability* and *information processing capacity* of the learner. It should however be noted that this line of reasoning suggests that these variables moderate the effect *time on learning tasks* on *learning performance during evaluation*. Although this implication is recognised this implication is not formally pursued in this study.

The above section discussed the impact that *time on learning tasks* is likely to have on learning success. It was hypothesised that students who spend more *time on learning tasks*, are more likely to be successful at *learning during evaluation*. During the discussion it was also posited that it is not merely the amount of time spent that affect learning outcomes, but also the degree to which students are engaged in their learning tasks during that time. The prominent importance of student engagement during the discussion of *time on learning tasks* therefore warrants a separate discussion of the construct *cognitive engagement*.

2.3.1.1.3 Cognitive engagement

When considering the importance of *cognitive engagement*, it firstly necessitates an examination of the wider perspective of student engagement, of which *cognitive engagement* forms part.

Student engagement is a construct that has been receiving increased attention in the literature. According to Caraway, Tucker, Reinke and Hall (2003), student engagement incorporates students' initiation of action, effort, and persistence on schoolwork, as well as ambient emotional states during learning activities. According to Skinner, Marchand, Furrer, and Kindermann (2008), engagement is more than motivation. It is defined as student's psychological investment in, and effort directed towards, learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote. Skinner et al. (2008) list attributes of engaged students to include (1) sustained, effortful and enthusiastic participation, (2) positive attitude, (3) intense effort, (4) focused attention and (5) goal directedness. Individuals who are engaged therefore show sustained involvement in learning activities. They initiate action when given the opportunity and exert intense effort and concentration in the implementation of learning tasks. Appleton, Christenson, Kim and Reschly (2006) refer to engagement as 'energy in action' and explain it as reflecting a person's active involvement in a task or activity.

Student engagement has been linked to a number of positive academic outcomes such as increased learning and higher grades (Caraway et al., 2003; Chapman, 2003; Singh et al., 2002). Student engagement has also been found to predict patterns of attendance, retention, graduation, and academic resilience (Appleton et al., 2006; Skinner et al., 2008) and also to be related to lowered rates of drop out and lowered substance abuse (Caraway et al, 2003; Skinner et al., 2008). Thus, students who are engaged in school are both more successful academically and more likely to avoid the pitfalls of adolescence.

A popular conceptualisation of student engagement distinguishes between behavioural, affective, and cognitive indices of student engagement in specific learning tasks (Chapman, 2003; Davis, Chang, Andrzejewski & Poirier, 2010).

Behavioural indices reflect the extent to which students are making active responses to the learning tasks presented. Behavioural indices include student behaviours in the classroom, study behaviours, regular class attendance, participation in class discussions, doing homework, and not skipping classes.

Affective indices reflect the level of students' investment in, and their emotional reactions to, the learning tasks. Affective indices of engagement would include emotions such as enthusiasm, enjoyment, satisfaction and zest.

Cognitive indices reflect the extent to which students are attending to and expending mental effort in the learning tasks encountered. Cognitive indices of engagement include cognitive strategy use, attention, task mastery, and preference for challenging tasks.

According to the above conceptualisation, the term "student engagement" refers to students' active behavioural participation, emotional engagement, and cognitive investment in specific learning tasks.

Due to the nature of this study, the cognitive dimension of student engagement is deemed the most relevant to the study and is therefore the only criterion of student engagement focused on and included in the constitutive definition of the construct. Specifically relevant to this study to be focused on is *cognitive engagement*.

Cognitive engagement refers to the amount of effort and type of processing strategies that students use for learning (Ravindran, Greene & DeBacker, 2005). According to Zhu et al., (2009) and Chapman (2003), *cognitive engagement* refers to the extent to which students are attending to and expending mental effort in the learning tasks encountered. Students' *cognitive engagement* represents a motivated behaviour associated with their persistence on difficult tasks and the usage of cognitive strategies. It is the intentional and purposeful processing of lesson content. *Cognitive engagement*, in effect, entails strategies that promote manipulation rather than memorisation, as the means through which learners acquire both lesson knowledge and deeper conceptual insight (Davis et al., 2010). Finally, Metallidou and Viachou (2007) argued that *cognitive engagement* is a reflection of students' will; that is, how students feel about themselves and their work, their skills, and the strategies they employ to master their work. According to Metallidou and Viachou, *cognitive engagement* draws on the idea of investment whereby it incorporates thoughtfulness and willingness to exert the effort necessary to comprehend ideas and master difficult skills. The inclusion of *cognitive engagement* therefore makes an important distinction between students' efforts to simply 'do' the work and effort that was focused on understanding and mastery.

It is widely found in the literature (Appleton et al., 2006; Bayat & Tarmizi, 2010; Davis et al., 2010; Greene & Miller, 1996; Metallidou & Vlachou, 2007; Rastegar, Jahromi, Haghigli & Akbari, 2010; Ravindran, Greene & DeBacker, 2005) that *cognitive engagement* can be conceptualised as a bipolar construct where a cognitively engaged student will employ deep processing during the learning process whereas a student who is not cognitively engaged will merely employ surface processing during learning. This conceptualisation is based on the influential ''levels of processing,'' (Craik & Lockhart, 1972) and subsequent ''elaborative processing''

(Anderson & Reder, 1979) theories. These theories posit that the quality of our learning, our understanding, depends on the level of our *cognitive engagement*.

According to Phan (2010), an individual may adopt a deep approach to learning, with the intention of understanding the author's meaning and linking it to their prior knowledge and personal experience. Deep processing is associated with cognitive elaboration of the to-be-learned material and involves creating a more complex knowledge structure (Anderson & Reder, 1979). Deep processing is characterised by such strategies as elaborating ideas, thinking critically, and linking as well as integrating one concept with another (Liem, Lau & Nie, 2007). Similarly, Sins, van Joolingen, Savelsbergh and van Hout-Wolters (2007) state that deep cognitive processing involves active learning processes, such as relating ideas, looking for patterns and principles and attempting to integrate new information with prior knowledge and experience. Bayat and Tarmizi (2010) add that deep cognitive processing involve challenging the veracity of information encountered and attempting to integrate new information with prior knowledge and experience, which facilitates long-term retention of the target information for example making an outline of important concepts after a learning session.

According to Phan (2010) a surface learning approach has the main emphasis on studying merely for the intention of reproducing information without any further analysis. According to Anderson and Reder (1979) surface processing involves superficial engagement with the new material and does not typically involve the connection of new information with existing knowledge nor does it involve the creation of integrated knowledge structures. Surface learning is characterized by such strategies as memorization and reproduction of the learning materials (Liem et al., 2007). According to Sins et al. (2007) surface cognitive processing entails processes without much reflecting and involves treating the learning material as more or less unrelated bits of information. Surface processing does not implicate elaboration of the learning material and leads to more restricted learning processes. Surface cognitive strategies refer to rehearsal, involving the repetition, rehearsal and rote memorisation of information, which helps to encode new information into short-term memory mainly through reading the course material over and over again (Bayat & Tarmizi, 2010). Strictly speaking a surface learning approach does not truely constitute learning in the sense that *transfer* is unlikely to occur. Therefore, *cognitive engagement* will be operationalised as deep cognitive processing as described above.

2.3.1.1.4 Cognitive engagement and learning performance during evaluation

Cognitive engagement as constitutively defined in this study is a learning competency that constitutes *learning performance in the classroom*. As such, *cognitive engagement*, or deep processing, has been recognised to play

an important role in students' academic *learning performance during evaluation*. It is suggested that the use of different types of processing result in different learning outcomes, and, thus, different levels of achievement. It has generally been found that deep processing is typically regarded to be more adaptive as it that brings students to higher achievement outcomes, whereas surface processing is considered to be a less desirable form of learning process that leads to a lower level of academic performance (Greene & Miller, 1996; Liem et al., 2007; Ravindran et al., 2005; Richardson & Newby, 2006; Sins et al., 2008). Phan (2010) conducted a study on first year university students and conclusively found that academic *learning performance during evaluation* is influenced positively by deep processing. In contrast, Phan found that surface cognitive engagement is detrimental and leads to a decline in students' academic *learning performance during evaluation*. The results obtained by Seabi (2011) in research conducted at Wits University also suggest that deep processing positively influence learning success during first year engineering studies at tertiary education level. Zhu et al. (2009) conducted research in a physical education environment and similarly found that student *cognitive engagement* contributed significantly to achievement indicated by knowledge gain. Metallidou and Vlachou (2007) conducted research in a primary school on levels of maths and language achievement, and found deep processing to be related in the two subject areas. According to Komarraju, Karau, Schmeck and Avdic (2011), students who employ deep processing are more likely to use appropriate study methods and draw conclusions effectively than students employing shallow processing. Kuyper, van der Werf and Lubbe (2000), also found deep cognitive strategy use to contribute significantly to the prediction of scholastic achievement. McKenzie, Gow and Schweitzer (2004) found in their research that knowledge of a student's self-reported use of learning strategies enhanced the prediction of that student's grades in their first semester of study. Students who reported a greater use of effective learning strategies were more likely to achieve higher grades than students who reported a low use of effective learning strategies. According to McKenzie et al. (2004), students who manage their time effectively, who regulate the amount of effort they expend on tasks, who self-monitors their comprehension, who draws connections between readings and lecture materials, and who effectively organises course material attain higher grades than students who do not practice such behaviours. Wang, Peng, Huang, Hou and Wang (2008) found *cognitive engagement* to be a factor that influenced learning performance during evaluation. Lliterature seems to provide overwhelming evidence that *cognitive engagement*, or deep processing, is predictive of academic success and *learning performance during evaluation*.

Referring back to the discussion of *time on learning tasks*, it was hypothesised that students who spend more *time on learning tasks*, are more likely to be successful at *learning performance during evaluation*. However, during the discussion it was also posited that it is not merely the amount of *time on learning tasks* that affect learning outcomes, but also the degree to which students are engaged in their learning tasks during the time

which students spend on their academic work. Acknowledging this line of reasoning of the interrelatedness of *time on learning tasks* and *cognitive engagement*, the constructs are combined and conceptualised as a single construct, namely *time cognitively engaged. Time cognitively engaged*, as defined here, involves the extent to which individuals were spending time attending to and expending mental effort in their learning tasks encountered. The mental effort the learner exerts, as well as for how long that individual exerts that mental effort, is therefore vital in its combination. Both these aspects are therefore encapsulated in the *time cognitively engaged* construct which is the first additional learning competency included in the proposed leaning potential structural model. The manner in which *time cognitively engaged* manifests itself in the learning potential structural model is hypothesised as affecting *learning performance during evaluation* through the mediating effect of *transfer*.

2.3.1.1.5 Time cognitively engaged and transfer

Transfer of knowledge, as previously defined*,* can be described as a process through which the skills, knowledge and abilities that an individual already possess contribute to the development of new skills, knowledge and abilities (as cited in De Goede, 2007; De Goede & Theron, 2010). In order for t*ransfer* to occur, the individual must attempt to create meaningful structure out of the learning problem by adapting existing knowledge or applying the knowledge that he or she has acquired from prior learning to different but similar or related problems. In other words, *transfer* requires existing knowledge to be adapted, applied, and manipulated in order to allow the student to make sense of novel information. Keeping this definition of *transfer* in mind, Davis et al. (2010) defined *cognitive engagement* as a motivated behaviour associated with the persistence on difficult tasks and the usage of cognitive strategies. Davis et al. furthermore stated that these cognitive strategies promote manipulation of information rather than memorisation thereof and also described it as the intentional and purposeful processing of lesson content through which learners acquire both lesson knowledge and deeper conceptual insight. Following the above logic, it is therefore hypothesised that it is the cognitive strategies used by the learner during *cognitive engagement* that encourage and promote existing knowledge to be adapted, applied, and manipulated in order to allow the student to make sense of novel information. Other authors share this line of thinking that *cognitive engagement* encapsulates strategies that promotes *transfer* to take place. Lim et al. (2007) described *cognitive engagement* to be characterised by such strategies as elaborating ideas, thinking critically, and integrating one concept with another. Sins et al. (2007) described *cognitive engagement* to involve strategies such as relating ideas and looking for patterns and principles. According to Sins et al. (2007) and Phan (2010) these cognitive strategies are utilised in order to attempt to integrate new information with prior knowledge and experience, in other words, for *transfer* to

take place. It is therefore hypothesised that in order for *transfer* to take occur, the student must be cognitively engaged, or in other words must be expending mental effort and utilising cognitive strategies to promote *transfer*. However, as was stated previously, it is not only the quality of mental effort that is important but also the length of time for which the student exerts that effort. The combination of mental effort and time spent encapsulates the construct of *time cognitively engaged*. Therefore, this argument suggests that transfer can only be achieved if the student spends sufficient time attending to and expending mental effort on this novel learning tasks encountered.

Hypothesis 2

In the proposed learning potential structural model it is hypothesised that *time cognitively engaged* positively influences *transfer*

In addition to the significant impact that *time cognitively engaged* may have on learning, numerous literature studies (Appleton et al., 2006; Bayat & Tarmizi, 2010; Davis et al., 2010; Greene & Miller, 1996; Metallidou & Vlachou, 2007; Rastegar et al., 2010; Ravindran et al., 2005) state the importance of regulating student cognition during learning. Not only is it important for a student to be cognitively engaged, but is also necessary for the student to plan, organise, regulate and monitor cognitive resources for increased efficiency during learning. This latter concept refers to the process of *meta-cognitive regulation* which is the next additional construct to be considered for inclusion in the study.

2.3.1.2 Meta-cognitive regulation

When considering the importance of *meta-cognitive regulation* in the learning performance structural model, it firstly necessitates an examination of the wider perspective of *meta-cognition*, of which *meta-cognitive regulation* is one dimension.

John Flavell was the first to identify the phenomenon called *meta-cognition*. According to Flavell (1976), *meta-cognition* refers to one's knowledge concerning one's own cognitive processes or anything related to them. More simply, *meta-cognition* can be described as cognition about cognition, or thinking about thinking (Boström & Lassen, 2006; Efklides, 2006; Georghiades, 2004; Mitchell, Smith, Gustafsson, Davidsson, & Mitchell, 2005). Subsequent to Flavell's initial conceptualisation, many authors have undertaken to expand upon the understanding of the construct. Schraw and Dennison (1994) describe *meta-cognition* as the ability to reflect upon, understand, and control one's learning while Tobias and Everson (1996) describe *meta-cognition*

as the ability to monitor, evaluate, and make plans for one's learning. *Meta-cognition* is usually related to learners' knowledge, awareness and control of the processes by which they learn and the meta-cognitive learner is thought to be characterized by ability to recognise, evaluate and, where needed, reconstruct existing ideas (Georghiades, 2004). According to Anderson (2002), learners who are *meta-cognitively* aware know what to do when they don't know what to do; that is, they have strategies for finding out or figuring out what they need to do. Paris and Winograd (1990) describes a *meta-cognitive* student using the analogy of a craftsman with a wide assortment of tools who has the knowledge to independently select the most appropriate tool to complete a particular task. It is important to note that students should be taught to use particular strategies in particular settings to accomplish specific purposes and not simply be taught an inventory of strategies.

Literature on meta-cognition propose that it is a multidimensional construct and differentiates between two major components, namely (a) *meta-cognitive knowledge* and (b) *meta-cognitive regulation* (Kuhn, 2000; Schraw, 1998; Schraw & Dennison, 1994; Schwartz & Perfect, 2002). *Meta-cognition* thus includes both an awareness of cognition and the capacity to change cognitions.

Relevant to the discussion on additional learning competencies, is *meta-cognitive regulation*. *Meta-cognitive knowledge* will be discussed at a later stage as an additional competency potential latent variable.

According to Schraw and Dennison (1994) and Schraw (1998), *meta-cognitive regulation* refers to the processes that facilitate the control aspect of learning. In other words*, meta-cognitive regulation* refers to a set of activities that help students control their learning. According to Schmidt and Ford (2003), *meta-cognitive regulation* include decisions such as where to allocate one's resources, the specific steps to be used to complete the task, the speed and intensity at which to work on the task, and the prioritisation of activities. *Meta-cognitive regulation* thereby constitutes a fourth learning competency (along with *transfer*, *automisation* and *time cognitively engaged*). A number of regulatory skills are described in the literature. This report will be based upon the work of Schraw (1998) who described the regulatory skills of (a) planning, (b) monitoring, and (c) evaluating.

Planning involves the selection of appropriate strategies and the allocation of resources that affect performance. This could include making predictions before reading, strategy sequencing, and allocating time and attention selectively before beginning a task. Planning helps the student analyse the problem, retrieve relevant domain-specific skills, and properly sequence problem solving strategies.

Monitoring can be described as one's on-line awareness of comprehension and task performance, such as engaging in periodic self-testing while learning. Monitoring ensures that students are closely following their plan and tracking whether the plan is helping to successfully solve the problem.

Evaluating of the problem is placed at the end of the process. It can be described as appraising the products and efficiency of one's learning. Typical examples of this would include re-evaluating one's goals and conclusions.

An interrelationship seems to exist between the above described regulatory skills. According to Schraw (1998), it is likely that improving one aspect of regulation (e.g. planning) may improve another aspect of regulation, such as monitoring. The model proposed in this study will, however, not formally pursue this hypothesis. Once support for the hypothesised role of *meta-cognitive regulation* has been obtained subsequent refinements to the learning potential structural model can explore this possibility.

An issue of particular importance is the domain generality, or domain specificity, of *meta-cognition*. In other words, are the meta-cognitive skills a student possesses just as relevant in one subject area as in another or is this skills-set restricted to the specific subject area in question and useless when applied to other subject areas. Schraw (1998) postulates *meta-cognition* to be domain-general in nature, rather than domain-specific. According to Schraw, both *meta-cognitive knowledge* and *meta-cognitive regulation* appear to span a wide variety of subject areas. He believed that the meta-cognitive skills an individual possesses would be equally effective in one subject area, as in another, even when those domains have little in common. Similarly Veenman, Elshout and Meijer (1997), Veenman and Verheij (2003) and Veenman, Wilhelm and Beishuizen (2004) obtained strong support for the generality of meta-cognitive skills. No research to date seems to support the domain-specificity of *meta-cognition*.

The above domain-generality of *meta-cognitive regulation* may have powerful implications in the domain of learning potential. Empowering affirmative development candidates with meta-cognitive skills may give them the tools to not only gain skills in the subject matter of the specific learning intervention, but will equip them with the means to allow learning across subject areas and domains. This is especially relevant in light of the fact that we are living in world where technology and processes is constantly changing and evolving and where what is learned today may become obsolete tomorrow. Obtaining meta-cognitive skills again equip individuals with the required tools to continue learning and gaining skills outside of formal learning environments.

2.3.1.2.1 Meta-cognitive regulation and learning

Meta-cognitive regulation as constitutively defined in this study is a learning competency that constitutes *learning performance in the classroom*. As such, *meta-cognitive regulation* has been recognised to play an important role in students' academic *learning performance during evaluation*. It is suggested that the use of different types of *meta-cognitive regulation* result in different learning outcomes, and, thus, different levels of achievement. The relation of *meta-cognition* to *learning performance during evaluation* was first posited by Flavell (1976) and, since then, there is growing research evidence that justifies *cognitive regulation* as a critical learning competency and supports the existence of a relationship between *meta-cognition* and *learning performance during evaluation* (Anderson, 2002; Efklides, 2006; Georghiades, 2004; Hallam, 2001; Kuyper et al., 2000; Mitchell et al., 2005; Pressley & Ghatala, 1989; Rickey & Stacey, 2000; Schoenfeld, 1992; Swanson, 1990; Tarchi, 2010). Some research findings are briefly listed below. Anderson (2002) describes the importance of meta-cognitive skills during the acquisition of a second language. Georghiades (2004) found a relationship between *meta-cognition* and the learning of science in a sample of 11-year olds in an educational context. A review study by Wang, Haertel, and Walberg (1990) revealed *meta-cognition* to be a powerful predictor of learning in a classroom setting. Hallam (2001) reported that professional musicians demonstrated extensive *meta-cognitive regulation* in their preparations for performances. Rickey and Stacy (2000) demonstrated the application of *meta-cognition* in aiding student to learn chemistry. Kuyper et al. (2000) conducted a longitudinal study in a Dutch school in order to determine what variables influence academic achievement and found that *meta-cognition* significantly contributed to the prediction of academic achievement. Mitchell et al. (2005) conducted a study of *meta-cognition* in an entrepreneurial context and found that students exposed to a meta-cognitive treatment gain entrepreneurial expertise faster than those who are not. Schmidt and Ford (2003) conducted a study on learners participating in a Web-based training course and found that *meta-cognition* was a strong predictor learning regardless of skill or previous experience in creating Web pages. Tarchi (2010) found *meta-cognition* to be important in the text comprehension when reading study material for both science and history. Efklides (2006) also reported a positive relationship between *meta-cognitive regulation* and learning. Landine and Stewart (1998) found *meta-cognition* to be related to academic achievement and enhanced learning outcomes in a sample of Grade 12 students. It therefore seems there is strong support for the premise that *meta-cognition* (specifically *meta-cognitive regulation*) is an important dimension of *learning performance in the classroom* that is positively related to *learning performance during evaluation* and that a student utilising meta-cognitive skills may be more successful at learning than a learner who does not. Learning however comprises a number of performance areas or learning competencies.

Considering the theoretical discussion of *meta-cognition* and also the past research findings positively linking *meta-cognition* to learning, this study postulates that affirmative action candidates with high levels of meta-cognitive skills (i.e., *cognitive regulation*) are more likely to be successful in training and development interventions than those who do not possess those skills. This study therefore identifies *cognitive regulation* as the second additional learning competency to be added to the proposed expanded learning potential structural model. It is however hypothesised that *meta-cognitive regulation* will not directly influence *learning performance during evaluation,* however will do so through the mediating effects of *transfer* and *time cognitively engaged*.

2.3.1.2.2 Meta-cognitive regulation and transfer

It is hypothesised that *meta-cognitive regulation* will not directly influence *learning performance during evaluation,* however will do so through the mediating effects of *transfer*. Therefore, in the proposed expanded learning potential structural model *cognitive regulation* positively affects *transfer*

Hypothesis 3

In the proposed learning potential structural model it is hypothesised that *meta-cognitive regulation* positively influences *transfer*.

2.3.1.2.3 Meta-cognitive regulation and time cognitively engaged

According to Gettinger and Seibert (2006), *time cognitively engaged* is related to *meta-cognition*. According to Gettinger and Seibert, *cognitive engagement* requires some degree of self-regulation of learning and performance. Specifically, a strategy for increasing engaged learning time would include a focus on how to develop student meta-cognitive skills. This will enable students to regulate their own *cognitively engaged time* effectively. This will include:(a) providing students with knowledge about strategies to promote *cognitive engagement* during learning tasks and how to use them, (b) demonstrating how and when utilisation of strategies is appropriate for maximising the efficiency of learning time, (c) providing feedback on the appropriate use of strategies, and (d) providing instruction concerning when and why strategies should be used and how strategy use can enhance their learning time.

The relationship between *time cognitively engaged* and *meta-cognition* is furthermore supported by Metallidou and Vlachou (2007), who state that the use of ''deep,'' meaningful processing strategies in

conjunction with the use of meta-cognitive strategies lead to better performance and enhanced learning performance. Landine and Stewart (1998) also support the relationship between *time cognitively engaged* and *meta-cognitive regulation*. According to Landine and Stewart, deep processing strategies are considered to involve high level uses of *meta-cognition* while the surface approach involves a shallow use of *meta-cognition*. According to the authors, students adopt a surface approach as an unthinking and short-term reaction to a learning task resulting in a strategy characterised as a shallow use of *meta-cognition*. The deep processing strategies presuppose high levels of *meta-cognition* as they require greater self-knowledge and task knowledge. In the proposed expanded learning potential structural model *meta-cognitive regulation* positively affects *time cognitively engaged.*

Hypothesis 4

In the proposed learning potential structural model it is hypothesised that *meta-cognitive regulation* positively influences *time cognitively engaged*.

2.3.2   Additional learning competency potential latent variables proposed for inclusion in the expanded learning potential structural model

According to the De Goede (2007) learning potential structural model, *learning performance* comprises of the two learning competencies *transfer* and *automisation*. The above section identified two additional learning competencies, *cognitively engaged time*, and *meta-cognitive regulation* that constitute *learning performance in the classroom* and *learning performance during evaluation*.

The level of competence that learners achieve on the learning competencies is not a random event. Whether or not learners will display the behaviours required to achieve the desired results or learning outcomes depends on the presence or absence or certain person-centered characteristics and on specific variables characterising the learning situation (variables in both these categories were referred as learning competency potential latent variables). The purpose of this section is to identify additional learning competency potential latent variables, other than *information processing capacity* and *abstract thinking capacity* that affect *learning performance during evaluation* through the identified competencies.

Meta-cognitive knowledge is identified as a learning competency potential that is essential to the proposed elaborated learning potential structural model.

2.3.2.1 Meta-cognitive knowledge

According to Veenman, van Hout-Wolters, and Afflerbach (2006), *meta-cognitive knowledge* refers to explicit knowledge of one's cognitive strengths and weaknesses. Similarly, Sperling, Howard, and Staley (2004), refers to *meta-cognitive knowledge* as how much an individual understands about the way they learn. Schraw (1998) refers to *meta-cognitive knowledge* as what individuals know about their own cognition or about cognition in general.

Literature suggest that *meta-cognitive knowledge* can effectively be divided into three distinct areas namely, (a) declarative knowledge, (b) procedural knowledge, and (c) conditional knowledge (Sperling et al., 2004; Schraw, 1998; Schraw & Dennison, 1994).

Declarative knowledge refers to knowledge about self and about strategies (Schraw & Dennison, 1994). Sperling et al. (2004) refers to declarative knowledge as knowledge of one's general processing abilities. According to Schmitt and Sha (2009) declarative knowledge refers to knowing about the characteristics of the self, the task and strategies relevant to the task. Declarative knowledge includes knowledge about oneself as a learner and about what factors influence one's performance. Declarative knowledge refers to knowing "about" things (Schraw, 1998).

Schraw and Dennison (1994) and Schmitt and Sha (2009) refer to *procedural knowledge* as knowledge about how to use strategies. Sperling et al. (2004) uses knowledge of how to successfully solve problems as an example of procedural knowledge. Individuals with a high degree of procedural knowledge perform tasks more automatically, are more likely to possess a larger repertoire of strategies, to sequence strategies effectively, and use qualitatively different strategies to solve different problems. Typical examples include how to chunk and categorise new information. Procedural knowledge refers to knowing "how" to do things (Schraw, 1998).

According to Schraw and Dennison (1994) and Sperling et al. (2004), *conditional knowledge* refers to knowledge about when and why to use strategies. According to Schmitt and Sha (2009), conditional knowledge represents the critical aspects of knowing when it is a good idea to use a specific strategy and specifically why it is helpful at that point. Conditional knowledge is important because it helps students selectively allocate their resources and use strategies more effectively. Conditional knowledge refers to knowing when and why to use declarative and procedural knowledge (Schraw, 1998).

According to Schmitt and Sha (2009) there is an important interrelationship between the three components of *meta-cognitive knowledge*. For example, an individual may not be an effective learner if the individual knows how to use a variety of strategies (procedural knowledge), but does not know when it is appropriate to use which strategy (conditional knowledge). Furthermore, according to Sperling et al. (2004) individuals vary in their *meta-cognitive knowledge*. The model proposed in this study will, however, not formally pursue this hypothesis. Once support for the hypothesised role of *meta-cognitive knowledge* has been obtained subsequent refinements to the learning potential structural model can explore this possibility.

2.3.2.1.1 Meta-cognitive knowledge and regulation of cognition

Research suggests that *meta-cognitive knowledge* and *meta-cognitive regulation* are related to each other (Schraw, 1998) and possibly that *meta-cognitive knowledge* is a prerequisite for *meta-cognitive regulation* (Baker, 1989). The argument to support this stance states that if students cannot distinguish between what they know and do not know, they can hardly be expected to exercise control over their learning activities or to select appropriate strategies to progress in their learning (Schmidt & Ford, 2003). Research results from Sperling et al. (2004) support the hypothesis that *meta-cognitive knowledge* precedes *meta-cognitive regulation*. Sperling et al. conducted two studies examining the relationship between the *meta-cognitive knowledge* and *meta-cognitive regulation*, and reported strong correlations in both studies (r = .75, p < .001; r= .68, p < .001). It is therefore hypothesised that a positive relationship exists between *meta-cognitive knowledge* and *meta-cognitive regulation*.

Hypothesis 5

In the proposed learning potential structural model it is hypothesised that *meta-cognitive knowledge* positively influences *meta-cognitive regulation*.

The next construct to be considered for addition to the learning potential structural model as competency potential is *learning motivation*.

2.3.2.2 Learning motivation

According to Ames and Archer (1988), *learning motivation* is characterised by long-term, quality involvement in learning and commitment to the process of learning. It is the desire or want that energises and directs goal-oriented behavior. According to Brewster and Fager (2000) *learning motivation* refers to a student's

willingness, need, desire and compulsion to participate in, and be successful in, the learning process. Colquitt and Simmering (1998) has defined *learning motivation* as the desire on the part of trainees to learn the content of the training programme. Motivation influences direction of attentional effort, the proportion of total attentional effort directed at a task and the extent to which attentional effort toward the task is maintained over time. *Learning motivation* determines the extent to which an individual directs his or her energy towards the learning task in an attempt to form structure and ultimately to *transfer* existing knowledge to the current task.

2.3.2.2.1 Learning motivation and learning

According to Colquitt and Simmering (1998) research has consistently shown a positive relationship between *learning motivation* and *classroom learning performance* (as constituted by the learning competencies) across a variety of settings. Wang et al. (2008) found *learning motivation* to be a factor that directly influenced *classroom learning performance*[10]. According to the researchers, this means that the higher the *learning motivation* level, the higher the *learning performance during evaluation*. They concluded that learning is affected by various factors, of which motivation is one of the dominant one. Kuyper et al. (2000) similarly found *learning motivation* to be a major determinant of success at learning. Singh et al. (2002) also reported *learning motivation* to have the largest effects on eighth-grade achievement from all variables included in their study.

Following the above conclusion that *learning motivation* is influential in predicting *learning performance*, consideration must be given to how *learning motivation* affects *classroom learning performance*. *Learning motivation* is a characteristic of an individual. This means that this characteristic will affect *classroom learning performance* by means of eliciting certain wanted behaviours. In the case of this study, the wanted behaviours are *time cognitively engaged* and *meta-cognitive regulation*. In other words, *learning motivation* will positively affect *classroom learning performance* as a student with a high *learning motivation* will be more likely to display high competence on *time cognitively engaged* and *meta-cognitive regulation*. Numerous studies (Krapp, 1999; Landine & Stewart, 1998; Pintrich & Schrauben, 1992; Singh et al., 2002) have found the above described positive relationships between *learning motivation* and *time cognitively engaged* and *meta-cognitive regulation*.

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[10] It is thereby, however, not implied that learning motivation affects all learning competencies directly. The learning competencies are imbedded in a nomological network in which the different learning competencies are causally related to each other in a specific manner. Learning motivation most probably affects learning performance by entering this nomological net through specific learning competencies.

2.3.2.2.2 Learning motivation and time cognitively engaged

Previous research supports a relationship between *learning motivation* and *time cognitively engaged*. Pintrich and Schrauben (1992) have studied the relationship between students' motivation (intrinsic value, self-efficacy and test-anxiety) and self-regulated learning (use of cognitive and meta-cognitive control strategies) during a school year. They found that students with positive motivational beliefs report more use of cognitive and self-regulated learning strategies. Krapp (1999) found that at university level, *learning motivation* affects students' attitude towards different kinds of learning strategies as well as their specific use of learning strategies in concrete learning situations. Learners who had higher levels of *learning motivation* were more likely to make use of deep-processing strategies and spend more time on their studies. Furthermore, Singh et al. (2002) have found that *learning motivation* leads to engagement in academic tasks, which is related to achievement. They found that students who had high *learning motivation* were more likely to spend more time on mathematics homework. Greene, Miller, Crowson, Duke and Akey (2004) concur that one of the critical influences on students choice of cognitive strategies is their *learning motivation*. Skinner et al. (2008) also report a relationship between *learning motivation* and *cognitive engagement*. Singh et al. (2002) concur that there is a relationship between *learning motivation* and *time cognitively engaged*. According to the authors, *learning motivation* affects engagement in academic tasks, and engagement in academic tasks subsequently furthers learning. It seems evident that *learning motivation* will influence *learning performance during evaluation* by means of eliciting the wanted behaviour of *time cognitively engaged*.

Hypothesis6

In the proposed learning potential structural model it is hypothesised that *learning motivation* positively influences *time cognitively engaged*

2.3.2.2.3 Learning motivation and meta-cognitive regulation

Landine and Stewart (1998) suggested a positive relationship between the use of *meta-cognition* and *learning motivation* in students. Furthermore, Krapp (1999) reported *learning motivation* to be a determinant of the use of meta-cognitive strategy use. The research evidence that *learning motivation* is a determinant of *meta-cognitive regulation* is in accordance to the hypothesis of Schmitt and Sha (2009). Schmitt and Sha argued that *meta-cognitive knowledge* is a prerequisite for *meta-cognitive regulation*, however, they believe that although *meta-cognitive knowledge* may enhance one's self-control of cognition when the knowledge is being implemented, such knowledge does not guarantee the control of cognition. Schmitt and Sha (2009) believed

that external variables such as a lack of *learning motivation* may influence whether or not a learner will apply their *meta-cognitive knowledge*. This line of reasoning posits that students with higher levels of *learning motivation* are more likely to make use of meta-cognitive strategies and be successful at learning.

Hypothesis7

In the proposed learning potential structural model it is hypothesised that *learning motivation* positively influences *meta-cognitive regulation*

The construct of *goal-orientation* is the next competency potential latent variable to be included in the study.

2.3.2.3 Goal-orientation

The construct of *goal-orientation* has been selected for discussion as it has of late been receiving increased attention in the literature for the positive effect on learning (Ames & Archer, 1988; Bell & Kozlowski, 2002; Bulus, 2010; Chiaburu & Marinova, 2005; Day, Yeo & Radosevich, 2003; Dweck & Leggett, 1988; Farr, Hofmann & Ringenbach, 1993; Kozlowski, Gully, Brown, Salas, Smith & Nason; Salas & Cannon-Bowers, 2001; Locke, 1996; Schmidt & Ford, 2003; Van Hooft & Noordzij, 2009). It makes logical sense that setting a goal and subsequently striving to reach that goal would strongly impact success at learning.

Furthermore, numerous studies have positively linked *goal-orientation* to the competencies under consideration, namely *time cognitively engaged* and *meta-cognitive regulation*. Accumulating evidence has established a consistent pattern that learning goals would facilitate the use of deep processing and meta-cognitive strategies (Ames & Archer, 1988; Caraway et al., 2003; Dupeyrat & Marine, 2005; Dweck & Legget, 1988; Ford, Smith, Weissbein, Gully & Salas, 1998; Greene & Miller, 1996; Greene et al., 2004; Harackiewicz, Barron, Pintrich, Elliot & Thrash, 2002; Liem et al., 2008; McWhaw & Abrami, 2001; Phan, 2010; Rastegar et al., 2010; Schmidt & Ford, 2003; Sins et al., 2007).

A discussion of the construct and the mechanism through which it will affect the learning competencies comprising *classroom learning performance* and *learning performance during evaluation* is to follow.

A definition of *goal-orientation* is provided by Chiaburu and Marinova (2005) and Payne, Youngcourt and Beaubien (2007), who refer to *goal-orientation* as an individual's dispositional goal preferences in achievement situations. Similarly, Farr et al. (1993) described *goal-orientation* as a mental framework that determines how

individuals interpret and respond to achievement situations. According to Bulus (2010) *goal-orientation* theory proposes that students' level of motivation and behaviours can be understood by considering the reasons learners offer to justify the effort they extend in academic work or the purpose of doing their academic work.

Goal-orientation was initially considered a two-dimensional construct distinguishing between: (a) *learning goal-orientation* (*LGO*), whereby individuals seek to develop competence by acquiring new skills and mastering novel situations, and (b) *performance goal-orientation* (*PGO*), whereby individuals pursue assurances of their own competence by seeking good performance evaluations and avoiding negative ones (Ames & Archer, 1988; Bell & Kozlowski, 2002; Dweck & Leggett, 1988; Salas & Cannon-Bowers, 2001; Schmidt & Ford, 2003).

It has subsequently been argued that *PGO* is in fact multidimensional and that *goal-orientation* should rather be considered a three-dimensional construct rather than a two-dimensional construct. Considering that *PGO* is defined as the desire to gain favorable judgments and avoid unfavorable judgments about one's ability, vandeWalle (1997) suggested that *PGO* should be partitioned into two dimensions which he labeled: *prove performance goal-orientation* and *avoid performance goal-orientation*. VandeWalle defined *prove performance goal-orientation* (*PPGO*) as the desire to prove one's competence and to gain favorable judgments about it and *avoid performance goal-orientation* (*APGO*) as the desire to avoid the disproving of one's competence and to avoid negative judgments about it. He subsequently demonstrated a three-factor model was superior to a two-factor model (vandeWalle, 1997). Similarly, Elliot and Harackiewicz (1996) proposed a three-dimensional *goal-orientation* construct by partitioning *PGO* into separate approach and avoidance components. He described performance-approach goals as focusing on the attainment of competence relative to others, whereas performance-avoidance goals focus on avoiding the perception of incompetence relative to others. The three factor model is also supported by the research of Day et al. (2003). Day et al. meta-analysed 127 studies and found a three-factor model bifurcating performance goals into separate approach and avoidance dimensions explained 7% more variance in academic performance than a two-factor model. Therefore, adopting the ideas of Dweck and Leggett (1988) and Elliot and Harackiewicz (1996), this study will consider *goal-orientation* to consist of: (a) *learning goal orientation* (LGO), (b) *approach PGO* and (c) *avoidance PGO*.

According to Kozlowski et al. (2001) the originators of *goal-orientation* postulated that *LGO* and *PGO* are mutually exclusive, in other words, *goal-orientation* was conceptualised as a single bipolar trait. According to this perspective, individuals are assigned to one category or the other without consideration for the possibility that both *goal-orientations* are held to some degree. In terms of the original conseptualisation, when pursuing a goal, individuals will either be striving to improve skills, or will strive to perform well relative to others.

Button, Mathieu and Zajac (1996), however, contend that learning goals and performance goals are not mutually exclusive. Rather, *LGO* and *PGO* are viewed as separate latent variables and it is therefore possible for an individual to simultaneously strive to improve his/her skills and to perform well relative to others. For example, competitive divers must continually train to both perfect increasingly difficult dives and to outperform other divers in order to compete at higher levels. The successful diver will work toward each type of goal. It is also possible for individuals to be simultaneously motivated by, or oriented toward, each type of goal. However it is probable that individuals will tend to favour one type of goal over the other i.e., be predominately *learning-* or *performance goal-oriented*. However it is important to recognise that *LGO* and *PGO* are not mutually exclusive, but rather simultaneously motivate and drive individuals towards actions.

Individuals will tend to favour one type of goal over the other i.e., be predominately *LGO* or *PGO* based on their individual view of crystalised intelligence. Individuals with an incremental view of crystalised intelligence (the belief that one's ability is malleable) are likely to believe intelligence and performance can be improved through increased effort and therefore adopt a *learning goal-orientation*. On the other hand, individuals who have an entity view of intelligence (the belief that one's ability is static) are likely to believe intelligence and performance are fixed and therefore adopt a *performance goal-orientation* (Payne et al., 2007; Van Hooft & Noordzij, 2009).

Dweck and Leggett (1988) proposed that the goals pursued by individuals create the framework for their interpretation and reaction to events or outcomes. Similarly, Bell and Kozlowski (2002) believe that the two types of *goal-orientation* differentially influence how individuals respond to task difficulty and failure. Individuals with a *LGO* tend to pursue what researchers have called an adaptive response pattern while individuals with a *PGO* pursue a maladaptive response pattern. The adaptive and maladaptive response patterns are strikingly different in the cognitions, affect, and behaviour that characterise each.

A learner that favours a *LGO* (and responds to task difficulty and failure with an adaptive response pattern) believes that success requires interest, effort, and collaboration and views effort positively because it is perceived as a means toward accomplishment. According to Ames and Archer (1989), with a *LGO* the process of learning itself is valued, and the attainment of mastery is seen as dependent on effort. When performance on a task is poor or when facing failure, the individual will not offer personal attributions for their failure. In fact, they will not believe that they are failing. Rather than viewing setback and difficulties as failures, they will view it as challenges to be mastered through effort. Poor performance and failure causes them to increase effort and persistence or to analyse and change their strategies. Such individuals will also display unflagging

optimism that their efforts will be fruitful and a heightened positive affect. These individuals are also likely to improve their problem-solving strategies when facing difficulties. *LGO* individuals are likely to choose difficult and challenging tasks, as this will allow them to exert effort and subsequently enable them to develop their competencies (Ford et al, 1998). According to Kozlowski et al. (2001) a *LGO* is viewed as an adaptive response to novel or challenging achievement situations. Individuals with a *LGO* are thought to be attracted to such situations and approach them with an orientation toward self-improvement. They believe that effort directed toward exploration and learning will yield self-improvement. They are resilient to challenge, persisting in the face of obstacles and failures. Errors and feedback are regarded as diagnostic of this improvement process and are used to aid learning.

Conversely, a learner that favours a *PGO* (and responds to task difficulty and failure with a maladaptive response pattern) believes success requires high ability and views the exertion of effort negatively because it is perceived as indicative of low ability. According to Ames and Archer (1988) with *PGO* there is concern with being judged able, to show one's ability of being successful, outperforming others, or achieving success with little effort. When performance is poor or when faced with obstacles or failures, *PGO* individuals attribute this to low ability. The individual will attribute this failure to personal inadequacies such as deficient intelligence, memory, or problem-solving ability. In the face of failure or setback, such individuals will experience negative affect such as aversion to the task, boredom with the problem, or anxiety over performance. Furthermore, poor performance and failure are regarded as predictive of future failures, leading to refraining from further effort and to withdrawal. Ultimately, a maladaptive response pattern will lead to a marked deterioration of performance in the face of difficulties or setback. In summary, such individuals will view their difficulties as failures, as indicative of low ability, and as insurmountable. They will perceive further effort as futile and as further documentation of their inadequate ability. Therefore, such individuals are likely to avoid difficult and challenging tasks, rather choosing easier tasks that enable them to show others their competencies (Ford et al., 1998). According to Kozlowski et al. (2001) performance oriented individuals seek easy situations that ensure positive evaluations of their capabilities, preferring to avoid novel or challenging achievement situations. They view their capabilities as more stable and failure to achieve reflects negatively on the self. Thus, they seek to avoid errors negative feedback. Failure is associated with the withdrawal of attention and effort. According to Hsieh, Sullivan and Guerra (2007) *PGO* individuals view error as a sign of failure and help-seeking as a sign of weakness.

Furthermore, the two *goal-orientations* differ in terms of the standard used for evaluating and defining performance. Whereas individuals with a strong *LGO* evaluate their competence according to whether they have mastered the task or developed their skills (i.e., an absolute or intrapersonal standard), individuals with a

strong *PGO* evaluate their competence according to how they performed compared to others (i.e., a normative standard) (Ford et al., 1998). Therefore, *LGO* and *PGO* represent different ideas of success.

2.3.2.3.1 Goal-orientation and learning

Accumulated research evidence has shown that the adoption of either a *LGO* or *PGO* is driven by differential antecedents and leads to differential patterns of cognitive, affective, and behavioral consequences (Fried & Slowik, 2004; Liem et al., 2008). *Goal-orientation*, in terms of learning and performance, has emerged in recent years as one of the more prominent influences in the educational and training research literatures. Of particular relevance, differences in *goal-orientation* have been proposed to influence the nature and quality of skill acquisition. Studies have shown, in general, that *goal-orientation* influences learning outcomes and performance. For example, Salas and Cannon-Bowers (2001) cite research having found that a *LGO* was a strong predictor of learning outcomes. Positive relationships have been found between *LGO* and outcomes such as knowledge, performance, and self-efficacy (Schmidt & Ford, 2003). Prior research linked *LGO* to greater effort, more complex learning strategies and deep processing (Chiaburu & Marinova, 2005). According to Ford et al. (1998) and Payne et al. (2007), learning goals are related to students using more effective learning strategies, to prefer challenging tasks, to have a more positive attitude toward the class. Phillips and Gully (1997) found a positive relationship between *LGO* and classroom exam scores, and Button et al. (1996) found a positive relationship between *LGO* and grade point average. Van Hooft and Noordzij (2009) cite previous studies on *goal-orientation* demonstrating that a *LGO* are especially adaptive for complex and ambiguous tasks, and similarly that a *PGO* become dysfunctional when tasks are ambiguous, when tasks are novel and have multiple stages, or when people do not have the abilities to perform well. A study conducted by Button et al. (1996) demonstrated a positive relationship between college GPA and *LGO*. According to Button et al., college students with a *LGO* are more likely to pursue challenging activities and to exert greater effort when presented with a difficult class, topic, or activity. They argued therefore that this learning pattern is adaptive in an academic setting and leads to a higher level of achievement. According to Hsieh et al. (2007) researchers have consistently concluded that a *LGO* is associated with positive patterns of learning and achievement. However, Sedaghat, Abedin, Hejazi and Hassanabadi (2011) found no significant relationship between *LGO* and learning. These results were attributed to the influence of the social environment of the school. Klein and Lee (2006) also found no relationship between *LGO* and learning.

Whereas previous research on *LGO* has produced rather consistent findings, research on *PGO* has resulted in mixed and contradictory findings. Button et aI. (1996) also found that *PGO* was unrelated to student's grade

point average. Rastegar et al. (2010) found a negative relationship between *avoidance-PGO* and mathematical achievement. In addition, Bell and Kozlowski (2002) and Kowlowski et al. (2001) found *PGO* to be generally unrelated to both knowledge and performance. Payne et al. (2007) also found that individuals high on LGO are likely to learn more and that avoidance-PGO, but not *approach-PGO*, is detrimentally related to learning. Payne et al. (2007) found virtually no relationship between *approach-PGO* and learning or academic performance.

Considering the theoretical discussion of *goal-orientation* and also the past research findings positively linking *goal-orientation* to learning, it is clear that the adoption of a *LGO* is very influential in predicting *classroom learning performance* and then also subsequent *learning performance during evaluation*.

Following the above conclusion that a *LGO* is influential in predicting *learning performance*, consideration must be given to how a *LGO* affects learning. A *LGO* is a characteristic of an individual. The means that if this characteristic will affect *learning performance* it will have to be by eliciting certain desired learning behaviours. In the case of this study, the desired behaviours are the learning competencies *transfer*, *automisation*, *time cognitively engaged* and *meta-cognitive regulation*. It seems unlikely that a *LGO* will have a direct effect on *transfer* and *automisation* as these two competencies are largely dependent on the cognitive ability of the learner. It can, however, be argued that since learners high on *LGO* tend to believe that crystalised intelligence and performance can be improved through increased effort and focus it follows that LGO should have an impact on *time cognitively engaged and on meta-cognitive regulation.*

Numerous studies (Ames & Archer, 1988; Dupeyrat & Marine, 2005; Dweck & Legget, 1988; Greene & Miller, 1996; Greene et al., 2004; Rastegar et al., 2010) have found positive relationships between *LGO* and *time cognitively engaged* and also between *LGO* and *meta-cognitive regulation*. Findings that *learning goal-orientation*, *time cognitively engaged* and *meta-cognitive regulation* correlate positively, however, still begs the question what structural process produced the correlation between these three variables. The position put forward in this study is that *learning motivatio*n mediates the effect of *learning goal-orientation* on *time cognitively engaged* and *meta-cognitive regulation.* In evidence of this position, to follow is a discussion of firstly the relationship between *goal-orientation* and *time cognitive engaged*, secondly the relationship between *goal-orientation* and *meta-cognitive regulation* and thirdly the relationship between *goal-orientation* and *learning motivation* supporting the stance of *learning motivation* acting as mediator.

