Developing metacognition among young learners by using stories

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Being aware of our thinking as we perform learning tasks and then using this knowledge to actively self-regulate what we are doing, is commonly known as metacognition. This study investigated the influence of a story-based intervention on the development of metacognition among Intermediate Phase learners engaged in content area learning. Two intact Grade 4 class groups from two public schools in different socio-economic communities in the Western Cape participated in the study. This design-based research (DBR) study comprised of 2 iterative cycles. A pragmatic paradigm underpins the use of multiple data collection methods. This article reports on the pre- and post-intervention data from the second iteration, comparing the 2 groups. Most learners seemed to have improved in terms of metacognition and strategy knowledge on most data collection instruments. The data, however, revealed that learners in both groups struggled to verbalise their thoughts. Low literacy rates influenced both data collection and the outcome of the intervention. From the study, it appears that the story-based intervention could be a feasible and effective learning tool to develop metacognition within the contexts described in this study.

Keywords: constructivism; content area learning; design-based research; intermediate phase learners; intervention; metacognition; metacomprehension; reflection; self-regulation; storytelling

Introduction
In the face of aging workforces in Europe and North America, there is a global interest in investing in quality education for the youth, the workforce of tomorrow, in emerging economic markets. According to a report by the McKinsey Global Institute, the economies of South Asia and Africa will supply nearly 60% of the world's new workers by 2030 (Turbot, 2016). However, if current education trends such as high drop-out rates, meagre funds, a lack of access and inclusion, and acute teacher shortages continue to plague progress (Turbot, 2016), the global labour force will include a billion workers who lack secondary level education. Hoffman (2003) maintains that future employability requires the ability to deal effectively with change, to keep learning new things and *to know how to learn* and *think* independently. A fundamental goal of education today, more than ever, is to promote the development of self-regulated learning. Success in the knowledge society depends on our ability to learn and the core competence of learning to learn, therefore, needs to be prioritised. Metacognition, our ability to think about our thinking and how we learn, plays a central role in self-regulation (Fisher, 2007).

Metacognition can be developed, and the potential benefits for learner performance are well documented (Dimmitt & McCormick, 2012). The problem is, however, that not all people develop metacognition spontaneously, and for many the development is delayed (Mahdavi, 2014). In other words, not all people become what Ertmer and Newby (1996:1) call "expert learners." Expert learners are metacognitively aware of themselves as learners and possess strategies to establish what they know and do not know, and what to do when confronted with a novel learning assignment.

Our purpose is to report on an investigation into the effectiveness of using storytelling to develop metacognition at Intermediate Phase level. We believe that the development of metacognition does not happen for many people if not explicitly modelled and taught, and that early intervention is critical, before learners form ineffective habits and beliefs about themselves as learners. We furthermore believe that an innovative way of developing metacognition is needed, considering the contextual challenges faced by the South African education system, which include low literacy rates of learners and a lack of training and mentoring resources for teachers (Van Tonder, 2013). The latter also alludes to exploring whether diverse socio-economic contexts would play a role in the feasibility and possible influence of the story-based intervention.

Motivation for the Research
South Africa has a serious education challenge (Pretorius & Lephala, 2011). Of the 40 participating countries, South Africa was rated last in several Progress in International Reading Literacy Studies (PIRLS) before 2012 (Mullis, Martin, Foy & Drucker, 2012). Given the reality of under-resourced school communities and low literacy rates, this study aimed to address the need for the development of metacognitive awareness among young learners. Unfortunately, teaching metacognition as a higher-order concept is largely unknown to the average teacher, learner and parent/caregiver (Woolfolk, 2013). On the off chance that learners are taught abstract study skills (strategies), they struggle to apply (transfer) these when they read and learn (Veenman, 2015). The habit of rote learning and memorising without deep processing therefore becomes commonplace (Moonsamy, 2014). Learners learn about the strategies, but not when and how to apply them in the context of everyday learning, scaffolded by teachers.

Relatively little research has been done and published on the topic of metacognition within the South African context, particularly among early Intermediate Phase learners and in content area learning. The urgent need for research has therefore been expressed by numerous authors (Klopper, 2012; Van der Walt & Maree, 2007). The learning crisis and importance of research is, however, a global issue. According to the 2013/2014 Education for All (EFA) Global Monitoring Report it is estimated that at least 250 million primary-school-aged children, more than 50% of whom have spent at least four years in school, cannot read, write or count well enough to meet minimum learning standards (United Nations Educational, Scientific and Cultural Organization [UNESCO], 2014).

Our point of departure in designing the story-based intervention was the assumption that metacognition is not explicated in the school environment (Van der Walt & Maree, 2007) and that there is a lack of learning support material, particularly in Afrikaans and at Intermediate Phase, to address this issue. The feasibility and influence of an inexpensive resource to advance metacognition, not dependent on highly trained teachers, namely a story about themselves as learners pitched at their level of development, was therefore explored in this research study.

Conceptual Framework
Metacognition
Metacognition can be defined as knowledge about one's knowledge, processes and cognitive and affective states, and the ability to consciously and deliberately monitor and regulate one's knowledge, thinking processes and cognitive and affective states (Zheng & Gardner, 2017). Metacognition comprises two fundamental components referred to as metacognitive knowledge (static source of knowledge of cognition) and metacognitive self-regulation (regulation of cognition or metacognition in action) (Brown, 1987).

Reflection (in the form of conscious verbalisations of reflective thought while engaged in the learning process) actively links metacognitive awareness with metacognitive self-regulation (metacognition in action) (Ertmer & Newby, 1996). Reflecting learners become more aware of their own thinking as well as more knowledgeable about cognition in general, and as they act on this awareness, they tend to learn better (Dimmitt & McCormick, 2012). This was the premise of the study reported on in this article.

In this study we acknowledged the situated nature of learning (Post, Boyer & Brett, 2006; Zimmerman, 2001) and built on the assumption that learning is socially mediated and socially constructed, underpinned by Vygotsky's (1986) theory of cognitive development. In this study, mediation is, however, not primarily realised through the traditional direct teacher-learner relationship, but by means of a socially contextualised learning tool using the principles of peer modelling and demonstrative self-reflection in a story text.

