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Fostering self-regulated learning of Grade 10 learners by means of participatory action research

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Self-regulated learning (SRL) skills are crucial to improving learner achievement, to supporting effective lifelong learning, and to developing the capability to overcome learning difficulties arising from a disadvantaged environment. However, only a few South African studies address the development of SRL skills of secondary school learners. By means of participatory action research (PAR), this study aimed to foster SRL of Grade 10 learners in a selected secondary school in an underprivileged urban environment. An intervention programme consisting of 10 action research cycles was implemented with 35 learners over the course of 10 weeks. The study implemented quantitative and qualitative data collection methods using a study skills inventory, learner diaries, weekly class discussions and interviews. A statistically significant improvement in learners' SRL skills, time management, attitudes, motivation and certain cognitive strategies was observed and reported by learners. However, a key finding was that additional support was needed to improve learners' meta-cognitive skills.

Keywords: meta-cognition; participatory action research; secondary school learners; self-regulated learning; study strategies

Introduction

Learner self-regulated learning (SRL) enhances academic achievement in key subjects (e.g., Mathematics and Science) and supports lifelong learning (Seabi, 2011). This is particularly crucial for developing economies worldwide. SRL enhances learners' ability to achieve set goals (Phillips, 2013) and to improve performance in non-academic fields (Ramdass & Zimmerman, 2011) and academic fields from elementary to secondary school and beyond (Dent & Koenka, 2016; Seabi, 2011; Wolters, 2010). In South Africa, the context of this study, learner underachievement in key subjects has been well-documented (Poor academic performance must be probed, as noted by *News24*, 2014; Reddy, Prinsloo, Arends, Visser, Winnaar, Feza, Rogers, Janse van Rensburg, Juan, Mthethwa, Ngema & Maja, 2012; Spaul, 2013), and this highlights the importance of developing learners' SRL.

Several definitions of SRL exist, all of which indicate that learners need to be involved in tasks on behavioural, cognitive and motivational level. Pintrich (2000b:453) defines SRL as an "active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behaviour, guided and constrained by their goals and the contextual features of their environment." This definition indicates the vital role of meta-cognition (such as setting goals), cognitive skills, motivation, and managing environmental resources.

Most international literature on SRL is based on studies with university students, rather than on school learners (Seabi, 2011; Simsek & Balaban, 2010). Thus, to address this gap, the aim of this study was to report on how a group of Grade 10 learners in a low socioeconomic urban environment responded to a self-regulated study skill learning intervention, and whether the latter would significantly improve their SRL skills. The paper presents a theoretical framework of SRL models and the development of a SRL programme. An explanation of the research method and the main findings of the study follow. The authors argue that teachers should be equipped to facilitate SRL in secondary school learners on a regular basis.

SRL Models

Pintrich's (2000a) and Zimmerman's (1986, 2008) models emphasise the active role that learners play in their own learning. Their models are based mainly on the social-cognitive theory of Bandura (1999), which highlights the principal of triadic reciprocity, that is, how environmental, personal and behavioural factors interactively affect learning.

During learning, personal factors (e.g., attitude and motivation), individual study goals and self-regulatory processes interactively contribute to learning. Core skills include learners' repertoire of study strategies, which affects their control over their behaviour and the environment, thereby impacting on performance (Monteith, 1996). Both models accentuate similar processes (goal-setting, planning, self-monitoring), although Pintrich (2000a) proposes four in place of Zimmerman's (2008) three phases of self-regulation.

This study drew on Zimmerman's cyclical model, because of its simplicity. It describes SRL in terms of forethought, performance control, and self-reflection (Spruce & Bol, 2015; Winne & Hadwin, 2011; Zimmerman & Cleary, 2009; Zimmerman & Schunk, 2011). Forethought requires that prospective reflection (Reinholz, 2016) occurs before learning, and involves goal setting and strategic planning. Learners apply their meta-cognitive skills when they analyse a task, set learning goals, and select learning strategies to achieve their goals. The goals that are set depend on the learners' motivation, which is influenced by their attitudes and self-efficacy. Thereafter, the learners execute tasks through their cognitive skills and simultaneously monitor their progress by way of self-

assessment (a meta-cognitive skill). Final self-reflection, called *retrospective* reflection (Reinholz, 2016) occurs *after* the performance, when the learners critically reflect on the extent to which they had achieved their goals (Reinholz, 2016). Reflection enhances conceptual insight and guides future learning processes.