2.3.2.3.2 Goal-orientation and time cognitively engaged

Accumulating evidence has established a consistent pattern that a *LGO* would facilitate *time cognitively engaged* (Ames & Archer, 1988; Dupeyrat & Marine, 2005; Dweck & Legget, 1988; Greene & Miller, 1996; Greene et al., 2004; Rastegar et al., 2010). Students who feel that mastering skills and increasing understanding and knowledge are important (*LGO*) engage more in deep processing. This relation makes sense as students with a *LGO* attempt to gain rich insight in the given learning material and will therefore engage in deep cognitive processing to increase their comprehension (Sins et al., 2007). Furthermore, because *LGO* students tend to attribute learning success to invested effort and attempt to understand the learning material, they may be more likely to employ and value processes that stress understanding, even if these processes require more effort than less elaborate processes. According to Liem et al. (2008), *LGO* students are more inclined to persistently engage in their learning although the tasks may be perceived dull or difficult. Similarly, Caraway et al. (2003) found *goal-orientation* to influence students' level of engagement in school. Specifically, the researchers found *LGO* to be positively related to *cognitive engagement*. Also, Miller, Behrens and Greene (1993) have shown that students who adopted learning goals were more likely to value and use cognitive strategies which fostered understanding of the material to be learned than subjects who adopted performance goals.

Studies have also examined the relationship between a *performance goal-orientation* and processing strategies however, this relationship is more complex and inconclusive. Some studies (Dupeyrat & Marine, 2005; Phan, 2010) demonstrated that an *approach-PGO* was only predictive of the use of surface learning strategies. The relationship between *approach-PGO* and surface processing may be attributed to the notion that individuals who have high aspirations to achieve and succeed in their learning are more likely to adopt superficial cognitive strategies that would enable quick learning in order to achieve maximise their grade points, rather than to learn the contents in a deep and engaged manner. In other studies, an *approach-PGO* was associated with the use of both deep and surface learning strategies (Harackiewicz et al., 2002; Rastegar et al., 2010). Phan (2010) rationalised the relationship between *approach-PGO* and deep processing by proposing that in their endeavor to perform better than their peers and to demonstrate their capabilities, *approach-PGO* students would tend to utilise deep learning. The use of deep learning reflects the students' awareness that the use of deep learning, rather than surface learning, is more likely to be rewarded with higher grades by the assessment system. Yet, in other studies (Greene et al., 2004; Liem et al., 2008), the relations between an *approach-PGO* and learning strategies were not observed. Furthermore, studies have established a clear positive relation between an *avoid-PGO* and a more superficial level of learning strategies (Greene & Miller, 1996; McWhaw &

Abrami, 2001; Miller et al., 1993). This gives additional support for the notion that the avoidance form of *performance goal-orientation* is generally less adaptive than its approach form (Liem et al., 2008). Sins et al. (2008) however found no relationship between *avoid-PGO* and surface learning.

The above discussion provides clear evidence of a positive relationship between LGO and *time cognitively engaged.* However, a positive relationship between a *PGO* and *time cognitively engaged* was not unequivocally evidenced. Therefore this study postulates that a *LGO* will have a positive influence on *time cognitively engaged,* however, will not formally be pursuing a stance on the relationship between *PGO* and *time cognitively engaged* in the learning potential structural model.

Hypothesis 8

In the proposed learning potential structural model it is hypothesised that a *learning goal-orientation* positively influences *time cognitively engaged.*

2.3.2.3.3 Goal-orientation and meta-cognitive regulation

Research conducted by Schmidt and Ford (2003), found that a *LGO* was positively related to meta-cognition. Individuals with a greater focus on learning the training content reported that they more actively monitored their learning processes. Similarly, Ford, Smith, Weissbein et al. (1998) conducted a study and found a relationship between *LGO* and *meta-cognitive regulation*. Individuals with a *LGO* engaged in greater meta-cognitive activity during learning. Individuals who approached the learning environment with the purpose of learning were more active in attending to and correcting their understanding of the task. McWhaw and Abrami (2001) also found that individuals who are more learning oriented employ *meta-cognitive regulation* more often than students who are more performance oriented. McWhaw and Abrami (2001) concluded that individuals with a *LGO* are willing to devote their effort to monitor their learning and seek diagnostic feedback. The relationship between *learning goal-orientation* and *meta-cognition* can be theoretically justified. Referring back to the theoretical discussion on *goal-orientation*, it was stated that individuals with a *LGO* believe that success requires effort, hard work and persistence and views effort positively because it is perceived as a means toward accomplishment. Furthermore, individuals with a *LGO* are thought to be attracted to such novel learning situations and approach them with an orientation toward self-improvement. They believe that effort directed toward exploration and learning will yield self-improvement. Therefore, an individual with a *LGO* is attracted to novel learning situations in which new concepts or texts must be mastered. Furthermore, they are willing to expend energy and effort on the task of learning as they view this as essential to success and self-

improvement. It seems therefore very likely that such an individual who wants to learn and is willing to put effort into learning will be more likely to employ various strategies, including meta-cognitive strategies, in order to be successful at the task of learning. Ames and Archer (1988) and Meece et al. (1988) found that students with a *LGO* were more likely to report engaging in self-regulatory activities such as planning, monitoring, (*meta-cognitive regulation*) and help-seeking.

The above discussion provides clear evidence of a positive relationship between LGO and *meta-cognitive regulation.* However, a positive relationship between a *PGO* and *meta-cognitive regulation* was not unequivocally evidenced. Therefore this study postulates that a *LGO* will have a positive influence on *meta-cognitive regulation* however will not formally be pursuing a stance on the relationship between *PGO* and *meta-cognitive regulation* in the learning potential structural model.

Hypothesis 9

In the proposed learning potential structural model it is hypothesised that a *learning goal-orientation* positively influences *meta-cognitive regulation.*

2.3.2.3.4 Goal-orientation and learning motivation

According to Dweck and Leggett (1998), *learning motivation* is tied to progress towards a goal. The difference between current level of performance and the goal is thought of as a source of motivation. Learners will work to narrow that gap. When students see that they are making progress towards the goal, they will be more motivated to continue. Also, when students see others who have reached their goal receive positive benefits, they develop an anticipation that if they too reach the goal, they will receive those same benefits. This discussion posits the importance of goals in *learning motivation*. Ames and Archer (1988) also allude to the importance of goals when they define *learning motivation* as the desire or want that energises and directs goal-oriented behaviour. According to Ames and Archer (1988), students with a *LGO* are motivated by the desire to learn something new. They are not concerned with how long it takes or how many mistakes they have to make to learn. It is the drive to develop competence by acquiring new skills and mastering novel situations. A LGO therefore energises an individual to pursue behaviour that will enhance learning and subsequently motivates the individual to learn. There is further evidence to support this relationship. Research by Colquitt and Simmering (1998) found a positive relationship between *LGO* and *learning motivation*. Learners who had high levels of this personality variable exhibited higher *learning motivation* levels during the learning process.

According to Baird, Scott, Dearing and Hamill (2009), learners who pursue learning goals rather than performance goals are more likely to show optimal motivation for academic tasks.

In summary of the above, it is posited that a *LGO* positively influence the competency variables *time cognitively engaged* and *meta-cognitive regulation.* However, *LGO* will not directly influence *time cognitively engaged* and *meta-cognitive regulation*, but will do so through the mediating effect of *learning motivation*.

Hypothesis 10

In the proposed learning potential structural model it is hypothesised that a *learning goal-orientation* positively influences *learning motivation.*

Following the above, it becomes necessary to further explore other competency potentials likely to affect *time cognitively engaged* and *meta-cognitive regulation*. The next competency potential to be included is the personality variable, *conscientiousness*.

2.3.2.4 Conscientiousness

Numerous studies have shown the importance of *conscientiousness* during learning (Barrick & Mount, 2005; Bidjerano & Dai, 2007; Colquitt & Simmering, 1998; ; Eilam, Zeidner & Aharon, 2009; Furnham, Monsen & Ahmetoglu, 2009; McCrae & Costa, 1999; Nijhuis, Segers & Gijselaers, 2007; O'Connor & Paunonen, 2007; Steinmayr, Bipp & Spinath, 2011) and researchers have also found positive relationships between *conscientiousness* and *time cognitively engaged* (Bidjerano & Dai, 2007; McCrae & Costa, 1999; McKenzie et al., 2004; Woo, Harms & Kuncel, 2007). A clear relationship between *conscientiousness* and *meta-cognitive regulation* has seemingly not yet been established as very limited research studies have been undertaken examining this relationship. However, Turban, Stevens and Lee (2009) allude to a positive relationship between *conscientiousness* and the use of *meta-cognitive regulation*. A discussion of the variable and its influence on learning follows below.

When considering the importance on *conscientiousness*, it firstly necessitates an examination of the wider perspective of personality, of which *conscientiousness* forms part.

John and Srivastava (1999) view personality as referring to a set of more or less stable characteristics, as assessed and judged by others that distinguish one individual from another. Ryckman (1997) defines

personality as the dynamic and organised set of characteristics of a person that uniquely influences his/her cognitions, motivations and behaviours. Also, Bidjerano and Dai (2007) define personality traits as stable individual difference characteristics explaining an individual's disposition to particular patterns of behavior, cognitions and emotions. An important point to be extracted from the above definitions is that personality is an influential explanatory construct that explains why the behaviour of individuals differ in essentially the same situation[11]. Personality variables therefore hold importance to researchers and practitioners who seek to understand individual's suitability for a role or work-related activities as well as their propensity to respond in certain ways in different settings or environments.

A substantial number of research studies (Barrick & Mount, 2005; Bidjerano & Dai, 2007; Colquitt & Simmering, 1998; McCrae & Costa, 1999; Nijhuis et al., 2007; O'Connor & Paunonen, 2007) provide evidence of the importance of including personality variables in research on learning. Barrick and Mount (2005) attribute the pervasive effects of personality on performance in all jobs due to its ''will do'' motivational components while on the other hand, general mental ability affects performance in all jobs primarily through ''can do'' capabilities.

Specifically, the Big Five model of personality is pervasive throughout literature (Barrick & Mount, 1991; Barrick & Mount, 2005; Bidjerano & Dai, 2007; Bipp, Steinmayr & Spinath, 2008; Dean, Conte and Blankenhorn, 2006; Nijhuis et al., 2007). The Big Five framework has been widely adopted as a description of the structure of personality. The terms Extraversion, Agreeableness, Conscientiousness, Neuroticism (or Emotional Stability), and Openness to Experience seem to be the most commonly used terms. Factor analyses have consistently identified these five factors. The Big Five factors have been at the center of a tremendous number of studies, and the empirical data yield support for their stability and predictive validity (see McCrae & Costa, 1999).

Costa and McCrae in 1992 (as cited in Nijhuis et al., 2007) provides the following description of the Big Five personality traits:

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[11]It is typically assumed that a specific standing on a latent personality dimension will result in consistent behaviours across numerous different situations. Situational characteristics may exert a causal main effect on behaviour as well. In doing so the situation is seen to influence behaviour independent of stable personality traits. An agreeable individual is expected to behave agreeably across a wide variety of situations. Empirical research, however, forces one to question this assumption. "The individual's behaviour and rank order position on virtually any psychological dimension tends to vary considerably across diverse situations, typically yielding low correlations" (Mischel, 2004, p. 2). According to Mischel (2004) in explaining the variability in behaviour across situations the situation should not be regarded as a nuisance variable that creates noise, but should rather be treated it as a necessary and integral component of any attempt to explain how personality affects behaviour. The interaction between personality and specific situational characteristics hold the key to understanding and predicting behavioural variability across situations.   Moreover, it is the individual's subjective interpretation of the situation rather than the objective reality that is important. Behavioural consistency should therefore only be expected across situations if the individual perceive the situation to be the same (Mischel, 2004).

- *Emotional stability* describes the way individuals deal with psychological distress. A high score on this dimension indicates that people are calm, relaxed, feel confident and are not easily disturbed.

- *Extroversion* is about social interaction with other people. Individuals scoring high on this dimension tend to be sociable, assertive and like to work with other people.

- *Agreeableness* is about the attitude of an individual towards other people. Individuals with high scores on this scale are characterised as being forgiving, readily helpful and peaceable.

- *Conscientiousness* deals with someone's level of organisation, persistence and goal-directed behaviour. Individuals with a high score tend to be strong-willed, responsible, neat and well organised.

- *Openness* refers to proactive search behaviour and tolerance of and exploring the unfamiliar. Individuals who score highly on this scale tend to be open-minded, imaginative and independent of judgment by others.

Of the Big Five factors, *conscientiousness* seems particularly relevant for success in domains such as school and work. Conscientious persons are characterised as being industrious, systematic, dutiful, high on achievement striving, and hardworking (Nijhuis et al., 2007). According to Eilam et al. (2009), this dimension includes features such as ambition, energy, control of inclinations, diligence, carefulness, and being practical. This dimension is also termed 'the will to succeed,'' which expresses orientation and intentional goal driven behaviour. Individuals scoring low in *conscientiousness* tend to be lazy, without orientation to succeed, and unable to meet their own standards as a results of deficient self-discipline. *Conscientiousness* involves a tendency to be organised, efficient, systematic, and achievement oriented. In the context of training, a conscientious personality may serve a trainee well in planning, forecasting, seeking out additional learning assistance, and following through with academic goals (Dean et al., 2006). Barrick and Mount (2005) captures the essence of *conscientiousness* when they state that it is hard to imagine that a manager would prefer to hire someone who is careless, irresponsible, lazy, impulsive, and low in achievement striving (low in *conscientiousness*) above someone who is disciplined, meticulous, diligent and ambitious (high in *conscientiousness*). The importance of considering *conscientiousness* becomes obvious in this statement.

2.3.2.4.1 Conscientiousness and learning

In general, empirical studies were successful in delineating a consistent relationship between *conscientiousness* and academic achievement (Barrick & Mount, 1991; Eilan et al., 2009; Fransson, 1977; Furnham et al., 2009; O'Connor & Paunonen, 2007; Steinmayr et al., 2011; Trautwein, Lüdtke, Roberts, Schnyder and Niggli, 2009; Vermetten, Lodewijks & Vermunt, 2001). A review by O'Connor and Paunonen (2007) on Big Five predictors of

post-secondary academic performance implies that *conscientiousness* is the best trait predictor of a variety of academic outcomes including exams, essays, continuous assessment, and supervised dissertations. This is attributed to the motivated, hard-working, responsible, and achievement-orientated nature of highly conscientious individuals. Furnham et al. (2009), in their study of Grade 10 British pupils, found that personality trait difference factors can account for a quarter of the variance in outcome in core subjects. Specifically, they found *conscientiousness* to be a major predictor of success on the core subjects. In a study measuring school performance of grade 11 and 12 students, Steinmayr et al. (2011) found that personality traits together explained 14% of the variance in school performance beyond intelligence, and that *conscientiousness* contributed the largest amount of unique variance. Komarraju, Karau and Schmeck (2009) found *conscientiousness* to have a significant relationship with *learning motivation* and achievement. Eilam et al. (2009) found *conscientiousness* to be related to academic achievement in the science subject area. According to Colquitt and Simmering (1998) individuals who were reliable, self-disciplined, and persevering were more likely to perceive a link between effort and performance and were more likely to value high performance levels. Dean et al. (2006) found *conscientiousness* to be significantly related to simulation-based criterion measures in Marine training, and concluded that personality measures can be helpful in predicting training performance. In a meta-analysis investigating the impact of the Big Five personality factors on academic success at university, Trapmann, Hell, Hirn and Schuler (2007) found that *conscientiousness* shows the strongest validity for academic achievement as measured by college grades as compared to the other Big Five traits. *Conscientiousness* achieved a validity coefficient of .269 indicating that 7.2% of the criterion measure variance can be explained by this trait. According to Trapmann et al. (2007), *conscientiousness* covers many facets that have high face validity for college success: the drive to accomplish something, being organised, efficient, systematic, orderly, and steady. A meta-analytic review conducted by Barrick and Mount (1991) similarly found *conscientiousness* to be related to educational achievement and job performance across all occupations studied. According to Barrick and Mount, individuals who exhibit traits associated with a strong sense of purpose, obligation, and persistence generally perform better than those who do not. Perlow and Kopp (2004) conducted research on students enrolled in an accounting course and found a positive relation between *conscientiousness* and training performance. Specifically, they found the relation to become stronger over time. Perlow and Kopp explained this relation through the fact that when students enter into a training programme, there is an element of novelty which is likely to have a positive impact on the motivation of the students. As time passes, the novelty diminishes, and it may negatively affect the motivation and subsequent training performance of students. However, the negative effect on training performance affect students on varying levels and this variation is attributed to the effect of *conscientiousness*. Specifically, people with higher levels of *conscientiousness* perform better over time than their counterparts with lower levels of

conscientiousness. There are some studies however that report less positive findings about the relationships between *conscientiousness* and learning. Although Colquitt, LePine and Noe (2000) found *conscientiousness* to be positively related to *learning motivation*, their results actually found *conscientiousness* to be negatively related to skill acquisition. Colquitt et al. (2000) attributed this counterintuitive result to the conscientious individuals' tendency to be self-deceptive regarding actual learning progress.

Although it has seemingly been established in the above that personality, specifically *conscientiousness*, positively affects *classroom learning performance*, consideration must be given to how *conscientiousness* affects learning. *Conscientiousness* is a characteristic of an individual. This means that if this characteristic will affect *learning performance* it will have to be by eliciting certain desired learning behaviours. In the case of this study, the desired behaviours are the learning competencies *transfer*, *automisation*, *time cognitively engaged* and *meta-cognitive regulation.* It seems unlikely that *conscientiousness* will have a direct effect on *transfer* or *automisation* as these two competencies are largely dependent on the cognitive ability of the learner. It can, however, be argued that since learners high on *conscientiousness* tend to disciplined, meticulous, diligent and ambitious and thereby reflect 'the will to succeed,'' which expresses intentional goal-driven behaviour it follows that *conscientiousness* should have an impact on *time cognitively engaged.* The question is whether the impact is direct and/or whether it should be mediated by other learning competencies or learning competency potential latent variables*.* Earlier it was argued that *time cognitively engaged* is affected by *learning motivation*. In terms of the preceding argument it therefore seems reasonable to argue that *conscientiousness* should affect *time cognitively engaged* directly as well as indirectly via *learning motivation*.

Furthermore, *meta-cognitive regulation* was defined earlier as referring to decisions such as where to allocate one's resources, the specific steps to be used to complete the task, the speed and intensity at which to work on the task, and the prioritisation of activities. It seems reasonable to argue that the same belief in the instrumentality of hard work will also express itself indirectly in a concern about and a focus on where to allocate one's resources, the specific steps to be used to complete the task, the speed and intensity at which to work on the task, and the prioritisation of activities. It therefore seems reasonable to argue that *conscientiousness* should affect *meta-cognitive regulation* indirectly via *learning motivation*.

The position put forward in this study firstly is that *conscientiousness* will have a direct positive influence on *time cognitively engaged*. Secondly, this study posits that *learning motivatio*n mediates the effect of *conscientiousness* on *time cognitively engaged* and *meta-cognitive regulation.*

2.3.2.4.2 Conscientiousness and time cognitively engaged

McKenzie et al. (2004) found in their research that *conscientiousness* was the most important predictor of learning strategy use, accounting for 15.2% of the variance. Students who displayed high levels of *conscientiousness* were more likely to report that they utilised learning strategies than students with a more lackadaisical nature. Bidjerano and Dai (2007) found that high *conscientiousness* is related to higher tendencies for the use of time management and effort regulation and higher order cognitive skills such as elaboration, critical thinking, and *meta-cognition*. The fact that *conscientiousness* was significantly related to students' tendencies to manage their learning efforts and structure their time and learning environment is not surprising. Students who were conscientious and described themselves as cooperative were likely to have a designated place for studying or choose a study place where they could be more focused, and to skillfully manage and make a good use of their study time. The intrinsic connectedness of *conscientiousness* and time and effort regulation is expected because the construct of *conscientiousness* is expressed by attributes such as self-discipline, deliberation, hard-working attitude, order, dutifulness, compliance, and imperturbability. Following the above, a direct relationship is hypothesised between *conscientiousness* and *time cognitively engaged*.

Hypothesis 11

In the proposed learning potential structural model it is hypothesised that *conscientiousness* positively influences *time cognitively engaged*

2.3.2.4.3 Conscientiousness and meta-cognitive regulation

Very limited research seems to have been conducted examining the relationship between personality and *meta-cognitive regulation*. One such study was conducted by Turban et al. (2009) who posit a positive relationship between *conscientiousness* and the use of *meta-cognitive regulation*. The lack of studies examining this relationship does not necessarily mean such a relationship does not exist, it merely indicates to the necessity of further theorising and empirical studies examining this relationship.

This study will follow the above line of thought and postulates that there is a positive relationship between *conscientiousness* and *meta-cognitive regulation*. However, the effect of *conscientiousness* on *meta-cognitive regulation* is probably not direct and it is rather postulated that the underlying causal dynamics operate via *learning motivation*. Therefore, in the current study it is hypothesised that the effect of *conscientiousness* on *meta-cognitive regulation* is mediated by *learning motivation*. A hypothesis on the effect of *learning motivation*

on *meta-cognitive regulation* already exists and was fully explored in a previous discussion. A hypothesis on the effect of *conscientiousness* on *learning motivation* follows below.

2.3.2.4.4 Conscientiousness and learning motivation

According to Barrick and Mount (2005), motivation is the major mediating link between personality and performance. Kanfer (1991) similarly advocated using a distal-proximal framework for examining personality effects and casts *conscientiousness* as a distal variable that influenced learning through the more proximal mechanism of *learning motivation.* Other studies have found evidence to support the proposed positive relationship between *conscientiousness* and *learning motivation*. Research by Colquitt and Simmering (1998) found a positive relationship between *conscientiousness* and *learning motivation*. Learners who had high levels of this personality variable exhibited higher *learning motivation* levels during the learning process. According to Colquitt and Simmering, individuals who were reliable, self-disciplined, and persevering were more likely to perceive a link between effort and performance and were more likely to value high performance levels. The above posits a strong argument of the positive relationship between personality, specifically *conscientiousness*, and *learning motivation* and is therefore included in the structural model.

Hypothesis 12

In the proposed learning potential structural model it is hypothesised that *conscientiousness* positively influences *learning motivation.*

The next competency potential included in the study is that of *academic self-efficacy*.

2.3.2.5 Academic self-efficacy

Academic self-efficacy was selected due to its prominence in the literature relating to training and learning and the strong evidence linking academic *self-efficacy* to *classroom learning performance* and to *learning performance during evaluation* (Bandura, Barbaranelli, Caprara & Pastorelli, 1996; Ford et al., 1998; Hsieh et al., 2007; Schunk, 1990; Sedaghat et al., 2011; Skinner et al., 2008; Zimmerman, 2000), *time cognitively engaged* (Dupeyrat & Marine, 2005; Greene & Miller, 1996; Greene et al., 2004; Hsieh et al., 2007; McWhaw & Abrami, 2001; Metallidou & Vlachou, 2007; Schunk, 1990; Sins et al., 2008) and *meta-cognitive regulation* (Ford et al., 1998; Hsieh et al., 2007; Landine & Stewart, 1998; Schmidt & Ford, 2003). A discussion of the construct and the manner in which it affects learning will be discussed below.

Bandura (1977; 1997) defined perceived *self-efficacy* as personal judgments of one's capabilities to organise and execute courses of action to successfully complete tasks and attain designated goals. Judge and Bono (2001) described *self-efficacy* as one's estimate of one's fundamental ability to cope, perform, and be successful while Hsieh et al. (2007) describes *self-efficacy* as an individuals' belief about their capabilities to successfully complete a task. In other words, an individual's estimate of his or her ability to perform a specific behaviour is called *self-efficacy*. *Self-efficacy* is however more than telling ourselves that we can succeed. *Self-efficacy* involves a strong conviction of competence that is based on our evaluation of various sources of information about our efficacy.

According to the theory of perceived *self-efficacy*, whether a person undertakes a task depends, in part, on his or her perceived levels of efficacy regarding that task. According to Bandura's (1997) key contentions regarding the role of *self-efficacy* beliefs in human functioning, *"people's level of motivation, affective states, and actions are based more on what they believe than on what is objectively true"* (p. 2). For this reason, how people (attempt to) behave can often be better predicted by the beliefs they hold about their capabilities than by what they are actually capable of accomplishing, for these *self-efficacy* perceptions help determine what individuals do with the knowledge and skills they have. Furthermore, research results posit that perceived *self-efficacy* may differ from one's actual abilities. This helps explain why individual's behaviours are sometimes disjointed from their actual capabilities and why their behaviour may differ widely even when they have similar knowledge and skills. For example, many talented people who are highly competent at a particular task may suffer frequent (and sometimes debilitating) bouts of self-doubt about capabilities they clearly possess, and due to their lack of belief in themselves will not attempt the task. Similarly, many individuals are confident about what they can accomplish despite possessing only a modest repertoire of skills. Belief and reality are seldom perfectly matched, and individuals are typically guided by their beliefs when they engage the world.

Efficacy expectations are be distinguished from outcome expectations. Outcome expectations refer to one's estimate that a given action will results in a particular outcome; they are beliefs about the responsiveness of one's environment. *Locus of control* will be discussed to address this. In contrast, efficacy expectations are beliefs about one's own competence and for this study is conceptualised as *self-efficacy*. Optimal performance usually requires both efficacy and outcomes expectations to be high (Bandura, 1997).

In terms of the relationship between *self-efficacy* and outcomes, the level of specificity of the outcome to be predicted should be considered. *Self-efficacy* has been assessed on different levels of specificity and in general differentiates between *task specific self-efficacy* and *generalised self-efficacy*. Both *task specific self-efficacy*

and *generalised self-efficacy* denote beliefs about one's ability to achieve desired outcomes, but the constructs differ in the scope (i.e., generality or specificity) of the performance domain contemplated (Judge, Erez, Bono & Thoreson, 2002).

Self-efficacy was originally conceptualised as task specific when Bandura (1977; 1997) defined *self-efficacy* as an individual's perceptions of his/her ability to perform adequately in a given situation. Bandura's definition is restrictive and has given *self-efficacy* a narrow focus, conceptualising *self-efficacy* as task specific. According to this stance, *self-efficacy* beliefs is not a single disposition but rather multidimensional in form and differ on the basis of the domain of functioning. For example, efficacy beliefs about performing on a history test may differ from beliefs about being successful at playing a sport. In terms of the context of this study, *task specific self-efficacy* would refer to *academic self-efficacy*, the belief in one's capability to learn and be academically successful.

However, despite Bandura's restrictive definition of the construct, *generalised self-efficacy* has merited some attention in the literature. *Generalised self-efficacy* is defined by Judge et al., (2002, p. 96) as a "judgement of how well one can perform across a variety of situations." According to this stance, *generalised self-efficacy* is therefore a motivational state because it involves the individual's beliefs regarding his/her abilities to perform and succeed at tasks across different situations (Kanfer & Heggestad, 1997). Thus, *generalised self-efficacy* captures differences between individuals in their tendency to view themselves as capable of meeting task demands in a broad array of contexts. *Generalised self-efficacy* is a global sense of competence that influences diverse behaviours.

Chen, Gully and Eden (2001) have argued that *generalised self-efficacy* positively influences *task specific self-efficacy* across tasks and situations. Specifically, the tendency to feel efficacious across tasks and situations (i.e., *generalised self-efficacy*) "spills over" into specific situations. Thus, individuals with high *generalised self-efficacy* expect to succeed across a variety of task domains. Nevertheless, the majority of *self-efficacy* researchers have continued to focus on *task specific self-efficacy* exclusively while ignoring the *generalised self-efficacy*. Chen et al. (2001) argue that further disregard of *generalised self-efficacy* may exact a price in terms of theoretical comprehensiveness and proportion of variance explained in motivation research. Moreover, given that jobs and roles in organisations are becoming increasingly broad, complex, and demanding, high *generalised self-efficacy* is a valuable resource for organisations because it can maintain employees' work motivation throughout rapidly changing and stressful job demands and circumstances and buffer them from the potentially demotivating impact of failure. In addition there is reason to be concerned that the constant

stream of negative messages emitted by Apartheid policies and practices could have eroded the *generalised self-efficacy* of many Black South Africans and through that could have negatively indirectly affected some of the other more core determinants of *class room learning performance*.

In light of the compelling evidence given above in support of both *generalised self-efficacy* and *task specific self-efficacy*, this study will incorporate both constructs. Specifically, *task specific self-efficacy* will be defined as referring to *academic self-efficac*y (ie an individual's beliefs regarding his/her abilities to perform and succeed at tasks specific to learning and academic situations) and *generalised self-efficacy* will be defined as an individual's beliefs regarding his/her abilities to perform and succeed at tasks across different situations. Furthermore, it is postulated that *generalised self-efficacy* positively influences *task specific self-efficacy*, or in other words, *academic self-efficacy.*

Hypothesis 13

In the proposed learning potential structural model it is hypothesised that *generalised self-efficacy* positively influences *academic self-efficacy*

According to theory and research by Bandura (1986), *self-efficacy* makes a difference to how people think, feel, and act. According to Bandura et al. (1996) individuals' *self-efficacy* perceptions impact many aspects of their lives including their aspirations, the decisions they make, the strength of their goal commitment, the level of their motivation and their perseverance in the face of difficulties and setbacks, their resilience to adversity, the quality of their analytic thinking, their causal attributions for successes and failures, and their vulnerabilities to stress and depression. This is attributed to the fact that unless people believe that they can produce desired effects by their actions, they have little incentive to act. Similarly, Caraway et al. (2003) state that *self-efficacy* may also influence the types of tasks individuals take on, the level of stress they experienced in demanding situations, and the positivity or negativity of their thought patterns. According to Bandura (1997), a low sense of *self-efficacy* is associated with depression, anxiety, and helplessness. Individuals with low *self-efficacy* also have low self-esteem and they harbour pessimistic thoughts about their accomplishments and personal development. In terms of thinking, a strong sense of competence facilitates cognitive processes and performance in a variety of settings including the quality of decision-making and academic achievement. *Self-efficacy* has an influence on preparing action because self-related cognitions are a major ingredient in the motivation process. *Self-efficacy* levels can enhance or impede motivation. People with high *self-efficacy* choose to perform more challenging tasks. They set themselves higher goals and stick to them. Actions are pre-shaped in thought, and people anticipate either optimistic or pessimistic scenarios in line with their level of

self-efficacy. Once an action has been taken, highly self-efficacious people invest more effort and persist longer than those low in *self-efficacy*. When setbacks occur, they recover more quickly and maintain commitment to their goals. High *self-efficacy* also allows people to select challenges to explore their environment, or create new ones.

2.3.2.5.1 Academic self-efficacy and learning

Extensive evidence is available to substantiate the claim that *academic self-efficacy* is related to *classroom learning performance* as well as subsequent *learning performance during evaluation* (Bandura et al., 1996; Ford et al., 1998; Hsieh et al., 2007; Lee & Klein, 2002; Rastegar et al., 2010; Schunk, 1990; Skinner et al., 2008; Swanberg & Martinsen, 2010; Zimmerman, 2000). Zimmerman (2000) describes *academic self-efficacy* as an essential component for successful learning. According to Hsieh et al. (2007) an extensive body of research has examined the relationship between *academic self-efficacy* and achievement in the domains of math and reading and cites several studies suggesting that students with higher *academic self-efficacy* perform better in these areas than students who have lower *academic self-efficacy*. According to Schunk (1990), *academic self-efficacy* beliefs influence academic motivation and achievement. According to Ford et al. (1998), *academic self-efficacy* plays an important affective and motivational role in learning. Their study found a significant relationship between *academic self-efficacy* and training performance. Zimmerman (2000) found *academic self-efficacy* to be highly correlated with students' rated success in course work in college. In a study documenting the level of engagement of school children, Skinner et al. (2008) suggest that personal motivational resources such as *academic self-efficacy* may affect the level of engagement experienced by a trainee. Skinner et al. postulate that learners who start off confident in their capacities engage with learning tasks in ways that lead to more success, thus reinforcing their initial optimism, whereas learners low in *academic self-efficacy* tend to avoid challenges or engage in tasks so half-heartedly that they do not succeed, thereby cementing their initial self-doubts. This statement reinforces the importance of learner *academic self-efficacy* in success at learning. According to Bandura et al. (1996), children's beliefs in the efficacy to regulate their own learning activities and master difficult subject matters affects their academic motivation, interest, and scholastic achievement. Moreover, *academic self-efficacy* beliefs shape career aspirations and pursuits during early formative years. The stronger the students' belief in their *academic self-efficacy*, the more occupational options they consider possible, the greater the interest they show in them, the better they prepare themselves educationally for different career pursuits, and the greater their persistence and success in academic coursework. Rastegar et al. (2010) found a positive relationship between *academic self-efficacy* and

mathematical achievement. Sedaghat et al. (2011) found *academic self-efficacy* to predict academic performance of junior high school students.

In conclusion it seems that when students are faced with learning demands, the way they view their own capabilities can play a significant role in their academic success. Considering the theoretical discussion of the construct and also the past research findings, it is clear that *academic self-efficacy* is an influential predictor of learning. Specifically, levels of *academic self-efficacy* should influence learning success through its indirect effect on the learning competencies of *time cognitively engaged* and *meta-cognitive regulation* and through its effect on the learning competency potential latent variable *learning motivation*.

2.3.2.5.2 Academic self-efficacy and time cognitively engaged

The literature consistently posits that *time cognitively engaged* is positively influenced by *academic self-efficacy*. According to Singh et al. (2002) positive cognitive outcomes are most likely to occur when learning is self-directed and intrinsically motivated. Ample evidence is provided in the literature that student's perception of *academic self-efficacy* is related to higher levels of *cognitive engagement* (Dupeyrat & Marine, 2005; Greene & Miller, 1996; Greene et al., 2004; McWhaw & Abrami, 2001; Sins et al., 2008). Furthermore, consistent research findings is available indicating the positive correlations between *academic self-efficacy* and the use of deep cognitive strategies are consequently related to better achievement outcomes (Greene and Miller, 1996; Metallidou & Vlachou, 2007.; Schunk, 1989; Zimmerman, 2000). Recent research results indicate the predictive effect of *academic self-efficacy* on *time cognitively engaged* (Liem et al., 2008; Rastergar et al., 2010; Sins et al., 2008) and posits that *academic self-efficacy* serves as impetus for deep cognitive learning. This is in line with the theoretical contention that students who feel more confident in their ability regarding a task are more likely to engage their repertoire of strategies and persist in their use than students doubting their capabilities. According to Caraway et al. (2003), the more confident students are about their general level of competence, the more likely they are to be engaged in various aspects of school and subsequently get better grades. Gettinger and Seibert (2006) states that *academic self-efficacy* is a predictor of the amount of time that a student will spend on academic tasks as well as the degree to which the student will be cognitively engaged in the learning task. Similarly according to Hsieh et al. (2007) having high *academic self-efficacy* may lead to more positive learning habits such as deeper cognitive processing, cognitive engagement, persistence in the face of difficulties, initiation of challenging tasks, and use of self-regulatory strategies. This fits with Bandura's social-cognitive theory and related research which asserts that *self-efficacy* determines aspects of engagement including which tasks individuals choose to take on, amount of effort, persistence, and perseverance they

demonstrate with regard to the task, and their feelings related to the task. Similarly, Skinner et al. (2008) posit that perception of academic competence is a robust predictor of effort and persistence during learning and of students' emotional reaction to success and failure. Furthermore, Skinner et al. believed that students who start off confident in their capacities engage with learning tasks in ways that lead to more success, thus reinforcing their initial feelings of competence, whereas children low in efficacy tend to avoid challenges or engage in tasks so half-heartedly that they do not succeed, thereby cementing their initial self-doubt. This implies a complex causal chain of influences in which *academic self-efficacy* (indirectly via learning motivation) affects *time cognitively engaged* which affects *transfer* and *automisation* and which eventual eventually affects *learning performance during evaluation* where self-efficacious students are more likely to succeed, and whereby academic success will again lead to increased levels of *academic self-efficacy* by means of a feedback loop. Schunk (1991) also suggested the possibility of a bi-directional relationship where *academic self-efficacy* is not only predictive of *time cognitively engaged*, but that possessing cognitive strategies that have proved effective in the past can also enhance a learner's perceptions of ability.

In relation to surface processing, however, research studies have produced inconclusive findings. For example, Fenollar, Roman, and Cuestas (2007) and Rastegar et al. (2010) reported that individuals' perceived competence exerted a negative influence on surface processing, whereas studies (Liem et al., 2008; Sins et al., 2008) have indicated a non-significant association between the two constructs.

The above seems to conclusively point to a positive correlational relationship between *academic self-efficacy* and *time cognitively engaged.* It, however seem more plausible to argue that the effect of *academic self-efficacy* on *time cognitively engaged* is not direct but rather mediated by learning motivation.

2.3.2.5.3 Academic self-efficacy and meta-cognitive regulation

Research evidence is provided that there is a positive relationship between levels of *academic self-efficacy* in an individual, and the individual's likelihood of utilising *meta-cognitive regulation* during learning. Schmidt and Ford (2003) demonstrated in their study that learners who display more meta-cognitive activity, reported higher levels of *self-efficacy*. Similarly, Ford et al. (1998) found a strong relationship between *self-efficacy* and *meta-cognition*. According to the researchers, engaging in greater meta-cognitive activity was related to greater self-confidence in the learner's capability to succeed at the task. Ford et al. (1998) found that meta-cognitive activity was significantly related to knowledge and skill acquisition as well as to the perception of *self-efficacy*. Landine and Stewart (1998) also report a positive relationship between *self-efficacy* and *meta-*

cognition. According to Hsieh et al. (2007), having high *academic self-efficacy* may lead to more positive learning habits such as deeper cognitive processing, cognitive engagement, and use of self-regulatory strategies all of which can contribute to success at learning tasks. The above research results of a positive relationship between *academic self-efficacy* and *meta-cognition* makes theoretical sense. Individuals with a strong sense of personal competence approach difficult tasks as challenges to be mastered rather than as threats to be avoided. Individuals who have a strong sense of *academic self-efficacy* deploy their attention and effort to the demands of the situation and are spurred by obstacles to greater effort. Therefore, it would seem that individuals with high *academic self-efficacy* will view learning as a challenge to be mastered and will deploy effort and attention to the task of learning. When faced with the challenge of having to learn a novel concept or unfamiliar text, it is expected that individuals with high *self-efficacy* would be motivated and driven to succeed in the task and will be willing to implement various strategies and do whatever is required to master the challenge of learning. It therefore seems very likely that individuals with high *academic self-efficacy* would be more likely to employ *meta-cognitive regulation* as part of the strategy to overcome the challenge of learning.

The above discussions elucidates that *academic self-efficacy* is a very influential variable in determining *classroom learning performance* and will do so by means of instigating wanted behaviours namely *time cognitively engaged* and *meta-cognitive regulation*. However, following the above discussions, *academic self-efficacy* will not directly influence the competencies, but will do so through its influence on *learning motivation*.

2.3.2.5.4 Academic self-efficacy and learning motivation

Although strong evidence is provided of the positive role that judgments of *academic self-efficacy* play in human behaviour, it is still important to note that behaviour is affected by a number of factors. There may be disincentives and performance constraints; that is, even highly self-efficacious and well-skilled people may choose not to behave in concert with their beliefs and abilities because they simply lack the incentive to do so, because they lack the necessary resources, or because they perceive social constraints in their envisioned path or outcome. In such cases, *academic self-efficacy* will fail to predict performance. An individual may feel capable but do nothing because he feels impeded by these real or imaginary constraints. So although a person a highly skilled and self-efficacious, it still does not guarantee positive behaviour due to other influences or constraints.

In the proposed learning potential structural model it is hypothesised that *academic self-efficacy* positively influences *learning motivation* as individuals who believe that they are capable of learning may be more motivated to learn. Bandura's theory of *self-efficacy* (Bandura, 1977, 1986, 1997) indicates that *academic self-efficacy* determines the *learning motivation* and academic achievement. According to the authors, *self-efficacy* has an influence on preparing action because self-related cognitions are a major ingredient in the motivation process. Bandura et al. (1996) concur that an individuals' perceptions of *academic self-efficacy* affects *learning motivation*. This has been demonstrated in many studies. According to Schunk (1990), *academic self-efficacy* beliefs influence academic motivation and achievement. In their study of the effect of *academic self-efficacy* on nurses motivation to utilise web-based learning opportunities, Liang and Wu (2010) found *academic self-efficacy* to be the most important factor towards nurses' motivation towards web-based continuous learning. According to the researchers, this suggested that only if nurses had confidence in the basic usage of the Internet would they consider using web-based learning opportunities. According to Baird et al. (2009), levels of *academic self-efficacy* influence *learning motivation*. Specifically, learners who are more self-efficacious are more likely to be motivated to learn while low levels of *academic self-efficacy* are likely to result in a host of maladaptive motivational and performance responses in learning contexts. According to Singh et al. (2002), individuals' own experiences and expectations of success in mathematics and science subjects also determine their attitudes and motivation toward learning these subjects. According to Miller et al. (2004), in the case of *learning motivation*, high *academic self-efficacy* is a necessary prerequisite.

Hypothesis 14

In the proposed learning potential structural model it is hypothesised that *academic self-efficacy* positively influences *learning motivation.*

Furthermore, it is proposed that a relationship exists between the competency potentials, *academic self-efficacy* and *learning goal-orientation*.

2.3.2.5.5 Academic self-efficacy and learning goal-orientation

Literature posits that a relationship exists between *goal-orientation* and *self-efficacy*. Various researchers have found a positive relationship between *self-efficacy* and a *LGO* (Greene & Miller, 1996; Greene et al., 2004; Kozlowski et al., 2001; Rastegar et al. 2010; Schmidt & Ford, 2003). In addition to evidencing a positive relationship between the constructs, researchers (Ames & Archer, 1988; Phan, 2010; Sedaghat et al., 2011) have found a causal relationship where high levels of *academic self-efficacy* determine the adoption of a *LGO*.

According to Baird et al. (2009), youth with high levels of *academic self-efficacy* were more likely than their peers with low levels of *academic self-efficacy* to endorse learning-oriented goals. Kanfer (1991) suggested that individuals who view their intelligence as fixed (*PGO*) have lower levels of *general self-efficacy* than individuals who view their intelligence as malleable (*LGO*). Furthermore, Schunk (1990) found that students with higher *self-efficacy* tend to participate more readily, work harder, pursue challenging goals and spend much effort toward fulfilling identified goals (thereby referring to learning goals). Dweck (1989) argued that individuals with a strong *LGO* tend to believe performance can be improved through effort. These beliefs are facilitated by higher levels of *self-efficacy*, suggesting a positive relationship between *self-efficacy* and LGO. Previous research results therefore suggest that a relationship exists between *academic self-efficacy* and *learning goal-orientation*.

Hypothesis 15

In the proposed learning potential structural model it is hypothesised that *academic self-efficacy* positively influences *learning goal-orientation*.

The next additional learning competency potential latent variable under consideration for inclusion is that of *locus of control*.

2.3.2.6 Locus of control

Locus of control is frequently positively associated in the literature with learning (Anderson, Hattie & Hamilton, 2005; Boersma and Chapman, 1981; Bulus, 2011; Colquitt et al., 2000; Joo, Joung & Sim, 2011; Marks, 1998; Nunes, 2003; Prociuk & Breen, 1977) and is also chosen for inclusion due to its seeming relevance in the South African context, which will be discussed below.

The concept of *locus of control* was originally developed by Julian Rotter in the 1950's and has its foundation in social learning theory (Marks, 1998). *Locus of control* refers to the extent to which individuals believe that they can control events and behavioural results in their lives (Judge & Bono, 2001) or the extent to which people believe that the rewards they receive in life can be controlled by their own personal actions (Wang, Bowling, & Eschleman, 2010). According to Bulus (2011), *locus of control* is a well-known cognitive-behavioural psychological attribute used to describe students' perceptions of how much they can control the circumstances of life.

Literature on *locus of control* differentiates between an *internal locus of control* and *external locus of control* as two opposite poles on a bipolar continuum, According to Judge and Bono (2001), individuals with an *internal locus of control* believe they can control a broad array of factors in their lives. Gibson, Ivancevich, Donnelly and Konopaske (2006) state that people with an *internal locus of control* believe that they are masters of their own fate and bear personal responsibility for what happens to them. Individuals with an *internal locus of control* believe that rewards are contingent upon their own efforts. According to Joo et al. (2011) having an *internal locus of control* means attributing results to internal factors, such as one's own behavior or effort. Conversely, individuals with an *external locus of control*, or externals, view themselves as helpless pawns of fate controlled by outside forces over which they have little, if any, influence (Gibson et al., 2006). According to Joo et al. (2011) having an *external locus of control* means attributing results to external factors, such as fortune, situation, and so forth. *Locus of control* emphasises that an individual tries to explain the outcomes of his or her behaviour as being controlled internally or externally; as being directly determined by their own behaviour or as being beyond their control. *Locus of control* is therefore based on causal beliefs regarding behaviour-outcome expectations of the individual. *Locus of control* focuses on an individual's perceptions about control over situations.

Locus of control seems a very relevant construct to consider in a South African study. This is taken from the perspective that previously disadvantaged individuals are being told by political leaders that they are entitled to receive free housing, free access to services, free education including tertiary education, that jobs will be created, that the wealth will be shared among the poor. The above creates a feeling that material possessions and means will be freely given, and it will be provided by external forces, and that the need for own effort and to work to receive it has been eliminated. Political leaders are instilling a sense of *external locus of control* into individuals, that they are not required to affect the outcomes of their lives but that external forces will improve their lives for them. This reinforces the message that Apartheid forcefully brought home to many disadvantaged individuals; that the socio-political system controls one's fate. If you were Black you were denied numerous privileges and there was very little you could do about it. This thereby further enforces the necessity of including this construct in the study of affirmative action skills development.

It should be noted that other perspectives on the constructs have been postulated by various authors. Levenson and Miller (1976) suggest a multidimensional view separating external beliefs into control by (a) *powerful others* and (b) *fate or chance* control. According to Levenson and Miller, beliefs in control by powerful others lead to different thoughts and behaviours than beliefs in control by chance. Externality may reflect a belief in control by powerful others that may express a genuine appraisal of certain sociopolitical situations and

not a maladjusted personality. An exact example of this would be the inhibitions that were placed upon a large portion of South Africans during the Apartheid era. Gurin, Gurin and Morrison (1978) provide a useful conceptualisation of *locus of control*. Gurin et al. (1978) proposed a differentiation between (a) *personal control*, which refers to individuals' beliefs about their ability to control events in their lives, and (b) *ideological control*, which refers to individuals' belief about the potential for control in their society at large. This differentiation was found to be especially prominent in individuals of lower socio-economic status and African Americans. Specifically, they postulated there these groups' high external scores were a function of personal control beliefs resulting from their experience with discrimination, not their belief about the effects of a person's effort in society. Gurin et al. argued that scores of greater externality on measures of *locus of control* among minority groups is in fact their sense of low personal control which reflected a correct perception of a harsh environment over which they had little control. Weisz, Rothbaum, and Blackburn (1984) conducted an analysis of the differences in control cognitions between American and Japanese cultures and subsequently offered a distinction between (a) *primary control* and (b) *secondary control*. In primary control, individuals influence existing realities, whereas in secondary control, individuals adapt to existing realities. The parallel between primary and secondary and internal- and external control is evident. Primary and internal control places the person as having responsibility for acting on the environment. Secondary and external control has the person adjust to being acted upon by the environment. Weisz et al. (1984) described four forms of secondary control namely (a) *predictive* (preparing for future events and their impact), (b) *vicarious* (enhancing one's sense of control by aligning with powerful others), (c) *illusory* (enhancing acceptance of chance or fate), and (d) *interpretive* (altering perspectives of reality in other to understand the meaning of events).