Constructivist learning
A metacognitive approach (learning to learn) is a process of discovery about learning where the learner is actively involved in the meaning-making process. Constructivist learning emphasises self-reflection and locates the understanding within the individual (Daley, 2002). According to Vygotsky's theory of cognitive development (1986), for learners to *construct* an understanding about themselves as learners and how to learn, they need to interact with more knowledgeable others. This study employed peer modelling in the form of story characters to guide learners to construct their own understanding of metacognitive strategies. According to Vygotsky (1986), children's interactions with competent others (in this case the story characters) serve to mediate thinking and text comprehension in the cognitive space between what can be accomplished alone and in collaboration with more capable others – the zone of proximal development.

Content area learning and metacomprehension
As children leave the Foundation Phase, the emphasis on learning to read shifts to reading to learn, involving moving beyond just decoding words to acquire information and meaning from text (Goldman, 2012). In addition to languages and mathematics, learners are introduced to content area learning in Natural Sciences and Technology, and Social Sciences, often without any support on how to learn and solve problems in these areas.

To ensure deep learning, readers need to not only grasp the meaning of the text, but also correctly assess how accurate their understanding of the text is, i.e. "metacomprehension" (Griffin, Wiley & Thiede, 2008:96). Metacomprehension refers to our awareness of text-processing strategies and the metacognitive skill of monitoring understanding of what is being read. Expert learners detect comprehension failure (breakdown), which alerts them to pause and invest in conscious strategies to restore understanding. These metacognitive strategies allow learners to control their own cognition and improve comprehension.

Based on the research by Jacobs and Paris (1987), Miholic (1994) and Schmitt (1990), this study focused on the following six strategies or groups of related strategies that expert learners employ to metacomprehend text: previewing; predicting and verifying; self-questioning; drawing on prior knowledge; purpose setting; summarising and drawing on mental images; and applying fix-up strategies. These metacomprehension strategies were further allotted to the three stages in the read-

ing process (Pressley & Afflerbach, 1995): before, during and after reading. These stages parallel the three metacognitive processes of planning, regulat-

ing and evaluating. Table 1 provides an outline of these strategies.

Table 1 Metacomprehension strategies included in the intervention

Strategy/Strategy group	Behaviour indicator (example)	WHEN should the strategy be applied? Before/during/after reading text
Previewing, predicting and verifying	"Before I begin reading, I read the heading and look at the pictures to predict what the text is about, and after I have read the informative piece, I think about what made me make good or poor predictions."	Before, during and after
Self-questioning	"Before I begin reading, I ask myself questions that I would like to have answered, and then, as I read through the text, I check to see if I can answer any of the questions."	Before, during and after
Drawing on prior knowledge	"While I am reading, I keep thinking of what I already know about the things and ideas in the text to help me connect the new information with my prior knowledge of the topic."	Before and during
Purpose setting	"After I've read the text, I check to see if I met my purpose for reading the text."	Before and after
Summarising and drawing on mental images	"After I've read the text, I retell the main points of what I have read about the topic so that I can check to see if I understand it, and I draw a mind map."	During and after
Applying fix-up strategies	"While I'm reading, I reread some parts or read ahead to see if I can figure out what is happening if things aren't making sense."	During and after

Method

Research Problem and Aim of the Study

The aim of the study was to determine whether metacognition among learners in the Intermediate Phase in content areas could be improved using a story-based intervention, modelling metacognition and strategy awareness by means of telling stories with the learning process as theme. In addition, to understand metacognitive development in context and as supported by the DBR methodology used, we also explored different socio-economic school environments (refer to the sample profile in Table 2). The research problem was: How can storytelling help young learners acquire reflective self-awareness and knowledge of metacognitive strategy use in content area learning? This article reports on the implementation of the intervention, and forms part of a larger DBR study that investigated formulating design principles to inform new frameworks.

Design

The study is situated within a pragmatic paradigm. A design-based research (DBR) methodology was employed with multiple data collection instruments. Qualitative and quantitative methods (descriptive statistics only) were used to identify themes that guided the development of design principles and informed the implementation of the conceptualised intervention. The study was presented in a comparative, instrumental case study format (see Bartlett & Vavrus, 2017).

Design-based research is an ideal approach for investigating complex and real-world educational problems, assisting in closing the chasm between practice and theory (Reeves, Herrington & Oliver, 2005). Typically, within a DBR methodology, interventions are conceptualised and then implemented in natural settings to generate new frameworks for conceptualising learning, instruction, design processes and educational reform (Brown, 1992). The goal of DBR is not to prove the merits of any intervention, or to reflect passively on a context in which learning occurs, but to examine the practical application of theories of learning themselves in specific, situated contexts. By designing purposeful, naturalistic, and sustainable educational ecologies, researchers can test, extend, or modify their theories and innovations based on their pragmatic viability. This process offers the prospect of generating theory-developing, contextualized knowledge claims that may complement the claims produced by other forms of research (Dominguez, 2017).

Two distinct iterative cycles characterised the study, each cycle having the following four phases as in Reeves's (2006) DBR model (see Figure 1): analysis of a practical problem, the development of a solution (intervention) within a theoretical framework, the evaluation and testing of the proposed solution in practice, and documentation and reflection to produce design principles.
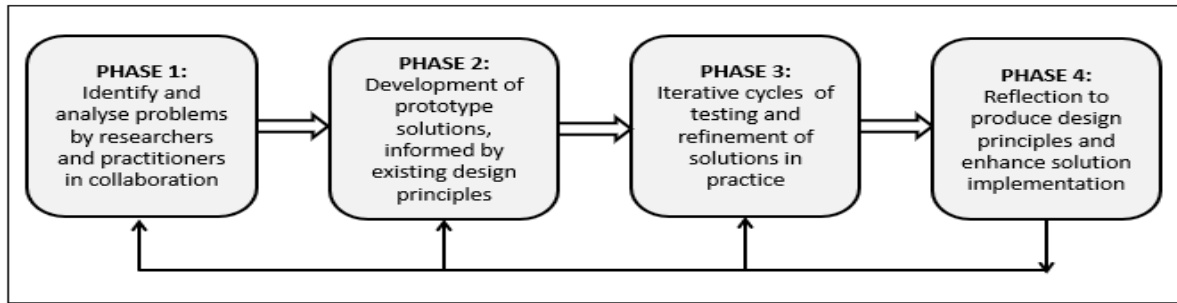
Figure 1 Design-based research approach – a cycle (adapted from Reeves, 2006)

During the first iteration, researchers and practitioners collaboratively developed the story-based intervention, and its design and content were evaluated using a systematic implementation strategy. Feedback from the first iteration led to improvements of the prototype and during the second iteration, a pre- and post-intervention strand of inquiry was added to explore potential learning in the two groups of participants compared to before the intervention. In this article, we report on the second iteration and results. Further articles will elaborate on the development of design principles concerning the story-based intervention. The primary contribution of a DBR study is the set of design principles accompanying the conceptualised intervention, providing insight into the function and key characteristics of the story-based intervention, as well as the procedural conditions guiding implementation (Dominguez, 2017).