The distinctions offered by these authors are valuable, as it emphasises the importance that researchers using the construct of *locus of control* in their studies should take cognisance of the various dimensions of *locus of control* and the differing reasons why an individual may have a high score in *internal- or external locus of control*.

Furthermore, Wong and Sproule (1984) and Anderson et al. (2005) warn against the tendency of dichotomising the construct and dividing the world into externals and internals, typically equating internal with good and external with bad where externals seemed to be deficient compared to internals. They believe that equating internality with health and externality with pathology reflects an overly simplistic view of the construct as both extreme externality as well as extreme internality may be irrational. They rather suggest the importance of observing an optimal mix between personal responsibility (*internal locus of control*) and faith in appropriate outside resources (*external locus of control*) and stress the importance of striking a healthy balance between

belief in *internal- and external locus of control*. The authors stress the importance of balanced control instead of focusing only on the benefits of being internal or the distresses associated with being external, and suggest it as a sensible alternative to the prevailing views of *locus of control*.

Taking in consideration the fact that so many differing perspectives have been postulated in the conceptualisation of the *locus of control* construct, it becomes necessary to clarify the conceptualisation of the construct used in this study. *Locus of control*, in terms of this study, is conceptualised according to the stance of Levenson and Miller (1976). According to this multidimensional view, an individual can be considered as having either (a) an *internal locus of control*, (b) an *external locus of control* as influenced by *powerful others* or (c) an *external locus of control* as influenced by *fate or chance.* This conceptualisation was chosen due to the relevance of the differentiation between *powerful others* and *fate or chance* in the South African context. An individual believing that outcomes are determined by *powerful others* might legitimately believe so due to the prior control that was placed upon them during Apartheid and may do so irrespective of their beliefs in their own abilities. This is in contrast to an individual believing that outcomes are determined by *fate or chance* as this could be more indicative of a lack of belief in their own abilities.

An important consideration when discussing the concept of *locus of control* is the fact that prior research has determined *locus of control* is in fact influenced by cultural differences and social contexts. Marks (1998) cite such research regarding the social context of *locus of control*. Accordingly, *internal locus of control* is more frequently reported among members of higher socio-economic status and *external locus of control* among members of lower socio-economic status. Marks (1998) also cites research results from an American study regarding cultural differences and *locus of control*. In this study, members of the majority group such as Euro-Americans more frequently reported *internal locus of control* than members of minority groups such as African Americans, Spanish Americans, and Native Americans. This difference was attributed to differences in access to opportunities where the minority groups had lesser access to opportunities than the majority Euro-American group and therefore were more likely to have an external control belief. According to Wong and Piran (1995), differences in control beliefs can be a function of culture. According to Wong and Piran, Westernised cultures were more likely to have internal control beliefs than more traditional cultures such as the Chinese and Japanese cultures where the situation and luck are seen as the major influence of success, therefore implying a more external control belief among the Chinese and Japanese than Americans. Similarly, Kumar in 1986 (as cited in Marks, 1998) found that in Indian culture there is less consideration of the individual as controlling reinforcements and more emphasis on 'cosmic order', again implying that Indians have a more external control belief than Western cultures. Cultural identity may be another factor influencing control beliefs. In a study

cited by Marks (1998), Black participants endorsed a belief in powerful others and external forces more than Whites thereby implying Blacks to have a more external control belief than Whites. All the participants in the study were economically disadvantaged, which suggest these differences were not related to economic status but indicative of cultural identity. Taken together, these studies demonstrate that *locus of control* beliefs vary across countries and that cultural and societal factors often account for differences. This is an important consideration when conducting a study in a country like South Africa with a diverse mix of cultures, background, ethnicities and traditions. Specifically, this study will be conducted mostly on Black South Africans, of lower socio-economic status, who have had only limited access to opportunities, and who traditionally have cultural beliefs that external forces such as their ancestors have a big influence over the course of their lives. The research results above posit that these characteristics are most often related to an external locus of control. It is therefore important when analysing the research results, to recognise that cultural and societal factors may to an extent influence the scores obtained on the locus of control measure.

According to Tziner, Haccoun and Kadish (1991) environmental constraints may have a stronger impact on the behaviour of trainees who have an *external locus of control*. This is supported by Smith-Jentch et al. in 2000 (as cited in Nunes, 2003) who found that trainees with an *internal locus of control* may be more resilient to the demotivating effects of a non-supportive climate. Taking these findings into account, it makes logical sense that candidates for an affirmative action training intervention with an *internal locus of control* have an increased likelihood at success at learning. Candidates for affirmative development are likely to experience greater environmental constraints than their more privileged counterparts, due to poverty and socio-economic deprivation. If environmental constraints may have a stronger impact on the behaviour of trainees who have an *external locus of control*, then candidates for affirmative development with an *internal locus of control* will be impacted less by their greater environmental constraints and subsequently may be more successful at learning.

2.3.2.6.1 Locus of control and learning

Numerous studies have been undertaken in which the relationship between *locus of control* and learning have been examined (Anderson et al., 2005; Bulus, 2010; Colquitt et al., 2000; Davis & Phares, 1967; Joo et al., 2011; Kifer, 1975; Phares, 1968; Prociuk & Breen, 1977; Starnes & Ziner, 1983; Wolfe, 1972). These studies mostly concluded that there is a positive relationship between *internal locus of control* and learning. According to Bulus (2011) individuals with an *internal locus of control* are more effective in acquiring and using knowledge and thereby learn more effectively than individuals with a more *external locus of control*. Bulus also states that

locus of control is an important factor influencing intellectual functioning and learning behaviours. Individuals with an *internal locus of control* are more adaptable to learning and development. According to Anderson et al. (2005), individuals with an *internal locus of control* belief generally report greater satisfaction with schooling than individuals with an *external locus of control*. This was attributed to the fact that externals prefer high discipline conditions and very structured environments whereas internals do better in relatively unstructured (novel/unpredictable) environments, which characterises learning environments. Furthermore, Anderson et al. also found that there is a relationship between *locus of control* and academic achievement. However interestingly, they found that high externality might have a detrimental effect on academic achievement, rather than high internality having a beneficial effect. Marks (1998) reported internality in male college juniors to be positively related to achievement. According to Prociuk and Breen (1977), an *internal locus of control* implies an active, inquiring attitude in many life situations to improve one's opportunity for success experiences. According to Joo et al. (2011), *internal locus of control* causes students to concentrate more than *external locus of control* does. Students with an *internal locus of control*, believing that their behavioral outcomes result from their own efforts, are likely to concentrate on their learning with more pleasure than do those having an *external locus of control*. A study conducted by Prociuk and Breen (1977) concluded that internals more actively seek and acquire information relevant to academics than externals. This is supported by Nunes (2003) who cites that an *internal locus of control* was positively related to the degree to which trainees reported that they engage in exploratory-type behaviours, such as academics and training programmes. In their meta-analytic review of variables that affect learning, Colquitt et al. (2000) found *locus of control* to be highly related to *learning motivation* and subsequent skill acquisition; with internals being more motivated. Boersma and Chapman (1981) concur that *locus of control* is seen as an important affective variable influencing learning. According to Boersma and Chapman (1981), locus of control reflects the way in which individuals see their successes and failures. Those who attribute the source of success and failure to themselves (*internal locus of control*) and who see within themselves the ability to achieve, tend to obtain higher levels of achievement. On the other hand, individuals who attribute success-failure experiences to external reasons tend to achieve at lower levels. The above, findings relating learning performance to individuals with an *internal locus of control* is also supported by Kifer (1975) who noted that underachieving children tend to have a more *external locus of control*. Wolfe (1972) conducted a study in which he concluded that internals acquire more information pertaining to their own situation and use it more effectively in pursuing their personal goals. These finding corroborate the conclusions of Davis and Phares (1967) and Phares (1968) who found that internals tend to seek information more actively, and to utilise it more fully, than externals. According to Judge and Bono (2001), when individuals with an *internal locus of control* are faced with discrepancies between acceptable standards

of performance and actual performance, they tend to increase their efforts to match their actual performance to the standards.

Given the theoretical foundation of the construct and the previous research findings, it seems clear that an *internal locus of control* is an important construct to consider in learning. Specifically, *internal locus of control* would probably not directly influence *classroom learning performance*, but rather as a more distal force. In this case, it is postulated to influence learning through the mediation of *LGO* and *learning motivation*.

2.3.2.6.2 Locus of control and learning motivation

According to Landine and Stewart (1998) there appears to be a link between *learning motivation* and an *internal locus of control*. More specifically, intrinsic motivation has been linked to an *internal locus of control*. Colquitt, LePine and Noe (2000) found *locus of control* to be highly related to *learning motivation* and subsequent skill acquisition; with internals being more motivated. The positive relationship between *internal locus of control* and *learning motivation* makes theoretical sense. An individual with an *internal locus of control* believes that success in an academic setting is dependent on his/her own efforts and contributions. Therefore, knowing that success in learning is possible under the condition of his/her own efforts, the internal should likely be more motivated to expend effort and work hard due to the belief that it will lead to success in learning. This in contrast with an individual with an *external locus of control*; such an individual will believe that success is not dependent on the self or own efforts, but rather dependent on external forces. An external will therefore not be motivated to expend effort or work hard as there is no belief that this effort will lead to success at learning.

Hypothesis 16

In the proposed learning potential structural model it is hypothesised that *internal locus of control* positively influences *learning motivation*.

2.3.2.6.3 Locus of control and goal-orientation

According to Ford et al. (1998), a *LGO* is related to a belief that success follows from effort (*internal locus of control*). This stance is supported by Dweck and Leggett (1988) who also believe that *internal locus of control* is strongly related to a *LGO*. According to the results of research conducted by Dweck and Leggett, those who hold a strong *LGO* are more likely to perceive personal control over outcomes or events, ie. have an *internal*

locus of control. Bulus (2010) reports very relevant research results on the relationship between *locus of control*, *goal-orientation* and learning. According to Bulus, a *LGO* is positively related with *locus of control* (r = .35; p< .01) and academic achievement (r = .15; p < .05) and *avoidance PGO* is negatively related with *locus of control* (r = -.21; p < .01) and academic achievement (r = -.19; p < .01). A positive relationship was found between *locus of control* and academic achievement (r = .14; p < .05). According to these results, it could be said that as the level of *internal locus of control* and *LGO* increase the level of academic achievement increases, as the level of *avoidance PGO* increases the level of academic achievement decreases, as the level of *internal locus of control* increases the level of *LGO* increases and finally as the level of *locus of control* decreases (as the level of *external locus of control* increases) the level of *avoidance PGO* increases.

The relationship between *LGO* and *internal locus of control* can be theoretically explained by the stance of Dweck and Leggett (1988). Dweck and Leggett noted that *goal-orientation* and *locus of control* both deal with the question of whether one perceives oneself to have personal control over important elements in one's life. However, *locus of control* pertains to individuals' perceived control over rewards or outcomes, while *goal-orientation* involves perceptions of control over the basic attributes that influence these outcomes (e.g., one's level of competence). Dweck and Leggett argues that a *learning goal-orientation* (ie the perception that one has control over and can increase and develop competence), is a precursor to an *internal locus of control* (ie the perception that success is due to own effort and competence). Therefore, an individual who believes that he/she is able to control, improve and develop their own competence (*LGO*) is more likely to believe that they can determine their own success (*internal locus of control*). Therefore it is hypothesised that *LGO* positively affects *internal locus of control*.

Hypothesis 17

In the proposed learning potential structural model it is hypothesised that *learning goal-orientation* positively influences *internal locus of control*.

2.3.2.7 Feedback loops

In addition to the above hypotheses discussed, this study also postulates the existence of feedback loops within the learning potential structural model. A feedback relationship is suggested between *learning performance during evaluation* and *learning motivation* and also between *learning performance during evaluation* and *academic self-efficacy.*

2.3.2.7.1 Learning performance during evaluation and learning motivation

A feedback relationship is suggested between *learning performance during evaluation* and *learning motivation* whereby positive learning experiences can further increase *learning motivation* and negative learning experiences can decrease *learning motivation*. This stance is supported by Brewster and Fager (2000) who reports that unpleasant experiences in the classroom and negative learning experiences may result in the deterioration of student *learning motivation*. This is also supported by Colquitt and Simmering (1998). According to Colquitt and Simmering, not all learners succeed in every facet of the learning process—many experience some difficulty in learning the material. Whether learners internally perceive this difficulty or receive feedback regarding it, reactions to performance levels are likely to have important motivational consequences. The researchers emphasised the importance of giving feedback during the learning process, identifying it as an instructional event that facilitates learning and stated it is important to understand these consequences to maximize the effectiveness of learning settings. The above clearly elucidates a feedback relationship between *learning performance* and *learning motivation* where success during learning can positively influence *learning motivation* and negative performance during learning can detrimentally affect *learning motivation*.

Hypothesis 18

In the proposed learning potential structural model it is hypothesised that *learning performance* during evaluation positively influences *learning motivation*.

2.3.2.7.2 Learning performance during evaluation and academic self-efficacy

According to Bandura (1986, 1977), *self-efficacy* is affected by five primary sources: (a) learning experience, (b) vicarious experience, (c) imaginal experiences, (d) social persuasion, and (e) physiological states. The most influential source of *self-efficacy* beliefs is the interpreted result of one's previous performance, or learning experience. Individuals engage in tasks and activities, interpret the results of their actions, and use the interpretations to develop beliefs about their capability to engage in subsequent tasks or activities. Typically, outcomes interpreted as successful raise *self-efficacy*; those interpreted as failures lower it. Therefore when a student achieves a successful learning outcome, it is likely to enhance the student's *self-efficacy*. Conversely, if the student receives a negative learning outcome, it is likely to have a negative effect on the student's level of *self-efficacy*. This feedback relationship between *academic self-efficacy* and *learning performance during evaluation* has been found is some studies. According to Colquitt and Simmering (1998) low performance

decreases *self-efficacy* levels. Wang et al. (2008) stated that the result of negative behaviour over a long time will lead to the decline of learners' learning efficacy, alluding to the fact that poor *learning performance during evaluation* has the ability to decrease *academic self-efficacy*. According to Baird et al. (2009) past performance is a major determinant of *self-efficacy* implying that poor performance is likely to negatively affect *self-efficacy* while good performance is likely to positively affect *self-efficacy*. Similarly, Skinner et al. (2008) postulate that learners who start off confident in their capacities engage with learning tasks in ways that lead to more success, thus reinforcing their initial optimism, whereas learners low in efficacy tend to avoid challenges or engage in tasks so half-heartedly that they do not succeed, thereby cementing their initial self-doubts. Schunk (1991) also suggested the possibility of a bi-directional relationship where *self-efficacy* is not only predictive of learning performance, but that successful learning performance in the past can also enhance a learner's perceptions of ability. The above clearly elucidates a feedback relationship between *learning performance* and *academic self-efficacy* where success during learning can positively influence *academic self-efficacy* and negative performance during learning can detrimentally affect *academic self-efficacy*.

Hypothesis 19

In the proposed learning potential structural model it is hypothesised that *learning performance during evaluation* positively influences *academic self-efficacy*.

The foregoing theoretical argument logically culminates in the learning potential structural model depicted below in Figure 2.2.
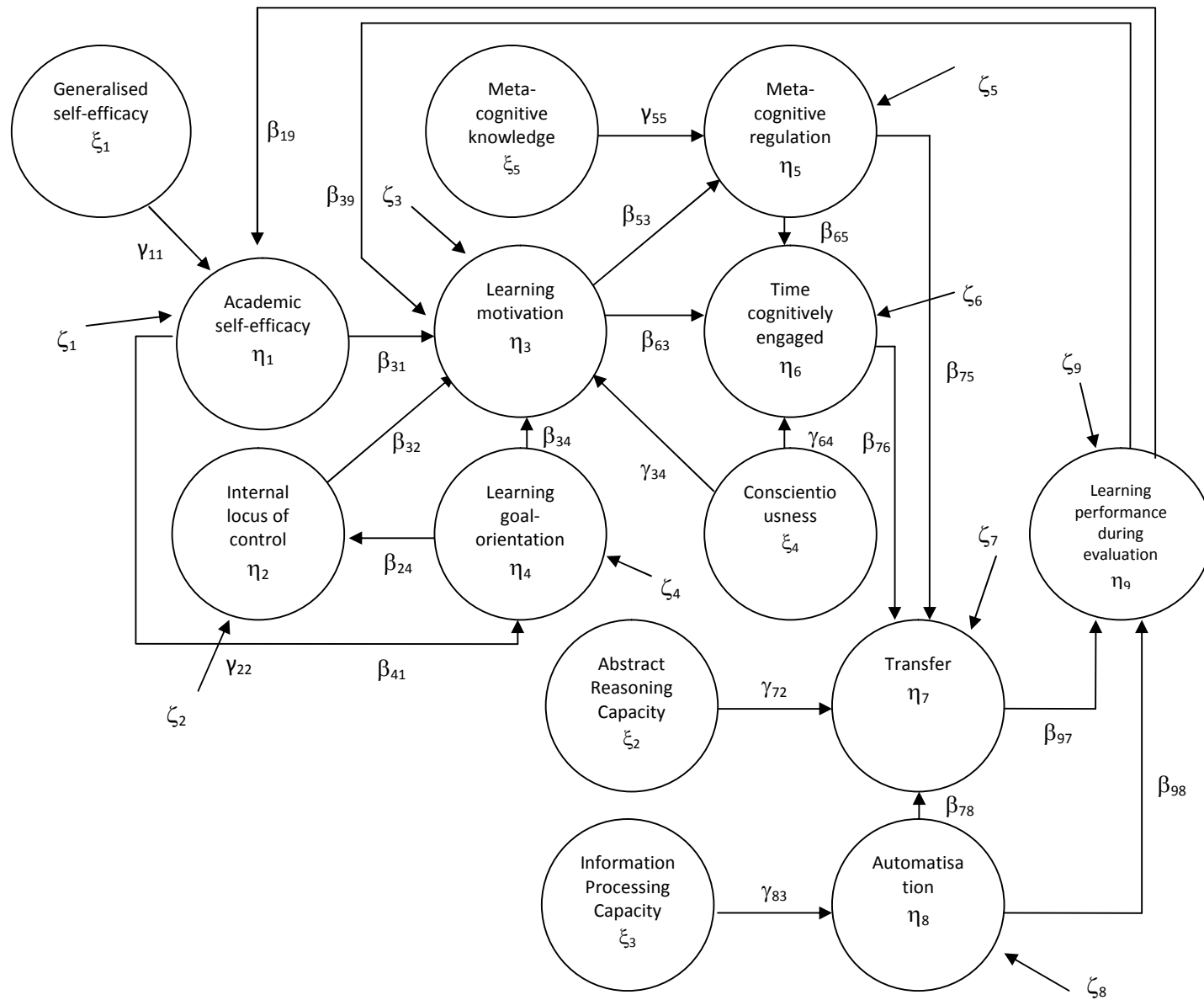
Figure 2.2. The hypothesised van Heerden - De Goede expanded learning potential structural model

CHAPTER 3

RESEARCH METHODOLOGY

3.1   INTRODUCTION

This study is guided by the research aim of investigating "Which person characteristics and behaviours influence affirmative action candidates' potential to learn?" To provide an answer to this research initiating question, a structural model was developed through theorising that identifies the hypothesised critical determinants of *classroom learning performance* and the manner in which these determinants combine to *affect classroom learning performance* as well as subsequent *learning performance during evaluation*.

The learning potential structural model will have value in assisting HR in improving the success of affirmative development interventions to the extent that it provides a valid account of the psychological process underlying learning performance. The structural model can be considered valid (or permissible) to the extent that the model closely fits the available empirical data (Babbie & Mouton, 2001). Research methodology serves the epistemic ideal through two characteristics, namely objectivity and rationality (Babbie & Mouton, 2001). Objectivity refers to the scientific method's deliberate, explicit focus on the reduction of error. A number of critical points exist in the process of testing the validity of the explanatory structural model where the epistemic ideal runs the risk of derailing. Appropriate steps need to be taken at these points to maximise the likelihood of valid findings. Scientific rationality refers to the scientific method's insistence that the validity of research findings should be critically evaluated by knowledgeable peers by evaluating the methodological rigour of the process that was used to arrive at the conclusions (Babbie & Mouton, 2001). To allow this process to operate, however, requires a detailed description and a thorough motivation of the methodological choices that were made at the various critical choice points in the method.

In this chapter the substantive research hypotheses, the research design, statistical hypotheses, statistical analysis techniques, sampling design and measuring instruments are discussed.

3.2   SUBSTANTIVE RESEARCH HYPOTHESES

The objective of the research is to elaborate the De Goede (2007) learning potential structural model. The literature study culminated in an elaborated learning potential structural model depicted in Figure 2.2.

The structural model depicted in Figure 2.2 includes the latent variables *transfer* and *automisation.* Earlier it was argued (see paragraphs 2.2.4 and 2.2.5) that operationalising these latent variables will present daunting logistical problems. In the classroom specific crystalised ability developed through prior learning is transferred onto the novel learning problems comprising the curriculum. The meaningful structure that is found in the learning material in this manner subsequently needs to be automated. It is the actual *transfer* that takes place in the classroom and the subsequent *automatisation* of the derived insight that determines the *learning performance during evaluation*. Operational measures of *transfer* and *automatisation* comprising *learning performance in the classroom* therefore have to be specific to the learning material relevant to the specific training or development procedure utilised in the empirical testing of the learning potential structural model and as dynamic measures they will have to be integrated into the training programme. *Transfer* and *automisation* as learning competencies/behaviour have to be measured by observing these processes in action over time. That means that the extent to which learners solve/make sense of/find structure in novel learning problems/material that they are confronted with in class and how they use the solution to make sense of subsequent problems in class needs to be evaluated. How these insights are automated/written to knowledge stations needs to be evaluated as well. That seems logistically/practically rather challenging. This line of reasoning points to the need to delete *transfer* and *automatisation* from the revised model that is empirically tested as separate latent variables not because they do not belong there but because of the questionable utility of investing significant resources in overcoming the logistical challenges associated with the development and implementation of suitable measures of classroom transfer and automatisation but with virtually no subsequent practical value (in contrast to the generic APIL measure).

Furthermore, in the interest of reducing the magnitude of the model it was also decided to not specifically test the hypothesis that *generalised self-efficacy* positively influences *academic self-efficacy*. Only *academic self-efficacy* was retained in the reduced structural model.

The reduced van Heerden - De Goede learning potential structural model is shown in Figure 3.1. The reduced van Heerden -De Goede learning potential structural model will be subjected to empirical testing. Although the reduced van Heerden -De Goede learning potential structural model no longer contains any of the De Goede (2007) latent variables but for learning performance during evaluation, the study nonetheless remains an attempt to elaborate on the De Goede model. The model being subjected to test remains a subset of the model depicted in Figure 2.2. If the reduced model will be modified based on empiruical feedback obtained in this study, the modified model will be grafted back into the larger model. The larger research project of which this study forms part will in due course subject the additional as yet untested hypotheses that emerged from the theorizing in this study to empirical test.
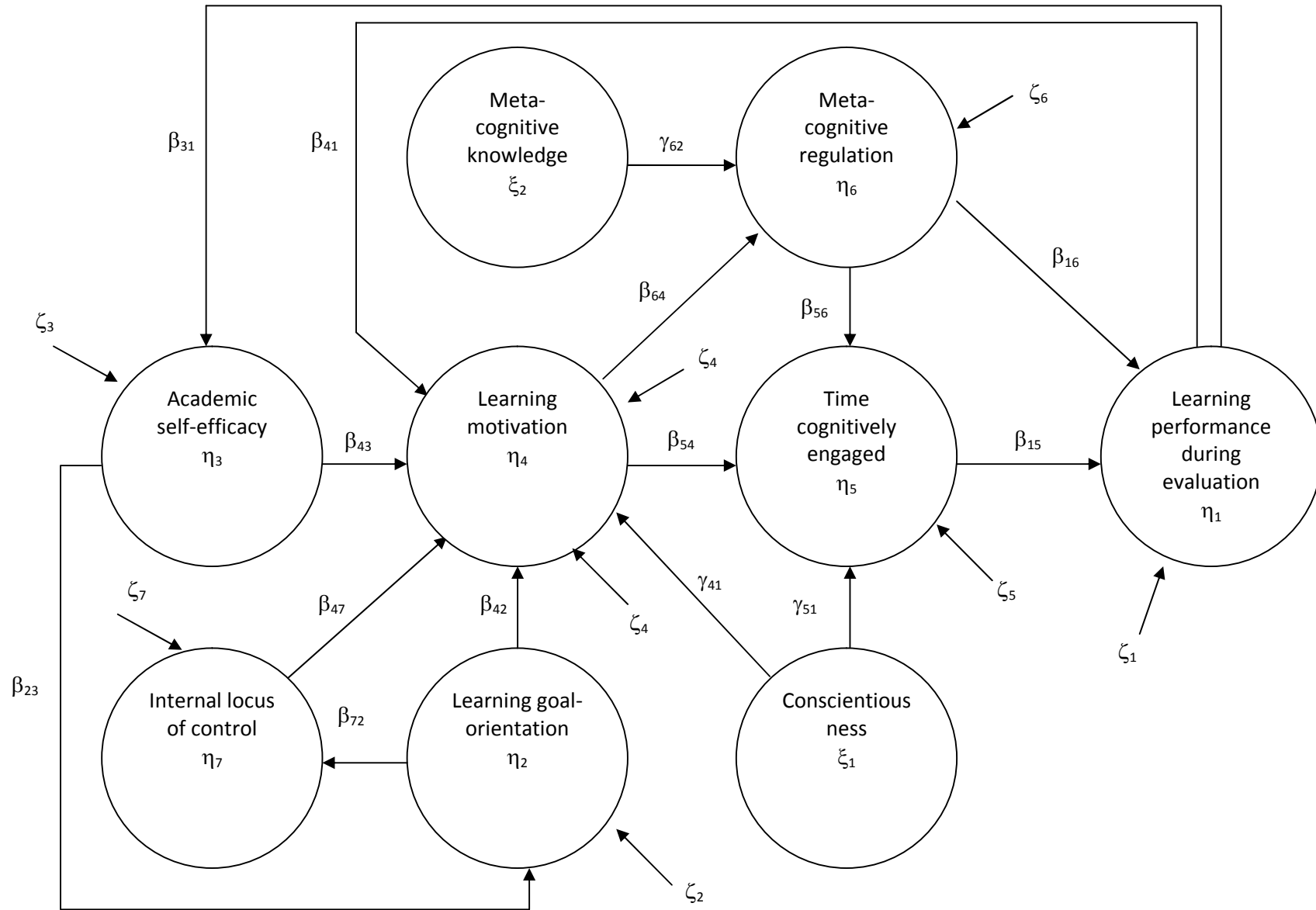
Figure 3.1. Reduced van Heerden - De Goede –learning potential structural model

The overarching substantive hypothesis of this study (Hypothesis 2[12]) is that the learning potential structural model depicted in Figure 3.1 provides a valid description of the psychological process that determines the level of *classroom learning performance* and the level of *learning performance during evaluation* achieved by affirmative development learners. The overarching substantive research hypothesis can be dissected into the following 15 more detailed, specific direct effect substantive research hypotheses:

Hypothesis 3: In the proposed learning potential structural model it is hypothesised that *time cognitively engaged* positively influences *learning performance during evaluation*.

Hypothesis 4: In the proposed learning potential structural model it is hypothesised *that meta-cognitive regulation* positively influences *learning performance during evaluation*.

Hypothesis 5: In the proposed learning potential structural model it is hypothesised that *meta-cognitive regulation* positively influences *time cognitively engaged*.

Hypothesis 6: In the proposed learning potential structural model it is hypothesised that *meta-cognitive knowledge* positively influences *meta-cognitive regulation*.

Hypothesis 7: In the proposed learning potential structural model it is hypothesised that *learning motivation* positively influences *time cognitively engaged.*

Hypothesis 8: In the proposed learning potential structural model it is hypothesised that *learning motivation* positively influences *meta-cognitive regulation.*

Hypothesis 9: In the proposed learning potential structural model it is hypothesised that a *learning goal orientation* positively influences *learning motivation.*

Hypothesis 10: In the proposed learning potential structural model it is hypothesised that *conscientiousness* positively influences *time cognitively engaged.*

Hypothesis 11: In the proposed learning potential structural model it is hypothesised that *conscientiousness* positively influences *learning motivation.*

Hypothesis 12: In the proposed learning potential structural model it is hypothesised that *academic self-efficacy* positively influences *learning motivation.*

Hypothesis 13: In the proposed learning potential structural model it is hypothesised that *academic self-efficacy* positively influences *learning goal orientation*.

Hypothesis 14: In the proposed learning potential structural model it is hypothesised that *internal locus of control* positively influences *learning motivation*.

Hypothesis 15: In the proposed learning potential structural model it is hypothesised that *learning goal-orientation* positively influences *internal locus of control*.

Hypothesis 16: In the proposed learning potential structural model it is hypothesised that *learning performance during evaluation* positively influences *learning motivation*.

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[12] Hypothesis 1 refers to the measurement model.

Hypothesis 17: In the proposed learning potential structural model it is hypothesised that *learning performance during evaluation* positively influences *self-efficacy*.

3.3   RESEARCH DESIGN

The overarching substantive research hypothesis makes a specific claim with regards to the learning potential structural model. The learning potential structural model as depicted in Figure 3.1 hypothesises specific structural relations between the various learning competency potential latent variables and the various learning competencies. To empirically test the validity of the overarching substantive hypothesis and the validity of the various specific direct effect substantive research hypotheses require a plan or strategy that will guide the gathering of empirical evidence to test the hypotheses. According to Kerlinger and Lee (2000), the research design is the plan, structure and strategy of investigation conceived so as to obtain answers to research questions and to control variance. Similarly, Babbie and Mouton (2001) defines the research design as the plan or structured framework of how the researcher intends conducting the research process in order to solve the research problem. It is the blueprint of how the researcher intends conducting the research.

Kerlinger and Lee (2000) emphasise that a discussion of research design must be prefaced by a distinction between experimental-and *ex post facto* approaches. The distinction between the two approaches will briefly be discussed below in order to guide the choice of research design selected for this study. In experimental research, the researcher manipulates and controls one or more independent variables and observes the dependent variable or variables for variation concomitant to the manipulation of the independent variable. On the other hand, *ex post facto* research is a systematic empirical inquiry in which the researcher does not have direct control of independent variables because their manifestations have already occurred or because they are inherently not manipulable. Inferences about relations among variables are made, without direct intervention, from concomitant variation of independent and dependent variables. The most important difference between experimental research and *ex post facto* research, then, is control. In *ex post facto* research, direct control of variables is not possible. In the experimental case, the researcher has manipulative control over at least one of the active variables (Kerlinger & Lee, 2000).

Kerlinger and Lee (2000) stress the importance of researchers having a balanced understanding of the strengths and weaknesses of both kinds of research. According to Kerlinger and Lee, *ex post facto* research has three major limitations. They are:

- The inability to manipulate independent variables
- The lack of power to randomise, and
- The risk of improper interpretation

The first limitation has already been discussed above during the comparison between *ex post facto-* and experimental research. As for the second limitation, it is possible to draw subjects at random in both experimental and *ex post facto* research. But it is not possible, in *ex post facto* research, to assign subjects to groups at random or to assign treatments to groups at random. Thus, during *ex post facto* research, the researcher must be aware of the possible influence of self-selection whereby subjects can "select themselves" into groups on the basis of characteristics other than those in which the investigator may be interested. On the other hand, during experimental research the researcher can exercise control by randomisation. The researcher can assign subjects to groups at random, or can assign treatments to groups at random. The third limitation, risk of improper interpretation, refers to the fact that the nature of the *ex post facto* research design prevents the drawing of casual inferences from significant path coefficients as correlations do not imply causation.

Despite the above discussed limitations, there is significant value in *ex post facto* research because the nature of research problems especially in psychology and education do not lend themselves to experimental inquiry as the variables usually considered in these studies are not manipulable. Careful consideration will be given to the limitations discussed above as to minimise improper interpretations.

After consideration of the above, this study will utilise an *ex post facto* approach due to the fact that the nature of the variables considered in this study do not lend themselves to manipulation. More specifically the *ex post facto* correlational research design in which each latent variable is operationalised in terms of at least two or more indicator variables (assuming in total p exogenous indicator variables and q endogenous indicator variables) shown in Figure 3.2 will be used to test the overarching and specific direct effect substantive research hypotheses.

$[X_{11}]$	$[X_{12}]$	…	$[X_{1p}]$	Y_{11}	Y_{12}	…	Y_{1q}
$[X_{21}]$	$[X_{22}]$		$[X_{2p}]$	Y_{21}	Y_{22}	…	
:	:		:	:	:	…	:
$[X_{i1}]$	$[X_{i2}]$		$[X_{ip}]$	Y_{i1}	Y_{i2}	…	Y_{iq}
:	:		:	:	:	…	:
$[X_{n1}]$	$[X_{n2}]$		$[X_{np}]$	Y_{n1}	Y_{n2}	…	Y_{nq}

Figure 3.2. Ex post facto correlational design

The design requires measures on the p exogenous indicator variables and the q endogenous indictor variables across n observations. The observed covariance matrix is subsequently calculated. Estimates for the freed parameters in the comprehensive LISREL model are obtained in an iterative fashion with the

objective of reproducing the observed covariance matrix as closely as possible (Diamantopoulos & Siguaw, 2000). If the fitted model fails to accurately reproduce the observed covariance matrix (Diamantopoulos & Siguaw, 2000; Kelloway, 1998) the inescapabe conclusion is that the elaborated learning potential structural model does not provide an acceptable explanation for the observed covariance matrix. It then follows that the structural relationships hypothesised by the model do not provide an accurate description of the psychological process determining the level of learners' learning performance. The converse, however, does not apply. If the fitted covariance matrix derived from the parameter estimates obtained for the comprehensive LISREL model closely agrees with the observed covariance matrix it does not mean that the psychological process portrayed in the structural model necessarily produced the observed covariance matrix. It can therefore not be concluded that the psychological process depicted in the structural model necessarily must be the one that operates to determine the level of learning performance that learners achieve. A high degree of fit between the observed and estimated covariance matrices only means that the it is permissible to interpret the statistical significance and magnitude of the estimated path coefficients and to regard that part of the structural model that receives support as one plausible account of the psychological process that determines the level of learning performance that learners achieve. If the model fits closely it can therefore be concluded that the statistically significant paths in the model collectively provides a valid account (Babbie & Mouton, 2001) of the psychological process determining learning performance.

3.4   STATISTICAL HYPOTHESES

The nature of the argument in terms of which the proposed research design intends to evaluate the validity of the proposed structural model together with the nature of the envisaged statistical analyses determines the appropriate format of the statistical hypotheses. The preceding argument explicitly made reference to the use of structural equation modelling to evaluate the validity of the proposed structural model via the *ex post facto* correlational design. The statistical hypotheses are formulated using the conventional LISREL notational system (Du Toit & Du Toit, 2000; Jöreskog & Sörbom, 1996b).

The overarching substantive research hypothesis (Hypothesis 2) claims that the elaborated learning potential structural model provides a valid portrayal of the psychological process that determines the level of learners' learning performance. If the overarching substantive research hypothesis is understood to mean that the structural model provides a perfect account of the manner in which learning competency potential latent variables affect classroom learning competencies and learning performance during evaluation, the substantive research hypothesis translates into the following exact fit null hypothesis:

$$H_{03}: \text{RMSEA} = 0^{13}$$

$$H_{a3}: \text{RMSEA} > 0$$

If the overarching substantive research hypothesis is taken to mean that the structural model provides an approximate account of the manner in which learning competency potential latent variables affect classroom learning competencies and learning performance during evaluation the substantive research hypothesis translates into the following close fit null hypothesis:

$$H_{04}: \text{RMSEA} \leq 0{,}05$$

$$H_{a4}: \text{RMSEA} > 0{,}05$$

The overarching substantive research hypothesis was separated into 15 more detailed, specific substantive research hypotheses. These 15 detailed research hypotheses translate into the following path coefficient statistical hypotheses:

Table 3.1

Path coefficient statistical hypotheses

Hypothesis 3:	Hypothesis 8:	Hypothesis 13:
$H_{05}\ \beta_{15} = 0$	$H_{010}\ \beta_{64} = 0$	$H_{015}: \beta_{23} = 0$
$H_{a5}: \beta_{15} > 0$	$H_{a10}: \beta_{64} > 0$	$H_{a15}: \beta_{23} > 0$
Hypothesis 4:	Hypothesis 9:	Hypothesis 14:
$H_{06}: \beta_{16} = 0$	$H_{011}: \beta_{42} = 0$	$H_{016}: \beta_{47} = 0$
$H_{a6}: \beta_{16} > 0$	$H_{a11}: \beta_{42} > 0$	$H_{a16}: \beta_{47} > 0$
Hypothesis 5:	Hypothesis 10:	Hypothesis 15:
$H_{07}: \beta_{56} = 0$	$H_{012}: \gamma_{51} = 0$	$H_{017}: \beta_{72} = 0$
$H_{a7}: \beta_{56} > 0$	$H_{a12}: \gamma_{51} > 0$	$H_{a17}: \beta_{72} > 0$
Hypothesis 6:	Hypothesis 11:	Hypothesis 16:
$H_{08}: \gamma_{62} = 0$	$H_{013}: \gamma_{41} = 0$	$H_{018}: \beta_{41} = 0$
$H_{a8}: \gamma_{62} > 0$	$H_{a13}: \gamma_{41} > 0$	$H_{a18}: \beta_{41} > 0$
Hypothesis 7:	Hypothesis 12:	Hypothesis 17:
$H_{09}: \beta_{54} = 0$	$H_{014}: \beta_{43} = 0$	$H_{019}: \beta_{31} = 0$
$H_{a9}: \beta_{54} > 0$	$H_{a14}: \beta_{43} > 0$	$H_{a19}: \beta_{31} > 0$

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[13] The numbering of the statistical hypotheses reflect the fact that the success with which the latent variables in the elaborated learning potential structural model has been operationalised will be evaluated by testing the exact and close fit of the measurement model prior to fitting the comprehensive LISREL model.

3.5   SAMPLING

The purpose of the research is to inform HR interventions aimed at the facilitation of the successful learning of relatively cognitively demanding learning material in training and development in South Africa. The focus of this research falls specifically on the successful learning amongst previously disadvantaged South Africans with learning potential. The assumption is, however, made that the psychological dynamics underpinning the learning performance of previously disadvantaged South Africans does not differ from the psychological dynamics underpinning the learning performance of previously advantaged South Africans[14]. The target population is therefore the population of South African learners. Testing the validity of the proposed van Heerden - De Goede learning potential structural model on the target population is not practically feasible.

According to Gravetter and Forzano (2003), the purpose of sampling is to select a representative set of individuals from the target population in the research study. To do so requires that the target population be operationalised as a sampling population. The sampling population consists of those final sampling units in the target population that has a positive, non-zero probability of being selected in the sample (Babbie & Mouton, 2001). According to Theron (2007), a sample will be considered representative to the extent to which it provides an accurate portrayal of the characteristics of the sampling population. The ideal moreover is then for the sampling- and target populations to coincide. Theron admits however that in practice this is seldom the case. The objective should therefore be to try and minimise the gap between the target and sampling population.

3.5.1   Choice of sampling method

Kerlinger and Lee (2000) categorise methods of sampling as either being probability sampling or non-probability sampling. A detailed discussion of the two categories of sampling and each of their sub-categories with all the advantages and disadvantages is beyond the scope of this thesis. However, a brief discussion will follow below. This will aid in the choice and critical evaluation of sampling method used in this study.

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[14] It is thereby, however, not implied that the level of the latent variables involved in the process does not differ across the two groups. The level of the latent variables comprising the process most likely will differ. The assumption rather is that the essential nature of the psychological process that operates to determine the level of learning performance that is achieved is the same across a wide variety of cognitively demanding learning material.

3.5.1.1 Probability sampling methods

According to Babbie and Mouton (2001), the ultimate purpose of sampling is to select a set of final sampling units (FSU) from a population in such a way that descriptions of the statistical characteristics of specific attributes of those sampling units (in terms of statistics) accurately portray the parameters of the total population from which the FSU's are selected. Probability sampling enhances the likelihood of accomplishing this aim and also provides methods for establishing the degree of probable success. According to Gravetter and Forzano (2003), in probability sampling, the entire (sampling) population is known, each individual in the population has a specific non-zero probability of selection, and sampling is done by a random process based on the probabilities.

According to Babbie and Mouton (2001), *random sampling* is that method of drawing a sample from a population so that each member of the population has an equal and independent chance of being selected. According to Kerlinger and Lee (2000), this is an easily understood definition of random sampling although not completely satisfactory. A more satisfactory definition would be that random sampling is that method of drawing a sample from a population so that all possible samples of fixed size n have the same probability of being selected. In *stratified sampling* the population is divided into strata, such as men and women, Black and White, and the like, from which random samples are drawn (Babbie & Mouton, 2001). According to Kerlinger and Lee (2000), multi-stage *cluster sampling* is the most used method in surveys, and involves successive random sampling of units, or sets and subsets. In educational research, for example, school districts can be randomly sampled, then schools, then classes, and finally pupils (Babbie & Mouton, 2001). During *systematic sampling*, the first sample element is randomly chosen in the first interval of length k and following on that every k[th] FSU is selected from every interval. For example, if the element randomly selected from the elements 1 through 10 is 6, then the subsequent elements are 16, 26, 36 and so on (Babbie & Mouton, 2001).

3.5.1.2 Non-Probability sampling methods

According to Gravetter and Forzano (2003), in non-probability sampling procedures, the population is not completely known, individual probabilities cannot be known, and the sampling method is based on factors such as common sense or ease, with an effort to maintain representativeness and avoid bias. In *quota sampling*, knowledge of strata of the population (eg, sex, race, religion) is used to select sample members that are considered to be representative, 'typical' and suitable for certain research purposes (Babbie & Mouton, 2001). *Purposive sampling* is characterised by the use of judgment and a deliberate effort to obtain representative samples by including presumably typical areas or groups in the sample (Babbie & Mouton, 2001). Kerlinger (1973) describes *accidental sampling* as the weakest form of sampling but also

states that it is probably the most frequently used. In effect, during accidental sampling the researcher takes available samples at hand: classes of seniors in high school, members of a specific department in an organisation.

3.5.2   Sampling procedure

The aim of this study is to explicate the determinants of learning performance from the perspective of affirmative development and more specifically to elaborate the learning potential structural model tested by De Goede (2007). Due to the affirmative action perspective from which this study stems, one would want to argue that the sample needs to consist of participants that qualify as affirmative development candidates. However, when investigating this obvious statement further, the other side of the coin argues that the value of the structural model developed for this study extends to all forms of formal training and teaching and is not restricted only to affirmative development candidates. The essence of the psychological dynamics governing learning performance in affirmative development programmes does not differ from those that govern learning performance in other teaching and training contexts. The assumption is that the same complex nomological network of latent variables that determine learning performance in affirmative development programmes also is at work to determine learning performance of learners not from previously disadvantaged backgrounds. The level of latent variables will, however, most likely differ across different teaching and training contexts. Diagnosing failures at learning requires identifying thoses determining latent variables that have inappropriately high or low levels. Success at learning is explained in by the fact that the latent variables that determine learning performance have appropriate/optimal values. The fact that specific latent variables are flagged as important contributing variables to diagnostically explain the failure of disadvantaged learners to succeed at learning tends to errenously suggest that these variables are uniquely relevant to explain the learning performance of disadvantaged learners. Advantaged learners succeed at learning because they are fortunate enough not to be held back by low levels on those latent variables flagged as important contributing variables to diagnostically explain the failure of disadvantaged learners to succeed at learning.

Therefore, when it came to selecting a sample, it was deemed acceptable to draw a sample that includes participants that does not qualify as affirmative development candidates. Although admittedly it would have been preferable to conduct the study on affirmative action candidates participating in an affirmative development programme, the (in a very real sense disquieting) reality is that such programmes are not easy to locate. Logistical and practical problems prevented finding a large enough sample of willing participants that qualify as affirmative development candidates enrolled in an affirmative development training programme. The logic of the preceding argument, however, allowed the selection of a sample that includes participants that do not qualify as affirmative development candidates

Accidental sampling was used to select Grade 12 learners from three high schools to participate in the study. The schools are based in the Western Cape and consist of a socio-economically and racially diverse group of students. Institutional permission was obtained from the Western Cape Department of Education and the principal from the schools that participated in the study. Informed consent was further obtained from the parents of the Grade 12 learners as well as informed assent from the learners who participated in the study.

Due to the non-probability sampling procedure that was used to select the sample it cannot be claimed that the sample is representative of the target population.

3.6   DATA COLLECTION PROCEDURE

Data was collected my means of a paper-and-pencil format questionnaire. The participants completed the questionnaires during school hours in a Life Orientation class. The questionnaires were handed out to the students at the beginning of the class. The students were explained the purpose of the research, given instructions on completing the questionnaires and were assured of the confidentiality of their responses (see Appendix A). The students then completed the questionnaires and subsequently handed the questionnaires back to the researcher upon completion thereof.

3.7   MEASURING INSTRUMENTS

Measuring the identified latent variables in the proposed van Heerden - De Goede learning potential structural model required the use of standardised measuring instruments to operationalise each latent variable. Seven questionnaires were identified through a literature review as being reliable, valid measures of the latent variables in question and applicable to this study. Each of these seven questionnaires is briefly discussed below.

3.7.1   Locus of control

The current study used the Internality, Powerful others, and Chance Scales developed by Levenson and Miller (1976) to operationalise the *locus of control construct*. In this measuring instrument locus of control is assumed to consist of two components, viz: (a) *internal locus of control*, and (b) *external locus of control*. More specifically, the *external locus of control* component can be further distinguished in terms of powerful others and chance factors. This measuring instrument has 24 items measuring an individual's causal beliefs distinguishing between two external forces = chance (C) and powerful others (P) – together with internality (I). There are three sub-scales with 8 items each. A high score on one of the three scales indicates that the

individual views this source of control as having a considerable influence on what he/she experience. As discussed in Chapter 2, the distinction between chance (C) and powerful others (P) will be interesting in the South African context as "powerful others" have been very influential in the lives of the previously disadvantaged population, firstly restricting opportunities and inhibiting behaviours during the Apartheid regime and now currently proclaiming promises of government changing their lives for the better. Levenson and Miller (1976) reported the following Cronbach's alpha for the measure: (I) r_{ttx} = .77, (C) r_{ttx} = .73, and (P) r_{ttx} = .71.

3.7.2   Goal-orientation

The current study used a measure developed by Button et al. (1996) to operationalise the *goal-orientation* construct. In this measuring instrument *goal-orientation* in assumed to consist of two components, namely *learning goal-orientation* and *performance goal-orientation*. The operationalisation of *goal-orientation* made by this measuring instrument therefore corresponds with the definition of *goal-orientation* as given during the literature review. This measuring instrument consists of two 8-item scales, for *LGO* and *PGO* respectively. Button et al. (1996) found that this two-factor model of *goal-orientation* fits better than a one-factor model in four different samples. In addition, Button et al. (1996) provide construct validity evidence for the measures. They found the two *goal-orientation* measures to be uncorrelated and systematically and meaningfully related to a number of relevant demographic and substantive variables. Bell and Kowlowski (2002) provides evidence of the psychometric soundness of this measuring instrument and reports an overall reliability coefficient of .77 for *learning goal-orientation* and .73 for *performance goal-orientation*. Button et al. (1996) similarly provide evidence of the psychometric soundness of this measuring instrument and reported the measure to exhibit a reliability coefficient of .79 for *learning goal-orientation* and .76 for *performance goal-orientation.*

3.7.3   Academic self-efficacy

A sub-section of the Motivated Strategies for Learning Questionnaire (MSLQ) was administered in this study to measure the construct of *academic self-efficacy*. The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich, is a widely used self-report instrument designed to assess students' motivational orientations and their use of different learning strategies (Pintrich & De Groot, 1990). This 81-item instrument, 7-point Likert scale (1 = not at all true of me and 7 = very true of me) consists of six motivation scales (31 items measuring value, expectancy, and affective component) and nine learning strategies (50 items measuring cognitive and metacognitive strategies, and resource management strategies).

The *self-efficacy* sub-section is one of the sub-sections contained in the motivation main section. The *self-efficacy* scale consisted of nine items regarding perceived competence and confidence in performance of class work. Sedaghat et al. (2011) reported a Cronbach reliability coefficient of .87 for the *self-efficacy* subsection while Pintrich and De Groot (1990) reported a Cronbach reliability coefficient of .89 for the subsection.

3.7.4   Meta-cognition

The meta-cognitive Awareness Inventory (MAI) as developed by Schraw and Dennison (1994) was utilised in this study. The MAI comprises of 52 items that are divided into two scales. These two scales represent the two components of *meta-cognition*, namely *meta-cognitive knowledge* and *meta-cognitive regulation*. The operationalisation of *meta-cognition* of the MAI thus corresponds to the constitutive definition of the construct as used in this study. Analyses conducted by Schraw and Dennison (1994) on the instrument support two distinct factors. Schraw and Dennison (1994) also found the instrument to be a reliable measure of *meta-cognition* related to academic learning tasks with a Cronbach reliability coefficient of .90.

3.7.5   Learning motivation

Nunes (2003) developed a combined questionnaire to measure trainee motivation to learn and intention to learn. The motivation to learn questionnaire (MLQ) was divided into three sections. Section B (Motivation to Learn) provides an assessment of *learning motivation* defined as the specific desire to learn the content of the training programme. The motivation to learn section of the questionnaire was used (in a slightly revised format) in the present study. Analysis performed by Nunes (2003) on her motivation to learn scale with 20 items revealed a Cronbach Alpha of .94 with N = 114.

3.7.6   Conscientiousness

In this study the Alphabetical Index of 204 Labels for 269 International Personality Item Pool IPIP Scales (retrieved May 28, 2011 from http://ipip.ori.org/newNEOKey.htm#Conscientiousness) was used. The IPIP is freely available in the public domain. The revised versions of the scales are almost 20% shorter than the original. It is based on the revised version of the NEO Personality Inventory (NEO-PI-R) developed by Costa and McCrae (1992) and contains 20 items.

The scales in the IPIP have been shown to correlate highly with the corresponding NEO-PI-R domain scores, with correlations that range from .85 to .92 when corrected for unreliability (International Personality Item

Pool, 2001). This 20 item scale appeared to define *conscientiousness* as constitutively defined in this study although some items were deleted and others adapted.

3.7.7   Time cognitively engaged

A sub-section of the Motivated Strategies for Learning Questionnaire (MSLQ) was administered in this study to measure the construct of *time cognitively engaged*. The Motivated Strategies for Learning Questionnaire (MSLQ), developed by Pintrich, is a widely used self-report instrument designed to assess students' motivational orientations and their use of different learning strategies (Pintrich & De Groot, 1990). This 81-item instrument, 7-point Likert scale (1 = not at all true of me and 7 = very true of me) consists of six motivation scales (31 items measuring value, expectancy, and affective component) and nine learning strategies (50 items measuring cognitive and metacognitive strategies, and resource management strategies).

The *time cognitively engaged* sub-section is one of the sub-sections contained in the learning strategies main section. The *time cognitively engaged* scale consisted of 13 items regarding the use of deep processing or shallow processing. Pintrich and De Groot (1990) reported a Cronbach reliability coefficient of .83 for the *time cognitively engaged* subsection.

3.7.8 Learning performance

Learning performance was represented through the learners' grade 12 first semester (term 1 and 2) academic results. More specifically, all the learners from the three schools included in this study had the subjects English 1st language and Afrikaans 2nd language and therefore marks for these subjects were used to represent *Learning Performance*. No psychometric evidence on the reliability and validity of these measures were available. This should be acknowledged as a methodological limitation since it really only makes sense to test the substantive hypotheses if confidence exists that the measured operational definitions succeeded in obtaining valid and reliable measures of the latent variables as constitutively defined. In addition the question needs to be asked whether the evaluations that contributed to the English 1st language and Afrikaans 2nd language marks significantly depended on the ability to transfer the linguistic insight obtained and automated via the formal language teaching. The concern exists that the English 1st language and Afrikaans 2nd language marks reflect little more than the ability to memorise and regurgitate. Inspection of the assignements, tests and examinations contributing to the marks in question *vis-à-vis* the curriculum could have shed light on this matter. This was, however, not done.

3.8   MISSING VALUES

Missing values can potentially present a problem that would have to be solved before the composite indicator variables could be calculated and the data analysed. Calculating the composite indicator variables without appropriately treating the problem of missing values can result in seemingly adequate, but in reality deficient, indicator variables. Various options exist to treat the problem of missing values and are discussed below (Du Toit & Du Toit, 2001; Mels, 2003):

a)   List-wise deletion of cases;

b)   Full information maximum likelihood estimation (FIML);

c)   Multiple imputation (MI); and

d)   Imputation by matching;

(a) List-Wise Deletion

The list-wise deletion of cases is typically used as the default option in the treatment of missing values in most statistical analyses. List-wise deletion typically entails the identification and deletion of all cases that have one or more items with missing values, leaving only cases with complete data. The danger with this option is that the size of the sample could be dramatically reduced.

(b) The Full Information Maximum Likelihood

The Full Information Maximum Likelihood (FIML) estimation procedure is probably more efficient than the available multiple imputation procedures, but it has the disadvantage that no separate imputed data set is created which thus prevents item- and dimensionality analyses as well as the calculation of item parcels, which is a requirement in this study. A disadvantage of this method is the fact that FIML assume that the data values are missing at random and that the observed variables are continuous and follow a multivariate normal distribution. The latter was seen as problematic in this case especially as the variables most probably do not follow a multivariate normal distribution.

(c) Multiple Imputation Method

The multiple imputation method for the treatment of missing values has the advantage that estimates of missing values are derived for all cases in the initial sample (i.e. no cases with missing values are deleted) and that the data set is available for subsequent item and dimensionality analyses and the formation of item parcels. The problem with this method is that the multiple imputation procedures available in LISREL assume that the data values are missing at random and that the observed variables are continuous and follow a multivariate normal distribution. The latter was seen as problematic in this case especially as the variables most probably do not follow a multivariate normal distribution. According to Mels (2007) it would

be acceptable to use multiple imputation if observed variables are measured on a scale comprising five or more scale values, provided that the observed variables are not excessively skewed (even though the null hypothesis of multivariate normality had been rejected) and provided that less than 30% of the data constitutes missing values.

(d) Imputation by Matching

Imputation by matching makes less stringent assumptions than the multiple imputation procedures. According to Theron (2010) this method normally appears to be the most conservative, safe procedure in the treatment of missing values. Imputation by matching refers to a process of substituting of real values for missing values. The substitute values replaced for a case are derived from one or more cases that have a similar response pattern over a set of matching variables. The ideal is to use matching variables that will not be utilised in the confirmatory factor analysis. This is however usually not possible. The items least plagued by missing values are consequently typically identified to serve as matching variables. By default, cases with missing values after imputation are eliminated.

Based on the foregoing, multiple imputation (MI) was used as the method to solve the problem. The multiple imputation method conducts several imputations for each missing value. Each imputation creates a completed data set, which could be analysed separately in order to obtain multiple estimates of the parameters of the model (Davey et al, Raghunatha and Schafer as cited in Dunbar-Isaacson, p.29, 2006). In LISREL missing values for each case are substituted with the average of the values imputed in each of the data sets (Du Toit & Du Toit, 2001). Plausible values are therefore delivered whilst also reflecting the uncertainty in the estimates. The advantage of the MI procedure is that all cases are retained in the imputed data set (Du Toit & Du Toit, 2001).

The data in this study meets the requirements according to Mels (2007) for the use of the multiple imputation methods, namely, the observed variables should be measured on a scale comprising five or more scale values, the observed variables should not be excessively skewed (even though the null hypothesis of multivariate normality had been rejected) and less than 30% of the data should constitute missing values.

3.9   DATA ANALYSIS

Item analysis, exploratory factor analysis and structural equation modelling (SEM) were used to analyse the questionnaire data and to test the proposed modified and elaborated learning potential structural model as depicted in Figure 3.1.

3.9.1   Item analysis

The various scales used to operationalise the latent variables comprising the structural model depicted in Figure 3.1 were developed to measure a specific construct or dimension of a construct carrying a specific constitutive definition. Items have been developed to reflect the standing of research participants on these specific latent variables. The items were developed to function as stimulus sets to which research participants respond with behaviour that is a relatively uncontaminated expression primarily of a specific underlying latent variable. If these design intentions were successful it should reflect in a number of item statistics. In cases where latent variables are constitutively defined in terms of two or more dimensions, the item analysis was performed for each subscale separately.

Item analysis (or scale reliability analysis) was conducted by means of SPSS Reliability Procedure (SPSS 19.0). Item analyses were conducted to: (a) investigate the reliability of indicators of each latent variable, (b) investigate the homogeneity of each sub-scale and (c) screen items prior to their inclusion in composite item parcels representing the latent variables. The purpose of item analysis is therefore to ascertain which of the items in a scale, if any, have a negative effect on the overall reliability of the scale due to their inclusion in the particular scale. Item analysis allows for bad items (i.e. items that do not reflect the latent dimension that the items have been tasked to reflect, that are not sensitive to relative small differences on the latent dimension and/or that do not respond in unison with other items assigned to a specific subscale) to be removed from the sub-scale as to ensure that all items in the subscale contribute to a valid and reliable description of the latent dimension in question.

3.9.2 Exploratory factor analysis

The architecture of each of the scales and subscales (in the case of multi-dimensional latent variables) used to operationalise the latent variables comprising the learning potential structural model reflects the intention to construct essentially one-dimensional sets of items. These items are meant to operate as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific uni-dimensional underlying latent variable. The intention is to obtain relatively uncontaminated measures of the specific underlying latent variable or dimension of a latent variable via the items comprising the scale/subscale.

The objective of these analyses is to investigate the uni-dimensionality of each scale/sub-scale and to evaluate the success with which each item measures the specific latent variable or latent dimension it purports to measure. The purpose is to establish whether the different items in a sub-scale were reflective

of the single hypothesised latent variable or dimension of a latent variable the items were designed to reflect.

In the case of latent variables constitutively defined in terms of a single dimension the uni-dimensionality assumption was tested using exploratory factor analysis with oblique rotation. The uni-dimensionality assumption would be supported if (a) the eigenvalue-greater-than-unity rule (supported by the scree test) would result in the extraction of a single factor, (b) the magnitude of the factor loadings are reasonably high (> .50), and (c) only a small percentage of the reproduced correlations are greater than .05. Theron (2010) suggest < 40% as cut-off value for reproduced correlations.

The purpose of the analysis would also be to recommend the removal or rewriting of an item with inadequate factor loadings and to split heterogeneous sub-scales into two or more independent homogeneous sub-sets of items.

Costello and Osborne (2005) suggest a number of steps to be followed in the process of exploratory factor analysis. They are: (a) evaluating the factor analysability of the sub-scales, (b) choosing a factor extraction method, (c) deciding on the number of factors to be extracted, and (d) choosing a rotation method. They are discussed below.

(a) Evaluating the factor analysability of the sub-scales

The Kaiser-Meyer-Olkin (KMO) measure and the Bartlett's test of sphericity were used to examine the factor analysability of the observed inter-item correlation matrix.

The KMO values represent the ratio of the squared correlation between variables to the squared partial correlation between variables. The KMO statistic varies between 0 and 1. The cut-off value that will be utilised in this study is .7. The following interpretation of the values are suggested (a) >.9 superb; (b) .8-.9 great values; (c) .7-.8 good; (d) .5-.7 mediocre; and (e) <.5 barely acceptable.

The Bartlett test of sphericity was used to test the null hypothesis that the inter-item correlation matrix is an identity matrix in the parameter. An identity matrix is one in which all items only correlate with themselves and not with each other (i.e. all the diagonal elements are 1's and all off diagonal elements are 0's).

(b) Choosing the factor extraction method

Costello and Osborne (2005) list several extraction methods that have been developed to extract factors from an inter-item correlation matrix. These include amongst others, unweighted least squares, generalised

least squares, maximum likelihood, principal axis factoring, principal component analysis and image factoring which are all compatible with SPSS software. Principal axis factoring was selected for the purpose of this study.

(c) Decision on the number of factors to extract

To decide on the appropriate number of factors to extract, the eigenvalue- greater-than-unity rule and the scree test were used. According to the Eigenvalue-greater-than-unity rule, only factors with eigenvalues greater than one are retained. Costello and Osborne (2005) confirm that the default in most statistical software packages is to retain all factors with eigenvalues greater than one. However, Costello and Osborne also state that there is broad consensus in the literature that this is among the least accurate methods for selecting the number of factors to retain and should not solely be relied on. Costello and Osborne (2005) describe the scree test as involving the examination of the graph of the eigenvalues and looking for the natural bend or break point in the data where the curve flattens out. The number of data points above the "break" (i.e., not including the point at which the break occurs) is usually the number of factors to retain.

(d) Choosing rotation method

According to Costello and Osborne (2005), the goal of rotation is to simplify and clarify the data structure. There are a variety of rotation methods, namely varimax, quartimax and equamax which are commonly available orthogonal methods of rotation, and direct oblimin, quartimin and promax which are oblique methods of rotation. Orthogonal rotations produce factors that are uncorrelated; oblique methods allow the factors to correlate. Costello and Osborne continue that researchers to use orthogonal rotation because it produces more easily interpretable results, however the authors conclude that this is an erroneous argument. In the social sciences some correlation among factors are generally expected, since behaviour is rarely partitioned into neatly packaged units that function independently of one another. Therefore using orthogonal rotation results in a loss of valuable information if the factors are correlated, and oblique rotation should theoretically render a more accurate, and perhaps more reproducible, solution. If the factors are truly uncorrelated, orthogonal and oblique rotations produce nearly identical results.

Taking the above into consideration, the oblique rotation method, oblimin rotation, was selected for the purpose of this study. The rationale for selecting this method is that it generally produces more realistic results albeit slightly more difficult to interpret.

In the case of latent variables constitutively defined in terms of a two or more (p) dimension the success with which the multi-dimensional latent variable was operationalised in terms of p homogenous subscales was evaluated via structural equation modelling. Successful operationalisation is indicated if (a) the

measurement model reflecting the design intention and the constitutive definition of the latent variable shows close fit, (b) the freed factor loadings are all statistically significant (p<.05) and large ($\lambda_{ij} \geq .50$) in the completely standardised solution, (c) the measurement error variances are statistically significant (p<.05) and small (in the completely standardised solution) for all items, and (d) reasonably large R^2 values ($R^2 \geq .25$) for all items.

3.9.3   Structural equation modelling

3.9.3.1 Variable type

At this point in the study it becomes important to decide whether to continue treating the individual items as indicator variables, or to create item parcels. The pending decision discussed above thus warrants a discussion of the advantages and disadvantages to the process of item parcelling.

There are clear advantages to undertaking item parcelling. Little, Cunningham and Shahar (2002) argue that because fewer parameters are needed to fit a model when parcels are used, parcels are preferred. This is particularly so when sample sizes are relatively small. As it may become cumbersome and extensive to operationalise the latent variables comprising the model in terms of individual items, item parcelling has the advantage of simplifying the logistics of fitting the model. The use of item parcelling is a practical measure to reduce the number of measurement model parameters to be estimated in a study. Nunnally (as cited in Theron 2010) support the formation of linear composite measures as it has the advantage of creating more reliable indicator variables. It has also been found that the use of parcelling could significantly improve model fit in some circumstances. It may also help ensure that multivariate normality is obtained when handling data using maximum likelihoods estimation methods (Sass & Smith, 2006). Little et al. (2002) propose that item parcelling hold certain advantages above the use of individual items due to the fact that item-level data contain one or more of the following disadvantages: lower reliability, lower communality, a smaller ratio of common-to-unique factor variance, and a greater likelihood of distributional violations. Items also have fewer, larger, and less equal intervals between scale points than do parcels.

However, there are purported disadvantages to item parcelling. Theron (2010) cite Marsh, Balla and Grayson who state that solutions in confirmatory factor analysis tend to improve with the increasing number of indicators per factor. Kim and Hagtvet (2003) indicate that using parcels may increase the likelihood of misrepresenting the latent construct. Little et al. (2002) support this statement by cautioning that when constructs are not unidimensional, and when it is unclear what dimensions may underlie a construct, undertaking item parcelling may be problematic. They state that only under conditions of uni-

dimensionality should parceling be considered. Little et al. (2002) also warn against the use of item parcels in the establishment of scale norms as the use of parcels may run the risk of creating arbitrary metrics that no longer carry important information regarding threshold parameters that is contained in each scale.

All of the arguments, both pro and con, have merits. Although the amount of argumentation for the pro side tends to outweigh the con side, the importance of the con arguments is not disproportionately weaker. However, based on the above discussion of the advantages of item parcelling, it was decided that item parcelling would be a suitable strategy to employ in this study due to the statistical advantages resulting from the use of item parcels.

As was indicated in the foregoing discussion, item parcelling was undertaken for this study. A discussion of the different approaches to item parcelling follows. Little et al. (2002) suggest the following approaches to item parcelling: (i) random assignment, (ii) item-to construct balance, (iii) a priori questionnaire construction, (iv) internal consistency, and (v) the domain representative approach. Little et al. (2002) suggest considering one of the first three approaches if the uni-dimensionality of the items to be parceled have been established and considering one of the last two approaches for dealing with multi-dimensional item sets.

Theron (2010) suggest either the use of factor loading information in creating item parcels, or the split-half approach. The latter approach to item parcelling was subsequently utilised for this study. Two item parcels were created per sub-scale by taking the mean of the items allocated to each parcel. The even numbered items of the specific sub-scale were divided into the first item parcel, and the odd numbered items were divided into the second item parcel. The first item of the sub-scale was allocated to the first parcel, the second item of the sub-scale was allocated to the second parcel, the third item of the sub-scale was again allocated to the first parcel, and so forth. The process was repeated for each sub-scale.

3.9.3.2 Multivariate normality and normalisation

The maximum likelihood estimation technique that LISREL uses by default to obtain estimates for the freed model parameters assumes that the indicator variables follow multivariate normal distribution. The null hypothesis that this assumption is satisfied was consequently formally tested in PRELIS. It was decided that if the null hypothesis of multivariate normality is rejected, normalisation would be attempted (Jöreskog & Sörbom, 1996a). The success of the attempt at normalising the data was evaluated by testing the null hypothesis that the normalised indicator variable distribution follows a multivariate normal distribution. It was further decided that if the null hypothesis of multivariate normality is still rejected, robust maximum likelihood estimation would be used (Mels, 2003).

3.9.3.3 Confirmatory factor analysis

Comprehensive LISREL model fit indices can only be interpreted unambiguously for or against the fitted structural model if it can be shown that the indicator variables used to operationalise the latent variables when fitting the comprehensive LISREL model successfully reflected the latent variables they were assigned to represent. The fit of the measurement model used to operationalise the structural model therefore needs to be evaluated prior to fitting the comprehensive LISREL model.

A poor fitting comprehensive LISREL model can only be unambiguously interpreted as evidence against the structural relations hypothesised by the structural model if the measurement model fits closely and the indicator variables load significant and strongly on the latent variables they were tasked to reflect. The measurement model was fitted by analysing the covariance matrix. Maximum likelihood estimation will be used if the multivariate normality assumption is satisfied (before or after normalization). Where normalisation failed to achieve multivariate normality in the observed data robust maximum likelihood estimation will be used. LISREL 8.8 (Du Toit & Du Toit, 2001) was used to perform the confirmatory factor analysis.

The substantive measurement hypothesis claims that the indicator variables used to operationalise the latent variables when fitting the comprehensive LISREL model successfully reflect the latent variables they were assigned to represent. The substantive measurement hypothesis translates into the following two more specific hypotheses.

Hypothesis 1a:

The proposed measurement model fits the data exactly and perfectly explains the manner in which the indicator variables covary. There is no discrepancy between the reproduced covariance matrix implied by the model $\Sigma(\Theta)$ and the observed population covariance matrix Σ.

$$H_{01} : RMSEA = 0)$$
$$H_{a1} : RMSEA > 0)$$

However, the exact fit null hypothesis described above represents a somewhat unrealistic position. It is implausible that any model that we use is anything more than an approximation to reality. Since a null hypothesis that a model fits exactly in some population is known *a priori* to be false, it seems pointless even to try to test whether it is true. It would therefore be more appropriate to test the null hypothesis of close model fit. The following null hypothesis of close model fit would also be tested:

Hypothesis 1b:

The proposed measurement model fits the data closely and approximately explains the manner in which the indicator variables covary. The reproduced covariance matrix implied by the model $\Sigma(\Theta)$ closely approximates the observed population covariance matrix Σ.

$$H_{02} : \text{RMSEA} \leq 0{,}05$$

$$H_{a2} : \text{RMSEA} > 0{,}05$$

The above hypothesis of exact and close model fit will be investigated by means of conducting an overall fit assessment on the measurement model.

Measurement model fit was interpreted by inspecting the full array of fit indices provided by LISREL (Diamantopoulos & Sigauw, 2000). If the measurement model shows at least close fit the measurement model parameter estimates will be interpreted. Specifically the statistical significance and magnitude of the freed factor loadings in $\mathbf{\Lambda_x}$, the statistical significance and magnitude of the measurement error variances in the main diagonal in $\mathbf{\Theta_\delta}$ and the statistical significance and magnitude of the covariances between the latent variables. The magnitude and distribution of the standardised residuals and the magnitude of model modification indices calculated for $\mathbf{\Lambda_x}$ and $\mathbf{\Theta_\delta}$ will also be interpreted. Large modification index values indicate measurement model parameters that, if set free, would improve the fit of the model. If a large percentage of the currently fixed parameter in the model would result in a significant improvement in model fit when freed this comments negatively on the fit of the measurement model in as far as it suggests that numerous possibilities exist to improve the fit of the current model proposed. Inspection of the model modification indices for the aforementioned matrices here primarily served the purpose of commenting on the model fit rather than suggesting ways of improving the measurement model.

The operationalisation of the latent variables comprising the structural model will be considered successful if (a) the measurement model reflecting the allocation of item parcels to the latent variable they were designed to reflect shows close fit, (b) the freed factor loadings are all statistically significant (p<.05) and large ($\lambda_{ij} \geq .71$) in the completely standardised solution, (c) the measurement error variances are statistically significant (p<.05) and small (in the completely standardised solution) for all items, and (d) reasonably large R^2 values ($R^2 \geq .25$) for all items.

The latent variables in the measurement model are in terms of the theorising underlying the structural model assumed to be qualitatively distinct, separate constructs. When latent variables correlate strongly in Φ concern arises as to whether the latent variables are in fact qualitatively distinct, separate constructs.

The discriminate validity of the measurement model will be examined by calculating confidence intervals for the ϕ_{ij} estimates using an Excel template developed by Scientific Software International (Mels, 2010). If the 95% confidence intervals for the variance phi-estimates ϕ_{ij} do not include unity discriminant validity has been shown. If one or more confidence-intervals do contain unity it suggests that the correlation between those two latent variables could be unity in the parameter. Confidence in the claim/position that the two latent variables in question are qualitatively distinct constructs is then seriously compromised.

3.9.3.4 Testing the fit of the comprehensive LISREL model

The comprehensive LISREL model was fitted by analysing the covariance matrix. Maximum likelihood estimation will be used if the multivariate normality assumption is satisfied (before or after normalization). Where normalisation failed to achieve multivariate normality in the observed data robust maximum likelihood estimation will be used. LISREL 8.8 (Du Toit & Du Toit, 2001) was used to obtain estimates of the freed model parameters. If at least H_{03} was not rejected the path-specific null hypotheses were tested. The magnitude of the direct effect completely standardized path coefficients were interpreted for all significant path coefficients. The significance and magnitude of the indirect and total effects were calculated for each hypothesized influence in the model.

Further consideration was also given to the magnitude and distribution of the standardised residuals and the magnitude of model modification indices. Large modification index values indicated structural model parameters that, if set free, would improve the fit of the model. Large numbers of large and significant modification index values comment negatively on the fit of the model in as far as it suggests that numerous possibilities exist to improve the fit of the model proposed by the researcher. Inspection of the model modification calculated for the Γ and **B** matrices was used to explore possible modifications to the current structural model if such modifications make substantive theoretical sense.

CHAPTER 4

RESEARCH RESULTS

4.1   INTRODUCTION

The purpose of Chapter 4 is to present and discuss the statistical results of the various analyses performed. This chapter will start off by discussing the item analysis executed to determine the psychometric integrity of the indicator variables meant to represent the various latent dimensions, followed by an evaluation of the extent to which the data satisfied the statistical data assumptions relevant to the data analysis techniques utilised. The fit of the measurement model is subsequently evaluated. In evaluating the success with which the latent variables comprising the structural model had been operationalised no distinction is made between the exogenous and endogenous measurement models. On condition of acceptable measurement model fit, the structural model was to be considered.

4.2   SAMPLE

Grade 12 learners from three high schools participated in the study. The schools are based in the Western Cape and consist of a socio-economically and racially diverse group of students. All three schools are former model C public schools, predominantly English and mixed-gender schools.

Initially the sample consisted of 232 students from school A, 116 from school B, and 130 from school C totaling 478 respondents. However, after incomplete or questionnaires were disregarded and only leaners who had both English and Afrikaans as first language were considered, the final sample was decreased to 320 learners. Demographic information such as gender and racial categories was not collected from the sample as it was not deemed essential to the results at the time of data collection. However after the fact it is acknowledged to be a limitation of the study as it becomes problematic to compare the results of this study to the results of future replicated studies if no demographic information about the sample is available.

4.3   MISSING VALUES

Missing values presented a problem that had to be addressed before the data could be analysed. Missing values did not seriously plague the majority of the items comprising the scales used to operationalise the latent variables in the model. The maximum number of respondents who failed to respond to any

individual item was 11. Table 4.1 depicts the distribution of missing values across items. The items measuring *meta-cognition* were seemingly more prone to non-responses.

Table 4.1
Distribution of missing values across items

Deep1	Deep2	Deep3	Deep4	Deep5	Shallow1	Shallow2	Shallow3	Deep6
1	1	1	1	0	0	1	0	1
Deep7	Shallow4	Deep8	Deep9	ILocus1	EXLocus1	EXLocus2	ILocus2	ILocus3
0	1	0	1	1	0	11	1	0
EXLocus3	EXLocus4	EXLocus5	ILocus4	EXLocus6	EXLocus7	EXLocus8	EXLocus9	EXLocus10
2	0	1	0	2	0	1	0	1
EXLocus11	EXLocus12	EXLocus13	ILocus5	ILocus6	EXLocus14	ILocus7	EXLocus15	ILocus8
2	4	2	0	2	0	1	2	1
EXLocus16	PGoal1	PGoal2	PGoal3	PGoal4	PGoal5	PGoal6	PGoal7	PGoal8
0	0	0	1	2	0	0	0	0
LGoal1	LGoal2	LGoal3	LGoal4	LGoal5	LGoal6	LGoal7	LGoal8	Self1
1	1	0	0	0	0	0	0	0
Self2	Self3	Self4	Self5	Self6	Self7	Self8	Self9	LMot1
1	1	1	1	1	3	0	0	0
LMot2	LMot3	LMot4	LMot5	LMot6	Cons1	Cons2	Cons3	Cons4
0	1	1	0	0	1	0	1	1
Cons5	Cons6	Cons7	Cons8	Cons9	Cons10	Cons11	Cons12	MReg1
1	2	0	0	1	0	1	0	0
MReg2	MKnow1	MReg3	MKnow2	MReg4	MReg5	MReg6	MReg7	MKnow3
0	2	2	1	0	2	4	1	4
MReg8	MKnow4	MReg9	MKnow5	MKnow6	MKnow7	MKnow8	MKnow9	MReg10
4	2	0	0	1	2	3	0	1
MKnow10	MReg11	MReg12	MReg13	MReg14	MReg15	MKnow11	MKnow12	MReg16
1	3	0	0	0	1	2	1	0
MKnow13	MReg17	MReg18	MKnow14	MKnow15	MReg19	MKnow16	MReg20	MReg21
0	1	1	0	1	3	2	1	1
MReg22	MReg23	MReg24	MReg25	MReg26	MReg27	MReg28	MReg29	MKnow17
2	2	1	3	1	6	1	1	3
MReg30	MReg31	MReg32	MReg33	MReg34	MReg35	English	Afrikaans	
1	2	1	3	0	0	0	0	

Multiple imputation (MI) was used as the method to solve the problem of missing values. The multiple imputation method conducts several imputations for each missing value. Each imputation creates a completed data set, which could be analysed separately in order to obtain multiple estimates of the parameters of the model (Davey et al, Raghunatha and Schafer as cited in Dunbar-Isaacson, p.29, 2006). In LISREL missing values for each case are substituted with the average of the values imputed in each of the data sets (Du Toit & Du Toit, 2001). Plausible values are therefore delivered whilst also reflecting the uncertainty in the estimates. The advantage of the MI procedure is that all cases are retained in the imputed data set (Du Toit & Du Toit, 2001).

4.4   ITEM ANALYSIS

To identify and eliminate possible items that do not contribute to an internally consistent description of the various latent variables forming part of the proposed revised talent management competency model (Theron, 2010), item analysis was performed on the items of the different measuring instruments. Item analyses were conducted on all the scales after imputation. Problematic items were not used to represent latent variables in the model and were not included in the calculation of composite indicator variables. Item analysis was conducted by means of SPSS Reliability Procedure (SPSS 19.0). The actual wording of the items can be examined in Appendix A.

4.4.1   Item analysis: C*onscientiousness* scale

The *conscientiousness* scale comprised 12 items. An item was negatively keyed and therefore was reflected before proceeding with the item analysis. The results for the item analysis for the *conscientiousness* scale are depicted in Table 4.2.

The *conscientiousness* scale obtained a Cronbach's alpha of .887. The item means ranged from 2.481 to 6.159. (on a 7-point scale) and the item standards deviation ranged from 1.111 to 2.112. The inter-item correlation matrix revealed correlations ranging between .080 and .863.

Cons3 was flagged as problematic. The inter-item correlations of Cons3 with the remainder of the items, the item-total correlation (.260), the squared multiple correlation (.140) and the increase in Cronbach's alpha (.887 to .897) raised the concern that Cons3 shares insufficient variance with the remainder of the items in the scale. This basket of evidence was considered sufficient to justify the removal of this item. The decision was then made to delete item Cons3 from the item pool, decreasing the scale length from 12 to 11 items. The item analysis was subsequently repeated on the remaining items but no further items were identified that ought to be considered for deletion.

Table 4.2

Item statistics for the conscientiousness scale

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	.887	.891	12

	Mean	Std. Deviation	N
Cons1	3.7031	1.11810	320
Cons2	3.8625	1.11128	320
Cons3	6.1594	1.74815	320
Cons4	4.4469	1.31199	320
Cons5	3.7781	1.50989	320
Cons6	3.5219	1.47694	320
Cons7	2.8625	1.75627	320
Cons8	3.3688	1.32789	320
Cons9	4.4438	1.46750	320
Cons10	2.8063	1.99842	320
Cons11	2.4813	1.84160	320
Cons12	2.7906	2.11204	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Cons1	40.5219	145.366	.616	.458	.878
Cons2	40.3625	146.915	.559	.408	.880
Cons3	38.0656	149.071	.260	.140	.897
Cons4	39.7781	146.643	.468	.341	.884
Cons5	40.4469	142.198	.521	.507	.881
Cons6	40.7031	140.492	.587	.498	.878
Cons7	41.3625	130.890	.728	.693	.869
Cons8	40.8563	139.910	.686	.552	.874
Cons9	39.7813	140.660	.586	.468	.878
Cons10	41.4188	126.319	.733	.814	.869
Cons11	41.7438	129.313	.729	.738	.869
Cons12	41.4344	125.011	.715	.788	.870

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.685	2.481	6.159	3.678	2.482	1.013	12
Item Variances	2.548	1.235	4.461	3.226	3.612	1.098	12
Inter-Item Correlations	.405	.080	.863	.783	10.749	.028	12

4.4.2 Item analysis: *Academic self-efficacy* scale

The *academic self-efficacy* scale comprised 9 items. The results for the item analysis for the *academic self-efficacy* scale are depicted in Table 4.3.

Table 4.3
Item statistics for the academic self-efficacy scale

	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	.881	.883	9

	Mean	Std. Deviation	N
Self1	5.4000	1.31163	320
Self2	5.7031	.98388	320
Self3	5.6188	1.16033	320
Self4	5.3656	1.24470	320
Self5	5.4469	1.12411	320
Self6	5.5500	1.16802	320
Self7	4.1438	1.45506	320
Self8	4.6313	1.29925	320
Self9	5.8031	1.09229	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Self1	42.2625	47.454	.646	.507	.866
Self2	41.9594	51.757	.574	.379	.873
Self3	42.0438	48.556	.677	.528	.864
Self4	42.2969	48.203	.642	.473	.866
Self5	42.2156	48.985	.674	.463	.864
Self6	42.1125	47.605	.737	.588	.858
Self7	43.5188	46.934	.592	.439	.873
Self8	43.0313	48.538	.587	.411	.872
Self9	41.8594	51.137	.545	.313	.874

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	5.296	4.144	5.803	1.659	1.400	.300	9
Item Variances	1.468	.968	2.117	1.149	2.187	.117	9
Inter-Item Correlations	.457	.280	.646	.366	2.309	.006	9

The *academic self-efficacy* scale obtained a Cronbach's alpha of .881. Inspection of the means and standard deviations revealed the absence of extreme means and small standard deviations. The item means ranged

from 4.144 to 5.803 (on a 7-point scale) and the standard item deviations ranged from .983 to 1.455. The inter-item correlation matrix revealed correlations ranging between .280 and .576.

All the corrected item total correlations were larger than .30 indicating that the correlation between each item and the total score calculated from the remaining items was satisfactorily. In addition, the squared multiple correlations were all larger than .30 and the results revealed that none of the items, if deleted, would increase the current Cronbach alpha. None of the items were therefore deleted.

4.4.3 Item analysis: Learning motivation scale

The results for the item analysis for the *learning motivation* scale are depicted in Table 4.4.

Table 4.4

Item statistics for the learning motivation scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.855	.855	6

	Mean	Std. Deviation	N
LMot1	5.6969	1.09944	320
LMot2	5.3344	1.34283	320
LMot3	5.1813	1.33612	320
LMot4	5.4750	1.31044	320
LMot5	5.3500	1.44578	320
LMot6	5.8406	1.17827	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
LMot1	27.1813	26.895	.580	.383	.842
LMot2	27.5438	25.045	.585	.395	.841
LMot3	27.6969	23.823	.698	.509	.819
LMot4	27.4031	23.696	.729	.560	.813
LMot5	27.5281	23.266	.671	.482	.825
LMot6	27.0375	26.130	.597	.399	.838

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	5.480	5.181	5.841	.659	1.127	.061	6
Item Variances	1.666	1.209	2.090	.882	1.729	.100	6
Inter-Item Correlations	.495	.357	.605	.249	1.697	.007	6

The *learning motivation* scale comprised 6 items. The *learning motivation* scale obtained a Cronbach's alpha of .855. The item means ranged from 5.181 to 5.841 (on a 7-point scale) and the item standard deviations ranged from 1.099 to 1.445. The inter-item correlation matrix revealed correlations ranging between .357 and .595.

All the corrected item total correlations were larger than .30 indicating that the correlation between each item and the total score calculated from the remaining items was satisfactorily and that the items were reflecting the same underlying factor. In addition, the squared multiple correlations were all larger than .30 and the results revealed that none of the items, if deleted, would increase the current Cronbach alpha. The results of the item analysis of the *learning motivation* scale therefore did not raise any concerns and all the items of the scale were retained.

4.4.4 Item analysis: Meta-cognition scale

The Meta-cognitive Awareness Inventory (MAI) as developed by Schraw and Dennison (1994) was utilised in this study. The MAI comprises of fifty-two items that are divided into two scales. These two scales represent the two components of *meta-cognition*, namely *meta-cognitive knowledge* and *meta-cognitive regulation*. The operationalisation *of meta-cognition* of the MAI thus corresponds to the constitutive definition of the construct as used in this study. Therefore, separate item analyses were performed on the *meta-cognitive knowledge* scale and *meta-cognitive regulation* scale.

4.4.4.1 Item analysis: Meta-cognitive knowledge scale

The *meta-cognitive knowledge* scale comprised of 17 items. Table 4.5 presents the item statistics for the *meta-cognitive knowledge* scale. The *meta-cognitive knowledge* scale obtained a Cronbach's alpha of .886. Inspection of the item means and item standard deviations revealed the absence of extreme means and small standard deviations. The mean ranged from 3.613 to 5.247 (on a 7-point scale) and the standard deviation ranged from 1.111 to 1.481. The inter-item correlation matrix revealed correlations ranging between .101 and .587.

All the corrected item total correlations were larger than .30 indicating that the correlation between each item and the total score calculated from the remaining items was satisfactorily and that the items were reflecting the same underlying factor. In addition, the squared multiple correlations were mostly larger than .30 except for items MKnow4 (.274), MKnow7 (.296), and MKnow (.276). This was not sufficient reason for concern to delete the items as there is no other compelling evidence to support the deletion of these items. Furthermore the results revealed that none of the items, if deleted, would increase the current

Cronbach alpha. The results of the item analysis of the *meta-cognitive knowledge* scale did not raise any concerns and all the items of the scale were retained.

Table 4.5
Item statistics for the meta-cognitive knowledge scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.886	.886	17

	Mean	Std. Deviation	N
MKnow1	4.4844	1.24180	320
MKnow2	4.6125	1.26187	320
MKnow3	4.3813	1.19230	320
MKnow4	4.0281	1.43484	320
MKnow5	3.8438	1.36938	320
MKnow6	5.0375	1.11072	320
MKnow7	4.3969	1.29697	320
MKnow8	3.9781	1.35170	320
MKnow9	3.6125	1.44269	320
MKnow10	4.4531	1.45065	320
MKnow11	4.3250	1.48155	320
MKnow12	4.3000	1.35905	320
MKnow13	4.1531	1.30047	320
MKnow14	4.4156	1.17674	320
MKnow15	3.7344	1.36736	320
MKnow16	3.6813	1.32671	320
MKnow17	5.2469	1.11908	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
MKnow1	68.2000	161.383	.440	.257	.882
MKnow2	68.0719	159.158	.504	.382	.880
MKnow3	68.3031	157.485	.598	.397	.877
MKnow4	68.6563	156.991	.494	.274	.881
MKnow5	68.8406	153.652	.627	.459	.875
MKnow6	67.6469	164.160	.401	.307	.884
MKnow7	68.2875	158.770	.500	.296	.880
MKnow8	68.7063	159.218	.462	.276	.882
MKnow9	69.0719	157.992	.461	.312	.882
MKnow10	68.2313	154.254	.567	.370	.878
MKnow11	68.3594	154.971	.532	.401	.879
MKnow12	68.3844	153.203	.647	.494	.875
MKnow13	68.5313	155.836	.594	.451	.877
MKnow14	68.2688	158.003	.589	.420	.877
MKnow15	68.9500	155.402	.573	.468	.878

MKnow16	69.0031	155.382	.595	.476	.877
MKnow17	67.4375	165.651	.344	.324	.885

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.276	3.613	5.247	1.634	1.452	.200	17
Item Variances	1.731	1.234	2.195	.961	1.779	.087	17
Inter-Item Correlations	.313	.101	.587	.486	5.817	.008	17

4.4.4.2 Item analysis: Meta-cognitive regulation scale

The *meta-cognitive regulation* scale comprised of thirty-five items. Table 4.6 presents the item statistics for the *meta-cognitive regulation* scale. The *meta-cognitive regulation* scale obtained a Cronbach's alpha of .937. Inspection of the item means and item standard deviations revealed the absence of extreme means and small standard deviations. The mean ranged from 3.225 to 5.159 (on a 7-point scale) and the standard deviation ranged from 1.156 to 1.859. The inter-item correlation matrix revealed correlations ranging between .069 and .567. The low minimum of the inter-item correlations is somewhat reason for concern, however low inter item correlations can be expected in scales of this length and was therefore not deemed sufficient reason to flag any items for deletion.

Table 4.6
Item statistics for the meta-cognitive regulation scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.937	.939	35

	Mean	Std. Deviation	N
MReg1	3.8313	1.64849	320
MReg2	3.9750	1.35744	320
MReg3	3.6844	1.42429	320
MReg4	4.3656	1.28437	320
MReg5	3.8625	1.45135	320
MReg6	3.6281	1.51559	320
MReg7	4.2031	1.28629	320
MReg8	3.8656	1.41557	320
MReg9	4.2594	1.28833	320
MReg10	3.8375	1.56324	320
MReg11	3.5563	1.41087	320
MReg12	3.2938	1.52141	320
MReg13	3.7531	1.52667	320
MReg14	3.5156	1.75803	320
MReg15	4.3344	1.49106	320

MReg16	3.5781	1.54356	320
MReg17	4.1156	1.23268	320
MReg18	4.1594	1.42621	320
MReg19	3.8125	1.36773	320
MReg20	3.8281	1.46810	320
MReg21	3.2250	1.89522	320
MReg22	3.4563	1.50380	320
MReg23	4.1813	1.39354	320
MReg24	3.8625	1.37823	320
MReg25	3.7438	1.32848	320
MReg26	4.4313	1.37657	320
MReg27	4.1281	1.36199	320
MReg28	4.2156	1.34388	320
MReg29	3.6563	1.61127	320
MReg30	4.1469	1.53955	320
MReg31	3.9594	1.44976	320
MReg32	3.7563	1.48238	320
MReg33	3.9406	1.43170	320
MReg34	4.4250	1.34631	320
MReg35	5.1594	1.15679	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
MReg1	133.9156	779.958	.472	.467	.936
MReg2	133.7719	782.810	.547	.581	.936
MReg3	134.0625	782.385	.524	.473	.936
MReg4	133.3813	788.732	.496	.411	.936
MReg5	133.8844	789.037	.430	.328	.937
MReg6	134.1188	775.691	.571	.548	.935
MReg7	133.5438	794.763	.410	.311	.937
MReg8	133.8813	777.823	.587	.532	.935
MReg9	133.4875	787.135	.517	.451	.936
MReg10	133.9094	791.713	.364	.257	.937
MReg11	134.1906	777.741	.590	.551	.935
MReg12	134.4531	776.481	.559	.489	.935
MReg13	133.9938	776.420	.557	.536	.935
MReg14	134.2313	777.113	.469	.399	.937
MReg15	133.4125	784.356	.474	.414	.936
MReg16	134.1688	770.172	.626	.507	.935
MReg17	133.6313	777.186	.691	.582	.934
MReg18	133.5875	779.792	.557	.431	.935
MReg19	133.9344	782.413	.548	.418	.936
MReg20	133.9188	773.078	.624	.528	.935
MReg21	134.5219	782.025	.383	.371	.938
MReg22	134.2906	777.160	.558	.505	.935
MReg23	133.5656	785.181	.500	.427	.936

MReg24	133.8844	775.639	.634	.528	.935
MReg25	134.0031	782.755	.560	.454	.935
MReg26	133.3156	787.076	.482	.458	.936
MReg27	133.6188	778.199	.607	.536	.935
MReg28	133.5313	783.441	.544	.508	.936
MReg29	134.0906	769.318	.607	.506	.935
MReg30	133.6000	775.771	.560	.450	.935
MReg31	133.7875	783.184	.504	.409	.936
MReg32	133.9906	773.790	.609	.555	.935
MReg33	133.8063	786.370	.470	.449	.936
MReg34	133.3219	780.482	.583	.483	.935
MReg35	132.5875	792.456	.497	.414	.936

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	3.936	3.225	5.159	1.934	1.600	.141	35
Item Variances	2.108	1.338	3.592	2.254	2.684	.188	35
Inter-Item Correlations	.305	.069	.567	.498	8.211	.007	35

All the corrected item total correlations were larger than .30 indicating that the correlation between each item and the total score calculated from the remaining items was satisfactorily and that the items were reflecting the same underlying factor. In addition, the squared multiple correlations were all larger than .30. Furthermore the results revealed that none of the items, if deleted, would increase the current Cronbach alpha. The results of the item analysis of the *meta-cognitive regulation* scale did not raise any concerns and all the items of the scale were retained.

4.4.5 Item analysis: Goal-orientation scale

The current study utilised a measure developed by Button et al. (1996) to measure the *goal-orientation* construct. The measure comprises of 16 items that are divided into two scales. These two scales represent the two components of *goal-orientation*, namely *learning goal-orientation* and *performance goal-orientation*. The operationalisation *of goal-orientation* of this measure thus corresponds to the constitutive definition of the construct as used in this study. As this study is only formally pursuing the relationship between *learning goal-orientation* (and not *performance goal-orientation*) and *learning performance*, item analysis was only performance on the items comprising *learning goal-orientation*.

4.4.5.1 Item analysis: Learning goal-orientation scale

The *learning goal-orientation* scale comprised of eight items. Table 4.7 presents the item statistics for the *learning goal-orientation* scale. The *learning goal-orientation* scale obtained a Cronbach's alpha of .834.

Inspection of the item means and item standard deviations revealed the absence of extreme means and small standard deviations. The mean ranged from 5.172 to 6.066 (on a 7-point scale) and the standard deviation ranged from .932 to 1.439. The inter-item correlation matrix revealed correlations ranging between .176 and .538.

Table 4.7
Item statistics for the learning goal-orientation scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.834	.840	8

	Mean	Std. Deviation	N
LGoal1	5.4750	1.27896	320
LGoal2	5.7844	1.31321	320
LGoal3	5.3594	1.35729	320
LGoal4	6.0313	1.01043	320
LGoal5	5.1719	1.40258	320
LGoal6	6.0375	1.00086	320
LGoal7	6.0656	.93289	320
LGoal8	5.3563	1.43990	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
LGoal1	39.8063	34.445	.587	.373	.811
LGoal2	39.4969	33.781	.615	.426	.807
LGoal3	39.9219	32.530	.679	.498	.797
LGoal4	39.2500	36.395	.613	.409	.810
LGoal5	40.1094	34.769	.493	.290	.825
LGoal6	39.2438	37.871	.489	.370	.824
LGoal7	39.2156	37.731	.549	.367	.818
LGoal8	39.9250	33.969	.527	.322	.821

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	5.660	5.172	6.066	.894	1.173	.131	8
Item Variances	1.517	.870	2.073	1.203	2.382	.229	8
Inter-Item Correlations	.395	.176	.538	.362	3.053	.007	8

All the corrected item total correlations were larger than .30 indicating that the correlation between each item and the total score calculated from the remaining items was satisfactorily and that the items were reflecting the same underlying factor. In addition, the squared multiple correlations were all larger than .30, except for item LGoal5. This was however not sufficient reason for concern to delete the item as there

is no other compelling evidence to support the deletion of this item. Furthermore the results revealed that none of the items, if deleted, would increase the current Cronbach's alpha. The results of the item analysis of the *learning goal-orientation* scale did not raise any concerns and all the items of the scale were retained.

4.4.6 Item analysis: Time cognitively engaged scale

A sub-section of the Motivated Strategies for Learning Questionnaire (MSLQ) was administered in this study to measure the construct of *time cognitively engaged*. The MSQL is comprised of two main sections, namely learning strategies and motivation. The *time cognitively engaged* sub-section is one of the sub-sections contained in the learning strategies section. The *time cognitively engaged* sub-section of the MSQL consists of 13 items of which nine items measure deep cognitive processing and four items measure shallow cognitive processing. As this study operationalised *time cognitively engaged* as deep cognitive processing (and not shallow cognitive processing), item analysis was only conducted on the nine items measuring deep cognitive processing.