Setting and Participants
In the South African school system learners are exposed to formal examinations for the first time at the age of nine to ten (Grade 4). The reasoning was

therefore to develop an intervention for this age group to foster more effective learning strategies from an early start. As we also wanted to explore the influence of the socio-economic context on the learning environment and its impact on metacognitive development, the sampling strategy was purposive in nature.

Two intact Grade 4 class groups (27 + 33 learners – second iteration), along with their teachers, in two public schools from diverse socio-economic communities in the Western Cape were involved in the study. The study spanned over two years. The class groups from School A and School B were similar in terms of language use (Afrikaans first language speakers), age of learners (average age 10) and geographical location, but very different in terms of other critical factors (see Table 2 for a summary of the sample profile). School A serves a more affluent community, while learners from School B are from a poorer community with far fewer resources. The two class groups differed most in terms of socio-economic factors, and this article also reports on the influence of context on the effectiveness of the intervention.

Table 2 Sample profile

	Grade 4 class from School A	Grade 4 class form School B
Location	Western Cape	Western Cape
School size (class size)	1,500 (27)	240 (33)
Parent profile: Tertiary education	Majority have a form of tertiary education	Very few have completed Grade 12
Parent profile: Average income	Above average/middle class	Farm workers with seasonal income/poor, most learners on food scheme; many orphans \
Learning support from parents/external source	Plentiful	Very limited
Teacher – experience	30 years' experience with degree and further development	Four years' experience as teacher in training, working towards degree
*ANA 2012 – language score (Afrikaans First Language)	80% class average	48% class average
*ANA 2012 – Mathematics	78% class average	41% class average
**Quintile classification	Quintile 5	Quintile 1

Note. KEY: *ANA = Annual National Assessment; Home Language and Mathematics. **Quintile classification = Quintile ranking determines the amount of funding that a school receives based on socio-economic status variables. Quintile 5 schools that serve more affluent communities receive the smallest allocation per learner, while a school such as School B, from a very poor community with far fewer resources, would need more funding.

The Story-Based Intervention

Young learners were exposed to stories about learning presented by learners like themselves, modelling how they think and act when encountering authentic learning activities. The aim was to model the vocabulary, strategy use and self-knowledge that we wanted learners to draw on in their thinking and understanding of learning. These elements were explicitly incorporated into the text of an entertaining story that learners could read and reflect on in or outside class, *without* being dependent on a highly trained teacher or parent.

The development and content of the 12 short stories were informed by a broad theoretical and evidence-based framework (see Jacobs & Paris, 1987; Schmitt, 1990). The six metacognitive strategy groups in content area learning, outlined in Table 1, gave direction to the stories (and formed the backbone of the data collection instruments used in the study). The intervention was structured not like a typical textbook with a series of factual sessions about learning, but as a story about Abe, Annabel and their friends learning about what it means to be an expert learner. The stories were written in the voice of young learners such as themselves, self-reflecting on their metacognitive experiences and what they learn about being metacognitive. Abe and his friends therefore peer-modelled metacognition and self-reflection by means of a reflective written text.

Data Collection and Analysis

The two groups of participants were surveyed at two points in time – once before the intervention and once thereafter. Guided by the DBR approach, the design comprised the use of multiple methods of data collection (see Figure 2), including a questionnaire, a content learning activity and test, a self-reflective written task and semi-structured focus group interviews (FGIs).

All the learners were requested to complete the self-designed read-to-learn questionnaire (RLQ) with 20 multiple-choice questions testing metacognitive strategy awareness in content learning. Thereafter, they were given a reading piece to prepare, followed by a comprehension test. Before, during and after reading the expository text, they completed written self-reflection tasks, expressing their thoughts and feelings about the learning process. Lastly, FGIs were conducted with the same small groups in each class. The story-based intervention followed and was carried out during the third school term. The data-collection process was then repeated with all the methods and in the same chronological order, as indicated in Figure 2. The order of the questions in the questionnaires was, however, changed and a new reading piece at a similar level of difficulty was selected for the comprehension test.

In terms of the actual intervention, the process included learners having story time twice a week for six weeks for about 20 minutes, followed by reflective discussion and practice for internalisation (e.g. rereading of stories) on the other days. No special arrangements were made to allocate additional time for this activity, as it simply slotted into the normal time allocated for reading by the schools. The idea was to test the practicability of this type of intervention. One of the research conjectures was that, if teachers found the intervention too difficult, complex, time-consuming or arduous, they could simply not apply it in future, even if we could demonstrate its benefits. Developing metacognitive awareness without interference was therefore proposed.
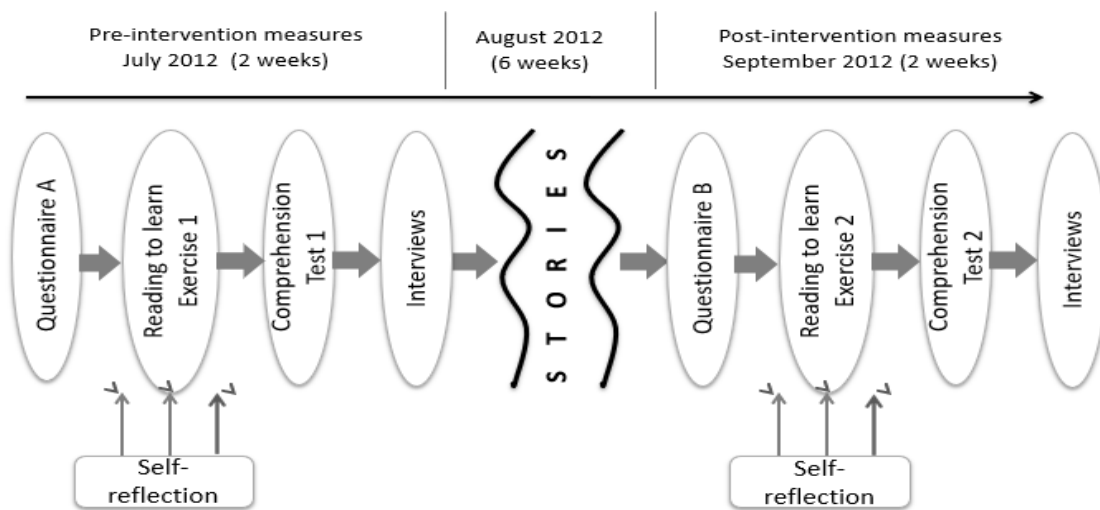

Figure 2 Data-collection process during phase 3 – second iteration

The Read-to-Learn Questionnaire (RLQ)
Metacognitive strategy awareness in terms of expository text comprehension was assessed using the RLQ questionnaire. The RLQ was developed for the research project as no existing questionnaires that measure metacognitive awareness in content learning (metacomprehension) appropriate for use by Intermediate Phase learners (10–12 years) with varying scholastic ability were available in Afrikaans. The RLQ consisted of 20 questions with three multiple-choice options each, grouped into three sections: before, during and after reading the text. A correct answer scored 1 and undecided or unanswered statements scored 0. The six metacognitive strategy groups were assessed in the RLQ. Descriptive frequencies were calculated, and tendencies determined for each strategy. See Figure 3 for an excerpt of the RLQ, translated into English.

5. BEFORE I start reading, it is a good idea to:		
A. Use the headings and pictures to think about what I am reading.	B. Sound the words I do not know until they make sense.	C. Practise to read the text out loud.
6. WHILE I read, it is a good idea to:		
A. Read the content very slowly to ensure that I do not miss anything important.	B. Think throughout why I am reading the text and about what I must do to reach my goal.	C. Think about how far I have already read and how much work I still need to go through.

Figure 3 Excerpt of RLQ questions

The RLQ was developed and piloted during the first iteration. The RLQ was partially modelled on the Metacognitive Strategy Index (MSI) by Schmitt (1988, 1990), in that it has a multiple-choice format and includes declarative and conditional knowledge of a variety of metacognitive behaviours that comprise of six broad categories. Schmitt (1990) points out that the MSI can easily be adapted to measure metacomprehension in expository texts. The results can be used to consider learners' individual strengths and weaknesses in metacognitive awareness, and the following questions with respect to types of strategies and conditional knowledge are considered (Schmitt, 1990): Which strategies were most well-known? Are there differences among the before, during and after stages that might signal strengths/weaknesses? Are there patterns indicating difficulty with conditional knowledge for items that have distracters that are relevant for a different stage of reading?

The MSI is widely regarded as a valid means for measuring learners' metacognition for the purpose of designing instructional programmes (Israel, Bauserman & Block, 2005) with reliability and validity data available. Schmitt (1988) found a statistically significant correlation between the questionnaire and the IRA ($r = 0.48$; $p < 0.001$), the measure devised by Paris, Cross and Lipson (1984) for third-grade learners who participated in a metacomprehension training study. Furthermore, Lonberger (1988) reported an MSI internal consistency value of 0.87 using the Kuder-Richardson Formula 20, and Pereira-Laird and Deane (1997) reported a Cronbach's alpha of 0.68 for the MSI when used to measure metacomprehension in intervention studies (see Schmitt, 1990:64).

Content learning activity and test
The study used a content learning activity, similar to a comprehension test, to measure the learners' ability to read expository text with recall and comprehension, and the possible influence of the intervention that modelled the use of metacognitive strategies. The learners were given a short informative piece to read on a topic about penguins (before intervention) and Henry Ford (after intervention), after which they were given a test on the piece. The readings (one page long with a few pictures and subheadings) were chosen in consultation with the class teachers, and the question papers were also checked for suitability. Learners were given at least two periods, over two days to read and study the material before the test questions were administered. The tests amounted to a total score of 20.

Written self-reflection responses while completing a learning task
Metacognitive behaviour is a dynamic interactive process and must therefore be measured *in progress* (Tanner, 2012). The learners in this study were asked to write down (to reflect on) what they were thinking, feeling and doing *while* completing a learning activity that involved reading an informational piece. Based on the work of Pressley and Afflerbach (1995), they were asked to respond at three stages: before, during and after they were given the page to read and study. The self-reflection tasks were scored by using the frequency of responses reflecting metacognitive awareness and comparing the data before and after the intervention for each group.

Semi-structured focus group interviews (FGI)

Focus group interviews (FGI) with selected learners were used as a further data-collection method. The interviews took place after all the other data collection methods (see Figure 2) had been completed, both before and after the intervention (second iteration). Purposeful sampling (Mertens, 2015) was employed to select the interviewees, as the participating teachers at each school were asked to identify groups of three to five learners in their class, according to their average academic performance (high-, average- and low-achieving). The interviews were recorded on a digital video recorder and transcribed verbatim. Thematic analysis was employed for identifying, analysing and reporting possible patterns of vocabulary use within the data, relating to metacognitive knowledge (Braun & Clarke, 2006).

The semi-structured FGIs followed an interview guide approach, where the interviewer used a set of predetermined open-ended questions but allowed the interview to follow a conversational path to gain an in-depth understanding of the issues at hand (see Johnson & Turner, 2003:305). The researchers were constantly aware of the possible risk of influence or judgemental comments during the interviews. Some of the questions were designed to explore the young learners' awareness of strategic reading and metacognitive thinking while studying from the text, and included: What makes a learner perform well at school? Do you like to study and why/why not? When your teacher gives you the assignment to read text for study purposes, what do you do first? What do you do to make sure you remember what you read?