An item was negatively keyed and therefore was reflected before proceeding with the item analysis. Table 4.8 presents the item statistics for the *time cognitively engaged* scale. The analysis revealed a somewhat marginal value for the Cronbach coefficient of internal consistency (.630). This stand in contrast to the reliability coefficient value (.83) originally reported by Pintrich and De Groot (1990).

Time3 was flagged as a problematic item. The Cronbach's alpha changing from .630 to .666 if the item is deleted, a low item-total correlation (.083) and a low squared multiple correlation (.071) prompted the decision to remove Time3. The deletion of Time3, however, brought Time4 and Time5 to the fore as problematic items. Both items consistently correlated lower than the mean inter-item correlation with the other remaining items in the scale and reported low corrected item-total correlations (.228 and .224 respectively) and low squared multiple correlations (.075 and .095 respectively). Deletion of Time4 would result in a zero change to the Cronbach's alpha and the deletion of Time5 would lead to an increase in the Cronbach's alpha from .666 to .668. Due to the fact that only Time5 would prompt an increase in the Cronbach's alpha, Time5 was removed from the scale while Time4 was retained. The analysis was subsequently re-run after the deletion of Time5. It then came to front that the deletion of Time4 would lead to an increase in the Cronbach's alpha from .666 to .670. Time4 was therefore also removed from the scale. The analysis was again re-run, but no further items were flagged for deletion. The *time cognitively engaged* scale was therefore reduced from 9 to 6 items.

Table 4.8

Item statistics for the time cognitively engaged scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.630	.653	9

	Mean	Std. Deviation	N
Time1	5.7656	1.31476	320
Time2	5.6625	1.32442	320
Time3	4.4875	1.77580	320
Time4	5.3594	1.42709	320
Time5	5.3563	1.50380	320
Time6	4.7281	1.76286	320
Time7	5.3781	1.32169	320
Time8	5.1500	1.82700	320
Time9	5.7031	1.19926	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Time1	41.8250	38.327	.413	.268	.581
Time2	41.9281	38.794	.378	.191	.589
Time3	43.1031	41.729	.083	.071	.666
Time4	42.2313	40.235	.249	.081	.617
Time5	42.2344	40.468	.212	.095	.626
Time6	42.8625	37.423	.290	.144	.610
Time7	42.2125	37.710	.451	.247	.573
Time8	42.4406	34.868	.397	.232	.578
Time9	41.8875	38.483	.461	.251	.575

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	5.288	4.488	5.766	1.278	1.285	.191	9
Item Variances	2.285	1.438	3.338	1.900	2.321	.525	9
Inter-Item Correlations	.173	-.044	.384	.428	-8.817	.012	9

Although the Cronbach's alpha of .670 is somewhat worrying and substantially lower than the cut off of .80, it was decided to retain the construct in the structural model and continue performing subsequent analyses on the scale.

4.4.7 Item analysis: Locus of control scale

The current study used the Internality, Powerful others, and Chance Scales developed by Levenson and Miller (1976) to operationalise the *locus of control construct*. In this measuring instrument locus of control is assumed to consist of two components, viz: (a) *internal locus of control*, and (b) *external locus of control*.

The operationalisation of *locus of control* of this measure thus corresponds to the constitutive definition of the construct as used in this study. As this study is only formally pursuing the relationship between *internal locus of control* (and not external *locus of control*) and learning performance, item analysis was only performance on the items comprising *internal locus of control*.

4.4.7.1 Item analysis: Internal locus of control scale

The *internal locus of control* scale comprised of eight items. Table 4.9 presents the item statistics for the *internal locus of control* scale. The Cronbach coefficient of internal consistency for the scale (.420) falls substantially below the critical cut-off value of .80. This stand in sharp contrast to the reliability coefficient value (.77) originally reported by Levenson and Miller (1976).

ILocus2 was flagged as problematic. The low inter-item correlations of ILocus2 with the remainder of the items, the low item-total correlation (.090), the low squared multiple correlation (.049) and the increase in Cronbach's alpha (.420 to .438) raised the concern that ILocus2 shares insufficient variance with the remainder of the items in the scale. This basket of evidence was considered sufficient to justify the removal of this item. The *internal locus of control* scale was therefore reduced from 8 to 7 items.

The item analysis was subsequently repeated on the remaining items but no further items could be identified for deletion to raise the Cronbach coefficient above the .80 cut-off value. The Cronbach's alpha of .438 was deemed unacceptably below the cut-off of .800, and concern was also raised by the general low and negative inter item correlations (ranging from -.004 to .290) and low squared multiple correlations (ranging from .048 to .118). It was therefore decided that the scale could not be included in further analyses of the structural model. The *internal locus of control* latent variable therefore had to be deleted from the reduced structural model.

Table 4.9

Item statistics for the internal locus of control scale

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.420	.458	8

	Mean	Std. Deviation	N
ILocus1	5.6969	1.32447	320
ILocus2	3.1625	1.83107	320
ILocus3	5.5250	1.23659	320
ILocus4	4.0750	2.11147	320
ILocus5	3.7594	1.94636	320
ILocus6	5.5375	1.19501	320
ILocus7	5.8875	1.20858	320
ILocus8	6.1406	1.12631	320

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
ILocus1	34.0875	26.074	.168	.049	.393
ILocus2	36.6219	25.101	.090	.049	.438
ILocus3	34.2594	25.992	.205	.086	.381
ILocus4	35.7094	21.605	.206	.065	.379
ILocus5	36.0250	22.934	.182	.116	.391
ILocus6	34.2469	25.077	.301	.189	.347
ILocus7	33.8969	26.795	.148	.067	.401
ILocus8	33.6438	26.105	.238	.119	.372

	Mean	Minimum	Maximum	Range	Maximum / Minimum	Variance	N of Items
Item Means	4.973	3.163	6.141	2.978	1.942	1.272	8
Item Variances	2.380	1.269	4.458	3.190	3.514	1.622	8
Inter-Item Correlations	.095	-.060	.290	.350	-4.830	.008	8

4.4.8. Summary of the item analysis results

The results of the item analysis performed on the various scales used to operationalise the latent variable in the structural model are summarized in Table 4.10. The reliability of the final scales used to represent the latent variables in the structural model depicted in Figure 3.1 can generally be considered satisfactory. The reliability of the *time cognitively engaged* scale however provides reason for concern. The reliability of *internal locus of control* was unacceptable and the decision was made that the scale could not be included in further analyses of the structural model.

Table 4.10

Summary of the item analysis results

Scale	Mean of the final scale	Standard deviation of the final scale	Cronbach's alpha of the final scale	Number of items deleted	Number of items retained in the scale
Conscientiousness	38.065	12.209	.897	1	11
Academic self-efficacy	47.663	7.801	.881	0	9
Learning motivation	32.878	5.892	.855	0	6
Meta-cognitive knowledge	72.684	13.297	.886	0	17
Meta-cognitive regulation	134.119	27.851	.935	0	35
Learning goal-orientation	45.281	6.700	.834	0	8
Time cognitively engaged	32.388	5.449	.670	3	6
Internal locus of control	36.622	5.010	.438	1	7

4.5   DIMENSIONALITY ANALYSIS

Specific design intentions guided the construction of the various scales used to operationalise the latent variables in the structural model (Figure 3.1) being tested in this study. The items comprising the scales and subscales were designed to operate as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific unidimensional underlying latent variable. Unrestricted principal axis factor analyses with oblique rotation were performed on the various scales and subscales. The objective of the analyses was to evaluate this assumption and to evaluate the success with which each item, along with the rest of the items in the particular subscale, measures the specific latent variable it was designed to reflect. The items that were deleted in the preceding item analyses were not included in the factor analyses. The decision on how many factors are required to adequately explain the observed correlation matrix was based on the eigenvalue-greater-than-one rule and on the scree test (Tabachnick & Fidell, 2001). Factor loadings of items on the factor they were designated to reflect will be considered satisfactory if they are greater than .50. The adequacy of the extracted solution as an explanation of the observed inter-item correlation matrix was evaluated by calculating the percentage large (> .05) residual correlations.

4.5.1. Dimensionality analysis: Conscientiousness scale

Item Cons3 was found to be a poor item in the item analysis and was therefore not included in the dimensionality analysis of the *conscientiousness* scale.

The correlation matrix indicated that the matrix was factor analysable as all the correlations were bigger than .30 and all were significant ($p < .05$). A KMO value of .896 was obtained providing sufficient evidence that the *conscientiousness* scale was factor analyzable (> .60). The Bartlett's Test of Sphericity indicated that H_0 could be rejected ($p < .05$) providing further support that the matrix was factor analysable.

The eigenvalue-greater-than-one rule and the scree plot suggested the extraction of two factors. The pattern matrix is depicted in Table 4.11. However, the *conscientiousness* latent variable was conceptualised as a unidimensional construct in this study as well as that the two factor solution is in conflict with the original design intention of the measure.

Table 4.11

Rotated factor structure for the conscientiousness scale

	Factor	
	1	2
Cons8	.735	-.532
Cons9	.709	-.381
Cons5	.694	-.297
Cons1	.688	-.468
Cons6	.678	-.421
Cons2	.645	-.405
Cons4	.601	-.262
Cons10	.474	-.939
Cons12	.473	-.913
Cons11	.525	-.874
Cons7	.525	-.842

7 items appeared to load onto the first factor and 4 items onto the second factor, although there is also the presence of three double loading items. The four items loading on the second factor all appeared to refer to the planning and scheduling of time and use of a timetable. The items loading on the first factor seem to reflect a more general *conscientiousness* theme. Although not originally part of the conceptualisation of the latent variable, the factor fission obtained on this scale nonetheless makes some theoretical sense.

However, in the proposed structural model *conscientiousness* was treated as a single, undifferentiated latent variable. In order to determine how well the items of the *conscientiousness* scale reflect a single underlying latent variable the analysis was re-run, by forcing the extraction of a single factor. The resultant single-factor factor structure is shown in Table 4.12. Table 4.12 indicates item Cons4 with a loading lower than .50. Cons4 was therefore deleted and the dimensionality analysis was subsequently re-run. All remaining items displayed loadings greater .50.

The residuals correlations were computed for both the 2-factor and the 1-factor solution. For the 2-factor solution only 7 (15%) of non-redundant residuals had absolute values greater than .05 thus suggesting that the rotated factor solution provides a very credible explanation for the observed inter-item correlation

matter. The 1-factor solution, however, failed to provide a credible explanation in that 43 (95%) of the residual correlations were greater than .05.

Table 4.12

Factor matrix when forcing the extraction of a single factor (Conscientiousness)

	Factor
	1
Cons11	.789
Cons10	.778
Cons7	.774
Cons12	.767
Cons8	.724
Cons1	.659
Cons6	.623
Cons9	.610
Cons2	.597
Cons5	.548
Cons4	.482

4.5.2. Dimensionality analysis: Academic self-efficacy scale

The correlation matrix showed that all correlations were larger than .30 and all were significant ($p < .05$). The scale obtained a KMO of .899 and the Bartlett's Test of Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

One factor was extracted, since only one factor obtained an eigenvalue greater than 1. The scree plot also suggested that a single factor should be extracted. The resultant factor structure is shown in Table 4.13.

Table 4.13

Rotated factor structure for the academic self-efficacy scale

	Factor
	1
Self6	.797
Self3	.731
Self5	.723
Self1	.703
Self4	.686
Self7	.628
Self2	.620
Self8	.614
Self9	.583

The factor matrix indicated that all the items loaded on one factor satisfactorily as all factor loadings were larger than .50. 36.0% of the non-redundant residuals obtained absolute values greater than .05. The credibility of the extracted factor solution was therefore somewhat tenuous.

4.5.3. Dimensionality analysis: Learning motivation scale

The correlation matrix showed that all correlations were larger than .30 and all were significant ($p < .05$). The scale obtained a KMO of .858 and the Bartlett's Test of Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

One factor was extracted, since only one factor obtained an eigenvalue greater than 1. The scree plot also suggested that a single factor should be extracted. The factor matrix indicated that all the items loaded on one factor satisfactorily as all factor loadings were larger than .50. The resultant factor structure is shown in Table 4.14.

Table 4.14

Rotated factor structure for the learning motivation scale

	Factor
	1
LMot4	.808
LMot3	.760
LMot5	.738
LMot6	.652
LMot2	.636
LMot1	.634

36.0% of the non-redundant residuals obtained absolute values greater than .05. The credibility of the extracted factor solution was therefore somewhat tenuous.

4.5.4 Dimensionality analysis: Meta-cognition scale

The Meta-cognitive Awareness Inventory (MAI) as developed by Schraw and Dennison (1994) was utilised in this study. The MAI comprises of fifty-two items that are divided into two scales. These two scales represent the two components of *meta-cognition*, namely *meta-cognitive knowledge* and *meta-cognitive regulation*. The operationalisation *of meta-cognition* of the MAI thus corresponds to the constitutive definition of the construct as used in this study. Therefore, separate dimensionality analyses were performed on the *meta-cognitive knowledge* scale and *meta-cognitive regulation* scale.

4.5.4.1 Dimensionality analysis: Meta-cognitive knowledge

The correlation matrix showed that all correlations were significant (p < .05), however it was flagged that not all correlation were larger than .30. The scale obtained a KMO of .900 and the Bartlett's Test of Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

The eigenvalue-greater-than-one rule suggested the extraction of three factors. The pattern matrix is depicted in Table 4.15.

Table 4.15

Rotated factor structure for the meta-cognitive knowledge scale

	Factor		
	1	2	3
MKnow16	.723	.290	-.397
MKnow12	.716	.359	-.494
MKnow15	.671	.283	-.421
MKnow5	.665	.357	-.512
MKnow11	.591	.341	-.372
MKnow3	.562	.481	-.526
MKnow10	.551	.374	-.523
MKnow14	.539	.510	-.534
MKnow9	.537	.194	-.340
MKnow4	.493	.360	-.393
MKnow7	.458	.453	-.423
MKnow17	.216	.750	-.248
MKnow6	.343	.578	-.259
MKnow2	.403	.307	-.757
MKnow13	.546	.324	-.707
MKnow8	.452	.216	-.497
MKnow1	.395	.381	-.397

The study conceptualised meta-cognitive knowledge as a uni-dimensional construct, however acknowledges that it comprises three distinct areas of knowledge namely, (a) declarative knowledge, (b) procedural knowledge, and (c) conditional knowledge (Sperling, Howard & Staley, 2004; Schraw, 1998; Schraw & Dennison, 1994). Therefore the extraction of three factors did not seem implausible. However, upon inspection of the factor loadings it was noted that the manner in which the items loaded onto the three factors did not correspond with declarative knowledge, procedural knowledge, and conditional knowledge according to the scoring key of the MAI.

The proposed structural model conceptualised *meta-cognitive knowledge* as a single latent variable and supported by the fact that the rotated structure matrix, as illustrated in Table 4.15, did not reveal a meaningful interpretation of the extracted three factors, the analysis was re-run, by forcing the extraction of a single factor. The resultant single-factor factor structure is shown in Table 4.16.

Table 4.16
Factor matrix when forcing the extraction of a single factor (Meta-cognitive knowledge)

	Factor
	1
MKnow12	.690
MKnow5	.667
MKnow16	.638
MKnow3	.636
MKnow13	.634
MKnow14	.629
MKnow15	.618
MKnow10	.604
MKnow11	.570
MKnow2	.541
MKnow7	.530
MKnow4	.523
MKnow8	.493
MKnow9	.489
MKnow1	.465
MKnow6	.422
MKnow17	.361

Table 4.16 indicates five items with loadings lower than .50. The deletion of items MKnow17, MKnow6, MKnow1, and MKnow9 sufficed in ensuring all items had loadings greater than .50. MKnow8 was therefore retained in the scale. The item analysis was subsequently re-run on the remaining items to determine the reliability of the scale. The analyses reported a Cronbach's alpha of .878 and all item statistics were satisfactory.

Furthermore supporting the one factor structure, only 23 (29%) of the reproduced correlations were larger than .05 suggesting that the rotated factor solution provides a credible explanation for the observed inter-item correlation matrix. The unidimensionality assumption was thus corroborated.

4.5.4.2 Dimensionality analysis: Meta-cognitive regulation

The correlation matrix showed that all correlations were significant ($p < .05$), however, it was flagged that not all correlation were larger than .30. The scale obtained a KMO of .918 and the Bartlett's Test of

Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

The eigenvalue-greater-than-one rule suggested the extraction of eight factors. The study conceptualised *meta-regulation regulation* as a uni-dimensional construct, however acknowledges that a number of regulatory skills are described in the literature. Schraw and Dennison (1994) based the MAI on five regulatory skills namely (a) planning, (b) information management, (c) monitoring, (d) debugging and (e) evaluation. In this later work Schraw (1998) began referring only to three regulatory skills namely, (a) planning, (b) monitoring, and (c) evaluating.

The extraction of eight factors did therefore not correspond to the design intention of the measure or to the conceptualistion of the construct of *meta-cognitive regulation* as according to this study. No theoretically meaningful structure could be made out of the factor loadings of the eight factor structure. The scree plot however seemingly suggested the extraction of only one factor. The pattern matrix is depicted in Table 4.17.

The proposed structural model conceptualised *meta-cognitive regulation* as a single latent variable and supported by the fact that the rotated structure matrix, as illustrated in Table 4.17, did not reveal a meaningful interpretation of the extracted eight factors, the analysis was re-run, by forcing the extraction of a single factor. The resultant single-factor factor structure is shown in Table 4.18.

Table 4.17

Rotated factor structure for the meta-cognitive regulation scale

| | Factor | | | | | | | |
	1	2	3	4	5	6	7	8
MCog26	.733	.300	-.355	-.282	-.258	.079	-.317	-.164
MCog27	.623	.256	-.370	-.321	-.419	.384	-.298	-.465
MCog28	.538	.134	-.326	-.378	-.361	.433	-.294	-.375
MCog35	.516	.139	-.437	-.271	-.322	.291	-.356	-.190
MCog34	.510	.163	-.484	-.300	-.440	.480	-.406	-.221
MCog11	.219	.619	-.435	-.382	-.417	.331	-.514	-.125
MCog29	.370	.608	-.434	-.328	-.402	.319	-.336	-.287
MCog12	.263	.601	-.345	-.290	-.397	.258	-.397	-.322
MCog14	.282	.560	-.291	-.160	-.384	.259	-.271	-.193
MCog3	.228	.340	-.662	-.359	-.252	.228	-.378	-.176
MCog6	.321	.425	-.606	-.486	-.452	-.004	-.328	-.175
MCog4	.372	.181	-.579	-.166	-.314	.300	-.315	-.278
MCog17	.562	.250	-.576	-.357	-.536	.459	-.408	-.359
MCog9	.491	.154	-.569	-.265	-.326	.360	-.293	-.166
MCog7	.246	.166	-.554	-.194	-.277	.113	-.295	-.171
MCog5	.246	.175	-.501	-.229	-.310	.282	-.153	-.255
MCog2	.328	.100	-.391	-.809	-.321	.365	-.282	-.257
MCog13	.410	.362	-.255	-.668	-.282	.355	-.247	-.353
MCog8	.416	.276	-.490	-.576	-.326	.333	-.196	-.369
MCog1	.203	.243	-.371	-.537	-.449	.173	-.331	-.067
MCog33	.265	.233	-.265	-.171	-.728	.326	-.137	-.279
MCog32	.238	.353	-.406	-.286	-.726	.297	-.457	-.335
MCog20	.293	.448	-.390	-.439	-.674	.309	-.331	-.248
MCog16	.264	.475	-.442	-.378	-.516	.275	-.493	-.331
MCog19	.245	.298	-.418	-.303	-.374	.603	-.289	-.321
MCog25	.380	.300	-.384	-.281	-.364	.472	-.295	-.403
MCog10	.136	.215	-.165	-.238	-.287	.468	-.185	-.239
MCog15	.353	.282	-.330	-.237	-.229	.219	-.693	-.192
MCog30	.313	.337	-.358	-.179	-.457	.332	-.494	-.410
MCog23	.325	.130	-.329	-.310	-.310	.359	-.233	-.633
MCog22	.267	.463	-.268	-.467	-.383	.372	-.120	-.581
MCog18	.390	.151	-.420	-.294	-.365	.370	-.361	-.512
MCog24	.399	.219	-.426	-.432	-.445	.435	-.399	-.512
MCog21	.093	.438	-.222	-.045	-.299	.188	-.254	-.471
MCog31	.205	.150	-.370	-.191	-.425	.376	-.456	-.459

Table 4.18

Factor matrix when forcing the extraction of a single factor (Meta-cognitive regulation)

	Factor
	1
MCog17	.720
MCog24	.658
MCog16	.643
MCog20	.640
MCog27	.631
MCog32	.626
MCog29	.620
MCog8	.612
MCog34	.610
MCog11	.602
MCog6	.586
MCog13	.580
MCog25	.576
MCog18	.576
MCog22	.573
MCog30	.572
MCog2	.571
MCog28	.570
MCog12	.570
MCog19	.563
MCog9	.543
MCog3	.539
MCog31	.520
MCog23	.519
MCog35	.519
MCog4	.516
MCog26	.505
MCog15	.492
MCog1	.492
MCog33	.486
MCog14	.478
MCog5	.448
MCog7	.425
MCog21	.387
MCog10	.374

Table 4.18 indicates eight items with loadings lower than .50. The deletion of items MCog10, MCog21, MCog7, MCog5, MCog14, MCog33, and MCog1 sufficed in ensuring all items had loadings greater than .50. MCog15 was therefore retained in the scale. The item analysis was subsequently re-run on the remaining items to determine the reliability of the scale. The analyses reported a Cronbach's alpha of .934 and all item statistics were satisfactory.

39.0% of the non-redundant residuals obtained absolute values greater than .05. The credibility of the extracted factor solution was therefore somewhat tenuous.

4.5.5 Dimensionality analysis: Goal-orientation scale

The current study utilised a measure developed by Button et al. (1996) to measure the *goal-orientation* construct. The measure comprises of 16 items that are divided into two scales. These two scales represent the two components of *goal-orientation*, namely *learning goal-orientation* and *performance goal-orientation*. The operationalisation *of goal-orientation* of this measure thus corresponds to the constitutive definition of the construct as used in this study. As this study is only formally pursuing the relationship between *learning goal-orientation* (and not *performance goal-orientation*) and learning performance, dimensionaity analysis was only performance on the items comprising *learning goal-orientation*.

4.5.5.1 Dimensionality analysis: Learning goal-orientation scale

The correlation matrix showed that all correlations were larger than .30 and all were significant (p < .05). The scale obtained a KMO of .864 and the Bartlett's Test of Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

One factor was extracted, since only one factor obtained an eigenvalue greater than 1. The scree plot also suggested that a single factor should be extracted. The factor matrix indicated that all the items loaded on one factor satisfactorily as all factor loadings were larger than .50. The resultant factor structure is shown in Table 4.19.

Table 4.19

Rotated factor structure for the learning goal-orientation scale

	Factor 1
LGoal11	.746
LGoal10	.689
LGoal12	.685
LGoa9	.638
LGoal15	.608
LGoal16	.579
LGoal14	.553
LGoal13	.537

39.0% of the non-redundant residuals obtained absolute values greater than .05. The credibility of the extracted factor solution was therefore somewhat tenuous.

4.5.6 Dimensionality analysis: Time cognitively engaged scale

Items Time3, Time4, and Time5 were found to be poor items in the item analysis and was therefore not included in the dimensionality analysis of the *time cognitively engaged* scale.

The correlation matrix showed that most correlations were larger than .30 and all were significant ($p < .05$). The scale obtained a KMO of .743 and the Bartlett's Test of Sphericity allowed for the null hypothesis to be rejected, thus there was strong evidence that the correlation matrix was factor analysable.

One factor was extracted, since only one factor obtained an eigenvalue greater than 1. The scree plot also suggested that a single factor should be extracted. The factor matrix indicated that all the items except for Time6 loaded on one factor satisfactorily (> .50). The resultant factor structure is shown in Table 4.20.

Table 4.20

Rotated factor structure for the time cognitively engaged scale

	Factor 1
Time7	.573
Time8	.563
Time1	.540
Time9	.525
Time2	.485
Time6	.399

Due to the unsatisfactory factor loading of the item, Time6 was removed from the scale. After the removal of Time6, the analysis was re-run and all further items reported satisfactory loadings in the one factor structure (> 0.5). The item analysis was subsequently re-run on the remaining items to determine the reliability of the scale. The analyses reported a Cronbach's alpha of .661 and all item statistics were satisfactory.

However, 40.0% of the non-redundant residuals obtained absolute values greater than .05. The credibility of the extracted factor solution was therefore somewhat doubtful.

4.5.7 Dimensionality analysis: Locus of control scale

The current study used the Internality, Powerful others, and Chance Scales developed by Levenson and Miller (1976) to operationalise the *locus of control construct*. In this measuring instrument locus of control is assumed to consist of two components, viz: (a) *internal locus of control*, and (b) *external locus of control*.

The operationalisation of *locus of control* of this measure thus corresponds to the constitutive definition of the construct as used in this study. As this study is only formally pursuing the relationship between *internal locus of control* (and not external *locus of control*) and learning performance, dimensionaity analysis was only performance on the items comprising *internal locus of control*.

4.5.7.1 Dimensionality analysis: Internal locus of control scale

Item ILocus2 was found to be a poor item in the item analysis and was therefore not included in the dimensionality analysis of the *internal locus of control* scale.

The scale obtained a KMO of .613. The correlation matrix showed that none of the correlations were significant (p > .05). ILocus5 removed at this point as the MSA lower than .6. The dimensionality analysis was re-run to test if it could salvage the situation. The scale obtained a KMO of .627. The correlation matrix still showed that none of the correlations were significant (p > .05). This seriously brings the meaningfulness of performing exploratory factor analysis in to question. It moreover, reinforces the concerns raised by the item analysis.

Both the eigenvalue-greater-than-one rule and the scree plot suggested the extraction of two factors. One item loaded strongly (> .5) onto the first factor however no items loaded strongly onto the second factor. In other words, only one item (ILocus8) reported a significant item loading (> .5) and this would compel the need for all other items to be deleted from the scale effectively reducing the scale to one item. The pattern matrix is depicted in Table 4.21.

The basket of evidence provided by the item analysis and the dimensionality analysis of the internal locus of control scale suggested that the scale cannot be used to represent the internal locus of control latent variable when testing the fit of the structural model depicted in Figure 3.1.

Table 4.21

Rotated factor structure for the internal locus of control scale

	Factor	
	1	2
ILocus8	.588	-.359
ILocus6	.453	.034
ILocus3	.386	.348
ILocus7	.327	-.067
ILocus1	.262	.104
ILocus4	.246	.227

4.6   CONCLUSIONS DERIVED FROM THE ITEM- AND DIMENSIONALITY ANALYSIS

The item analyses revealed that six scales achieved alpha values exceeding the desired threshold of .80 thus indicating sufficient internal consistency on those scales. The *time cognitively engaged* scale, however, revealed an only marginally acceptable internal consistency. *Internal locus of control* revealed an unacceptably low internal consistency and was therefore not included in any further model analyses. At a more detailed level, the item statistics revealed that there were some poor items which were flagged and after gaining a basket of evidence incriminating these items, five items were deleted across the eight scales.

With regard to the dimensionality analyses, four of the scales passed the unidimensionality assumption as was originally hypothesised and five did not. In all instances the items were successfully forced onto a single factor solution. Thirteen items were deleted because of an inadequate loading on the extracted single factor.

4.7   ITEM PARCELING

The choice to utilise item parcelling was described in section 3.9.3. Only the items that remained in the scale after the item and dimensionality analyses were used in the calculation of indicator variables to represent each of the latent variables in the structural model.

4.8   DATA SCREENING PRIOR TO CONFIRMATORY FACTOR ANALYSIS AND THE FITTING OF THE STRUCTURAL MODEL

Multivariate statistics in general and structural equation modelling in particular are based on a number of critical assumptions. Before proceeding with the main analyses it was necessary to assess the extent to which the data complies with these assumptions (Tabachnick & Fidell, 2007). Failure of the data to satisfy

these assumptions can seriously erode the quality of obtained solutions. The effect of non-normality in particular was considered. The default method of estimation when fitting measurement and structural models to continuous data (maximum likelihood) assumes that the distribution of indicator variables follow a multivariate normal distribution (Mels, 2003). Failure to satisfy this assumption results in incorrect standard errors and chi-square estimates (Du Toit & Du Toit, 2001; Mels, 2003).

The univariate and multivariate normality of the composite item parcels in this study was evaluated via PRELIS. The univariate tests examine each variable individually for departures from normality. This is done by examining whether the standardised coefficients of skewness and kurtosis are significantly different from zero. Departures from normality are indicated by significant skewness and/or kurtosis values. Multivariate normality test are performed in order to corroborate the univariate findings. If any of the observed variables deviate substantially from univariate normality, then the multivariate distribution cannot be normal. However, the converse is not true: if all the univariate distributions are normal, it does not necessarily mean multivariate normality. Consequently, it is also important to examine multivariate values of skewness and kurtosis and not solely investigate univariate normality.

The indicator variables were firstly evaluated in terms of their univariate and multivariate normality before a normalisation procedure had been undertaken. Thereafter, the data was normalised through PRELIS after which the indicator variables were again evaluated in terms of their univariate and multivariate normality.

The results of the tests of univariate and multivariate normality of the learning potential indicator variable distributions are depicted in Tables 4.22 and 4.23.

4.8.1 Results before normalisation

Table 4.22

Test of univariate normality before normalisation

	Skewness		Kurtosis		Skewness and Kurtosis	
Variable	**Z-Score**	**P-Value**	**Z-Score**	**P-Value**	**Chi-Square**	**P-Value**
ENGLISH1	3.960	.000	.540	.589	15.976	.000
AFRIKAANS	-.541	.588	-1.631	.103	2.954	.228
PGOAL1	-5.920	.000	1.301	.193	36.735	.000
PGOAL2	-7.224	.000	3.591	.000	65.085	.000
LGOAL1	-4.791	.000	1.552	.121	25.364	.000
LGOAL2	-5.828	.000	2.758	.006	41.566	.000
SE1	-4.480	.000	2.048	.041	24.268	.000
SE2	-4.994	.000	3.320	.001	35.964	.000
CO1	-.632	.527	-2.100	.036	4.811	.090
CO2	.117	.907	-3.614	.000	13.072	.001
LM1	-4.064	.000	-.277	.782	16.594	.000
LM2	-4.760	.000	.788	.430	23.277	.000
TIME1	-6.288	.000	3.613	.000	52.596	.000
TIME2	-6.162	.000	2.402	.016	43.732	.000
MK1	-4.030	.000	2.271	.023	21.400	.000
MK2	-4.543	.000	3.125	.002	3.401	.000
MR1	-4.035	.000	3.599	.000	29.232	.000
MR2	-4.267	.000	3.757	.000	32.321	.000

Table 4.23

Test of multivariate normality before normalisation

	Skewness			Kurtosis		Skewness and Kurtosis	
Values	**Z-Score**	**P-Value**	**Values**	**Z-Score**	**P-Value**	**Chi-Square**	**P-Value**
45.516	20.536	.000	427.494	13.252	.000	597.371	.000

The chi-square value for skewness and kurtosis indicates that 16 of the 18 indicator variables failed the test of univariate normality ($p < .05$). Furthermore, the null hypothesis that the data follows a multivariate normal distribution also had to be rejected ($\chi^2 = 597.371$; $p < .05$). Since the quality of the solution obtained in structural equation modelling is to a large extent dependent on multivariate normality, it was decided to normalise the variables through PRELIS. The results of the test for univariate normality on the normalised indicator variables are presented in Table 4.24 and the results of the test for multivariate normality in Table 4.25.

4.8.2 Results after normalisation

Table 4.24

Test of univariate normality after normalisation

Variable	Skewness		Kurtosis		Skewness and Kurtosis	
	Z-Score	P-Value	Z-Score	P-Value	Chi-Square	P-Value
ENGLISH1	.010	.992	.071	.943	.005	.997
AFRIKAANS	-.007	.994	.061	.951	.004	.998
PGOAL1	-1.552	.121	-2.281	.023	7.614	.022
PGOAL2	-1.867	.062	-2.394	.017	9.213	.010
LGOAL1	-.321	.748	-.445	.656	.301	.860
LGOAL2	-.689	.491	-1.064	.287	1.607	.448
SE1	-.128	.898	-.143	.886	.037	.982
SE2	-.203	.839	-.247	.805	.102	.950
CO1	-.027	.979	.011	.991	.001	1.000
CO2	.011	.991	-.096	.924	.009	.995
LM1	-.496	.620	-1.241	.215	1.785	.410
LM2	-.791	.429	-1.241	.214	2.167	.338
TIME1	-.539	.590	-.758	.449	.864	.649
TIME2	-.934	.350	-1.427	.154	2.909	.234
MK1	-.065	.949	-.017	.987	.004	.998
MK2	-.062	.951	-.020	.984	.004	.998
MR1	-.023	.982	.026	.979	.001	.999
MR2	-.004	.996	.076	.939	.006	.997

Table 4.25

Test of multivariate normality after normalisation

	Skewness			Kurtosis		Skewness and Kurtosis	
Values	Z-Score	P-Value	Values	Z-Score	P-Value	Chi-Square	P-Value
32.410	10.674	.000	401.905	9.894	.000	211.839	.000

The results indicate that the normalisation procedure succeeded in rectifying the univariate normality problem on the indicator variables and that all the individual variables are displaying a univariate normal distribution. The results indicate that even after a normalisation procedure, the null hypothesis that the data follows a multivariate normal distribution still had to be rejected (χ^2 = ; p < 0,05). In conclusion, even though the normalisation procedure has resulted in the variables displaying univariate normality, there is still not evidence of multivariate normality after the normalisation procedure. The normalisation procedure did, however, succeeded in reducing the deviation of the observed indicator distribution from the theoretical multivariate normal distribution as is evidenced by the decrease in the chi-square statistic.

Maximum likelihood is the default method when fitting measurement models to continuous data but requires a multivariate normal distribution. Since normalisation did not have the desired effect and the data still did not meet the multivariate normality assumption even after a normalisation procedure, the use

of an alternative method more suited to the data was considered. The robust maximum likelihood estimation technique was therefore used for the evaluation of the measurement model as that is the suggested technique for fitting measurement models of continuous data not fulfilling the multivariate normality assumption. Since the normalisation had the effect of reducing the deviation of the observed indicator distribution from the theoretical multivariate normal distribution the normalisaed data set was used in the subsequent analyses.

4.9   EVALUATING THE FIT OF THE MEASUREMENT MODEL

The measurement model represents the relationship between the *learning potential* latent variables and their corresponding indicator variables. The fit of the estimated *learning potential* measurement model is discussed next. A decision is made on the credibility of the measurement model parameter estimates and the parameters estimates of the fitted model are finally discussed. A visual representation of the fitted measurement model is provided in Figure 4.1 and the overall fit statistics are presented in Table 4.26.
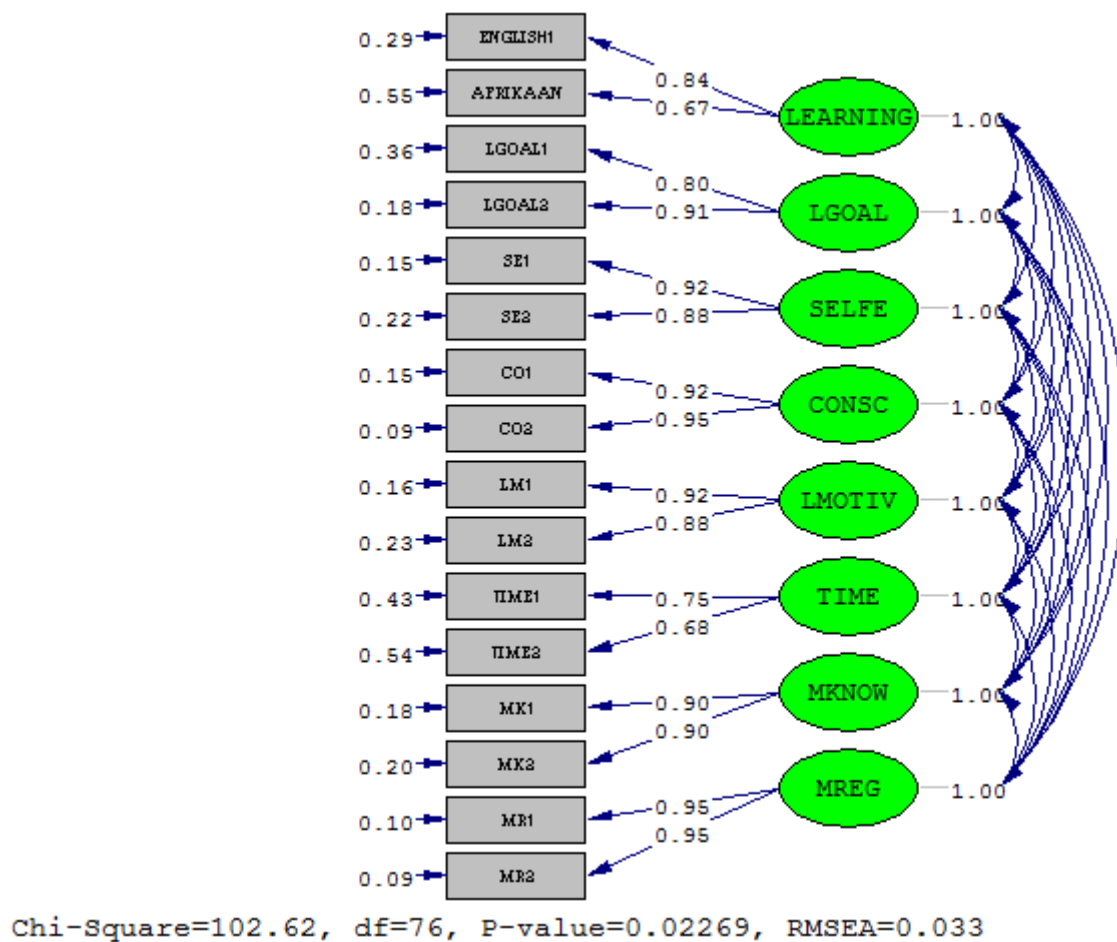
Figure 4.1. Representation of the fitted learning potential measurement model (completely standardised solution)

The results of the analysis will be discussed below in terms of:

   a) an evaluation of overall model fit, based on the array of model fit indices as reported by LISREL;

   b) an interpretation of the measurement model;

   c) the standardised residuals; and

   d) the modification indices

4.9.1   Assessing the overall goodness-of-fit of the measurement model

According to Diamantopoulos and Siguaw (2008), the purpose of assessing a model's overall fit is to determine the degree to which the model as a whole is consistent with the empirical data at hand. Diamantopoulos and Siguaw also state that a wide range of goodness-of-fit indices have been developed that can be used as summary measures of a model's overall fit. They then however continue to caution that none of the indices is unequivocally superior to the rest in all circumstances, and that particular indices have been shown to operate somewhat differently under various conditions. They claim that sample size, estimation procedure, model complexity, degree of multivariate normality and variable independence, or any combination thereof, may influence the statistical power of the given indices. Given this controversy, below will follow a brief description of each index, followed by an interpretation of the reported value for the given data. The results of the full range of fit indices (both comparative and absolute) are reported in Table 4.26.

The chi-square statistic (χ^2) is the traditional measure for evaluating overall model fit in covariance structure models and provides a test of perfect fit for the hypothesis of exact model fit ($H_{01} : \Sigma = \Sigma(\Theta)$ (or RMSEA = 0)). The χ^2 test statistic tests the null hypothesis that the model fits the population data perfectly. A statistically significant chi-square causes the rejection of the null hypothesis implying imperfect model fit and possible rejection of the model. Although the chi-square seems an attractive measure of the model's fit, caution needs to be exercised as it is sensitive to departures from multivariate normality, sample size, and also assumes that the model fits perfectly in the population. For these reasons it has been suggested that it should be regarded as a goodness (or badness)-of-fit measure in the sense that large χ^2 values correspond to bad fit and small χ^2 values to good fit. The degrees of freedom serve as a standard by which to judge whether χ^2 is large or small. A well-fitting model would ideally be indicated by a chi—square value that approximate the degrees of freedom. In practice, χ^2 / df ratios between 2 and 5 seem to be regarded as indicative of good fit. Table 4.29 indicates that this model achieved a Satorra-Bentler Scaled Chi-Square value of 102.62 with 76 degrees of freedom. The evaluation of the fit on the basis on the normed chi-square statistics χ^2 / df (102.62 / 76 = 1.35) for the measurement model suggest that the model fits the data well. Ratios less than 2 have, however, been interpreted as indicating over-fitting. Judged by these standards the model could, when viewed optimistically, be seen to fit the data well, or when viewed

somewhat pessimistically, be seen to have over-fitted. Kelloway (1998), however, comments that the guidelines indicative of good fit (ratios between 2 and 5) have very little justification other than the researcher's personal modeling experience, and does not advise a strong reliance on the normed chi-square.

Table 4.26

Goodness of fit statistics for the learning potential measurement model

Degrees of Freedom = 76
Minimum Fit Function Chi-Square = 109.74 (P = .0069)
Normal Theory Weighted Least Squares Chi-Square = 114.45 (P = .0029)
Satorra-Bentler Scaled Chi-Square = 102.62 (P = .023)
Chi-Square Corrected for Non-Normality = 128.48 (P = .00016)
Estimated Non-centrality Parameter (NCP) = 26.62
90 Percent Confidence Interval for NCP = (4.14 ; 57.16)
Minimum Fit Function Value = .35
Population Discrepancy Function Value (F0) = .085
90 Percent Confidence Interval for F0 = (.013 ; .18)
Root Mean Square Error of Approximation (RMSEA) = .033
90 Percent Confidence Interval for RMSEA = (.013 ; .049)
P-Value for Test of Close Fit (RMSEA < .05) = .96
Expected Cross-Validation Index (ECVI) = .71
90 Percent Confidence Interval for ECVI = (.64 ; .81)
ECVI for Saturated Model = .87
ECVI for Independence Model = 23.10
Chi-Square for Independence Model with 120 Degrees of Freedom = 7221.87
Independence AIC = 7253.87
Model AIC = 222.62
Saturated AIC = 272.00
Independence CAIC = 7329.91
Model CAIC = 507.77
Saturated CAIC = 918.35
Normed Fit Index (NFI) = .99
Non-Normed Fit Index (NNFI) = .99
Parsimony Normed Fit Index (PNFI) = .62
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00
Relative Fit Index (RFI) = .98
Critical N (CN) = 330.20
Root Mean Square Residual (RMR) = .21
Standardized RMR = .022
Goodness of Fit Index (GFI) = .96
Adjusted Goodness of Fit Index (AGFI) = .92
Parsimony Goodness of Fit Index (PGFI) = .53

The p-value associated with the χ^2 (p=.023) indicates a significant test statistic (p<.05). This suggests that there is a significant discrepancy between the covariance matric implied by the measurement model and the observed covariance matrix, thus rejecting the exact fit hypothesis (Kelloway, 1998). The measurement model is, therefore not able to reproduce the observed covariance matrix to a degree of accuracy in the sample that can be explained by sampling error only. The discrepancy between the observed and

reproduced covariances matrices in the sample would therefore have unlikely arisen by chance if the exact fit null hypothesis is true in the population.

As stated above, the assumption of the chi-square that the model fits the population perfectly is highly unlikely and thus the rejection of the null hypothesis of exact model fit is not surprising. Therefore, it is rather sensible to assess the degree of lack of fit of the model. That is the function of the non-centrality parameter (NCP*).* NCP will rather test the following hypothesis that the model fit is not perfect. An estimate of λ is obtained by subtracting the degrees of freedom from the chi-square statistic. The larger the λ, the farther apart is the true alternative hypothesis from the null hypothesis. The NCP of 26.62 was obtained with a 90 percent confidence interval of (4.14 ; 57.16).

The (Root Mean Square Error of Approximation) RMSEA is generally regarded as one of the most informative fit indices. The RMSEA shows how well the model, with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available. A test of the significance of the obtained value is performed by LISREL by testing H_{02} : RMSEA ≤ .05 against H_a2 : RMSEA > .05. The RMSEA value for the sample is .033 with a confidence interval of (.013 ; .049). It has been suggested by Theron (2010) and Diamantopoulos and Siguaw (2008) that RMSEA values less than .05 are indicative of good fit, RMSEA values greater than .05 but less than .08 of reasonable fit, RMSEA values greater than .08 but less than .10 of mediocre fit and RMSEA values greater than .10 are indicative of poor fit. According to these criteria, the model RMSEA value of .033 suggests good model fit. Since the 90 percent confidence interval for RMSEA (.013 ; .049) falls below the target value of .05, it seems further evidence of the good fit of the model. LISREL also explicitly tests the null hypothesis of close fit. Table 4.29 indicates that the null hypothesis of close model fit (H_{02}: RMSEA ≤ .05) is not rejected at a 5% significance level (p > .05).

The Expected Cross-Validation Index (ECVI) focuses on overall error. The ECVI measures the discrepancy between the fitted covariance matrix in the analysed sample, and the expected covariance matrix that would be obtained in another sample of equivalent size. It, therefore, focuses on the difference between Σ and Σ(θ). To assess the model's ECVI, it must be compared to the independence model and the saturated model. The model ECVI (.71) is smaller than the value obtained for the independence model (23.10). The model ECVI (.71) is also smaller than the saturated model (.87). Therefore, a model more closely resembling the fitted model seems to have a better chance of being replicated in a cross-validation sample than the saturated or independence models.

Akaike's Information Criterion (AIC) and the consistent version of AIC (CAIC) comprises what are known as information criteria and are used to compare models. Information criteria attempt to incorporate the issue of model parsimony in the assessment of model fit by taking the number of estimated parameters into

account. The Akaike's Information Criterion (AIC) and the consistent version of AIC (CAIC) for two such information criteria. As with the EVCI, the AIC and CAIC must be compared to the independence model and the saturated model. The model AIC (222.62) achieved a value lower than both the independence model (7253.87) and the saturated model (272.00). Similarly, the CAIC (507.77) also achieved a value lower than both the independence model (7329.91) and the saturated model (918.35). Therefore, a model more closely fitted the saturated model seems to have a better chance of being replicated in a cross-validation sample than the independence model and the saturated model.

The Standardised Root Mean Residual (SRMR) is the standardised square root of the mean of the squared residuals, in other words, an average of the residuals between individual observed and estimated covariance and variance terms. Lower SRMR values represent better fit and higher values represent worse fit. Values smaller than .05 are indicative of acceptable fit. The model produced a SRMR of .022. As this is significantly lower than .05, it is indicative of good model fit.

The Goodness-of-Fit Index (GFI) is an indicator of the relevant amount of variance and covariance accounted for by the model and this shows how closely the model comes to perfectly reproducing the observed covariance matrix. The Adjusted Goodness-of-Fit Index (AGFI) is GFI adjusted for the degrees of freedom in the model. Values of GFI and AGFI range between 0 and 1. GFI and AGFI values greater than .90 are indicative of acceptable fit. The model achieved a GFI of .96 and an AGFI of .92 both indicative of good model fit.

The assessment of parsimonious fit acknowledges that model fit can always be improved by adding more paths to the model and estimating more parameters until perfect fit is achieved in the form of a saturated or just-identified model with no degrees of freedom (Kelloway, 1998). The parsimonious normed fit index (PNFI = .62) and the parsimonious goodness-of-fit index (PGFI = .53) approach model fit from this perspective. PNFI and PGFI range from 0 to 1, but do not have a recommendation on how high these values should be to achieve parsimonious fit. It has however been suggested that neither index is likely to reach the .90 cut-off used for other fit indices. According to Kelloway (1998) and Hair, Black, Babin, Anderson, and Tatham (2006) these indices are more meaningfully used when comparing two competing theoretical models and are not very useful indicators in this CFA analysis. For this reason emphasis will not be placed on the relatively low values achieved on these indices when evaluating model fit in this study.