Ethical Considerations

Clearance for this research was obtained from the Research Ethics Committee (Humanities) of Stellenbosch University and permission was obtained from the Western Cape Education Department as the gatekeeper of schools in the province (excluded for review purposes). To protect the autonomy and welfare of the participants, we obtained informed consent in writing from the relevant principals, teachers and parents, and assent from the learners. Participants were clearly briefed on the aims and the implications of the research. All involved were made aware that participation was completely voluntary and that they could withdraw at any time with no consequences to them. The study did not involve any harmful physical activity or emotionally hazardous conduct, so no additional steps needed to be taken in this regard. Furthermore, information obtained during the research that may have revealed the identity of a participant or an institution was treated as confidential.

Results

The Read-to-Learn Questionnaire

On RLQ 1 (administered before the intervention), the Grade 4s of School A scored the highest on "summarising and drawing on mental images," while "purpose setting" received the lowest average score. When the questionnaire (RLQ 2) was administered again after the intervention, higher percentages on *all* items were found. "Drawing on prior knowledge" received the most responses (increased by 39.5%).

From the data collected by means of RLQ 1 before the intervention it appeared as if the class group from School B was unfamiliar with most of the metacognitive strategies. When the questionnaire was administered after the intervention (RLQ 2), an increase on all items was observed. The "previewing, predicting and verifying" indicator received the most responses with an increase of 31.3%, while "drawing on prior knowledge" also increased by19%.

Comparing the two class groups, the improvement for School A was 41.9% (17.6%/42%), while School B showed an improvement of 94% (see Figure 4). The learners from School B, however, started from a very low base and after the improvement still only achieved a score of 34.6%.
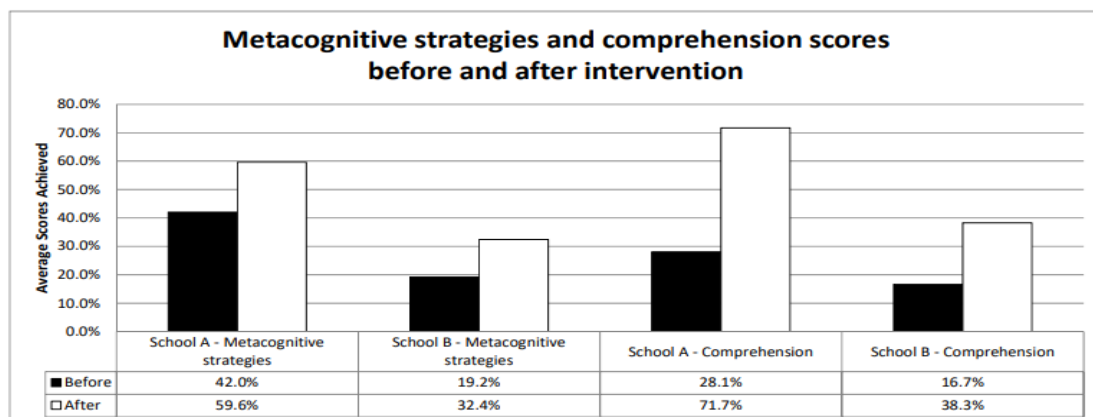

Figure 4 Metacognitive strategies – schools A and B, before and after intervention

Content Learning Activity

On the first reading piece, the average score out of 20 for the class from School A was only 5.6 (28.1%), but after the intervention, the average performance on the content learning activity increased to an average of 14.3 (71.3%). A noteworthy increase was evident for all learners in this group (see Table 3).

Although all the learners from School B individually improved their marks on the content learning activity, they did not improve to a competency level expected of a Grade 4 learner in terms of comprehension and recall after the intervention (43.2%). Compared to the other class group, their performance was poor (see Table 3).

Table 3 Content Learning Activity Results – Schools A and B

	School A	School B
Test 1 – average %	28.1	17.4
Test 2 – average %	71.3	43.2
% improvement	153.74	148.3
(difference/original score)		

Written Self-Reflection Responses While Completing a Learning Task

The self-reflection tasks were scored by using the frequency of responses reflecting metacognitive knowledge of strategies before, during and after reading the expository texts. Before the intervention, "summarising and drawing on mental images" received the highest frequency of responses among learners from School A. This corresponds with the data from the questionnaire also administered before the intervention (RLQ 1). However, the high number of references made to emotional states of mind is noteworthy. After the learners (School A) were exposed to metacognitive knowledge through the storytelling intervention, the number of references to "purpose setting," "posing questions" as well as "previewing, predicting and verifying" increased. The notion of connecting new knowledge with prior knowledge covered in the stories, therefore, featured quite prominently in the learners' utterances. One learner stated: "*I connect what I already know with what I learn now.*"

The learners from School B struggled to successfully complete the written self-reflection exercises. Before the intervention, "previewing" received the most mention, and after the intervention, "prior knowledge" was the most popular response. Although not much information on the learners' metacognitive awareness levels was obtained by means of this instrument, important contextual data emerged. Most of the remarks concerned either their emotional state or social and learning environments. Comments irrelevant to the task at hand were also quite frequent, particularly when the exercise was done for the first time. Apart from the normal school and learning challenges, these learners face numerous additional difficulties. The reflection sheets provided a platform for them to honestly share some of these hardships. One boy simply stated: "*After I get beaten, I am angry*" and another said: "*I am happy because no one is cross with me today.*" One of the boys wrote the same sentence down every time the self-reflection sheet was handed to him, namely: "*I am happy because I am now safely at school*" (referring to abuse and neglect).

Semi-Structured Focus Group Interviews

All the learners selected for the focus groups from School A struggled to explain how they learn from text, but more so before the intervention. Low-achieving learners had the most difficulty expressing themselves in this regard. Most learners simply said that they read and reread the information until they thought they would remember the facts. The only metacomprehension strategy the learners mentioned without any prompting was "summarising" – identifying key phrases and drawing a mind map. This finding corresponds with the other results on both the questionnaire and the self-reflection task. The learners also talked about underlining or circling unknown words quite frequently and this seems to be techniques taught in Grade 3. Interestingly, the learners also confessed that, although they underlined the unknown or difficult words, they did nothing to clarify their meaning afterwards ("applying fix-up strategies"). They simply read the page again in preparation for the test, still unsure of certain phrases in the text.

The data indicated that metacognitive knowledge seems not to have increased after the intervention, although two noteworthy contextual issues came to the fore during the interviews. The first concerns the parental support that the learners received, and the second issue was about motivation to learn. High-performing learners appeared to be more dependent on their parents to help them study, for instance, by asking them questions before a test. Motivation to learn plays a major role in academic performance (Hofer, 2004). The high achievers are performance-driven, and during the interviews they spoke about their desire to achieve – "*get the best marks in class.*"

The learners from School B found it even more difficult to put into words how they learn from text. During the initial interviews, they seemed unfamiliar with metacognitive strategies. They appeared tense during the interview process, even after the intervention. They simply stated that they read and reread and tried to remember as much as possible. During the follow-up interview, the researchers were surprised by the average-performing group of learners who, with a bit of prompting, started to enthusiastically talk about what they had learned from Abe, the main character in the story-based intervention. They could suc-

cessfully recite a summary of the metacognitive strategies covered in the stories, using hand gestures, as done by Abe and friends.

Discussion
Key Findings and Comparative Discussion
This article developed from an investigation into the development of metacognition among young learners by means of storytelling. A pragmatic, design-based research approach was used and although generalisations should be considered with care because of the small sample, the findings, as presented above, revealed various themes identified from both qualitative and quantitative methods employed.

The first theme concerns the learners' awareness of metacognitive strategy use in content learning and their improvement across the board. The questionnaire (RLQ) revealed that the young learners in this study had limited knowledge of metacognitive strategies. After the intervention there seemed to be an improvement in both groups. Most encouraging was to see that all the learners' knowledge about metacomprehension strategies broadened: they gained knowledge of a variety of strategies. Research suggests that poor performers will show greater improvement with metacognitive interventions compared to stronger learners (McCormick, Dimmitt & Sullivan, 2013), which is substantiated by the findings of this study (see Figure 4).

Another theme identified relates to learners' comprehension ability of an expository reading piece and their possible dependency on a mediator to help them recall what they have read. The content learning activity indicated an improvement in terms of comprehension and recall ability after the intervention. The average percentage on the first content learning activity for learners from School A was surprisingly low compared to what the teacher recorded for a prior similar activity. We suggest that the reason for this very low percentage level can be attributed to the way in which the activity was administered. Learners were used to refer to a reading piece while being tested on their comprehension. As we also wanted to explore their ability to recall information that they have read, the reading piece was not handed back to them, hypothesising that they would then be forced to apply more learning strategies. The learners were made aware of this beforehand. The other reason for this group (School A) to underperform in the activity might be the fact that they had to read with comprehension and learn for recall without the help of a parent or caregiver. They were given ample time to prepare for the test, but only during school hours. Their dependency on a parent to help them study was highlighted during the FGIs. One of the top performing learners maintained: "*I will feel ill-prepared if my mother did not help me study.*"

When they were given a similar content learning activity after the intervention, they achieved a much better average performance (see Table 3) under the same conditions. It could be speculated that they learned from the first experience and that the intervention made an impact.

The learners from School B, compared to the other class group, did not improve to a satisfactory level in terms of comprehension and recall, even after the intervention (see Table 3). These underperforming learners visibly struggled to read text independently and the teacher had to reread the piece several times out loud, but still comprehension clearly lacked. Quantitative data gathered from the questionnaire and content learning activity and (comprehension) test shows that inadequate reading comprehension had a direct impact on the findings, and this is supported by the qualitative data generated from the other instruments, namely the self-reflective task and the interviews. The theme of poor reading ability and its possible influence on research findings is important to note.

Another theme identified, and related to reading ability, was the learners' failure to verbalise how they learn and think. In terms of the self-reflection task, very little data concerning metacognition was obtained. The fact that learners from School B had a very low literacy rate also had a direct impact on the effectiveness of this method. Young children in general battle to express themselves in terms of their thoughts and emotions, but these learners had additional challenges. Their inability to articulate and write down what they think is supported by literature on learners from poor communities (Blease & Condy, 2014). As was explained earlier, to infuse the language of learning and explicitly embed thinking vocabulary into the text of an entertaining story was a further characteristic of the intervention proposed in the larger study.

The self-reflection tasks did, however, elicit contextual data, clearly indicating the influence of socio-economic factors on learning conditions. Many of the learners in School B get their only daily meal at school (feeding scheme) and a remark such as "*I am surprised that I get to eat every day*" was therefore not unexpected. Thinking about learning strategies is not a priority if you are hungry. The influence of socio-economic factors also came to the fore during the FGIs, possibly explaining the limited relevant data gathered. We know from literature that learners from less affluent communities have limited vocabulary (Blease & Condy, 2014). In addition, research conducted by Evans and Rosenbaum (2008) found that chronic exposure to poverty has been associated with diminished self-efficacy and a lack of personal control, beliefs and self-regulated behaviour. The learners from School B demonstrated a lack of initiative in class and were unable to express

themselves verbally or on paper. The theme of a contextually sensitive intervention is clear.

Finally, in terms of the type of intervention, the stories guiding learners in constructing their own understanding of knowledge through peer collaboration seemed to have had a positive influence. The storytelling concept is learner-centred. During the interviews it became apparent that the learners could relate to the characters in the stories. Abe (the main story character) modelled how to reflect on one's own learning and he related first-hand how he thinks and what he learns about himself and the learning process, providing the reader with the vocabulary and phrases to imitate. One of the learners from School A commented (after the intervention): "*I read and then I stop and ask myself: What does this part mean? I think out loud ... like Abe ... .*"

Limitations of the Study

This study presents some limitations, such as the small number of participants involved ($n = 60$, second iteration) and the fact that we only report on one intervention. Poor reading skills on the part of participating learners posed a serious challenge, as was particularly clear from the findings on the content learning activity from School B. The nature of some of the methods used generated only limited data (e.g. the learners struggled to verbalise their thoughts during FGIs). It should further be noted that participants could have matured during the time of the intervention. The Hawthorne effect could also be a reason for finding improved results, as the leaners could have changed their behaviour due to the attention they received from the researcher who read the stories and facilitated the assessments, rather than because of the actual intervention.

Contributions and Recommendations for Future Research

Various themes could be identified from the findings reported on in this article. The study revealed that learners had limited knowledge of metacognitive strategies, but most learners seemed to gain knowledge of a variety of strategies after the intervention, highlighting the importance of deliberate metacognitive strategy development. The findings also show that young learners struggle to articulate how they learn and think. The study contributes on a practical level, by investigating the feasibility of an inexpensive training-tool, stories, that empower learners with thinking vocabulary and strategy awareness.