The following set of fit indices contrast how much better the given model fits reproduce the observed covariance matrix than a baseline model which is usually an independence or null model. The fit indices presented include the normed fit index (NFI= .99), the non-normed fit index (NNFI= .99), the comparative fit index (CFI= 1), the incremental fit index (IFI=1) and the relative fit index (RFI =.98). All indices in this

group have a range between 0 and 1 (except the NNFI that can take values greater than 1) with values close to 1 (at least greater than .90) representing good fit. All value reported above fall comfortable above the .90 cut-off indicating good model fit. The Critical N (CN) shows the size that a sample must reach in order to accept the data fit of a given model on a statistical basis. As a rule-of-thumb, a CN greater than 200 is indicative that a model is an adequate representation of the data. The model in this study achieved a CN of 330.20 which is well above the threshold.

In conclusion, the results of the overall fit assessment, especially the RMSEA, SRMR, and the NFI, NNFI, CFI, IFI, and RFI, seem to suggest that good measurement model fit was achieved.

4.9.2   Interpretation of the measurement model

Through the examination of the magnitude and the significance of the slope of the regression of the observed variables on their respective latent variables, an indication of the validity of the measure is obtained. In other words, if a measure is designed to provide a valid reflection of a specific latent variable, then the slope of the regression of X_i on ξ_i in the fitted measurement model has to be substantial and significant (Diamantopoulos & Siguaw, 2008).

Table 4.27 contains the regression coefficients of the regression of the manifest variables on the latent variables they were linked to. The unstandardised $\mathbf{\Lambda_x}$ matrix indicate the average change expressed in the original scale units in the manifest variable associated with one unit change in the latent variable. The regression coefficients / loadings of the manifest variables on the latent variables are significant (p < .05) if the absolute value of the t-values exceed 1.96. Significant indicator loadings provide validity evidence in favour of the indicators (Diamantopoulos & Siguaw, 2008).

Table 4.27 indicates the unstandardised factor loading matrix. All the indicator variables load significantly on the latent variables that they were designed to reflect. The significant factor loadings are indicated by t-values that are greater than 1.96.

According to Diamantopoulos and Siguaw (2008), a problem with relying on unstandardised loadings and associated t-values is that it may be difficult to compare the validity of different indicators measuring a particular construct. They therefore recommend that the magnitudes of the standardised loadings are also inspected. The completely standardised factor loading matrix is presented in Table 4.28.

Table 4.27

Unstandardised lambda matrix

	LEARNING	LGOAL	SELFE	CONSC	LMOTIV	TIME	MKNOW	MREG
ENGLISH	9.06 (.81) 11.25							
AFRIKAANS	9.97 (1.09) 9.16							
LGOAL1		.75 (.04) 16.59						
LGOAL2		.79 (.04) 19.21						
SE1			.85 (.04) 20.34					
SE2			.80 (.04) 18.80					
CO1				1.06 (.05) 20.25				
CO2				1.18 (.05) 22.20				
LM1					.96 (.05) 20.44			
LM2					.90 (.05) 19.12			
TIME1						.70 (.06) 12.12		
TIME2						.85 (.08) 12.23		
MK1							.81 (.04) 21.23	
MK2							.81 (.04) 19.36	
MR1								.84 (.04) 22.54
MR2								.81 (.04) 22.55

As stated, the completely standardised factor loading matrix is presented in Table 4.28. The values shown in Table 4.28 could be interpreted as the regression slopes of the regression of the standardised indicator variables on the standardised latent variables. The completely standardised factor loadings therefore indicate the average change expressed in standard deviation units in the indicator variable associated with one standard deviation change in the latent variable. Factor loading estimates was considered to be satisfactory if the completely standardised factor loading estimates exceeded .71 (Hair et al, 2006). Satisfaction of this criterion would imply that at least 50% of the variance in the indicator variables can be explained by the latent variables they were assigned to represent. Interpreted in this sense (refer to Table 4.31), all loadings are greater than .71 except for the loading of *Afrikaans* on *Learning* and *Time2* on *Time* which could be regarded as somewhat problematic.

Table 4.28

Completely standardised lambda matrix

	LEARNING	LGOAL	SELFE	CONSC	LMOTIV	TIME	MKNOW	MREG
ENGLISH	.84							
AFRIKAANS	.67							
LGOAL1		.80						
LGOAL2		.91						
SE1			.92					
SE2			.88					
CO1				.92				
CO2				.95				
LM1					.92			
LM2					.88			
TIME1						.75		
TIME2						.68		
MK1							.90	
MK2							.90	
MR1								.95
MR2								.95

Determining the reliability of the indicators requires an investigation of the squared multiple correlations (R^2) of the indicators. A high R^2 value (>.50) would be indicative of high reliability of the indicator as this indicates that a satisfactory proportion of variance in each indicator variable is explained by its underlying latent variable. The results are indicated in Table 4.29. TIME2 and AFRIKAANS reported reliabilities lower than .50. This is problematic on the fit of the model and the reliability of the indicators as it means that a significant amount of variance can be attributed to systematic and random measurement error.

Table 4.29

Squared multiple correlations for item parcels

ENGLISH	AFRIKAANS	LGOAL1	LGOAL2	SE1	SE2	CO1	CO2
.71	.45	.64	.82	.85	.78	.85	.91

LM1	LM2	TIME1	TIME2	MK1	MK2	MR1	MR2
.84	.77	.57	.46	.82	.80	.90	.91

The Theta-delta matrix indicates the variance in measurement error terms. In other words, the percentage of variance in the indicator variable attributed to systematic and random measurement error and that cannot be explained in terms of the latent variable. This is presented in Table 4.30 and represents the converse of the squared multiple correlations (R^2) of the indicators presented in Table 4.29. Table 30 presents that TIME2 and AFRIKAANS are flagged as problematic indicators of their respective latent variables in that more variance is explained by measurement error than is explained by the latent variable these indicators are meant to reflect.

Table 4.30

Completely standardised theta-delta matrix

ENGLISH	AFRIKAANS	LGOAL1	LGOAL2	SE1	SE2	CO1	CO2
.29	.55	.36	.18	.15	.22	.15	.09

LM1	LM2	TIME1	TIME2	MK1	MK2	MR1	MR2
.16	.23	.43	.54	.18	.20	.10	.09

The unstandardised theta-delta matrix is presented in Table 4.31.

Table 4.31

Unstandardised theta-delta matrix

ENGLISH	AFRIKAANS	LGOAL1	LGOAL2	SE1	SE2	CO1	CO2
33.71	121.21	.31	.14	.12	.18	.20	.14
(12.53)	(17.48)	(.05)	(.04)	(.03)	(.03)	(.04)	(.04)
2.69	6.94	6.81	3.38	3.84	6.52	4.38	3.16

LM1	LM2	TIME1	TIME2	MK1	MK2	MR1	MR2
.18	.24	.37	.83	.14	.16	.08	.07
(.04)	(.05)	(.06)	(.10)	(.02)	(.03)	(.02)	(.01)
4.12	5.21	5.81	8.48	6.55	6.42	5.03	5.10

Table 4.31 indicates that all indicators are statistically significantly plagued by measurement error as is evident in the fact that all indicators report absolute t-values greater than 1.96. Perfectly reliable and valid measures of latent variables represent an unattainable ideal. Insignificant measurement error variances would therefore have raised suspicion on the measurement model.

According to Diamantopoulos and Siguaw (2008), the examination of the standardised residuals and the modification indices provide relevant information that can be used for modification of the model focusing on improving model fit. At the same time, however, the standardised residuals and the modification indices calculated for Λ_x and θ_δ comment on the quality of the measurement model. If a limited number of ways exist in which model fit can be improved this comments favourably on the fit of the model.

4.9.3   Examination of measurement model residuals

Standardised residuals are z-scores. Standardised residuals can be interpreted as large if they exceed +2.58 or −2.58 (Diamantopoulos & Siguaw, 2000). A large positive residual indicates that the model underestimates the covariance between two variables, while a large negative residual indicates that the model overestimates the covariance between variables. If the model generally underestimates covariance terms it indicates that additional explanatory paths should be added to the model, which could better account for the covariance between the variables. If, however, the model tends to overestimate the covariance between indicator variables paths that are associated with the particular covariance terms should be deleted from the model (Jöreskog & Sörbom, 1993).

A summary of the standardised residuals are presented in Table 4.32.

Table 4.32

Summary statistics for standardised residuals

Smallest Standardised Residual	-3.25
Median Standardised Residual	0
Largest Standardised Residual	2.98
Largest Negative Standardised Residuals	
Residual for (SE1) and (ENGLISH1)	-3.25
Residual for (LM2) and (CO1)	-2.59
Residual for MK1 and LGOAL1	-2.64
Largest Positive Standardised Residuals	
Residual for (TIME1) and (ENGLISH1)	2.89

Table 4.32 indicates one standardised residual larger than 2.58 and three standardised residuals smaller than - 2.58. The fact that only four extreme residuals were reported is again indicative of good model fit. This implies that only just under 3% (4/136) of all the variance-covariance estimates that were derived from the measurement model parameters can be considered poor estimates.

The stem-leaf residual plot captures the individual residual values and provides graphical information on the standardised residual distribution. Similarly to the above discussion, if a model fits well, the stem-leaf plots will be characterised by residuals which are clustered symmetrically around the zero-point, with most residuals lying in the middle of the distribution and fewer in the tails.

The stem-leaf plot (refer to Figure 4.2) confirms that the median of the distribution is zero with a slightly negatively skewed distribution. This indicates that there is a slightly stronger tendency for the model to overestimate the observed covariance terms.

```
- 3|2
- 2|66
- 2|4
- 1|9
- 1|321100
- 0|999988887666666555555
- 0|444444333222111000000000000000000000000000000000000000
  0|1111122222233444
  0|555556666677777888
  1|000001112344
  1|5799
  2|
  2|9
```

Figure 4.2. Stem-and-leaf plot of standardised residuals

The Q-plot displayed in Figure 4.3 provides an additional graphical display of residuals. When interpreting the Q-plot it is important to note whether the data points fall on the 45° reference line, or not. If the data points fall on the 45° reference line it is indicative of good model fit. To the extent that the data points deviate from the 45° reference line indicate less satisfactory fit. Figure 4.3 provides further evidence of reasonable model fit as it illustrates the fact that the standardised residuals for all pairs of observed variables tend to only moderately depart from the 45° reference line and only via the four poorly estimated variance-covariance terms.

Figure 4.3. Q-Plot of standardised residuals

4.9.4   Measurement model modification indices

Examining the modification indices for the currently fixed parameters of the model may also provide an additional way of determining if adding one or more paths would significantly improve the fit of the model. The aim of examining the modification indices is to estimate the decrease that would occur in the χ^2 statistic if parameters that are currently fixed are set free and the model is re-estimated. Modification indices with values larger than 6.64 (Theron, 2010) identify currently fixed parameters that would improve the fit of the model significantly (p<.01) if set free (Diamantopoulos & Siguaw, 2000). Diamantopoulos and Siguaw (2000) suggest that modifications to the model based on these statistics should be theoretically/substantially justified. Modification indices calculated for the Λ_x and θ_δ matrices will be examined.

Examination of the modification index values calculated for the Λ_x matrix shown in Table 4.33, indicates that four additional paths would significantly improve the fit of the model.

Table 4.33
Modification indices for lambda matrix

	LEARNING	LGOAL	SELFE	CONSC	LMOTIV	TIME	MKNOW	MREG
ENGLISH		.23	3.05	1.23	.00	.20	.79	1.94
AFRIKAANS		.25	3.94	1.04	.00	.23	.87	1.81
LGOAL1	1.19		2.27	.09	.57	.03	.05	1.52
LGOAL2	1.16		3.06	.11	.71	.03	.07	2.17
SE1	7.65	.54		2.34	1.49	.10	.56	.10
SE2	6.86	.46		2.20	1.00	.09	.07	.08
CO1	.00	1.60	.00		1.76	.27	.00	1.42
CO2	.00	1.60	.00		1.68	.25	.00	1.32
LM1	1.63	.24	.81	9.28		.29	1.12	3.22
LM2	1.59	.34	.48	4.61		.30	.99	3.34
TIME1	4.69	1.29	4.65	.25	4.46		.33	25.42
TIME2	4.45	.37	1.99	.26	1.18		.10	1.53
MK1	.07	.19	.00	2.58	2.68	.43		.00
MK2	.08	.20	.00	3.80	4.45	.63		.00
MR1	.09	.27	2.24	1.19	.25	.10	.30	
MR2	.09	.33	2.10	1.16	.29	.12	.43	

Self-efficacy appears to load on *learning, learning motivation* loads on *conscientiousness*, and *time cognitively engaged* loads on *meta-cognitive regulation*. An examination of the corresponding completely standardised expected change values support freeing only the additional parameter of *learning motivation* loads on *conscientiousness.* The important point here is the fact that only 1 out of a possible 134 ways of modifying the factor loading pattern (.75%) will result in a significant improvement in model fit. This small percentage comments very favourably on the fit of the model

Examination of the $\boldsymbol{\theta_\delta}$ matrix in Table 4.34 reveals 4 covariance terms that, if set free, would result in significant decreases in the χ^2 measure. However, the values of the completely standardised expected changes do want warrant setting these parameters free. There is also no persuasive theoretical argument to justify correlated measurement error terms. Again, the small percentage of covariance terms identified to significantly improve model fit if set free, is a positive comment on the merits of the measurement model.

Table 4.34
Modification index values calculated for theta matrix

	LEARNING	LGOAL	SELFE	CONSC	LMOTIV	TIME	MKNOW	MREG
ENGLISH		.03	-.16	-.09	.00	.03	-.07	-.10
AFRIKAANS		-.03	.17	.06	.00	-.03	.06	.07
LGOAL1	.05		.09	-.01	.05	.02	-.02	-.12
LGOAL2	-.05		-.14	.02	-.06	-.02	.03	.20
SE1	-.13	.04		.09	.10	-.02	.23	.02
SE2	.11	-.03		-.08	-.07	.02	-.03	-.02
CO1	.00	-.04	.00		-.07	-.02	.00	-.06
CO2	.00	.05	.00		.07	.02	.00	.06
LM1	-.06	.03	-.15	.56		-.06	-.16	-.17
LM2	.05	-.04	.09	-.27		.06	.14	.17
TIME1	.16	.22	-.29	.04	-.42		-.12	-2.49
TIME2	-.14	-.06	.11	-.04	.10		.03	.14
MK1	-.01	-.02	.00	.08	.07	.03		.00
MK2	.01	.02	.00	-.12	-.12	-.05		-.01
MR1	-.01	.02	-.05	.04	.02	.01	-.02	
MR2	.01	-.02	.05	-.04	-.02	-.01	.04	

The limited number of large positive standardised residuals in conjunction with the limited number of large modification index values comments very favourably on the fit of the measurement model. It is possible that some of these findings could be accounted for by the fact that the measurement model does not model the structural relations existing between the learning competency potential latent variables, the learning competency latent variables and the learning performance latent variable.

4.9.5   Discriminant validity

The 8 latent variables comprising the van Heerden – De Goede learning potential structural model are expected to correlate. Given that the 8 latent variables are conceputualised as 8 qualitatively distinct although related latent variables they should, however, not correlate excessively high with each other. The latent variable inter-correlations are shown in the phi matrix in Table 4.35.

Table 4.35

The measurement model phi matrix

	LEARNING	LGOAL	SELFE	CONSC	LMOTIV	TIME	MKNOW	MREG
LEARNING	1							
	.07							
LGOAL	-.07	1						
	1.03*							
	.36	.5						
SELFE	-.06	.06	1					
	5.64	8.93						
	.22	.33	.54					
CONSC	-.07	.06	.05	1				
	3.1	5.11	10.2					
	.21	.47	.59	.58				
LMOTIV	-.08	.06	.05	.05	1			
	2.77	.31	11.31	12.34				
	.24	.57	.49	.46	.55			
TIME	-.08	.06	.06	.07	.06	1		
	3.16	9.79	7.92	6.74	8.68			
	.31	.6	.71	.64	.56	.54		
MKNOW	-.06	.05	.04	.05	.05	.07	1	
	4.91	12.34	18.49	13.74	10.76	8.22		
	.15	.62	.57	.57	.57	.62	.87	
MREG	-.07	.05	.05	.05	.05	.06	.02	1
	2.19	13.01	12.21	10.98	12.15	11.13	35.19	

*p > .05

All the inter-latent variables are statistically significant ($p < .05$) but for the correlation between *learning performance during evaluation* and *learning goal orientation*. Correlations are considered excessively high in this study if they exceed a value of .90. Judged by this criterion none of the correlations in the phi matrix are excessively high. One of the 28 inter-latent variable correlations exceed .80 but fall below .88. The fact that there are no excessively high correlations between the latent variables in Table 4.35 is, however, not very convincing evidence of discriminant validity. The possibility still exists that latent performance dimensions can correlate unity in the population while they correlate less than unity in the sample because of sampling error still. To examine this possibility a 95% confidence interval was calculated for each sample estimate in Φ utilising an Excel macro developed by Scientific Software International (Mels, 2009). If the value 1 is included in any confidence interval it implies that the null hypothesis $H_0: \rho=1$ cannot be rejected. Confidence in the claim that the two latent performance dimensions are unique, qualitatively distinct dimensions of the performance construct would thereby be seriously eroded.

Table 4.36

95% confidence interval for sample phi estimates

ESTIMATE	STANDARD ERROR ESTIMATE	LOWER LIMIT OF 95% CONFIDENCE INTERVAL	UPPER LIMIT OF 95% CONFIDENCE INTERVAL	PHI CELL
.07	.07	-.068	.205	PHI(2,1)
.36	.06	.237	.471	PHI(3,1)
.22	.07	.079	.352	PHI(4,1)
.21	.08	.049	.36	PHI(5,1)
.24	.08	.078	.389	PHI(6,1)
.31	.06	.188	.422	PHI(7,1)
.15	.07	.011	.284	PHI(8,1)
.5	.06	.374	.608	PHI(3,2)
.33	.06	.208	.442	PHI(4,2)
.47	.06	.344	.579	PHI(5,2)
.57	.06	.441	.676	PHI(6,2)
.6	.06	.469	.705	PHI(7,2)
.62	.05	.512	.709	PHI(8,2)
.54	.05	.435	.631	PHI(4,3)
.59	.05	.483	.679	PHI(5,3)
.49	.06	.364	.599	PHI(6,3)
.71	.04	.623	.78	PHI(7,3)
.57	.05	.464	.66	PHI(8,3)
.58	.05	.474	.67	PHI(5,4)
.46	.07	.312	.586	PHI(6,4)
.64	.05	.531	.728	PHI(7,4)
.57	.05	.464	.66	PHI(8,4)
.55	.06	.422	.657	PHI(6,5)
.56	.05	.454	.65	PHI(7,5)
.57	.05	.464	.66	PHI(8,5)
.54	.07	.389	.663	PHI(7,6)
.62	.06	.488	.724	PHI(8,6)
.87	.02	.825	.904	PHI(7,8)

None of the 28 confidence intervals include unity although 1 interval include the value (.90) earlier considered to be a critical value for excessively large correlations   These findings indicate the discriminant validity of the van Heerden – De Goede learning potential structural model latent variables

4.10   SUMMARY ON THE MEASUREMENT MODEL FIT AND PARAMETER ESTIMATES

The results of the overall fit assessment indicated reasonable to good model fit. The null hypothesis of exact model fit (hypothesis 1a) was rejected. However, the null hypothesis of close model fit (hypothesis 1b) was not rejected. The interpretation of the measurement model, the standardised residuals, and the modification indices all indicate good model fit. The results seem to substantiate the claim that the specific indicator variables reflect the specific latent variables they were meant to reflect. There is some doubt, however, about the success with which one of the *time cognitively engaged* indicator variables (TIME2) represent the latent variable it was meant to reflect as well as doubt about the success with which

AFRIKAANS represents *learning performance during evaluation*. It is nonetheless concluded that there is sufficient merit to the measurement model to infer that the operationalisation of the latent variables in the reduced structural model was successful and that further analysis of the structural model may be undertaken as to investigate the relationship between the latent variables.

When interpreting the structural model, it will be important to consider that unless there is evidence to suggest that the operational measures do in fact reflect the latent variables of interest, the usefulness of using such data to investigate the hypotheses in the assumed nature of the relationships between the latent variables becomes contentious. Under the current circumstances it needs to be acknowledged that if poor model fit would be obtained for the comprehensive LISREL model it would not be possible to unequivocally rule out the possibility that it was not due to inherent structural flaws but rather to shortcomings in the operationalisation of specific latent variables (specifically the *time cognitively engaged* and the *learning performance during evaluation* latent variable).

4.11   EVALUATING THE FIT OF THE STRUCTURAL MODEL

The structural model is that component of the comprehensive LISREL model that prescribed relations between latent variables. The purpose of the model is to explain why variables are correlated in a particular fashion. The structural model describes the relationship between the latent variables themselves and indicates the amount of unexplained variance. When evaluation the structural part of a model it is necessary to focus on the substantive relationships of interest (i.e. the linkages between various endogenous and exogenous latent variables). The aim of this process is to determine whether the theoretical relationships specified in the research are supported by the data (Diamantopoulos & Siguaw, 2000). As the measurement model showed good fit and the indicator variables generally reflected their designated latent variables well, the structural relationships between latent variables hypothesised by the proposed model depicted in Figure 3.1 were tested via SEM.

LISREL 8.8 was used to evaluate the fit of the comprehensive learning potential structural model. Robust maximum likelihood estimation method was used to produce the estimates. An admissible final solution of parameter estimates for the revised reduced learning potential structural model was obtained after 33 iterations.

4.11.1   Assessing the overall goodness-of-fit of the structural model

The full spectrum of fit indices provided by LISREL to assess the absolute fit of the model is presented in Table 4.37.

Table 4.37
Goodness of fit statistics for the learning potential structural model

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Degrees of Freedom = 90
Minimum Fit Function Chi-Square = 368.55 (P = .0)
Normal Theory Weighted Least Squares Chi-Square = 310.48 (P = .0)
Satorra-Bentler Scaled Chi-Square = 281.06 (P = .0)
Chi-Square Corrected for Non-Normality = 376.21 (P = .0)
Estimated Non-centrality Parameter (NCP) = 191.06
90 Percent Confidence Interval for NCP = (144.28 ; 245.46)
Minimum Fit Function Value = 1.16
Population Discrepancy Function Value (F0) = .60
90 Percent Confidence Interval for F0 = (.45 ; .77)
Root Mean Square Error of Approximation (RMSEA) = .082
90 Percent Confidence Interval for RMSEA = (.071 ; .092)
P-Value for Test of Close Fit (RMSEA < .05) = .00
Expected Cross-Validation Index (ECVI) = 1.17
90 Percent Confidence Interval for ECVI = (1.02 ; 1.34)
ECVI for Saturated Model = .85
ECVI for Independence Model = 23.10
Chi-Square for Independence Model with 120 Degrees of Freedom = 7336.87
Independence AIC = 7368.87
Model AIC = 373.06
Saturated AIC = 272.00
Independence CAIC = 7445.16
Model CAIC = 592.40
Saturated CAIC = 920.49
Normed Fit Index (NFI) = .96
Non-Normed Fit Index (NNFI) = .96
Parsimony Normed Fit Index (PNFI) = .72
Comparative Fit Index (CFI) = .97
Incremental Fit Index (IFI) = .97
Relative Fit Index (RFI) = .95
Critical N (CN) = 141.87
Root Mean Square Residual (RMR) = .56
Standardized RMR = .20
Goodness of Fit Index (GFI) = .89
Adjusted Goodness of Fit Index (AGFI) = .84
Parsimony Goodness of Fit Index (PGFI) = .59

The p-value associated with the Satorra-Bentler χ^2 value in Table 4.37 clearly indicates a significant test statistic. A non-significant χ^2 indicates model fit in that the model can reproduce the observed covariance matrix to a degree of accuracy that can be explained in terms of sampling error only (Kelloway, 1998). In this case, the model is not able to reproduce the observed covariance matrix sufficiently accurately to allow the discrepancy to be attributed to sampling error only. The exact fit null hypothesis is therefore rejected.

The *Root Mean Square Error of Approximation (RMSEA)* of .082 indicates poor fit as values of .080 indicates mediocre fit and values exceeding .080 indicate poor fit. The 90% confidence interval for RMSEA shown in Table 4.35 (.071; .092) indicates mediocre to poor fit.

The *p-value for Test of Close Fit* indicates that the close fit null hypothesis (RMSEA≤.05) was also rejected. It was therefore concluded that the reduced structural model did not show good fit.

Determining and evaluating the fit of the structural model indicates to what extent the fitted model reproduces the observed sample covariance matrix (Diamantopoulos & Sigauw, 2000). The foregoing evidence indicated that the reduced structural model was unable to reproduce the observed covariance matrix to a degree of accuracy that warranted any faith in the structural model and the derived parameter estimates. Further interpretation was therefore not done and the modification indices calculated by LISREL were subsequently inspected to explore possible ways of improving the fit of the model.

4.11.2 Modification to the structural model

Model modification indices (MI) answer the question whether freeing any of the currently fixed parameters in the model will significantly improve the fit of the model. This is determined by calculating the extent to which the χ^2 fit statistic decreases when each of the currently fixed parameters in the model is freed and the model re-estimated (Jöreskog & Sörbom, 1993). Structural parameters currently fixed to zero with large modification index values (>6.6349) are parameters that, if set free, would improve the fit of the model significantly (p < .01) (Diamantopoulos & Siguaw, 2000; Jöreskog & Sörbom, 1993). Parameters with high MI values should, however, only be freed if it makes substantive sense to do so (Kelloway, 1998). A convincing theoretical argument should be put forward in support of the proposed causal linkage. The completely standardised expected change for the parameter is the extent to which it would change from its currently fixed value of zero in the completely standardised solution if it is freed. The magnitude of the completely standardised expected change should be substantial enough to warrant freeing the parameter. The sign of the completely standardised expected change should in addition make sense in terms of the theoretical argument put forward in support of the proposed path (Jöreskog & Sörbom, 1993).

Jöreskog and Sörbom (1993) suggest that the modification indices calculated for the various matrices defining the structural model (i.e., **Γ**, **B**, and **Ψ**) should be inspected to identify the parameter with the highest modification index value. The parameter with the largest modification index is then freed if a convincing theoretical argument can be put forward in support of the proposed causal linkage and if the magnitude of the completely standardised expected change is substantial enough. If a convincing theoretical argument cannot be put forward in support of the proposed causal linkage, or if the magnitude of the completely standardised expected change is not substantial enough, the parameter with the second largest modification index should be considered. For the purpose of modifying the reduced structural model depicted in Figure 3.1 only the **Γ** and **B** matrices were inspected. The possibility of freeing the fixed off-diagonal elements of the variance-covariance matrix **Ψ** was not considered. Putting forward a

theoretical rational for freeing currently fixed covariance terms in **Ψ** in a cross-sectional research design would require the introduction of additional latent variables currently not included in the model.

According to the process suggested by Jöreskog and Sörbom (1993), the parameter with the highest modification index value was found in the gamma matrix. Table 4.38 provides the results of the unstandarised gamma matrix.

Table 4.38
Modification indices for gamma matrix

	CONSC	MKNOW
LEARNING	10.13	131.38
LGOAL	3.21	27.77
SELFE	72.92	125.15
LMOTIV		.63
TIME		.15
MREG	.97	

According to Table 4.38, the parameter with the highest modification index value is that between *meta-cognitive knowledge* and *learning performance.* In other words, it is suggested that the addition of a path from *meta-cognitive knowledge* to *learning performance* would significantly improve the fit of the model. The critical question is whether the proposed path makes substantive sense. If it does not, it should not be considered as a possible modification to the model. A relationship between *meta-cognitive knowledge* to *learning performance during evaluation* does make sense, however not necessarily a direct relationship. The relationship is more complex in that it should be mediated by *meta-cognitive regulation* as depicted in the learning potential structural model in Figure 3.1. This is because the individual's *meta-cognitive knowledge* is put into motion via the behaviour of *meta-cognitive regulation* and it is *meta-cognitive regulation* that then ultimately positively influences *learning performance*. A path between *meta-cognitive knowledge* to *learning performance* was therefore not added and the next modification was considered.

After rejecting the suggested additional path between *meta-cognitive knowledge* and *learning performance,* the parameter with the second largest modification index was considered for modification. The parameter with the second highest modification index value is also found in the gamma matrix and according to Table 4.42 is that parameter between *meta-cognitive knowledge* and *academic self-efficacy*. Exploring this train of thought, it would mean that an individual with higher levels of *meta-cognitive knowledge* (in terms of the components parts therefore higher levels of declarative-, procedural- and conditional knowledge) would have higher levels of *academic self-efficacy*. In other words, an individual who knows more strategies, knows how to use these strategies and knows when to use these strategies would have a higher belief in their own ability to learn (*academic self-efficacy*). It does make substantive

sense that an individual who knows more about how to learn would have higher levels of belief in their own ability to learn. Furthermore to the substantive logic towards the addition of this path, the magnitude of the completely standardised expected change (not shown) is also substantial enough to support the addition of this path.

According to the procedure suggested by Jöreskog and Sörbom (1993) with regards to the modification of models, currently constrained paths should be freed one at a time as any change to the existing structural model will affect all existing parameter estimates and also all modification index values. Paths that will currently improve the fit of the model will therefore not necessarily do so in the revised model. Therefore, only the addition of the path between *meta-cognitive knowledge* and *academic self-efficacy* will be considered at this stage in the analysis.

When considering the modification of an initially proposed structural model, the question should not only be whether any additional paths should be added, but should also include the question whether any of the existing paths should be removed. This requires an examination of the unstandardised beta and gamma matrices. The unstandardised beta matrix is depicted in Table 4.39.

Table 4.39
Unstandardised beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING					.13 (.12) 1.08	.19 (.10) 1.96
LGOAL			.50 (.07) 7.12			
SELFE	.42 (.08) 5.18					
LMOTIV	-.06 (.08) -.72	.23 (.07) 3.23	.30 (.08) 3.80			
TIME				.27 (.08) 3.35		.43 (.10) 4.55
MREG				.13 (.05) 2.91		

Analysis of the beta matrix (see Table 4.39) indicates two paths that are not statistically significant (p > .05). Firstly, the path between *time cognitively engaged* and *learning performance* obtained a t-value of 1.08, which is smaller than the required 1.96 and the estimate is therefore not statistically significant (p > .05).

No support is therefore found for the hypothesis (hypothesis 3) that *time cognitively engaged* influences *learning performance*. Secondly, the path between *learning performance* and *learning motivation* obtained a t-value of .72, which is smaller than the required 1.96 and the estimate is therefore not statistically significant (p > .05). No support is therefore found for the hypothesis (hypothesis 16) of a feedback relationship between *learning performance and learning motivation*. Besides these two insignificant relationships all the other hypotheses in the beta matrix were supported. Both findings are somewhat surprising since the theoretical rational underpinning both these hypotheses was quite convincing.

Table 4.40 provides the results of the unstandarised gamma matrix. As can be seen in Table 4.40, the path between *conscientiousness* and *time cognitively engaged* obtained a t-value of .68, which is smaller than the required 1.96 and the estimate is therefore not statistically significant (p > .05). No support is therefore found for the hypothesis that *conscientiousness* influences *time cognitively engaged,* evidencing that the path should be deleted from the structural model. Again this finding is somewhat surprising since the theoretical rational underpinning both this hypothesis was quite convincing. It is noteworthy that all three hypotheses involve latent variables represented by a somewhat problematic indicator variable.

Table 4.40
Unstandardised gamma matrix

	CONSC	MKNOW
LEARNING		
LGOAL		
SELFE		
LMOTIV	.42	
	(.06)	
	7.01	
TIME	.06	
	(.09)	
	.68	
MREG		.81
		(.05)
		16.13

In summary, the structural model was subsequently modified by inserting a path from *meta-cognitive knowledge* to *self-efficacy* and by removing three paths namely, between *time cognitively engaged* and *learning performance*, between *learning performance and learning motivation* and between *conscientiousness* and *time cognitively engaged.* With these changes, the structural model was fitted again.

4.11.3 Assessing the overall goodness-of-fit of the structural model (after first modification)

The resultant fit statistics of the modified structural model are shown in Table 4.41.

Table 4.41
Goodness of fit statistics for the learning potential structural model (after first modification)

Degrees of Freedom = 92
Minimum Fit Function Chi-Square = 215.91 (P = .00)
Normal Theory Weighted Least Squares Chi-Square = 210.92 (P = .00)
Satorra-Bentler Scaled Chi-Square = 189.05 (P = .00)
Chi-Square Corrected for Non-Normality = 297.24 (P = .0)
Estimated Non-centrality Parameter (NCP) = 97.05
90 Percent Confidence Interval for NCP = (61.53 ; 140.33)
Minimum Fit Function Value = .68
Population Discrepancy Function Value (F0) = .30
90 Percent Confidence Interval for F0 = (.19 ; .44)
Root Mean Square Error of Approximation (RMSEA) = .058
90 Percent Confidence Interval for RMSEA = (.046 ; .069)
P-Value for Test of Close Fit (RMSEA < .05) = .14
Expected Cross-Validation Index (ECVI) = .87
90 Percent Confidence Interval for ECVI = (.76 ; 1.00)
ECVI for Saturated Model = .85
ECVI for Independence Model = 23.10
Chi-Square for Independence Model with 120 Degrees of Freedom = 7336.87
Independence AIC = 7368.87
Model AIC = 277.05
Saturated AIC = 272.00
Independence CAIC = 7445.16
Model CAIC = 486.85
Saturated CAIC = 920.49
Normed Fit Index (NFI) = .97
Non-Normed Fit Index (NNFI) = .98
Parsimony Normed Fit Index (PNFI) = .75
Comparative Fit Index (CFI) = .99
Incremental Fit Index (IFI) = .99
Relative Fit Index (RFI) = .97
Critical N (CN) = 214.40
Root Mean Square Residual (RMR) = .42
Standardized RMR = .070
Goodness of Fit Index (GFI) = .92
Adjusted Goodness of Fit Index (AGFI) = .89
Parsimony Goodness of Fit Index (PGFI) = .62

The Satorra-Bentler Scaled Chi-Square = 189.05 (p = .00) indicates that the null hypothesis of exact fit is again rejected (p < .05). The RMSEA value of .058, however, indicates reasonable fit. The 90 percent confidence interval for RMSEA (.046; .069) indicates reasonable to good it, as it includes the benchmark value of .05. The p-value for Test of Close Fit also supports that the null hypothesis of close fit cannot be rejected (p = .296). Seemingly the modifications to the initial structural model have significantly improved the fit of the model to the data.

4.11.4 Modification to the structural model

The unstandardised beta and gamma matrices were examined to determine whether any further paths needed to be deleted from the model. The unstandardised beta matrix is depicted in Table 4.42 and the unstandardised gamma matrix is depicted in Table 4.43.

Table 4.42
Unstandardised beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING						.19 (.07) 2.53
LGOAL			.53 (.07) 7.57			
SELFE	.18 (.05) 3.29					
LMOTIV		.21 (.07) 3.04	.29 (.08) 3.90			
TIME				.32 (.09) 3.65		.44 (.08) 5.33
MREG				.12 (.05) 2.42		

Table 4.43
Unstandardised gamma matrix

	CONSC	MKNOW
LEARNING		
LGOAL		
SELFE		.68 (.05) 12.73
LMOTIV	.37 (.06) 5.85	
TIME		
MREG		.80 (.06) 13.91

As can be seen in Table 4.42 none of the t-values were found to be smaller than 1.96 indicating all the relationships were found to be significant (p < .05) therefore no paths needed to be deleted.

As can be seen in Table 4.43 none of the t-values were found to be smaller than 1.96 and all the relationships were found to be significant (p < .05) therefore indicating that no paths needed to be deleted. It can also be concluded that the the newly inserted path from *meta-cognitive knowledge* to *self-efficacy* is statistically significant (p < .05).

The modification indices in the gamma and beta matrices were again also examined for the possible addition of paths to the model. According to the process suggested by Jöreskog and Sörbom (1993), the parameter with the highest modification index value was found in the gamma matrix. Table 4.44 provides the results of the unstandarised gamma matrix.

Table 4.44
Modification indices for gamma matrix

	CONSC	MKNOW
LEARNING	6.53	35.32
LGOAL	1.54	57.38
SELFE	5.70	
LMOTIV		.03
TIME	.19	.10
MREG	.51	

According to Table 4.44, the parameter with the highest modification index value is that between *meta-cognitive knowledge* and *learning goal-orientation.* In other words, it is suggested that the addition of a path from *meta-cognitive knowledge* to *learning goal-orientation* would significantly improve the fit of the model. A logical theoretical argument can be put forward to support this relationship. As was discussed during the literature review, individuals with a *learning goal-orientation* seek to develop competence by acquiring new skills and mastering novel situations. An individual with a *learning goal-orientation* has the goal to learn and acquire new knowledge. Also referring back to the literature review, an individual high in *meta-cognitive knowledge* will have knowledge about learning strategies (*declarative knowledge*), will know how to use learning strategies (*procedural knowledge*) and will also know when and why it is optimal to use which learning strategies (*conditional knowledge*). Considering the above, it makes sense to argue that an individual who knows how to learn (*meta-cognitive knowledge*) will be more likely to want to learn (*learning goal-orientation*) because of their knowledge.

Furthermore to the theoretical logic that substantiated the addition of this path, the magnitude of the completely standardised expected change (not shown) is also substantial enough to support the addition of this path.

In summary, the structural model was subsequently modified by inserting a path from *meta-cognitive knowledge* to *learning goal-orientation.* No paths were removed at this stage of the analysis*.* With these changes, the structural model was fitted again.

4.11.5 Assessing the overall goodness-of-fit of the structural model (after second modification)

The resultant fit statistics of the modified structural model are shown in Table 4.45.

Table 4.45
Goodness of fit statistics for the learning potential structural model (after second modification)

Degrees of Freedom = 91
Minimum Fit Function Chi-Square = 174.50 (P = .00)
Normal Theory Weighted Least Squares Chi-Square = 171.20 (P = .00)
Satorra-Bentler Scaled Chi-Square = 152.74 (P = .00)
Chi-Square Corrected for Non-Normality = 252.54 (P = .0)
Estimated Non-centrality Parameter (NCP) = 61.74
90 Percent Confidence Interval for NCP = (31.55 ; 99.81)
Minimum Fit Function Value = .55
Population Discrepancy Function Value (F0) = .19
90 Percent Confidence Interval for F0 = (.099 ; .31)
Root Mean Square Error of Approximation (RMSEA) = .046
90 Percent Confidence Interval for RMSEA = (.033 ; .059)
P-Value for Test of Close Fit (RMSEA < .05) = .68
Expected Cross-Validation Index (ECVI) = .76
90 Percent Confidence Interval for ECVI = (.67 ; .88)
ECVI for Saturated Model = .85
ECVI for Independence Model = 23.10
Chi-Square for Independence Model with 120 Degrees of Freedom = 7336.87
Independence AIC = 7368.87
Model AIC = 242.74
Saturated AIC = 272.00
Independence CAIC = 7445.16
Model CAIC = 457.31
Saturated CAIC = 920.49
Normed Fit Index (NFI) = .98
Non-Normed Fit Index (NNFI) = .99
Parsimony Normed Fit Index (PNFI) = .74
Comparative Fit Index (CFI) = .99
Incremental Fit Index (IFI) = .99
Relative Fit Index (RFI) = .97
Critical N (CN) = 262.68
Root Mean Square Residual (RMR) = .40
Standardized RMR = .046
Goodness of Fit Index (GFI) = .94
Adjusted Goodness of Fit Index (AGFI) = .91
Parsimony Goodness of Fit Index (PGFI) = .63

The Satorra-Bentler Scaled Chi-Square = 152.74 (p = .00) indicates that the null hypothesis of exact fit is again rejected (p < .05). The RMSEA value of .046 however indicates good fit. The 90 percent confidence interval for RMSEA (.033; .059) also indicates good model fit as it includes the benchmark value of .05. The p-value for Test of Close Fit also supports that the null hypothesis of close fit cannot be rejected (p = .68). Again it can seemingly be concluded the modifications to the structural model have improved the fit of the model to the data.

4.11.6 Modification to the structural model

The unstandardised beta and gamma matrices were examined to determine whether any further paths needed to be deleted from the model. The unstandardised beta matrix is depicted in Table 4.46. As can be seen in Table 4.46, the path between *self-efficacy* and *learning goal-orientation* obtained a t-value of 1.36, which is smaller than the required 1.96 and the estimate is therefore not statistically significant (p > .05). No support is therefore found for the hypothesis (hypothesis 13) that *self-efficacy* influences *learning goal-orientation* in a model that contains the remaining paths shown in Table 4.46 and Table 4.47[15], evidencing that the path should be deleted from the modified reduced structural model.

Table 4.46
Unstandardised beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING						.19 (.07) 2.57
LGOAL			.12 (.09) 1.36			
SELFE	.19 (.05) 3.57					
LMOTIV		.22 (.07) 3.23	.29 (.07) 4.45			
TIME				.31 (.09) 3.54		.44 (.09) 5.19
MREG				.10 (.05) 2.05		

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[15] The hypothesis rejected here is, however, not the same hypothesis formulated in Chapter 3 since the reduced structural model to which the original hypotheses referred was revised.

The unstandardised gamma matrix is depicted in Table 4.47. As can be seen in Table 4.47 none of the t-values were found to be smaller than 1.96 and all the relationships were therefore found to be significant (p < .05) therefore indicating that no paths needed to be deleted.

It can also be concluded that the the newly inserted path from *meta-cognitive knowledge* to *learning goal-orientation* is statistically significant (p < .05).

Table 4.47
Unstandardised gamma matrix

	CONSC	MKNOW
LEARNING		
LGOAL		.54 (.09) 6.25
SELFE		.66 (.05) 12.14
LMOTIV	.36 (.06) 5.55	
TIME		
MREG		.81 (.06) 13.81

The modification indices in the gamma and beta matrices were again also examined for the possible addition of paths to the model. Although parameters with large modification index values (>6.6349) were present in the beta matrix, either no substantive theoretical argument could be found to support the addition of the paths or the completely standardised change did not to support the addition of the paths. Therefore no paths were added to the structural model at this stage of the analysis. The modification indices calculated for Γ and B in this model will be discussed in paragraph 4.11.10.

In summary, the structural model was subsequently modified by deleting the path from *self-efficacy* to *learning goal-orientation.* No paths were added at this stage of the analysis*.* With these changes, the structural model was fitted again.

4.11.7   Assessing the overall goodness-of-fit of the structural model (after third modification)

An admissible final solution of parameter estimates for the modified learning potential structural model was obtained after 11 iterations. The completely standardised solution for the comprehensive LISREL model is depicted in Figure 4.4. The full spectrum of fit indices provided by LISREL to assess the absolute fit of the model is presented in Table 4.48.

e=152.87, df=92, P-value=0.00007, RMSEA=0.046
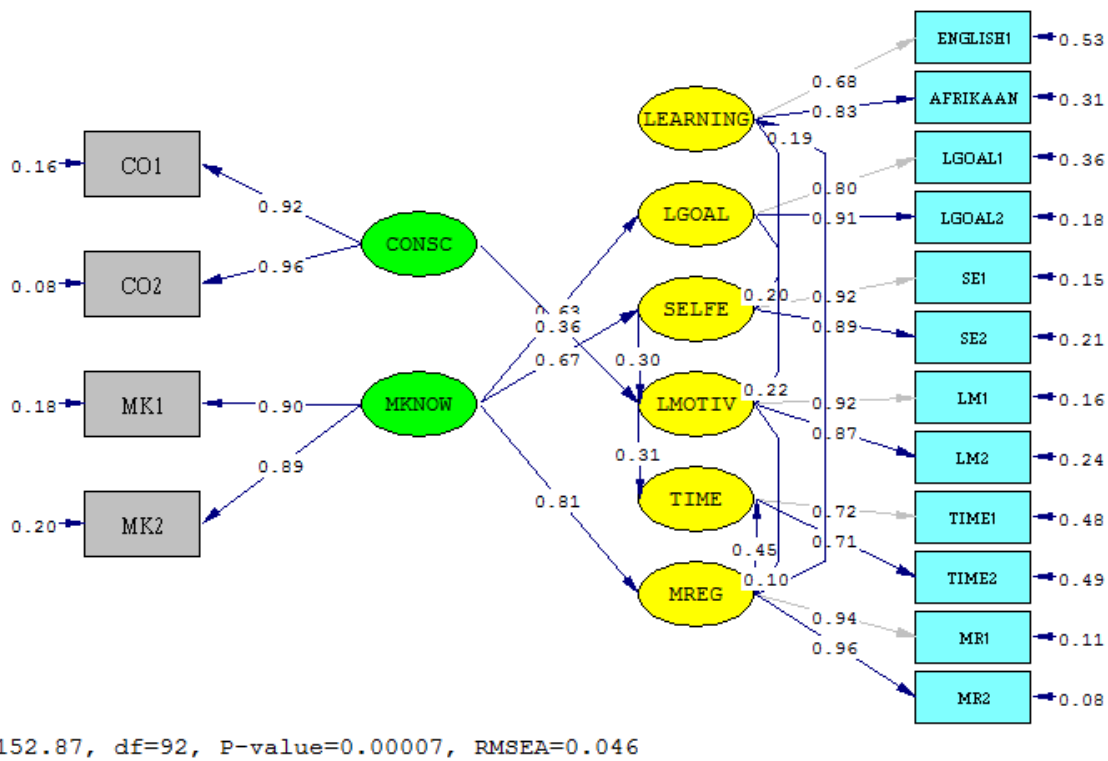
Figure 4.4. Representation of the modified learning potential structural model

Table 4.48 provides the results of the goodness-of-fit statistics of the learning potential structural model after the suggested changes were implemented.

Table 4.48 indicates that this model achieved a Satorra-Bentler Scaled Chi-Square value of 152.87 with 92 degrees of freedom. The evaluation of the fit on the basis on the normed chi-square statistics χ^2 / df (152.87 / 92 = 1.66) for the structural model suggest that the model fits the data well.

The p-value associated with the χ^2 (p = .00) indicates a significant test statistic (p < .05). H_{03} is therefore rejected. This suggests that there is a significant discrepancy between the covariance matrix implied by the structural model and the observed covariance matrix, thus rejecting the exact fit hypothesis (Kelloway,

1998). The structural model is, therefore not able to reproduce the observed covariance matrix to a degree of accuracy in the sample that can be explained in terms of sampling error only.

Table 4.48

Goodness of fit statistics for the learning potential structural model (after third modification)

Degrees of Freedom = 92
Minimum Fit Function Chi-Square = 176.58 (P = .00)
Normal Theory Weighted Least Squares Chi-Square = 171.24 (P = .00)
Satorra-Bentler Scaled Chi-Square = 152.87 (P = .00)
Chi-Square Corrected for Non-Normality = 262.84 (P = .0)
Estimated Non-centrality Parameter (NCP) = 60.87
90 Percent Confidence Interval for NCP = (30.75 ; 98.89)
Minimum Fit Function Value = .55
Population Discrepancy Function Value (F0) = .19
90 Percent Confidence Interval for F0 = (.096 ; .31)
Root Mean Square Error of Approximation (RMSEA) = .046
90 Percent Confidence Interval for RMSEA = (.032 ; .058)
P-Value for Test of Close Fit (RMSEA < .05) = .71
Expected Cross-Validation Index (ECVI) = .76
90 Percent Confidence Interval for ECVI = (.66 ; .87)
ECVI for Saturated Model = .85
ECVI for Independence Model = 23.10
Chi-Square for Independence Model with 120 Degrees of Freedom = 7336.87
Independence AIC = 7368.87
Model AIC = 240.87
Saturated AIC = 272.00
Independence CAIC = 7445.16
Model CAIC = 450.68
Saturated CAIC = 920.49
Normed Fit Index (NFI) = .98
Non-Normed Fit Index (NNFI) = .99
Parsimony Normed Fit Index (PNFI) = .75
Comparative Fit Index (CFI) = .99
Incremental Fit Index (IFI) = .99
Relative Fit Index (RFI) = .97
Critical N (CN) = 264.90
Root Mean Square Residual (RMR) = .39
Standardized RMR = .047
Goodness of Fit Index (GFI) = .94
Adjusted Goodness of Fit Index (AGFI) = .91
Parsimony Goodness of Fit Index (PGFI) = .63

The (Root Mean Square Error of Approximation) RMSEA is generally regarded as one of the most informative fit indices. The RMSEA shows how well the model, with unknown but optimally chosen parameter values, fit the population covariance matrix if it were available. A test of the significance of the obtained value is performed by LISREL by testing H_{04} : RMSEA ≤ .05 against H_{a4} : RMSEA > .05. The RMSEA value for the sample is .046 with a confidence interval of (.032 ; .058). It has been suggested by Theron (2010) and Diamantopoulos and Siguaw (2008) that values smaller than .05 are indicative of good fit, values larger than .05 but smaller than.08 are indicative of reasonable fit, values larger than .08 smaller than .10 are indicative of mediocre fit and values larger than .10 are indicative of poor fit. According to these

criteria, the model RMSEA value of .046 suggests good model fit. Since the 90 percent confidence interval for RMSEA (.032 ; .058) include the target value of .05, it seems further evidence of the good fit of the model. LISREL also explicitly tests the null hypothesis of close fit. Table 4.46 indicates that the null hypothesis of close model fit (H_{04}: RMSEA ≤ .05) is not rejected at a 5% significance level (p > .05).

The Expected Cross-Validation Index (ECVI) focuses on overall error. The ECVI measures the discrepancy between the fitted covariance matrix in the analysed sample, and the expected covariance matrix that would be obtained in another sample of equivalent size. It, therefore, focuses on the difference between Σ and Σ(θ). To assess the model's ECVI, it must be compared to the independence model and the saturated model. The model ECVI (.76) is smaller than the value obtained for the independence model (23.10). The model ECVI (.76) is also smaller than the saturated model (.85). Therefore, a model more closely resembling the fitted model seems to have a better chance of being replicated in a cross-validation sample than both the independence and saturated models.

Akaike's Information Criterion (AIC) and the consistent version of AIC (CAIC) comprises what are known as information criteria and are used to compare models. Information criteria attempt to incorporate the issue of model parsimony in the assessment of model fit by taking the number of estimated parameters into account. The Akaike's Information Criterion (AIC) and the consistent version of AIC (CAIC) for two such information criteria. As with the EVCI, the AIC and CAIC must be compared to the independence model and the saturated model. The model AIC (240.87) achieved a value lower than both the independence model (7368.87) and the saturated model (272.00). Similarly, the CAIC (450.68) also achieved a value lower than both the independence model (7445.16) and the saturated model (920.49). Therefore, a model more closely resembling the fitted model seems to have a better chance of being replicated in a cross-validation sample than the both the independence model and the saturated model.

The Standardised Root Mean Residual (SRMR) is the standardised square root of the mean of the squared residuals, in other words, an average of the residuals between individual observed and estimated covariance and variance terms. Lower SRMR values represent better fit and higher values represent worse fit. Values smaller than .05 are indicative of acceptable fit. The model produced a SRMR of .047. As this is lower than .05, it is indicative of good model fit.

The Goodness-of-Fit Index (GFI) is an indicator of the relevant amount of variance and covariance accounted for by the model and this shows how closely the model comes to perfectly reproducing the observed covariance matrix. The Adjusted Goodness-of-Fit Index (AGFI) is GFI adjusted for the degrees of freedom in the model. Values of GFI and AGFI range between 0 and 1. GFI and AGFI values greater than .90

are indicative of acceptable fit. The model achieved a GFI of .94 and an AGFI of .91 which are both indicative of good model fit.

The assessment of parsimonious fit acknowledges that model fit can always be improved by adding more paths to the model and estimating more parameters until perfect fit is achieved in the form of a saturated or just-identified model with no degrees of freedom (Kelloway, 1998). The parsimonious normed fit index (PNFI = .75) and the parsimonious goodness-of-fit index (PGFI = .63) approach model fit from this perspective. PNFI and PGFI range from 0 to 1, but do not have a recommendation how high these values should be to achieve parsimonious fit. It has however been suggested that neither index is likely to reach the .90 cut-off used for other fit indices. According to Kelloway (1998) and Hair, Black, Babin, Anderson, and Tatham (2006) these indices are more meaningfully used when comparing two competing theoretical models and are not very useful indicators in this CFA analysis. For this reason emphasis will not be placed on the relatively low values achieved on these indices when evaluating model fit in this study.

The following set of fit indices contrast how much better the given model fits reproduce the observed covariance matrix than a baseline model which is usually an independence or null model. The fit indices presented include the normed fit index (NFI= .98), the non-normed fit index (NNFI= .99), the comparative fit index (CFI= .99), the incremental fit index (IFI=.99) and the relative fit index (RFI =.97). All indices in this group have a range between 0 and 1 (except the NNFI that can take values greater than 1) with values > .90 representing good fit. All values fall comfortably above the .90 cut-off indicating good model fit.

The Critical N (CN) shows the size that a sample must reach in order to accept the data fit of a given model on a statistical basis. Generally a CN exceeding 200 is indicative that a model is an adequate representation of the data. The model in this study achieved a CN of 264.90 which is well above the threshold.

In conclusion, the results of the overall fit assessment, especially the RMSEA, SRMR, and the NFI, NNFI, CFI, IFI, and RFI, seem to suggest that good model fit was achieved.

4.11.8 Examination of the learning potential structural model residuals

Standardised residuals are z-scores. Standardised residuals can be interpreted as large if they exceed +2.58 or −2.58 (Diamantopoulos & Siguaw, 2000). A large positive residual indicates that the model underestimates the covariance between two variables, while a large negative residual indicates that the model overestimates the covariance between variables. If the model generally underestimates covariance terms it indicates that additional explanatory paths should be added to the model, which could better account for the covariance between the variables. If, however, the model tends to overestimate the

covariance between indicator variables paths that are associated with the particular covariance terms should be deleted from the model (Jöreskog & Sörbom, 1993). The standardised residuals resulting from the covariance estimates derived from the estimated model parameters obtained for the modified model are shown in Table 4.49.

Table 4.49
Modified learning potential structural model standardised residuals

	ENGLISH	AFRIKAANS	LGOAL1	LGOAL2	SE1	SE2	LM1	LM2
ENGLISH								
AFRIKAANS	-.04							
LGOAL1	.75	-1.05						
LGOAL2	-.40	-1.20						
SE1	1.20	.77	1.88	1.43				
SE2	**7.93**	1.72	1.86	.56				
LM1	.87	-.22	.44	-.63	1.53	.72		
LM2	1.86	.49	-.12	-.96	1.95	.95		
TIME1	**3.22**	.10	**2.91**	**3.07**	.04	.95	-.52	.49
TIME2	-.10	.28	1.78	1.62	1.45	.55	.46	-.54
MR1	-.49	-.87	**2.87**	2.24	-2.36	-1.79	.11	1.00
MR2	-.81	.42	1.19	1.92	-1.30	-1.26	-.66	.81
CO1	1.58	1.57	-1.44	-1.68	2.30	1.18	.53	-1.27
CO2	1.85	1.54	-1.58	-1.09	2.33	1.41	.77	.66
MK1	**3.47**	2.01		-1.00	1.73	.02	.42	.80
MK2	**3.32**	2.35	.57	-.73	1.031	.97	-.72	-.68

	TIME1	TIME2	MR1	MR2	CO1	CO2	MK1	MK2
ENGLISH								
AFRIKAANS								
LGOAL1								
LGOAL2								
SE1								
SE2								
LM1								
LM2								
TIME1								
TIME2	.08							
MR1	.63	-.70						
MR2	-.54	.76	.15					
CO1	.85	-.05	-.23	-.94				
CO2	.97	-.36	.33	-.59				
MK1	-.04	-.31	-.20	.11	.75	.39		
MK2	.01	1.31	.16	.09	-.37	-1.24	.21	

As can be seen from Table 4.49 there are only seven covariance terms in the observed sample covariance matrix (5%) that are substantially underestimated. This can be seen as a favourable comment on the fit of the modified structural model.

The stem-and-leaf plot and is depicted in Figure 4.5 below. A good model would be characterised by a stem-and-leaf plot in which the residuals are distributed approximately symmetrical around zero. An excess of residuals on the positive or negative side would indicate that the residuals are systematically under- or overestimated.

```
- 2|4
- 1|87643333221100
- 0|99877777665555444322211100000000000000000000000000
  0|111111223344445555566677788888999
  1|00000222444556667788999
  2|00233399
  3|1235
  4|
  5|
  6|
  7|9
```

Figure 4.5 Modified learning potential structural model stem-and-leaf plot of standardised residuals

From the stem-and-leaf plot depicted in Figure 4.5, the distribution of the standardised residuals appears to be slightly positively skewed. The estimated model parameters therefore tend to underestimate the observed covariance terms more than they tend to overestimate them.

Table 4.50 below indicates that all the large standardised residuals are positive. The fact that only seven extreme residuals were reported is again indicative of good model fit. The median standardised residual of .11 is indicative of the slightly positively skewed distribution.

Table 4.50

Summary statistics for standardised residuals

Smallest Standardised Residual	-2.36
Median Standardised Residual	.11
Largest Standardised Residual	7.93
Largest Positive Standardised Residuals	
Residual for SE2 and ENGLISH1	7.93
Residual for TIME1 and ENGLISH1	3.22
Residual for TIME1 and LGOAL1	2.91
Residual for TIME1 and LGOAL2	3.07
Residual for MR1 and LGOAL1	2.87
Residual for MK1 and ENGLISH1	3.47
Residual for MK2 and ENGLISH1	3.32

The Q-plot is depicted in Figure 4.6 below. When interpreting the Q-plot it is important to note whether the data points fall on the 45° reference line, or not. If the data points fall on the 45° reference line it is

indicative of good model fit. To the extent that the data points deviate from the 45° reference line indicate less satisfactory fit.
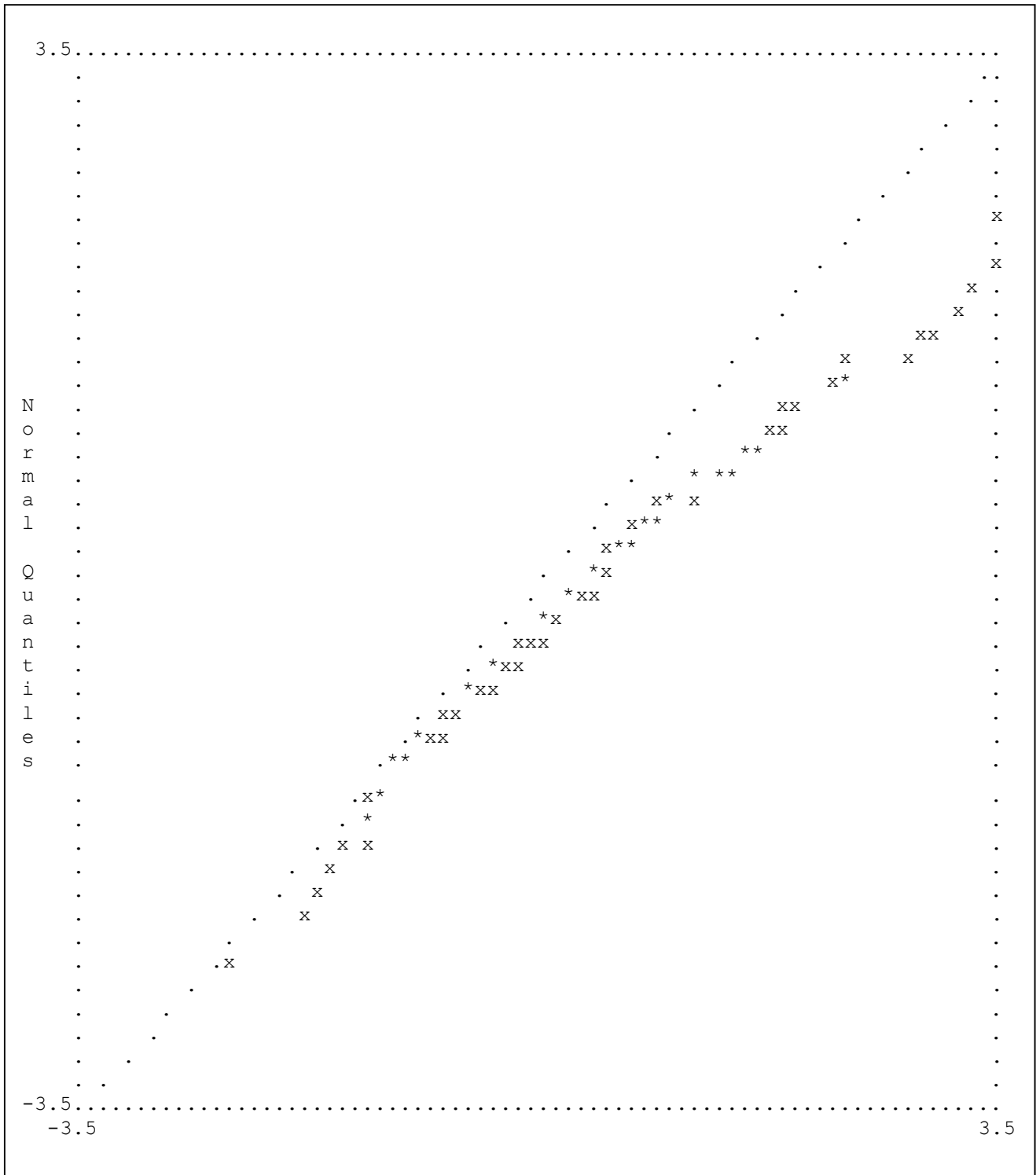

Figure 4.6 Learning potential structural model Q-plot of standardised residuals

Figure 4.6 indicates that the data deviates somewhat from the 45- degree reference line which is a somewhat negative comment on the fit of the model. However, the model fit appears to be quite

satisfactory as the data points only swivel away from the 45-degree reference line at the upper end in a positive direction.

In conclusion, the results of examining the model residuals seem to suggest that good model fit was achieved.

4.11.9   Further assessment of the structural model

Since the structural model has shown a good fit to the data as judged by the overall goodness of fit statistics and the model residuals, the structural model will be evaluated further. The aim of further assessing the structural model is to determine whether each of the hypothesised theoretical relationships is supported by the data. Here the focus is on the linkages between the various endogenous and exogenous variables. Three issues that are of relevance when evaluating the structural model include: a) the signs of the parameters representing the paths between the latent variables that will indicate whether the direction of the hypothesised relationships is as predicted (i.e. positive or negative) b) the magnitudes of the estimated parameters that will provide information on the strength of the hypothesised relationships; (at the very least these parameters should be significant ($p < .05$) as indicated by t-values in excess of 1.96), and c) the squared multiple correlations for the structural equations that will indicate the amount of variance in each endogenous latent variable that is accounted for by the latent variables that are expected to impact upon it(the higher the squared multiple correlation, the greater the joint explanatory power of the hypothesised antecedents) (Diamantopoulos & Siguaw, 2000).

In order to evaluate the structural model, LISREL provides the unstandardised parameters for the beta and gamma matrices, including their standard error and t-values. The beta matrix describes the slope of the relationship(s) between the endogenous variables. The unstandardised beta matrix is depicted in Table 4.51 below. The beta estimates can be interpreted as partial regression slopes. The completely standardised estimate for βi_j therefore indicates the average change in η_i, expressed in standard deviation units, associated with 1 standard deviation increase in η_j. These parameters are significant ($p < .05$) if $t > 1.96$ (Diamantopoulos & Siguaw, 2000). The results depicted in Table 4.51 indicate that all the path coefficient estimates are significant.

It is necessary at this stage to point out that obtaining a significant beta or gamma path coefficient estimate does not mean proof of a causal effect. When using correlational data obtained via an ex-post facto research design (as in this study), it is not possible to isolate the empirical system sufficiently so that the nature among the variables can be described as causal. The ex post facto nature of the research design therefore precludes the drawing of causal inferences from significant path coefficients (Theron, 2010). It is

also necessary to point out that the hypoptheses that are being evaluated by evaluating the statistical significance of the beta estimates shown in Table 4.49 (and the gamma estimates shown in Table 4.50) are not exactly the same hypotheses formulated in Chapter 3. Although not explicitly stated as such in Chapter 3 all the path specific substantive research hypotheses implicitly hypothesised a specific causal linkage between two latent variables when that relationship forms part of a specific structural model containing specific other structural relations. The beta and gamma estimates are partial regression coefficients. They reflect the average change in η_i, associated with 1 unit increase in η_j (or ξ_j) when holding the other effects in the structural equation constant.

Table 4.51
Unstandardised beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING						.19 (.07) 2.58
LGOAL						
SELFE	.20 (.05) 3.61					
LMOTIV		.22 (.06) 3.44	.30 (.06) 4.76			
TIME				.31 (.09) 3.52		.45 (.09) 5.18
MREG				.10 (.05) 1.96		

As is evident from Table 4.51 all the t-values are greater than 1.96 and all are positive, which is in-line with the nature of the hypothesised effects. More specifically Table 4.51 indicates that *learning performance* was found to be positively determined by the extent to which learners engage in *meta-cognitive regulatory* behaviour, thus the relationship postulated by hypothesis 4 between *meta-cognitive regulation* and *learning performance* in the structural model is corroborated. *Learning goal-orientation* has a statistically significant effect on *learning motivation,* thereby providing support for the casual relationship hypothesised by hypothesis 9 between *learning goal-orientation* and *learning motivation.* Furthermore, s*elf-efficacy* has a statistically significant effect on *learning motivation,* thereby providing support for the relationship as hypothesised by hypothesis 12 in the structural model. Table 4.51 also indicates that l*earning motivation* has a statistically significant effect on *time cognitively engaged* which corroborates the hypothesised relationship (hypothesis 7) between *learning motivation* and *time cognitively engaged. Learning motivation* also has a statistically significant effect on *meta-cognitive regulation,* thereby providing support for the

relationship as hypothesised by hypothesis 8 in the structural model. Furthermore, m*eta-cognitive regulation* has a statistically significant effect on *time cognitively engaged,* thereby providing support for the casual relationship hypothesised by hypothesis 5 between *meta-cognitive regulation* and *time cognitively engaged.* Lastly, it is indicated that l*earning performance* has a statistically significant effect on *self-efficacy*. This corroborates the feedback relationship hypothesised by hypothesis 17 between *learning performance* and *self-efficacy.*

The unstandardised gamma matrix is depicted in Table 4.52 below and describes the slope of the relationships between the exogenous variables and the endogenous variables. The completely standardised estimate for γ_{ijj} therefore indicates the average change in η_i, expressed in standard deviation units, associated with 1 standard deviation increase in ξ_j. These parameters are also significant ($p < .05$) if $t > 1.96$ (Diamantopoulos& Siguaw, 2000). The results depicted in Table 4.52 indicate that all the path coefficient estimates are significant.

Table 4.52
Unstandardised gamma matrix

	CONSC	MKNOW
LEARNING		
LGOAL		.63
		(.07)
		9.57
SELFE		.67
		(.05)
		12.18
LMOTIV	.36	
	(.07)	
	5.41	
TIME		
MREG		.81
		(.06)
		13.80

As is evident from Table 4.52, all the t-values are greater than 1.96 and all the signs are positive, which is in-line with the nature of the hypothesised effects. More specifically Table 4.52 indicates that *meta-cognitive knowledge* has a statistically significant effect on *learning goal-orientation*, thus the relationship postulated during the modification of the reduced model between *meta-cognitive knowledge* and *learning goal-orientation* in the structural model is corroborated. It is also indicated that *meta-cognitive knowledge* has a statistically significant effect on *self-efficacy,* thereby providing support for the casual relationship

hypothesised during the modification of the reduced model between *meta-cognitive knowledge* and *self-efficacy.* Furthermore, *meta-cognitive knowledge* has a statistically significant effect on *meta-cognitive regulation* which similarly corroborates the hypothesised relationship (hypothesis 6) between *meta-cognitive knowledge* and *meta-cognitive regulation* in the structural model. Lastly, Table 4.52 indicates that *conscientiousness* has a statistically significant effect on *learning motivation* and thereby providing support for the relationship as hypothesised in the structural model by hypothesis 11.

Diamantopoulos and Siguaw (2000) suggest that additional insights can be obtained by considering the completely standardised and parameter estimates provided by LISREL. The completely standardised and parameter estimates are not affected by differences in the unit of measurement of the latent variables and can thus be compared across equations. The completely standardised and parameter estimates reflect the average change, expressed in standard deviation units, in the endogenous latent variables, directly resulting from a one standard deviation change in an endogenous or exogenous latent variable to which it has been linked, holding the effect of all other variables constant (Diamantopoulos & Siguaw, 2000). The completely standardised and parameter estimates are depicted in Tables 4.53 and 4.54.

Table 4.53
Completely standardised beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING						.19
LGOAL						
SELFE	.20					
LMOTIV		.22	.30			
TIME				.31		.45
MREG				.10		

Table 4.54
Completely standardised gamma matrix

	CONSC	MKNOW
LEARNING		
LGOAL		.63
SELFE		.67
LMOTIV	.36	
TIME		
MREG		.81

Table 4.53 and Table 4.54 indicate that of the significant effects, the effect of *meta-cognitive knowledge* on *meta-cognitive regulation* is the most pronounced, followed by the effect of *meta-cognitive knowledge* on *self-efficacy* and *meta-cognitive knowledge* on *learning goal-orientation.* It is interesting to note that the latter two relationships were not originally hypothesised but were added later after running the analysis

and investigating the modification indices. The inter-latent variable correlation matrix shown in Table 4.55 for the model depicted in Figure 3.1 does suggest that a number of latent variables included in this model, are quite strongly related. The strongest correlations are obtained between *meta-cognitive knowledge* on *meta-cognitive regulation* and between *meta-cognitive knowledge* on *self-efficacy.*

Table 4.55
Inter-latent variable correlation matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG	CONS	MKNOW
LEARNING	1.00							
LGOAL	.10	1.00						
SELFE	.31	.44	1.00					
LMOTIV	.16	.49	.55	1.00				
TIME	.14	.40	.45	.57	1.00			
MREG	.19	.56	.63	.57	.62	1.00		
CONS	.11	.40	.45	.58	.44	.58	1.00	
MKNOW	.16	.63	.70	.57	.57	.87	.64	1.00

Table 4.56 indicates the R^2 values for the six endogenous latent variables. R^2 signifies the proportion of the variance in the endogenous latent variable that is accounted for by the learning potential structural model. As is evident from Table 4.56 the learning potential structural model successfully accounts for the variance in *meta-cognitive regulation* and *self-efficacy.* However, the learning potential structural model was less successful in explaining variance in *learning motivation, time cognitively engaged, learning goal-orientation* and in l*earning performance*. The model's inability to account for the variance in these latent variables is somewhat disappointing. The results of the latter could however in part be attributed to the fact that the more cognitively orientated learning competencies (*transfer of knowledge* and *automatisation*) were excluded from the current structural model, as well as the cognitive learning competency potential latent variables (*information processing capacity* and *abstract thinking capacity*).

Table 4.56
R^2 values for the six endogenous latent variables

LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
.04	.39	.53	.48	.45	.76

4.11.10 Structural model modification indices

According to the process suggested by Jöreskog and Sörbom (1993), the parameter with the highest modification index value was found in the gamma matrix. Table 4.57 provides the results of the unstandarised gamma matrix.

Table 4.57
Modification indices for gamma matrix

	CONSC	MKNOW
LEARNING	6.37	29.90
LGOAL	3.51	
SELFE	6.47	
LMOTIV		.00
TIME	.19	.00
MREG	.31	

Table 4.57 suggests the addition of a path between *meta-cognitive knowledge* and *learning performance*. Adding this path was already considered during the modification of the model in section 4.10.2. However, the path was not added due to the fact that a sound theoretical argument could not be put forward to substantiate the path. A relationship between *meta-cognitive knowledge* to *learning performance* does make sense, however not a direct relationship. The relationship is more complex in that the effect of *meta-cognitive knowledge* on *learning performance* should be mediated by *meta-cognitive regulation* as depicted in the learning potential structural model in Figure 3.1. This is because the individual's *meta-cognitive knowledge* is put into motion via the behaviour of *meta-cognitive regulation* and it is *meta-cognitive regulation* that then ultimately positively influences *learning performance*. A path between *meta-cognitive knowledge* to *learning performance* was therefore not added and the next modification was considered.

After rejecting the suggestion of adding a path between *meta-cognitive knowledge* and *learning performance,* the parameter with the second largest modification index should be considered for modification. The parameter with the second highest modification index value is found in the beta matrix (Table 4.58). The path in the beta matrix with the highest MI is the suggested path from *meta-cognitive regulation* to *self-efficacy*. This suggests a feedback loop that when an individual successfully engages in *meta-cognitive regulation* behaviour that it will enhance *self-efficacy*. Regardless of the theoretical soundness of this argument, the negative sign of the completely standardised change does not support the addition of this path. In addition theoretically it would seem to make more sense that *meta-cognitive regulation* behaviour that it will enhance *self-efficacy* indirectly through its indirect affect on *learning performance during evaluation* which then feeds back to *self-efficacy*.

The next modification to be considered is the addition of a path between *time cognitively engaged* and *learning goal-orientation*. This would suggest a feedback loop that when an individual spends time on the learning task and is cognitively engaged while doing so, that this will positively influence the *learning goal-orientation* of the individual. Although at first glance this stance could make conceptual sense if further investigated, the completely standardised change for this parameter is also not high enough to substantiate the addition of this path to the current structural model. The beta matrix also suggests adding a path

between *meta-cognitive regulation* and *learning goal-orientation*. This leads to exactly the same train of thought as was utilised above in the discussion of the path between *time cognitively engaged* and *learning goal-orientation*. Adding a feedback loop between *meta-cognitive regulation* and *learning goal-orientation*, ie when an individual engages in *meta-cognitive regulatory* skills this will enhance *learning goal-orientation* does seemingly make conceptual sense, the completely standardised change for this parameter is also not significant enough to unequivocally substantiate the addition of this path. The addition of paths between *learning goal-orientation* and *time cognitively engaged* and between *learning goal-orientation* and *meta-cognitive regulation* is suggested. Although relationships between these constructs make sense, it is rather postulated in this study that the relationships will not be direct but will rather be mediated through the construct of *learning motivation*. Furthermore, the completely standardised change values for the parameters are also not high enough to substantiate the addition of the two paths. A path between *self-efficacy* and *meta-cognitive regulation* is also suggested. Again, as above it is rather postulated this relationship will be mediated through the construct of *learning motivation*. Furthermore, the completely standardised change for this parameter is also not high enough to substantiate the addition of this path and also has a negative sign. Finally, a relationship between *learning performance* and *meta-cognitive regulation* is also suggested. However, the addition of this path was not considered due to the insignificant, and negative, standardised expected change associated with this parameter.

Table 4.58
Modification indices for beta matrix

	LEARNING	LGOAL	SELFE	LMOTIV	TIME	MREG
LEARNING		.63		.80	1.32	
LGOAL	3.61		2.10	.21	13.07	9.55
SELFE		4.34		5.08	.72	13.39
LMOTIV	.18				2.07	.18
TIME	.66	8.70	1.37			
REG	12.15	8.68	10.89		.00	

Therefore, although parameters with large modification index values (>6.6349) were present in the beta and gamma matrix (Table 4.57 and 4.58), either no substantive theoretical argument could be found to support the addition of the paths or the completely standardised change did not to support the addition of the paths. Therefore no paths were added to the structural model at this stage of the analysis.

4.12   SUMMARY

The purpose of this chapter was to report on the results obtained from this study. The following chapter will discuss in greater depth the general conclusions drawn from the research. The practical implications of

the study and limitations of the study will be discussed. Recommendations for future research will also be presented.

CHAPTER 5

CONCLUSIONS, RECOMMENDATION AND SUGGESTIONS FOR FUTURE RESEARCH

5.1   INTRODUCTION

In this final chapter, the objectives of the study are briefly reviewed after which the research results as presented in Chapter 4 are discussed and interpreted. The chapter concludes with a discussion of the practical implications of this study for HR and organisations, a discussion of the limitations of this study and lastly recommendations for further research.

5.2   BACKGROUND OF THIS STUDY

As a direct result of having segregated amenities and public services during the Apartheid era where Black individuals were provided with services inferior to those of White individuals, South Africa is currently challenged by serious and debilitating issues such as a skills shortage across most industry sectors, high unemployment and poverty rates, and inequality in terms of income distribution as well as in terms of racial representation in the workforce. The country is furthermore facing social problems such as high crime rates and high incidence of HIV/AIDS. A discussion is put forward that these challenges should not be viewed as isolated challenges each to be addressed separately from each other with their own separate interventions. Rather, it is postulated that these challenges are intricately interlinked and the consequence of a larger problem. The larger problem being the fact that knowledge, skills and abilities are not uniformly distributed across all races. The situation is that in the past during Apartheid, Black individuals were not allowed the same access to skills development and educational opportunities afforded to White South Africans. They were not given the opportunity to gain the skills, knowledge and abilities to now currently enter into the marketplace and offer themselves to organisations as employable resources. Furthermore compounding the effect of being barred access to skills development and educational opportunities during Apartheid is that still now White South Africans have greater access to skills development and educational opportunities. It is this fundamental cause, that Black individuals do not possess the knowledge, skills and abilities to be employable resources, that must be addressed to in order to create a sustainable solution to the challenges described above. It is therefore argued that a means to overcome the challenges the country faces as a result of Apartheid is through skills development – specifically affirmative action skills development. Affirmative action skills development will entail giving previously disadvantaged Black individuals access to skills development and educational opportunities as to equip them with the currently deficit skills, knowledge, and abilities. It is proposed that affirmative action skills development is one of the

most effective mechanisms through which the aforementioned problems facing the country might be alleviated.

A need was therefore identified for Industrial Psychology researchers to assist organisations to identify the individuals who would gain maximum benefit from such affirmative action skills development opportunities. To achieve this, an understanding is required of the factors that determine whether or not a learner will be successful if entered into an affirmative action skills development opportunity. Some studies have already been conducted regarding this need. One such study was conducted by De Goede (2007). The primary objective of this study consequently was to expand on De Goede's (2007) learning potential structural model. Non-cognitive factors were added to the De Goede (2007) learning potential structural model in order to gain a deeper understanding of the complexity underlying learning and the determinants of learning performance. Two competencies were added to the model namely *meta-cognitive regulation* and *time cognitively engaged*. Furthermore, the competency potentials *meta-cognitive knowledge*, *learning motivation*, *conscientiousness*, *academic self-efficacy*, and *learning goal-orientation* were added to the model. The model was subsequently empirically tested. The results of the analysis are discussed below.

5.3   RESULTS

5.3.1   Evaluation of the measurement model

To determine to what extent the indicator variables successfully operationalise the learning potential latent variables, the fit of the learning potential measurement model was analysed. The overall goodness-of-fit of the measurement model was tested through structural equation modelling (SEM). Various indices were interpreted to assess the goodness-of-fit of the measurement model and it was found that the measurement model fits the data well. The claim that the specific indicator variables used to reflect the specific latent variables comprising the learning potential structural model does seem reasonable. Some concern was raised about the success with which one of the *time cognitively engaged* indicator variables represent the latent variable it was meant to reflect as well some concern about the success with which the Afrikaans marks reflected the *learning performanvce during evaluation* latent variable.

All the item parcels loaded statistically significantly on the latent variables they were designed to reflect. Furthermore, the values of the squared multiple correlations for the indicators were generally quite high and the measurement error variances generally quite low, thereby legitimising the use of the proposed operationalisation of the latent variables to empirically test the learning potential structural model. Time2 and Afrikaans were the only two exceptions.

As the measurement model showed good fit and the indicator variables generally reflected their designated latent variables well, the structural relationships between latent variables hypothesised by the proposed model depicted in Figure 3.1 were tested via SEM

5.3.2   Evaluation of structural model

The reduced learning potential structural model initially showed poor fit, and modification to the model was therefore considered.

Analysis of the beta matrix indicated two paths that were not statistically significant (p < .05). No support was found for the hypothesis that *time cognitively engaged* influences *learning performance*. Secondly, no support was found for the hypothesis of a feedback relationship between *learning performance and learning motivation*. Besides these two insignificant relationships all the other hypotheses in the beta matrix were supported. Furthermore, analysis of the gamma matrix indicated that the path between *conscientiousness* and *time cognitively engaged* was insignificant therefore indicating that no support was found for the hypothesis that *conscientiousness* influences *time cognitively engaged.* The three paths evidenced in the beta and gamma matrices to be insignificant were therefore deleted from the structural model.

The lack of support for these three paths is rather surprising. The theoretical arguments underpinning all three these hypotheses were strong and convincing. All three hypotheses involve at least one latent variable whose operationalisation to some degree was problematic. One indicator of *time cognitively engaged* and one indicator of *learning performance* did not reflect the latent variable that it was tasked to represent to the standards that were set. The question arises whether the lack of support for these hypotheses is due to problems with the operationalisation of *time cognitively engaged* and *learning performance* or whether it is due to flaws in the theorizing. This ambiguity is exactly the problem that the initial item analysis, dimensionality analysis and confirmatory factor analysis attempted to prevent. In a study of this nature the ability to respond to feedback from these analyses and to appropriately modify and/or replace measures and to repeat data gathering is, however, limited by practical considerations.

Furthermore to removing insignificant paths from the structural model, the addition of paths to the existing model was considered. The modification indices for the gamma matrix suggested that an additional path should be added between *meta-cognitive knowledge* and *academic self-efficacy*. In other words, an individual with more knowledge about learning and about how to learn will have a higher level of belief in their own ability to learn. This relationship makes substantive sense and was therefore added to the structural model.

After having removed the three paths discussed above and having added the additional path between *meta-cognitive knowledge* and *academic self-efficacy,* the model was subsequently re-run and the output analysed again. Analyses of the gamma and beta matrix of the modified model indicated that no further paths needed to be removed. However the modification indices suggested that an additional path be added between m*eta-cognitive knowledge* and *learning goal-orientation.* This relationship makes substantive sense. An individual with more knowledge about learning and how to learn will be more likely to be goal directed towards learning. The path was therefore added to the structural model.

After having added the additional path between *meta-cognitive knowledge* and *learning goal-orientation,* the model was subsequently re-run and the output analysed again. In the subsequent analysis of the model after the second modification, the beta matrix indicated that the path between *academic self-efficacy* and *learning goal-orientation* was insignificant and therefore need to be removed. No additional paths were added at this stage.

After having removed the path between *academic self-efficacy* and *learning goal-orientation,* the model was subsequently re-run and the output analysed again. The results after the third modification indicated that all paths were significant and that therefore no paths needed to be removed. After an examination of the modification indices, the decision was made to not add any additional paths to the structural model. A full analysis of this final learning potential structural model was therefore undertaken.

Examination of the overall goodness of fit statistics indicated that the structural model fits the data well. It was concluded that good model fit was achieved. Therefore although the initial model showed poor fit, through the analysis of modification indices, a model was derived that eventually showed good fit.

Conscientiousness was found to positively influence *learning motivation.* Therefore a conscientious individual having the characteristics of ambition, energy, control of inclinations, diligence, carefulness, being practical and with 'the will to succeed,' (Eilam et al., 2009) will be more motivated and driven to learn. This relationship makes substantive sense as according to the theorising of this study. .

Academic self-efficacy, the belief in one's academic capability, was shown in the current study to positively influence l*earning motivation*. In other words, a strong belief in one's academic capabilities increases motivation to learn. It makes sense that an individual who believes in their ability to be successful in academic tasks, will be more motivated during academic tasks than an individual who does not believe in their ability to be successful in academic tasks.

Furthermore, *learning motivation* was shown to influence *time cognitively engaged* as well as *meta-cognitive regulation.* In other words the more an individual is motivated to learn, firstly the more time that individual will spend cognitively engaged in learning tasks and secondly the more likely that individual will be to utilise strategies such as planning, organising, regulating and monitoring cognitive resources for increased efficiency during learning. *Learning motivation* was therefore found to be the driver that compels individuals into engaging the behaviours that leads to increased learning.

Meta-cognitive knowledge was found to positively influence two competency potentials in the structural model namely *academic self-efficacy* and *learning goal-orientation* as well as positively influence the competency *meta-cognitive regulation*. Although not initially hypothesised during the theorising, examination of the modification indices after an initial analysis of the model indicated a relationship between *meta-cognitive knowledge* and *academic self-efficacy.* In other words*,* an individual with higher levels of *meta-cognitive knowledge* (in terms of the components parts therefore higher levels of declarative-, procedural- and conditional knowledge) would have higher levels of *academic self-efficacy*. An individual who knows more strategies, knows how to use these strategies and knows when to use these strategies would have a higher belief in their own ability to learn (*academic self-efficacy*). It does seemingly make substantive sense that an individual who knows more about how to learn would have higher levels of belief in their own ability to learn. Also not initially included during the theorising but only added after an examination of the modification indices, is the evidence of a positive relationship between *meta-cognitive knowledge* and *learning goal-orientation*. A logical theoretical argument can be put forward to support this relationship. As was discussed during the literature review, individuals with a *learning goal-orientation* seek to develop competence by acquiring new skills and mastering novel situations. An individual with a *learning goal-orientation* has the goal to learn and acquire new knowledge. An individual high in *meta-cognitive knowledge* will have knowledge about learning strategies (*declarative knowledge*), will know how to use learning strategies (*procedural knowledge*) and will also know when and why it is optimal to use which learning strategies (*conditional knowledge*). Considering the above, it makes sense to argue that an individual who knows how to learn (*meta-cognitive knowledge*) will be more likely to want to learn (*learning goal-orientation*). The results of the analysis also indicated that m*eta-cognitive knowledge* positively affects the competency *meta-cognitive regulation.* This relationship makes sense as the argument to support this stance states that if students cannot distinguish between what they know and do not know, they can hardly be expected to exercise control over their learning activities or to select appropriate strategies to progress in their learning

The results moreover indicated that *meta-cognitive regulation* positively affects *learning performance during evaluation. Meta-cognitive regulation* was the only construct in the learning potential structural model that evidenced a direct relationship with *learning performance during evaluation.* The relationship

between *meta-cognitive regulation* and *learning performance during evaluation* means that an individual who engages in cognitive processes such as planning strategies and the allocation of resources, monitoring of progress and the effectiveness of strategies and eventually evaluating their own learning, will be more successful at *learning performance during evaluation* than an individual who does not regulate their own cognitive processes during learning.

Learning performance was also found to have a feedback-effect in the learning potential structural model in that it influences *academic self-efficacy*. This is in line with the theorising of Bandura (1986, 1977) that *self-efficacy* is affected by five primary sources: (a) learning experience, (b) vicarious experience, (c) imaginal experiences, (d) social persuasion, and (e) physiological states. The most influential source of *self-efficacy* beliefs is the interpreted result of one's previous performance, or learning experience. Individuals engage in tasks and activities, interpret the results of their actions, and use the interpretations to develop beliefs about their capability to engage in subsequent tasks or activities. Typically, outcomes interpreted as successful raise *self-efficacy*; those interpreted as failures lower it. Therefore when a student achieves a successful learning outcome, it is likely to enhance the student's *self-efficacy*. Conversely, if the student receives a negative learning outcome, it is likely to have a negative effect on the student's level of *self-efficacy*.

5.4   PRACTICAL IMPLICATIONS

In Section 1.3.2 it was argued that a need exists for organisations to be able to identify those individuals who show the greatest potential to be successful in a skills development programme. It was furthermore argued that in order for organisations to be able to identify the individuals who would gain maximum benefit from such development opportunities, they must be empowered with relevant predictors according to which all applicants for skills development opportunities should be assessed and subsequently seemed suitable or not. In order to determine these predictors, an understanding is required of the factors that determine whether or not a learner will be successful if entered into an affirmative action skills development opportunity. This study undertook the task of taking a step towards explicating and understanding some of those factors that determine whether or not a learner will be successful if entered into an affirmative action skills development opportunity. The results of this study indicated that *self-efficacy*, *learning goal-orientation*, *learning motivation*, *meta-cognitive knowledge* and *conscientiousness* are competency potentials that influence the success of a learner during an affirmative action skills development opportunity. Therefore, the first practical implication would include using the results of this study in the recruitment and selection of candidates into the affirmative action skills development programme. It is especially true that non-malleable determinants of *classroom learning performance* and eventual *learning performance during evaluation* represent predictor constructs that warrant consideration

for inclusion in the learning potential selection battery that is used to select disadvantaged candidates with learning potential into the affirmative development opportunity[16]. A learning potential selection battery *that includes conscientiousness*, *fluid intelligence*, *information processing capacity*, *learning goal-orientation* and *internal locus of control* all are relatively non-malleable person-centered variables should be able to control the level of classroom learning performance by controlling the quality of the candidates that flow into the affirmative development opportunity.

The second practical implication would include using interventions/techniques to develop and enhance the malleable competency potentials of candidates admitted into the affirmative action skills development programme. Malleable latent variables offer the possibility to affect *classroom learning performance* by manipulating the quality of learners before they have been admitted onto the affirmative development programme and once they have been admitted. The van Heerden - De Goede learning potential structural model suggests that *learning motivation* and *self-efficacy* are two latent variables that should be considered in this regard. *Learning motivation* depends on the expectancy that exerting effort will result in successful *learning performance during evaluation* (P(E$\rightarrow$P)) and the instrumentality of high *learning performance during evaluation* in attaining positively valences outcomes (P(P$\rightarrow$O$_i$)xVal(O$_i$). *Learning motivation* can therefore be enhanced by increasing the expectancy of high *learning performance during evaluation* (by increasing *academic self-efficacy* for example) and by increasing the instrumentality of high *learning performance during evaluation* (by communicating the fact that appointment, promotion and advancement in the organisation is conditional on *learning performance during evaluation*. *Academic-self efficacy* can be developed (prior to admission to an affirmative development programme) in those candidates selected for admission to the programme.

For example, literature provides extensive information of the development of *self-efficacy. Self-efficacy* is affected by five primary sources: (a) learning experience, (b) vicarious experience, (c) imaginal experiences, (d) social persuasion, and (e) physiological states.

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[16] This raises a number of important questions. Are candidates directly selected into a job and developed as appointed employees? This would imply a single-stage selection procedure and would align well with the thinking on affirmative action as outlined in the Employment Equity Act (Republic of South Africa, 1998). Or are candidates first selected into the affirmative development opportunity and subsequently evaluated on their extent to which they benefited from the development and then considered, along with not-previously disadvantaged candidates) for selection into a job? This would imply a two-stage selection procedure that is somewhat at odds with the thinking of the Employment Equity Act (Republic of South Africa, 1998). A second question relates to the nature of the criterion against which the learning potential selection battery should be validated. The criterion could either be the level to which candidates succeed to rise on the learning performance during evaluation scale or it could be the distance on the scale over which the candidate improved. A third question relates to the manner in which the predictor information should be combined so as to assign candidates to a treatment category (i.e., accept or reject). Specifically the question is whether the traditional multiple regression model should be used or whether the ability of LISREL to derive latent scores from indicator variable scores along with the structural equations derived for the fitted learning potential structural model for the study sample.

(a) Learning experience

The most influential source of self-efficacy beliefs is the interpreted result of one's previous performance, or learning experience. Individuals engage in tasks and activities, interpret the results of their actions, and use the interpretations to develop beliefs about their capability to engage in subsequent tasks or activities. Typically, outcomes interpreted as successful raise self-efficacy; those interpreted as failures lower it. Bandura (1997) believed a strong self-efficacy to be resilient to the effects of occasional failures. Bandura (1997) believed that a after "a strong sense of self-efficacy is developed through repeated successes, occasional failures are unlikely to have much effect on judgments of one's capabilities" (p. 399).

(b) Vicarious experience

Self-efficacy beliefs are influenced by one's observations of the behaviour of others and the consequences of those behaviours. This information is used to form expectancies about one's behaviour and its consequences. When people see someone succeeding at something, their self-efficacy will increase; and where they see people failing, their self-efficacy will decrease. This process is more effectual when a person sees him- or herself as similar to his or her own model. Vicarious experiences generally have weaker effects on self-efficacy expectancy than performance experiences

(c) Imaginal experiences

According to Snyder (2002) one can influence self-efficacy beliefs by imagining oneself or others behaving effectively or ineffectively in hypothetical situations. Such images may be derived from actual or vicarious experiences with situations similar to the one anticipated, or they may be induced by verbal persuasion.

(d) Social persuasion

Social persuasions relate to encouragements and/or discouragements from other individuals. While positive persuasions increase self-efficacy, negative persuasions decrease it. Verbal persuasion has an even more limited impact on students' self-efficacy because outcomes are described, not directly witnessed, and thus depend on the credibility, expertness, trustworthiness, and attractiveness of the source.

(e) Physiological states

Finally, students base their self-efficacy judgments on their perceived physiological reactions to situations.In unusual, stressful situations, people commonly exhibit signs of distress; shakes, aches and pains, fatigue, fear, nausea, etc. A person's perceptions of these responses can markedly alter a person's self-efficacy. If a person gets 'butterflies in the stomach' before public speaking, those with low self-efficacy may take this as a sign of their own inability, thus decreasing their self-efficacy further, while those with high self-efficacy are likely to interpret such physiological signs as normal and unrelated to his or her actual

ability. Thus, it is the person's belief in the implications of their physiological response that alters their self-efficacy, rather than the sheer power of the response.

The above theory of how *self-efficacy* is influenced should be utilised to develop a training intervention delivered to the candidates in the affirmative action skills development programme to enhance their levels of self-efficacy. At the same time it is disconcerting to note that the sources of self-efficacy quite strongly suggest that Apartheid policies and practices most likely would have impacted negatively on the self-efficacy of many Black South Africans.

Furthermore, literature on *meta-cognition* suggest that individuals are not born with static levels of *meta-cognition* but rather that it is malleable and can be developed over time (Kuhn, 2000; Paris & Winograd, 1990; Schraw, 1998; Veenman et al., 2004). Authors suggest practical methods that can be applied in a learning context or classroom setting in order to assist in the development of *meta-cognition* of students. According to Schraw (1998), *meta-cognition* can be increased in four ways, namely promoting general awareness of the importance of metacognition, improving knowledge of cognition, improving regulation of cognition, and fostering environments that promote metacognitive awareness. According to Paris and Winograd (1990) teachers can directly promote *meta-cognition* by informing students about effective problem-solving strategies and discussing cognitive and motivational characteristics of thinking. Such suggestions should be utilised to develop a training intervention delivered to the candidates in the affirmative action skills development programme to enhance their levels of *meta-cognition*. The malleability of *meta-cognition* has powerful implications in the framework of learning potential. Individuals can acquire and develop metacognitive skills that will subsequently to allow them to more readily attain learning and to succeed in affirmative action development interventions. Students who do not currently possess high levels of meta-cognitive skills do not ultimately have to be disqualified from training interventions. Rather these skills can be developed and the probability that these learners will succeed in learning interventions will be enhanced.

The third practical application would have bearing on the design and delivery of the training programme. This study identified that certain behaviour of learners (ie the competencies of *meta-cognitive regulation* and *time cognitively engaged*) positively influences *learning performance*. In other words, the training design and delivery should be structured in such a manner as to encourage learners to engage in the behaviours of *meta-cognitive regulation* and *time cognitively engaged* and thereby positively affecting *learning performance*. The design and delivery of the training programme as well as the manner in which consequences following from the training programme are managed will in addition impact on learning motivation. Learning motivation should be enhanced if high *learning performance during evaluation* is

perceived to be instrumental in the achievement of high valence outcomes and if the design and delivery of the training programme facilitates the likelihood of high *classroom learning performance*.

5.5   SUGGESTIONS FOR FUTURE RESEARCH

It would firstly be recommended that future research with regards to the learning potential structural model be expanded to include other competency potentials and competencies not included within this current study. Following below is a discussion of additional competency potentials that should be considered during future research.