DBR is a relatively unexplored research approach in the South African academic environment, although it has received growing international support over the past decade (see Wall & Hall, 2007). It can, therefore, be argued that this study contributes to the field of educational research, not only in the form of actual outputs, but also in the way that the research was conducted. Apart from the design principles, containing substantive and procedural knowledge to inform future development and implementation decisions, the product of design is another major output of the DBR study. The story-based intervention is an original practice-oriented contribution to the field of study. The collaborative nature of the research approach also brings about the professional development of participants, and what Herrington, McKenney, Reeves and Oliver (2007) call "societal outputs."

This article only reports on one story-based intervention. Within the DBR approach, more sessions could be added in future, either more frequently or for a longer period, allowing for a deeper focus and repetition. Literacy levels and context (e.g. more parental support and experienced teachers at School A) play a vital role in developing metacognition, and we need to explore creative, novel ways to ensure that learning is optimised. Learners embraced the entertaining stories laced with metacognitive concepts, and the intervention was easy and inexpensive to administer, even if the contexts differed. Although the low literacy levels at School B limited learners' ability to independently use the story-based intervention, as was the initial idea, these stories can also aid in developing reading comprehension in general. For future study, one option for attaining an independent tool might be to provide an audiotaped version of the stories with the text to support struggling readers.

Accurate assessment of metacognition has always been a challenge (Veenman, 2015) making development of (metacognitive) knowledge and skills difficult. A combination of measuring instruments was used in this study, including the self-developed read-to-learn questionnaire. As far as we could establish, this is the only Afrikaans questionnaire to test metacomprehension strategy awareness in content area learning, specifically developed for early intermediate level learners. The validation of the RLQ questionnaire in Afrikaans and within the South African context requires a study in its own right with more participants.

Conclusion

The world's future growth will largely depend on the engines of emerging markets, but poor quality of education in regions such as Southern Africa, threatens this very possibility. Helping the workforce of tomorrow to develop the intellectual tools and learning strategies needed "to acquire the knowledge that allows people to think productively and can assist them in becoming self-sustaining, lifelong learners" is critical (Donovan, Bransford & Pellegrino, 1999:5). Given modern-day educational challenges, this study attempted to explore the possible impact of an innovative and practical, learner-centred way of presenting metacognitive concepts

to learners, at their level, and contribute to necessary research. The story-based intervention was beneficial in increasing learners' self-knowledge, meta-comprehension strategy awareness and comprehension ability applied to content area learning. The results indicate that socio-economic context, and particularly low literacy levels, could influence the development of metacognition and the effectiveness of a story-based intervention. This should be considered during the design and implementation of metacognitive development interventions.

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Authors' Contributions
SVA wrote the manuscript and provided data for the tables and figures in the text. All authors conceptualised the study and reviewed the final manuscript.

Notes

References

Bartlett L & Vavrus F 2017. Estudos de caso comparado [Comparative case studies]. *Educação & Realidade*, 42(3):899–920. https://doi.org/10.1590/2175-623668636

Blease B & Condy J 2014. What challenges do foundation phase teachers experience when teaching writing in rural multigrade classes? *South African Journal of Childhood Education*, 4(2):36–56. Available at http://www.scielo.org.za/pdf/sajce/v4n2/04.pdf. Accessed 19 April 2019.

Braun V & Clarke V 2006. Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2):77–101.

Brown A 1987. Metacognition, executive control, self-regulation and other mysterious mechanisms. In FE Weinert & RH Kluwe (eds). *Metacognition, motivation and understanding*. Hillsdale, NJ: Lawrence Erlbaum.

Brown AL 1992. Design experiments: Theoretical and methodological challenges in creating complex interventions in classroom settings. *Journal of the Learning Sciences*, 2(2):141–178. https://doi.org/10.1207/s15327809jls0202_2

Daley BJ 2002. Facilitating learning with adult students through concept mapping. *Journal of Continuing Higher Education*, 50(1):21–31. https://doi.org/10.1080/07377366.2002.10401192

Dimmitt C & McCormick CB 2012. Metacognition in education. In KR Harris, S Graham, T Urdan, CB McCormick, GM Sinatra & J Sweller (eds). *APA educational psychology handbook* (Vol. 1. Theories, constructs, and critical issues).

Washington, DC: American Psychological Association. https://doi.org/10.1037/13273-007

Dominguez M 2017. Qualitative design research methods. In *Oxford Research Encyclopedia of Education*. New York, NY: Oxford University Press. https://doi.org/10.1093/acrefore/9780190264093.013.170

Donovan MS, Bransford JD & Pellegrino JW (eds.) 1999. *How people learn: Bridging research and practice*. Washington, DC: National Academy Press. Available at https://files.eric.ed.gov/fulltext/ED440122.pdf. Accessed 21 April 2019.

Ertmer PA & Newby TJ 1996. The expert learner: Strategic, self-regulated, and reflective. *Instructional Science*, 24(1):1–24. https://doi.org/10.1007/BF00156001

Evans GW & Rosenbaum J 2008. Self-regulation and the income-achievement gap. *Early Childhood Research Quarterly*, 23(4):504–514. https://doi.org/10.1016/j.ecresq.2008.07.002

Fisher R 2007. Dialogic teaching: Developing thinking and metacognition through philosophical discussion. *Early Child Development and Care*, 177(6-7):615–631. https://doi.org/10.1080/03004430701378985

Goldman SR 2012. Adolescent literacy: Learning and understanding content. *The Future of Children*, 22(2):89–116. https://doi.org/10.1353/foc.2012.0011

Griffin TD, Wiley J & Thiede KW 2008. Individual differences, rereading, and self-explanation: Concurrent processing and cue validity as constraints on metacomprehension accuracy. *Memory & Cognition*, 36(1):93–103. https://doi.org/10.3758/MC.36.1.93

Herrington J, McKenney S, Reeves T & Oliver R 2007. Design-based research and doctoral students: Guidelines for preparing a dissertation proposal. In C Montgomerie & J Seale (eds). *Proceedings of ED-MEDIA 2007 - World Conference on Educational Multimedia, Hypermedia and Telecommunications*. Vancouver, Canada: Association for the Advancement of Computing in Education (AACE).

Hofer BK 2004. Epistemological understanding as a metacognitive process: Thinking aloud during online searching. *Educational Psychologist*, 39(1):43–55. https://doi.org/10.1207/s15326985ep3901_5

Hoffman E 2003. Learning how to learn. *Teaching Expertise*, 1.

Israel SE, Bauserman KL & Block CC 2005. Metacognitive assessment strategies. *Thinking Classroom*, 6(2):21–28.

Jacobs JE & Paris SG 1987. Children's metacognition about reading: Issues in definition, measurement, and instruction. *Educational Psychologist*, 22(3-4):255–278. https://doi.org/10.1080/00461520.1987.9653052

Johnson B & Turner LA 2003. Data collection strategies in mixed methods research. In AM Tashakkori & CB Teddlie (eds). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage.

Klopper B 2012. Riglyne vir die effektiewe onderig van leesbegripstrategieë in die seniorfase [Guidelines for the effective teaching of reading comprehension strategies in the senior phase]. MEd thesis. Cape Town, South Africa: Cape Peninsula University of Technology.

Lonberger R 1988. *Effects of training in a self-generated learning strategy on the prose processing abilities of 4th and 6th graders*. Paper presented at the Annual Meeting of the Eastern Education Association, Savannah, GA, February.

Mahdavi M 2014. An overview: Metacognition in education. *International Journal of Multidisciplinary and Current Research*, 2:529–535. Available at https://pdfs.semanticscholar.org/16b3/0363d9d81f7 4f7fc94e62502a9ca40c61651.pdf. Accessed 10 May 2017.

McCormick CB, Dimmitt C & Sullivan F 2013. Metacognition, learning, and instruction. In IB Weiner, WM Reynolds & GE Miller (eds). *Handbook of psychology: Educational psychology*. Hoboken, NJ: John Wiley & Sons.

Mertens DM 2015. *Research and evaluation in education and psychology: Integrating diversity with quantitative, qualitative, and mixed methods* (4th ed). Thousand Oaks, CA: Sage.

Miholic V 1994. An inventory to pique students' metacognitive awareness of reading strategies. *Journal of Reading*, 38(2):84–86.

Moonsamy S 2014. Thinking classrooms: How to recognise a thinking classroom. In L Green (ed). *Schools as thinking communities*. Pretoria, South Africa: Van Schaik.

Mullis IVS, Martin MO, Foy P & Drucker KT 2012. *PIRLS 2011 international results in reading*. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Lynch School of Education, Boston College. Available at https://timssandpirls.bc.edu/pirls2011/downloads/P 11_IR_FullBook.pdf. Accessed 30 April 2017.

Paris SG, Cross DR & Lipson MY 1984. Informed strategies for learning: A program to improve children's reading awareness and comprehension. *Journal of Educational Psychology*, 76(6):1239–1252. https://doi.org/10.1037/0022-0663.76.6.1239

Pereira-Laird JA & Deane FP 1997. Development and validation of a self-report measure of reading strategy use. *Reading Psychology*, 18(3):185–235. https://doi.org/10.1080/0270271970180301

Post Y, Boyer W & Brett L 2006. A historical examination of self-regulation: Helping children now and in the future. *Early Childhood Education Journal*, 34(1):5–14. https://doi.org/10.1007/s10643-006-0107-x

Pressley M & Afflerbach P 1995. *Verbal reports of reading: The nature of constructively responsive reading*. Hillsdale, NJ: Lawrence Erlbaum Associates.

Pretorius EJ & Lephalala M 2011. Reading comprehension in high-poverty schools: How should it be taught and how well does it work? *Per

Linguam: A Journal of Language Learning*, 27(2):1–24.

Reeves T 2006. Design research from a technology perspective. In J van den Akker, J Gravemeijer, S McKenney & N Nieveen (eds). *Educational design research*. London, England: Routledge.

Reeves TC, Herrington J & Oliver R 2005. Design research: A socially responsible approach to instructional technology research in higher education. *Journal of Computing in Higher Education*, 16:96. https://doi.org/10.1007/BF02961476

Schmitt MC 1988. The effects of an elaborated directed reading activity on the metacomprehension skills of third graders. In JE Readence & RS Baldwin (eds). *Dialogues in literacy research*. Chicago, IL: National Reading Conference.

Schmitt MC 1990. A questionnaire to measure children's awareness of strategic reading process. *The Reading Teacher*, 43(7):454–461.

Tanner KD 2012. Promoting student metacognition. *CBE–Life Sciences Education*, 11(2):113–120. https://doi.org/10.1187/cbe.12-03-0033

Turbot S 2016. *How to close the skills gap: Lessons from emerging markets*. Available at https://www.weforum.org/agenda/2016/08/skills-gap-emerging-economies-lessons/. Accessed 10 June 2017.

UNESCO 2014. *Teaching and learning: Achieving quality for all* (Education for All [EFA] Global Monitoring Report). Paris, France: Author. Available at https://unesdoc.unesco.org/ark:/48223/pf00002256 60. Accessed 10 June 2017.

Van der Walt M & Maree K 2007. Do mathematics learning facilitators implement metacognitive strategies? *South African Journal of Education*, 27(2):223–241. Available at http://www.sajournalofeducation.co.za/index.php/s aje/article/view/104/20. Accessed 26 March 2019.

Van Tonder D 2013. *Becoming and remaining an effective thinking school: Ideals versus reality*. Paper presented at the IACESA Conference, Cape Town, South Africa, 14–16 February.

Veenman MV 2015. Metacognition: 'Know thyself' – use this knowledge to control one's own behaviour [Special issue]. *De Psycholoog*, 50(4):10–21.

Vygotsky LS 1986. *Thought and language*. Cambridge, MA: MIT Press.

Wall K & Hall E 2007. Behind the buzzwords: Learning how to learn. *Learning and Teaching Update*.

Woolfolk A 2013. *Educational psychology* (12th ed). Boston, MA: Pearson Education.

Zheng R & Gardner MK 2017. *Handbook of research on serious games for educational applications*. Hershey, PA: IGI Global.

Zimmerman BJ 2001. Theories of self-regulated learning and academic achievement: An overview and analysis. In BJ Zimmerman & DH Schunk (eds). *Self-regulated learning and academic achievement: Theoretical perspectives* (2nd ed). Mahwah, NJ: Lawrence Erlbaum Associates.