5.5.1   Interest

McWhaw and Abrami (2001) define the construct of *interest* as a ''relatively enduring preference for certain topics, subject areas, or activities.'' According to McWhaw and Abrami, *interest* in an activity or subject matter would function within an individual as a form of intrinsic motivation. In other words, when students are *interest*ed in a topic they freely engage and become involved with that topic simply because they want to without needing any external inducements.

Harackiewicz, Barron, Durik, Linnenbrink-Garcia and Tauer (2008) distinguish between (a) *individual interest* and (b) *situational interest*. Harackiewicz et al. (2008) describe *individual interests* as a dispositional quality that is deep and enduring. *Individual interest* requires having substantial knowledge of a topic as well as valuing that knowledge. Students who enter a course with a high level of initial *interest* in the topic may be described as having an *individual interest*. *Individual interest* can be described as a long-lasting preference for a certain topic (Krapp, 1999). Harackiewicz et al. (2008) describe *situational interests* as emerging spontaneously in response to features or characteristics of the environment. According to Hidi (1990), *situational interest* can be elicited, for example, by seeing something in the environment, hearing a conversation, or reading a text. According to Harackiewicz et al. (2008), the distinction between *individual- and situational interest* lie in how the *interest* is generated. *Individual interest* resides within the individual over time while *situational interest* emerges in response to situational cues.

Hidi and Baird (1986) raise an important distinction between two types of *situational interest*. Hidi and Baird refer to situational factors that may initially "catch" the *interest* of trainees such as the instructional style of an interesting facilitator. This initial *interest* may or may not last. Course material should be personally meaningful and valued by trainee for it to "hold" their *interest* and for the *interest* to become maintained over time. If this is maintained *interest* endures beyond the particular situation and is associated with the accumulation of knowledge about the topic, it may eventually become a deep,

individual interest. Therefore, it is important to distinguish two types of *situational interest*: "caught" *interest* (associated with arousal, attention, and affect) and "held" *interest* (associated with personal value and meaning and leading to the *situational interest* turning into *individual interest*).

Whether or not a student is interested in the subject area of the training intervention is a relevant question in the South African context of affirmative action development. Due to the high unemployment and poverty rate in the country, for many previously disadvantaged individuals finding employment or training opportunities is a matter of survival and being able to afford basic necessities. When an opportunity presents itself, the person will most likely accept the opportunity as a means to afford a decent standard of living regardless whether they have previously considered a career in that field or whether they are truly interested in a career in that field.

Numerous studies have reported a profound effect between *individual interests* and *learning*. Renninger in 1990 (as cited in Hidi, 1990) investigated the *individual interest*s of young children and found that *individual interest*s served as powerful determinants of their attention, recognition and recall. Fransson (1977) also showed that *interest* strongly affect college student's comprehension and recall. According to Asher (1980), children performed better on text comprehension tasks when the text presented information on topics of high, rather than low, personal *interest*. Skinner et al. (2008) cite research results on the internal dynamics of engagement and report that *interest* in a subject fuel engaged behaviours such as effort and persistence. Skinner et al. also cite research findings that school children who become bored and uninterested in class exert less effort and stop paying attention. According to Hidi (1990) *individual interest* have a profound effect on cognitive functioning and performance. Individuals interested in a task or activity have been shown to pay more attention, persist for longer periods of time, and acquire more and qualitatively different knowledge that individuals without such *interest*. According to McWhaw and Abrami (2001), students who have high *interest* in a topic use more self-regulated learning strategies than students with low topic *interest*. Finally, Singh et al. (2002) conducted a study on 8th grade students and their achievement in mathematics and science and found that *interest* in a subject is positively related to motivation and *learning*. The above research findings make for a convincing argument that *interest* should be considered for inclusion in the learning potential structural model in future studies.

Furthermore, previous research studies have linked *interest* to the constructs of *self-efficacy*, *goal-orientation* and *learning motivation*. In their article on the influence of personality on motivation, Barrick and Mount (2005) stated the need for a study to investigate the relationship between *interest*s and motivational constructs such as *goal-orientation* and *self-efficacy* in order to enhance our understanding of how we do work. This stance is supported by Singh et al. (2002) who found *interest* in a subject to be a strong determinant of learning through its effect on student motivation. It is thereby hypothesised that

interest affects learning through the mediation of motivational variables of *learning motivation*, *goal-orientation* and *self-efficacy*.

Literature suggests a positive relationship between *interest* in a subject area and a *LGO*. Harackiewicz et al. (2002) found a positive association between *LGO* and *interest*. Similarly, Renninger in Harackiewicz et al. (2008) states that *interest* in the course content might predict the adoption of *LGO* because students who are interested in a topic may want to learn more about it. Furthermore, Pintrich and Garcia (1991) found that a *PGO* was negatively correlated with students' *interest* in their courses and their use of self-regulated learning strategies, while a *learning goal-orientation* was positively correlated with high *interest* and the use of learning strategies.

Zimmerman (2000) found *self-efficacy* to be highly correlated with students' rated intrinsic *interest* in a motoric learning task. Silvia (2001) also reported high levels of *self-efficacy* to be related to *interest* in a subject area. Further supporting the relationship between *interest* and *self-efficacy* is provided by Patrick, Care and Ainley (2011) who reported that realistic *interest*s in vocations to be strongly related to high levels of *self-efficacy*.

Furthermore, previous research evidences a relationship between *interest* and *meta-cognitive regulation*. This relationship would however most likely be an indirect relationship mediated by the motivational constructs discussed above namely, *self-efficacy*, *learning goal-orientation* and *learning motivation*.

Literature suggests that individuals who are interested in a subject area are more likely to make use of *meta-cognitive regulation* during *learning*. Pintrich and Schrauben (1992) found that students who are interested in their courses and judge them to be important will be more likely to employ *meta-cognitive regulation* than students who are not as interested in their courses or who do not feel their courses are important for them. Similarly, in studies conducted by Schiefele (1991) on text processing in which *meta-cognitive regulation* was actually measured, students with high *interest* in a specific text made significantly greater use of *meta-cognition* such as making notes in margins, underlining the text, and paraphrasing the main ideas than students with low *interest* in the text. Furthermore, McWhaw and Abrami (2001) found a main effect for *interest* on the use of *meta-cognition* such as planning, monitoring, and regulating while reading the text. McWhaw and Abrami concluded that students with high *interest* in the text reported using more *meta-cognitive regulation* strategies.

It makes logical sense that for an individual to be interested in a topic, the individual must have some *prior knowledge* of that topic. This leads to the discussion of the next construct that should be considered for inclusion in the learning potential structural model namely, *prior knowledge*.

5.5.2 Prior knowledge

Literature distinguishes between different types of subject matter knowledge. *Topic knowledge* refers to prior familiarity with specific concepts or topics within a subject area, whereas *domain knowledge* deals with familiarity with general information regarding an entire subject area (Lipson, 1982; Tobias, 1994; Dochy, Segers, & Buehl, 1999). For example, a student may know a fair amount about biology in general, yet know little about how the polio vaccine was developed. In this case, the student could be characterised as having good *domain knowledge* but poor *topic knowledge*. According to Tarchi (2010), *topic knowledge* can be described as the depth of one's knowledge about certain subject matter concepts, and *domain knowledge* can be described as the breadth of one's knowledge within a subject area.

Shapiro (2004) provided criticisms regarding the current conceptualisation of *prior knowledge* stating that the *topic knowledge* vs *domain knowledge* model is lacking in the sense that it does not explicate *what* should be assessed in terms of *prior knowledge*. Hailikari and Nevgi (2010) attempted to rectify this criticism by means of developing a multi-dimensional model of *prior knowledge*. This model makes a distinction between *declarative* and *procedural* knowledge, which differ both qualitatively and in their relevance to student achievement. According to Hailikari and Nevgri, *declarative knowledge* may be characterised as surface-level knowledge, which a student is able to recognise, remember or reproduce. This type of knowledge can be referred to as "knowing about", "knowing that" or "knowledge-telling" which describes its nature as consisting of many facts and details that do not form a whole. Although *declarative knowledge* is superficial, it is a necessary preliminary for deep-level understanding. *Procedural knowledge*, on the other hand, is qualitatively different and may be described as "knowing how". It is characterised by an ability to see interrelations between concepts and, ultimately, to apply that knowledge to solve novel problems. Thus, it may be described as a deeper-level understanding. This model makes an important contribution as it explicates the importance of the quality of *prior knowledge*. According to Hailikari and Nevgri (2010), simply possessing some basic *prior knowledge* is not enough. Students' *prior knowledge* that consisted mainly of a surface-level understanding of facts was not related to student achievement, whereas higher levels of *prior knowledge* correlated significantly with success in the course.

Various studies have demonstrated positive relationships between *prior knowledge* and *learning* (Beier & Ackerman, 2005; Dochy et al., 1999; Lipson, 1982; McNamara & Kintsch, 1996; Shapiro, 2004; Singh et al., 2002; Tarchi, 2010; Ziori & Dienes, 2008)*.* In an extensive review, Dochy et al. (1999) discuss the universal effect of *prior knowledge* on *learning*. From their study of 183 published books, articles, papers and research reports, they conclude that *prior knowledge* is strongly associated with *learning*. In fact, 92% of research that was reviewed found positive effects of *prior knowledge* on *learning.* Beier and Ackerman (2005) found *prior knowledge* to be important during new knowledge acquisition. Tarchi (2010) found *prior*

knowledge to be important in the text comprehension when reading study material for both science and history. Lewis and Lewis (2007) demonstrated in their study that students with little *prior knowledge* were more likely to drop out of the course in question. Ziori and Dienes (2008) found *prior knowledge* to be an important contributor in the learning of new concepts. Shapiro (2004) conducted a study and found that *domain knowledge* is positively related to the acquisition of factual knowledge. Shapiro (2004) emphasises the importance of including *prior knowledge* as a measure in studies of *learning* because of its dominant influence on *learning*. Singh et al. (2002) found a significant relationship between *prior knowledge* and *learning*. Dochy et al. (1999) cite research that was conducted to determine the relationship between *topic knowledge*, *domain knowledge* and success at *learning* in which it was found that *domain knowledge* is the best predictor of student achievement in various academic content fields. Tarchi (2010) similarly conducted research and also found evidence to support the profound effect of *domain knowledge* on *learning*. Considering the above research citing, it seems unrealistic to assume that there is not a significant relationship between *prior knowledge* and *learning*. This study therefore postulates that *prior knowledge* is an important variable affecting *learning* and should be considered for inclusion in the learning potential structural model during future studies.

According to Tobias (1994), previous research on the relationship between *interest* in a subject matter and *prior knowledge* on the subject matter is inconclusive. Tobias cites several studies showing an inverted U-shaped relationship between *interest* and *prior knowledge*. According to this perspective, moderate *topic knowledge* was expected to generate more *interest* that either high or low levels of prior familiarity. With little or no relevant *prior knowledge*, *interest* is expected to be low. *Interest* then increased as enough is known about a topic to relate it to different schemata, but it diminishes again as knowledge increases to the point where nothing new can be learned. Other authors again contradicted the U-shaped *interest-prior knowledge* relationship and rather found a linear relationship. According to this perspective, experts in any field have high levels of both *interest* and *prior knowledge* in that particular field. The dedication and persistence with which experts in a domain pursue activities related to that field suggest that they are deeply knowledgeable and interested in that topic. Certain studies do support this stance and have shown that individuals with greater background *knowledge* express more *interest* in the material than individuals with less background *knowledge* (Alexander, Kulikowich, & Schulze, 1994; Tobias, 1994). Regardless whether the relationship between *prior knowledge* and *interest* is inverted U-shaped or linear, the above seems conclusive that a relationship does exist. The exact nature of this relationship can be further explored during future studies.

Further supporting the importance of adding the additional competency potential of *prior knowledge* is found in the conceptualisation of one of De Goede's (2007) competencies, *transfer*. According to De Goede (2007), the acquisition of new job-specific knowledge, abilities and insight (job competency potential) can

be described as a process during which new attainments have to be built on older ones and these have to be integrated into conceptual frameworks that subsequently become more general and elaborated (Taylor, 1994). T*ransfer* forms the basis of this process of elaboration. *Transfer* can also be described as the effect previously learned behaviour has on the performance of new learning tasks. The given definitions all refer to the position that fluid intelligence (*Gf)* operates on existing knowledge, skills and abilities in solving novel problems through *transfer*. This seems to suggest that, apart from the static learning competency potential (*Gf* and information processing capacity), existing knowledge, skills and abilities also needs to be explicitly taken into account in the structural model. Specifically it could be hypothesised that the ability to cope with novel, cognitively demanding learning material (i.e. *transfer*) will depend on the interaction between crystallised knowledge and abilities and the ability to *transfer*. Somehow it seems naive to assume that candidates for affirmative development will be able to cope with novel, cognitively demanding learning material if a high *Gf* is present, irrespective of the extensiveness and level of crystallised knowledge and abilities in the domain on which the development intervention is focused.

The above discussion of previous research findings on *prior knowledge* makes a strong case for the inclusion of the construct in the learning potential structural model during future studies.

5.5.3   Self –esteem

According to Phan (2010), *self-esteem* is defined as an individual's sense of value or self-worth, or the extent to which an individual values, appreciates or like themselves. Phan also reports that *self-esteem* acts as a powerful initiator of human behaviour. Judge and Bono (2001) defined *self-esteem* as the overall value that an individual places on themselves as a person. *Self-esteem* therefore focuses on an individual's view on himself/herself.

Although admittedly this author is not very familiar with the *self-esteem* construct and has not extensively researched *self-esteem*, the construct still seems relevant for consideration. The reason for considering *self-esteem* for inclusion in the learning potential structural model is due to the fact that during the process of collecting information for the literature review, *self-esteem* was frequently cited to have a positive relationship with *learning*. This is discussed below.

An empirical research study conducted by Phan (2010) reported that *self-esteem* beliefs are related positively to academic performance. Individuals who feel good and value themselves are more likely to achieve and be successful in *learning.* Seabi (2011) reports that students who feel positive about themselves, are more persistent at difficult tasks, are happier and tend to perform better academically. Furthermore, individuals with high *self-esteem* undertake more challenging goals and persevere in the face

of obstacles more so than individuals with low *self-esteem*. Conversely, university students with low *self-esteem* tend to be unhappy, less sociable and are more likely to perform poorly at academic tasks. Swinson (2008) cites the results of research conducted by Lawrence and by Galbraith and Alexander who both report a positive relationship between *self-esteem* and *learning* in primary school children.

Furthermore to the literature reporting *self-esteem* to be positively related to *learning*, the literature also contains numerous studies linking *self-esteem* to other constructs already included in the learning potential structural model including *self-efficacy*, *locus of control*, *goal-orientation* and *cognitive engagement.*

Phan (2010) reports research results that *self-esteem* is predictive of *self-efficacy*. According to Phan, feelings of self-worth are instrumental and may serve as an informational source that could help individuals to construct their perceived competence in various courses of action. Phan contends that from a theoretical perspective, *self-esteem* is a global facet that subsumes other specific self-beliefs and that *self-esteem* help to direct more specific self-beliefs about one's perceived competence in ability to execute various actions (*self-efficacy*). Judge and Bono (2001) report a link between *self-esteem*, *self-efficacy* and *locus of control*. Liem et al. (2008) found *self-esteem* to relate positively to a *learning goal-orientation*. According to Liem et al., individuals who feel good about themselves are more likely to succeed in *learning* and will pursue a wide range of goals to help them in this achievement. Dweck and Leggett (1988) also contend that there is a positive relationship between *self-esteem* and a *LGO*. Greene and Miller (1996) reported from their research results a positive relationship between *self-esteem* and *cognitive engagement*. According to the researchers, the important implication of the relationship between *self-esteem* and *cognitive engagement* is that individuals' feelings of self-worth may instil the thinking of optimism, *interest* and mastery learning that, in turn, requires *cognitive engagement*.

The above evidence positively relating *self-esteem* to *learning* and the constructs already included in the learning potential model, along with the logical reasoning that *self-esteem* as a motivational construct should have a positive influence on *learning*, provides a compelling proposition to further investigate *self-esteem* as a construct and it's place in the learning potential model.

Three competency potentials were identified for possible inclusion in the learning potential structural model during future research, namely *interest*, *prior knowledge* and *self-esteem*. Following below is a discussion of additional competencies that should be considered during future research.

5.5.4   Persistence

Persistence, according to Henry (1995) is the continued pursuit of a goal despite some form of opposition or impediment. Similarly, Peterson and Seligman (2004) defined *persistence* as a voluntary continuation of a goal-directed action plan in spite of obstacles, difficulties or discouragement. Liem et al. (2008) also labeled persistence ''effort regulation'' or ''effort management'' and defined the construct as students' continued investment in learning when they encounter obstacles such as a comprehension difficulty.

The important point to be taken from these definitions is the emphasis placed on continued pursuits of a goal **despite opposition or impediment** and **in *spite of obstacles, difficulties or discouragement.*** In other words, persistence is that continued behaviour despite setbacks and difficulties. From this is becomes clear that persistence is a valuable behaviour for affirmative action candidates entering into a skills development programme. Considering that affirmative action candidates as definition find themselves in an environment riddled with difficulties including aspects such as poverty, informal housing and lack of services, the importance of persistence and the ability to overcome setbacks and impediments become obvious.

Further supporting the above hypothesis on the importance of adding *persistence* to the learning potential structural model as an additional learning competency, literature provides support for the inclusion of *persistence* by providing evidence of a positive relationship between *persistence*, *learning goal-orientation* and *self-efficacy*.

Literature provides evidence that a *learning goal-orientation* is related positively related to *persistence*. According to Ford et al. (1998), a *LGO* leads to greater *persistence* in the face of difficulty. Similarly, Miller et al. (1993) found that a *LGO* was positively correlated with measures of persistence. According to McWhaw and Abrami (2001) students who are more learning oriented work harder and persist longer at academic tasks. The relationship between a *LGO* and *persistence* can be explained due to the fact that individuals with a *LGO* view effort as predictive of success (rather than as a sign of low ability as in the case with a *PGO*). Therefore, an individual with a *LGO* would be more likely to devote time and effort to learning, and persist in the face of difficulty. Similarly, Liem et al. (2008) also found a positive relationship between a *LGO* and *persistence* when a student is faced with difficult or dull tasks.

Literature offers previous research results suggest a positive relationship between *self-efficacy* and *persistence*. According to Judge and Bono (2001), individuals with high *self-efficacy* deal more effectively with difficulties and persist in the face of failure. Similarly, Schunk (1990) found that students with higher *self-efficacy* tend to participate more readily, work harder, pursue challenging goals, spend much effort toward fulfilling identified goals, and persist longer in the face of difficulty. Zimmerman (2000) offers a very

relevant research finding on the relationship between *self-efficacy*, *persistence* and *learning performance* and reports that perceived *self-efficacy* influences students' skill acquisition both directly and indirectly by increasing their *persistence*.

Following the line of theorising that was utilised in this study, *self-efficacy* and *goal-orientation* would most likely affect *persistence* through the mediating effect of *learning motivation* rather than having a direct effect.

This study therefore suggests that future research expand the current learning potential structural model by considering additional competency potentials such as *interest*, *prior knowledge*, and *self-esteem* and additional competencies such as *persistence*.

It would secondly be recommended that future research in regards to the learning potential structural model be expanded to not solely focus on the competencies and competency potentials of the individual that will be participating in the skills development, but to take a more holistic stance acknowledging that the success of an individual during an affirmative action skills development intervention is not determined in isolation by the characteristics and behaviours of the individual, but that external situational factors also play a role.

It is therefore suggested that the factors pertaining to the design and delivery of the training must be considered. Having an understanding of the design and delivery of the training and how it affects learning performance would directly empower organisations with the knowledge to develop their training programmes in such a way to most optimally encourage success during affirmative action skills development opportunities.

In addition to considering the design and delivery of the training, the home- and social environment of the individual also be taken into consideration. Although it is implicitly expected that the home- and social environment of the affirmative action candidate is not optimal and although it can possibly be argued that it is beyond the scope and means of the organisation to intervene in the home- and social environment of the individuals, it still remains an important area to be included in the learning potential structural model. Having an understanding of the dynamics of the home- and social environment of the individual and how if affect learning performance may ultimately allow organisations to counteract the negative effects of the home- and social environment by, for example, tailoring training design and delivery and creating a conducive workplace environment. Formally including a latent variable like *situational favourableness* in the learning potential structural model will also force theorizing to consider what allow learners to successfully overcome adversity in their home- and social environment. Latent variables like *psychological*

capital (*hope*, *optimism*, *resilience* and *self-efficacy*) (Luthens, Luthens & Luthens, 2004) and *grit* (Duckworth, Peterson, Matthews, and Kelly, 2007) present themselves as variables to consider for inclusion in a model that formally acknowledges the fact that for many South Africans life is harsh, brutal and unaccommodating.

Furthermore, it should be considered whether the circumstances of childhood and the manner in which the child was raised may affect ability to learn as this child reached adulthood. From this point of view, aspects such as pre-and postnatal diets of the mother, early cognitive stimulation, quality of primary caregivers, and the relative absence of positive developmental role models can be considered in future research.

It is also suggested that future research again investigate adding *locus of control* to the learning potential structural model. It was disappointing that the construct reported such a poor reliability during the item analysis as to necessitate it being excluded from further model analyses. The theoretical argument for including locus of control in the study is sound and the application to the South African context is very compelling. It would therefore be fruitful to again consider this construct in the structural model and testing it on another sample. Future research could perhaps also consider operationalising the construct by means of another measuring instrument such as the Internal-External Control Scale as developed by Rotter in 1966 (as cited in Wolfe, 1972).

The literature discussed the components parts of both *meta-cognitive knowledge* and *meta-cognitive regulation*. This study discussed the component parts of *meta-cognitive knowledge* to consist of (a) declarative knowledge, (b) procedural knowledge, and (c) conditional knowledge (Sperling et al., 2004; Schraw, 1998; Schraw & Dennison, 1994) whereas the component parts of *meta-cognitive regulation* to consist of (a) planning, (b) monitoring, and (c) evaluating (Schraw, 1998). It is suggested that future studies consider breaking *meta-cognitive knowledge* and *meta-cognitive regulation* down into their component parts and assessing firstly the relationships among the component parts and secondly how the individual component parts influence learning performance.

As was discussed in Section 1.3, the ultimate aim is to develop a comprehensive learning potential model that closely approximates reality. However due to the enormity of this task, the only practically feasible manner in which a comprehensive learning potential model that closely approximates reality can be developed, is by means of a collaborated effort and a shared investment of resources from various researchers who build upon each other's research results. It was to this end that this study and the study by Burger (2012) elaborated on the work of De Goede (2007). Therefore it is suggested that future research investigate and test a combined learning potential structural model including not only the constructs used in this study but also the constructs that was used by De Goede (ie *transfer, automatisation, information*

processing capacity, abstract thinking capacity) and also the additional constructs that was used by Burger (ie *academic self-leadership*).

5.6   LIMITATIONS OF THIS STUDY

A number of limitations to this study may be identified. Firstly, the proposed learning potential structural model was tested on a non-probability, convenience sample of Grade 12 learners from three high schools under the Western Cape Department of Education. The three high schools were also selected on a non-probability, convenience basis. Due to the non-probability sampling procedure that was used to select the sample it cannot be claimed that the sample is representative of the target population. Furthermore to sampling limitation, due to the affirmative action perspective from which this study stems one would want to argue that the sample needs to consist of participants that qualify as affirmative development candidates. Therefore it specifically it stands out that the sample of respondents was not affirmative action candidates from disadvantages backgrounds but mostly from middle class socio-economic status. Although it was sufficiently argued in Section 3.5.1 that it is deemed acceptable to draw a sample that includes participants that does not qualify as affirmative development candidates, it still remains a limitation of the study that sample was not from a disadvantaged affirmative action background. Therefore, replication of this research on other samples and in different developmental contexts is therefore encouraged.

The second limitation relates to the measuring instruments used in this study. The instruments used are self-report measures. Self-report measures run the risk of social desirability. Social desirability refers to the risk that respondents may be tempted to attempt to manipulate the answers in order to create a more favourable impression when completing such instrument. This, in turn, impacts on the reported levels of the constructs investigated and it influences the results (Elmes, Kantowitz & Roediger, 2003). Furthermore, the question is left open as to whether the reported results pertain to the individuals' actual experiences, or mainly illustrate their perceptions. In other words, the respondents' perceptions may differ from the actual state of being causing them to rate themselves higher (or lower) on the constructs due to a false perception. This limitation is expecially a concern in this type of study as in a competitive environment such a Grade 12 class in school, students may be tempted to create a more favourable impression in order to appear on par with their peers. Exclusive relliance on self-report measures in addition also creates method bias. In the structural model that was tested the focal endogenous latent variable *learning performance during evaluation* was at least not obtained via self-report measures but was tested with objectively by using the results obtained on English 1st language and Afrikaans 2nd language during their first semester.

Vandenberg and Grelle (2009) presents a seemingly convincing argument of the importance to examine alternative model specifications (AMS) practices as applied to confirmatory factor analysis and structural equation modeling. According to Vanderberg and Grelle AMS is seldom undertaken despite compelling arguments in support of its application. Vanderberg and Grelle describe three basic AMS strategies, namely equivalent models, nested models and nonnested alternative models. Models are equivalent if they have identical fit to the data. Specifically, two models are considered equivalent when the reproduced covariance matrices generated by both models are equal. However, the authors warn that although identical fit is a necessary result of model equivalence, two models can have identical fit by chance and not be equivalent models. The authors further explain that though the fit parameters for the model as a whole will be identical, individual parameter estimates may differ. Nested models are one in which parameters of one model are a subset of another. Alternative models can be nested within the targets model, or the target model can be nested within the alternative model. Nonnested alternative models are ones in which their observed variance-covariance matrices, while overlapping, are not identical. The major point of nonnested alternative models is that a theoretically justified alternative model to the theoretically justified target model may exist that does not have the same set or number of latent variables. The compelling argument that Vanderberg and Grelle posits in favour of AMS alludes that third limitation of this study would be that no alternative, theoretically justifiable, model were tested.

5.7   CONCLUDING REMARKS

South Africa is currently facing challenges such as a skills shortage across most industry sectors, high unemployment and poverty rates, and inequality in terms of income distribution as well as in terms of racial representation in the workforce. The country is furthermore facing social problems such as high crime rates and high incidence of HIV/AIDS. These challenges are pervasive and debilitating and negatively influence all spheres of society. Addressing the root cause of the challenges, namely the fact that Black individuals lack skills, knowledge and abilities due to the consequences of Apartheid, is essential and require urgent and collaborative attention. This study is a step, although a slight one, in the direction of addressing the situation. It should however be noted that it is not only important for further research to be undertaken to build upon this study and also other relevant themes, the results of these studies must be filtered through to organisations for their practical use. Too often findings of research remain locked in academic journals and remain confined to library shelves. Theoretical studies published in academic journals will in and by themself not contribute towards solving the challenges the country is facing. Rather, it requires a collaborative relationship where academia impart the knowledge they gain from their studies to organisations in a practical manner that they will be able to apply in the way they conduct their business.

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Learning Potential Questionnaire

Purpose of the questionnaire:

- This questionnaire is part of a research initiative that aims to investigate the characteristics of a student that influence learning performance.

What you have to do:

- Read and sign the participant information leaflet and assent form (English or Afrikaans)
- This questionnaire consists of 7 sections – **please complete all 7 sections.**
- The entire questionnaire will take about 30 minutes to complete
- It is very important that you read the instructions carefully and complete the questionnaire honestly.

Identification:

Although your response to this questionnaire is <u>completely confidential</u> and will not be seen by anyone except the researcher; you are still required to identify yourself as to allow your responses to be correlated with your academic record.

Name and Surname of Learner: ....

Thank you for completing this questionnaire. Your participation is appreciated!

PARTICIPANT INFORMATION LEAFLET AND ASSENT FORM

TITLE OF THE RESEARCH PROJECT:

Modification, elaboration, and empirical evaluation of the De Goede Learning Potential Structural Model

RESEARCHER NAME:

Sunelle van Heerden

ADDRESS:

Department of Industrial Psychology
University of Stellenbosch

CONTACT DETAILS:

Cell: 082 773 8704
Email: sunellevanheerden@gmail.com

What is this research project all about?

The purpose of this research project is to investigate the factors that influence learning performance. The study will be an elaboration of an existing model that was developed by Johan De Goede in 2007 and will aim to incorporate additional, non-cognitive factors into the model.

Why have I been invited to take part in this research project?

The nature of the study requires the participants to currently be students at a learning institution or enrolled in a training programme. This is due to the fact that the answers given by the participants on the questionnaire must be correlated to the academic results of the participants. Specifically, this study will be conducted on current grade 12 pupils. Therefore, you have been invited to participate in this study as you are currently a grade 12 learner at a learning institution and therefore meet the requirements to participate in the study.

Who is doing the research?

The research will be conducted by Sunelle van Heerden who is currently a Masters student in the Department of Industrial Psychology at the University of Stellenbosch. This research project is being done as part of the requirements to obtain a MComm (Psych) degree.

What will happen to me in this study?

If you volunteer to participate in this study, you will be asked to complete a questionnaire that will take about 30 minutes. The questionnaire will be handed out to you at school during a specifically allocated time period. You will be asked to immediately complete the questionnaire and upon completion thereof hand it back to the researcher. This is the full extent of your participation in the study.

Can anything bad happen to me?

No, there are no risks or negative consequences involved in participating in this study.

Can anything good happen to me?

Although there are no direct benefits to the participants in this study, the overall results that will be obtained from this study will potentially be of benefit in learning institutions and organisations in facilitating skills development.

Will anyone know I am in the study?

All information gathered from this study that can directly be linked to you, including the answers given by you in the questionnaire, will be kept strictly confidential. Only the researcher and the study supervisor will have access to the information given by you and they will under no circumstances share this personal information with any person, including your parents or your teachers. You will be asked to write your name on the questionnaire. This is, however, only required to allow me to link the results of your questionnaire with your academic performance. This will allow me to test the validity of my model.

The results of the study will be reported on by means of an unrestricted electronic thesis and by means of an article published in an accredited scientific journal. A summary of the research findings will be presented to teachers of the school. In none of these instances will the identity of any research participant be revealed nor will any academic results for any pupil be reported. Only aggregated statistics will be reported. The identity of the school will not be revealed in any of the publications. A copy of my research results will be made available to your school.

Who can I talk to about the study?

If any questions or concerns regarding participation in this study should arise, please feel free to contact any of the following persons:

Ms Sunelle van Heerden (Researcher)
sunellevanheerden@gmail.com
082 773 8704

Prof Callie Theron (Study Supervisor)
ccth@sun.ac.za
0218083009

What if I do not want to do this?

Participation in this study is voluntary meaning you may refuse to take part even if your parents have agreed to your participation. In the event that you do agree to take part, you still reserve the right to at any stage during the research process withdraw yourself from participating in this study. There will be no negative consequences on you for refusing to participate in the study or withdrawing from the study.

Please tick either yes or no for each of the following questions:

Do you understand this research study and are you willing to take part in it?

YES		NO

Has the researcher answered all your questions?

YES		NO

Do you understand that you can pull out of the study at any time?

YES		NO

_____   _____
Signature of Participant   Date

INLIGTINGSTUK EN TOESTEMMINGSVORM VIR DEELNEMERS

TITEL VAN NAVORSINGSPROJEK:

Verandering, uitbreiding en empiriese evaluasie van die De Goede leerpotensiaal strukturele model.

NAVORSER:

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Waaroor gaan hierdie navorsingsprojek?

Die doel van hierdie studie is om die faktore wat leerprestasie beïnvloed te ondersoek. Die studie sal poog om uit te brei op 'n bestaande model wat in 2007 deur Johan De Goede ontwikkel is en sal addisionele, nie-kognitiewe faktore tot die model byvoeg.

Hoekom vra julle my om aan hierdie navorsingsprojek deel te neem?

Die studie vereis dat die deelnemers tans of skoliere is of andersins besig is met opleiding weens die feit dat die antwoorde wat gegee word op die vraelyste gekorreleer moet word met die deelnemer se akademiese prestasie. Jy is dus gekies om deel te neem aan hierdie studie omdat jy tans in Graad 12 is en voldoen aan die vereistes om deel te wees van die steekproef.

Wie doen die navorsing?

Die navorsing word uitgevoer deur Sunelle van Heerden, 'n Meestersstudent aan die Departement Bedryfsielkunde van die Universiteit van Stellenbosch. Die navorsingsprojek vorm deel van die vereistes om 'n MComm (Psig) graad te behaal.

Wat sal in hierdie studie met my gebeur?

Indien jy as instem om aan hierdie studie deel te neem sal jy gevra word om 'n kort vraelys te voltooi wat omtrent 30 minute sal duur. Die vraelys sal by die skool aan jou uitgedeel word. Jy sal gevra word om dit onmiddellik te voltooi, en dit dan weer aan die navorser terug te gee.

Kan enigiets fout gaan?

Daar is geen voorsienbare risiko's wat verband hou met deelname in hierdie navorsingstudie nie.

Watter goeie dinge kan in die studie met my gebeur?

Alhoewel deelname aan die navorsing jou nie direk sal bevoordeel nie, sal die resultate van die studie van waarde wees vir opleidingsentrums en organisasies wat regstellende ontwikkelingsgeleenthede aanbied.

Sal enigiemand weet ek neem deel?

Enige inligting wat verkry uit die studie wat op jou van toepassing is, sal streng vertroulik bly en slegs die navorser en studieleier sal toegang hê tot die inligting. Vertroulikheid sal gehandhaaf word deur toegang tot die data te beperk tot die navorser en die studieleier deur die data te stoor op 'n wagwoord-beskermde rekenaar en slegs opsommende statistiek van die opname bekend te maak. Jy sal gevra word om jou naam op die vraelys aan te dui. Dit word slegs benodig om die resultate van die vraelys te kan Koppel aan jou akademiese prestasie.

Die resultate van die studie sal versprei word deur middel van 'n onbeperkde elektroniese tesis en deur middel van 'n gepubliseerde artikel in 'n geakkrediteerde wetenskaplike tydskrif. In geeneen van hierdie gevalle sal die identiteit van enige navorsingsdeelnemer bekend gemaak word of sal enige akademiese uitslae van enige leerder bekend gemaak word nie. Die identiteit van die skool sal nie in enige publikasie bekend gemaak word nie. Jou skool sal wel 'n verslag oor die resultate van die navorsing ontvang.

Met wie kan ek oor die studie praat?

Indien jy enige vrae of probleme het met jou deelname in die studie, kontak gerus enige van die volgende persone:

Me Sunelle van Heerden (Navorser)

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Wat gebeur as ek nie wil deelneem nie?

Deelname aan hierdie studie is vrywilliglik wat beteken jy mag weier om deel te neem, selfs al het jou ouers alreeds ingestem. Verder, indien jy wel instem om deel te neem, behou jy steeds die reg om op enige staduim gedurende die studie jou deelname te ontrek. Daar sal geen negatiewe gevolge wees indien jy weier om deel te neem of jou deelname ontrek nie.

Kies asb vir elkeen van die onderstaande of ja of nee:

Verstaan jy hierdie navorsingstudie, en wil jy daaraan deelneem?

JA		NEE

Het die navorser ál jou vrae beantwoord?

JA		NEE

Verstaan jy dat jy kan ophou deelneem net wanneer jy wil?

JA		NEE

_____   _____

      Handtekening van deelnemer   Datum

Instructions

The following pages contain sets of statements about your first half of grade 12. Please react to each statement as **honestly and truthfully** as possible. **There are no right or wrong answers**.

Indicate the extent to which you agree or disagree with the following statements by crossing the number (from 1 to 7) that best describes your behaviours in the first half of grade 12.

For example:
If you were given the below statement, and you strongly agree with the statement, cross the box with the number 7.

	Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	I enjoy completing questionnaires	1	2	3	4	5	6	7 ✖

Read each statement carefully and choose only ONE answer!

Please respond to all questions

	TIME COGNITIVELY ENGAGED Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	When I study for a test, I try to put together the information from class and from the book.	1	2	3	4	5	6	7
2	When I do homework, I try to remember what the teacher said in class so I can answer the questions correctly.	1	2	3	4	5	6	7
3	It is hard for me to decide what the main ideas are in what I read	1	2	3	4	5	6	7
4	When I study I put important ideas into my own words.	1	2	3	4	5	6	7
5	I always try to understand what the teacher is saying even if it doesn't make sense	1	2	3	4	5	6	7
6	When I study for a test I try to remember as many facts as I can	1	2	3	4	5	6	7
7	When studying, I copy my notes over to help me remember material	1	2	3	4	5	6	7
8	When I study for a test I practice saying the important facts over and over to myself	1	2	3	4	5	6	7
9	I use what I have learned from old homework assignments and the textbook to do new assignments	1	2	3	4	5	6	7
10	When I am studying a topic, I try to make everything fit together	1	2	3	4	5	6	7
11	When I read material for this class, I say the words over and over to myself to help me remember	1	2	3	4	5	6	7
12	I outline the chapters in my book to help me study.	1	2	3	4	5	6	7
13	When reading I try to connect the things I am reading about with what I already know	1	2	3	4	5	6	7

	LOCUS OF CONTROL Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	Whether or not I get to be a leader depends mostly on my ability.	1	2	3	4	5	6	7
2	To a great extent my life is controlled by accidental happenings.	1	2	3	4	5	6	7
3	I feel like what happens in my life is mostly determined by powerful people.	1	2	3	4	5	6	7
4	Whether or not I get into a car accident depends mostly on how good a driver I am.	1	2	3	4	5	6	7
5	When I make plans, I am almost certain to make them work.	1	2	3	4	5	6	7
6	Often there is no chance of protecting my personal interests from bad luck happenings	1	2	3	4	5	6	7
7	When I get what I want, it is usually because I'm lucky.	1	2	3	4	5	6	7
8	Although I might have good ability, I will not be given leadership responsibility without appealing to those positions of power.	1	2	3	4	5	6	7
9	How many friends I have depends on how nice a person I am.	1	2	3	4	5	6	7
10	I have often found that what is going to happen will happen.	1	2	3	4	5	6	7
11	My life is chiefly controlled by powerful others.	1	2	3	4	5	6	7
12	Whether or not I get into a car accident is mostly a matter of luck.	1	2	3	4	5	6	7
13	People like myself have very little chance of protecting our personal interests when they conflict with those of strong pressure groups	1	2	3	4	5	6	7

	Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
14	It's not always wise for me to plan too far ahead because many things turn out to be a matter of good or bad fortune	1	2	3	4	5	6	7
15	Getting what I want requires pleasing those people above me.	1	2	3	4	5	6	7
16	Whether or not I get to be a leader depends on whether I'm lucky enough to be in the right place at the right time	1	2	3	4	5	6	7
17	If important people were to decide they didn't like me, I probably wouldn't make many friends.	1	2	3	4	5	6	7
18	I can pretty much determine what will happen in my life.	1	2	3	4	5	6	7
19	I am usually able to protect my personal interests	1	2	3	4	5	6	7
20	Whether or not I get into a car accident depends mostly on the other driver	1	2	3	4	5	6	7
21	When I get what I want, it's usually because I worked hard for it.	1	2	3	4	5	6	7
22	In order to have my plans work, I make sure that they fit in with the desires of people who have power over me	1	2	3	4	5	6	7
23	My life is determined by my own actions	1	2	3	4	5	6	7
24	It's chiefly a matter of fate whether or not I have a few friends or many friends	1	2	3	4	5	6	7

	GOAL-ORIENTATION Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	I prefer to do things that I can do well rather than things that I do poorly	1	2	3	4	5	6	7
2	I'm happiest at work when I perform tasks on which I know I won't make any errors	1	2	3	4	5	6	7
3	The things I enjoy the most are the things that I do the best	1	2	3	4	5	6	7
4	The opinions others have about how well I can do certain things are important to me	1	2	3	4	5	6	7
5	I feel smart when I do something without making any mistakes	1	2	3	4	5	6	7
6	I like to be fairly confident that I can successfully perform a task before I attempt it	1	2	3	4	5	6	7
7	I like to work on tasks that I have done well on in the past	1	2	3	4	5	6	7
8	I feel smart when I can do something better than most other people	1	2	3	4	5	6	7
9	The opportunity to do challenging work is important to me	1	2	3	4	5	6	7
10	When I fail to complete a difficult task, I plan to try harder the next time I work on it.	1	2	3	4	5	6	7
11	I prefer to work on tasks that force me to learn new things	1	2	3	4	5	6	7
12	The opportunity to learn new things is important to me	1	2	3	4	5	6	7
13	I do my best when I'm working on a fairly difficult task	1	2	3	4	5	6	7

	GOAL-ORIENTATION (continued) Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
14	I try hard to improve on my past performance	1	2	3	4	5	6	7
15	The opportunity to extend the range of my abilities is important to me.	1	2	3	4	5	6	7
16	When I have difficulty solving a problem, I enjoy trying different approaches to see which one will work	1	2	3	4	5	6	7

	LEARNING MOTIVATION Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	I intended to increase my knowledge during the first half of grade 12.	1	2	3	4	5	6	7
2	When I didn't understand some part of the first half of grade 12 course I tried harder for example by asking questions.	1	2	3	4	5	6	7
3	I was willing to exert considerable effort in order to enhance my knowledge and understanding during the first half of grade 12.	1	2	3	4	5	6	7
4	I wanted to learn as much as I could during the first half of grade 12.	1	2	3	4	5	6	7
5	I was motivated to learn the work covered in the first half of grade 12.	1	2	3	4	5	6	7
6	I intended to do my best in the first half of grade 12.	1	2	3	4	5	6	7

	SELF-EFFICACY Statement	Strongly Disagree	Disagree	Slightly Disagree	Neither Agree or Disagree	Slightly Agree	Agree	Strongly Agree
1	Compared with other students in grade 12 I expect to do well.	1	2	3	4	5	6	7
2	I'm certain I can understand the ideas taught in grade 12.	1	2	3	4	5	6	7
3	I expect to do very well in grade 12.	1	2	3	4	5	6	7
4	Compared with others in this class, I think I'm a good student.	1	2	3	4	5	6	7
5	I am sure I can do an excellent job on the problems and tasks assigned for grade 12.	1	2	3	4	5	6	7
6	I think I will receive a good grade in grade 12.	1	2	3	4	5	6	7
7	My study skills are excellent compared with others in grade 12.	1	2	3	4	5	6	7
8	Compared with other students in grade 12 I think I know a great deal about the subjects.	1	2	3	4	5	6	7
9	I know that I will be able to learn the material for grade 12.	1	2	3	4	5	6	7

| | CONSCIENTIOUSNESS | | | | | | | |
	Statement	**Never**	**Almost Never**	**Rarely**	**Some-times**	**Often**	**Very Often**	**Always**
1	I was always prepared in grade 12.	0	1	2	3	4	5	6
2	I paid attention to details.	0	1	2	3	4	5	6
3	My parents and/or teachers needed to check up on me in order for me to get started with my work in the first half of grade 12.	0	1	2	3	4	5	6
4	I got my grade 11 tasks done efficiently and effectively.	0	1	2	3	4	5	6
5	I successfully completed the first half of my grade 12 tasks in the manner I planned to.	0	1	2	3	4	5	6
6	When I made plans with regards to the first half of grade 12 I stuck to them.	0	1	2	3	4	5	6
7	I planned my study time.	0	1	2	3	4	5	6
8	I was thorough in my academic work.	0	1	2	3	4	5	6
9	I got my academic work competed on time.	0	1	2	3	4	5	6
10	I developed a study timetable to guide my studying.	0	1	2	3	4	5	6
11	I stuck to my developed study timetable.	0	1	2	3	4	5	6
12	The study timetable I set up was well organised.	0	1	2	3	4	5	6

	META-COGNITION Statement	Never	Almost Never	Rarely	Some- times	Often	Very Often	Always
1	I ask myself periodically if I am meeting my goals	0	1	2	3	4	5	6
2	I consider several alternatives to a problem before I answer	0	1	2	3	4	5	6
3	I try to use strategies that have worked in the past	0	1	2	3	4	5	6
4	I pace myself while learning in order to have enough time	0	1	2	3	4	5	6
5	I understand my intellectual strengths and weaknesses	0	1	2	3	4	5	6
6	I think about what I really need to learn before I begin a task	0	1	2	3	4	5	6
7	I know how well I did once I finish a test	0	1	2	3	4	5	6
8	I set specific goals before I begin a task	0	1	2	3	4	5	6
9	I slow down when I encounter important information	0	1	2	3	4	5	6
10	I know what kind of information is most important to learn	0	1	2	3	4	5	6
11	I ask myself if I have considered all options when solving a problem	0	1	2	3	4	5	6
12	I am good at organising information	0	1	2	3	4	5	6
13	I consciously focus my attention on important information	0	1	2	3	4	5	6
14	I have a specific purpose for each strategy I use	0	1	2	3	4	5	6
15	I learn best when I know something about the topic	0	1	2	3	4	5	6
16	I know what the teacher expects me to learn	0	1	2	3	4	5	6
17	I am good at remembering information	0	1	2	3	4	5	6
18	I use different learning strategies depending on the situation	0	1	2	3	4	5	6
19	I ask myself if there was an easier way to do things after I finish a task	0	1	2	3	4	5	6
20	I have control over how well I learn	0	1	2	3	4	5	6
21	I periodically review to help me understand important relationships	0	1	2	3	4	5	6
22	I ask myself questions about the material before I begin	0	1	2	3	4	5	6
23	I think of several ways to solve a problem and choose the best one	0	1	2	3	4	5	6
24	I summarise what I've learnt after I finish	0	1	2	3	4	5	6
25	I ask others for help when I don't understand something	0	1	2	3	4	5	6
26	I can motivate myself to learn when I need to	0	1	2	3	4	5	6
27	I am aware of what strategies I use when I study	0	1	2	3	4	5	6

	META-COGNITION (continued) Statement	Never	Almost Never	Rarely	Some- times	Often	Very Often	Always
28	I find myself analysing the usefulness of strategies while I study	0	1	2	3	4	5	6
29	I use my intellectual strengths to compensate for my weaknesses	0	1	2	3	4	5	6
30	I focus on the meaning and significance of new information	0	1	2	3	4	5	6
31	I create my own examples to make information more meaningful	0	1	2	3	4	5	6
32	I am a good judge of how well I understand something	0	1	2	3	4	5	6
33	I find myself using helpful learning strategies automatically	0	1	2	3	4	5	6
34	I find myself pausing regularly to check my comprehension	0	1	2	3	4	5	6
35	I know when each strategy I use will be most effective	0	1	2	3	4	5	6
36	I ask myself how well I accomplished my goals once I'm finished	0	1	2	3	4	5	6
37	I draw pictures or diagrams to help me understand while learning	0	1	2	3	4	5	6
38	I ask myself if I have considered all options after I solve a problem	0	1	2	3	4	5	6
39	I try to translate new information into my own words	0	1	2	3	4	5	6
40	I change strategies when I fail to understand	0	1	2	3	4	5	6
41	I use the organisational structure of the text to help me learn	0	1	2	3	4	5	6
42	I read instruction carefully before I begin a task	0	1	2	3	4	5	6
43	I ask myself if what I'm reading is related to what I already know	0	1	2	3	4	5	6
44	I re-evaluative my assumptions when I get confused	0	1	2	3	4	5	6
45	I organise my time to best accomplish my goals	0	1	2	3	4	5	6
46	I learn more when I am interested in the topic	0	1	2	3	4	5	6
47	I try to break studying down into smaller steps	0	1	2	3	4	5	6
48	I focus on overall meaning rather than specifics	0	1	2	3	4	5	6
49	I ask myself questions about how well I'm doing while I am learning something new	0	1	2	3	4	5	6
50	I ask myself if I learned as much as I could have once I finish a task	0	1	2	3	4	5	6
51	I stop and go back over new information that is not clear	0	1	2	3	4	5	6
52	I stop and reread when I get confused	0	1	2	3	4	5	6