The Development of SRL Skills: The Intervention Programme

SRL can be developed through training. Key publications (e.g., by Weinstein, Husman & Dierking, 2005) were consulted to design an intervention programme for secondary school learners, since the existing programme designed by Weinstein and Palmer (1990), focuses on university students. The aim was to facilitate the development of cognitive, meta-cognitive, motivational and resource management strategies (Bjork, Dunlosky & Kornell, 2013; Hattie & Donoghue, 2016).

Cognitive strategies are used when the learners encode and process information while studying. These strategies include the use of study aids such as rehearsal (by highlighting or under-lining the main ideas in a text), elaboration (e.g., drawing a mind map), and learning in groups. Theories on information-processing provide insight into how the learners' current knowledge base influences new learning, as well as how learners store mental images of information, and recall them from memory (Schulze, Snowman & McCown, 2016).

Meta-cognition refers to the learners' insight into managing their own learning. It comprises understanding what the task involves, setting goals, planning a study strategy that would enhance their concentration and insight, and monitoring the learning process. Meta-cognitive strategies also impact the preparation for and the taking of tests; for instance, some learners may reflect on possible questions that could be asked or how to regulate their time during test-taking.

Goal-setting is an important facet of meta-cognition. It is essential for effective time-management (Schunk, 2012) and thus a key component of forethought. Goal-setting requires a positive attitude towards learning and directs learner behaviour (Hadwin & Webster, 2013; Schunk, 2012; Zimmerman & Cleary, 2009). Goals are influenced by whether they are self-set or not, self-efficacy beliefs, specificity, difficulty and proximity (Cervone & Pervin, 2007; Schunk, 2008). Specific goals clearly describe the standard of performance required for the goal and tend to enhance learning more than general goals (Schunk, 2008) and promote self-efficacy (Wolters, 2003). Difficult goals are more likely to enhance performance, depending on the availability of prerequisite skills (Bandura, 1999). Proximal goals are short-term, provide immediate feedback, and tend to make it easier for learners to evaluate their progress. They

are therefore more likely to direct behaviour than distal (long-term) goals (Schunk, 2008). However, both are necessary for SRL.

The motivation for learning refers to the sustained, process-driven, goal-directed activity of studying (Schunk, Pintrich & Meece, 2008), and is crucial for learning (Chai, Wong & King, 2016). Motivation is related to locus of control, and to self-efficacy to behave in a way that will ensure academic success (Zimmerman, 2000). Strategies include prioritising and self-reinforcement (Boekaerts, 2002).

Resource management denotes, among other factors, time management, study schedules, the choice of a suitable space to study, and requesting help with difficult tasks (Schulze et al., 2016). Learners' motivation to use resources is influenced by their attitudes towards that resource.

The above exposition illustrates the way in which SRL is linked to the learners' personal attributes (e.g., their attitudes and motivation), their behaviour (how they manage their time, implement study strategies and information processing skills, monitor their progress, and approach test-taking), and the available resources. Self-regulated learners can adapt their cognition, meta-cognition, motivation and behaviour by means of adjusting the learning environment, seeking help and reformulating goals and plans (Nota, Soresi & Zimmerman, 2004; Winne & Hadwin, 2011). All of the above are influenced by the learners' self-efficacy beliefs, which is their perception and belief about their ability to perform designated tasks (Usher & Pajares, 2008). Individuals with positive self-efficacy beliefs are less anxious, set more difficult goals, and are more willing to persevere in the face of obstacles than learners with a lower self-efficacy (Schunk & Pajares, 2009).

As mentioned, the study designed and implemented an intervention programme to facilitate SRL of secondary school learners, in particular of Grade 10 learners. The programme started by explaining SRL to the participating learners, and how they needed to understand their strengths and weaknesses in terms of their pre-test Learning and Study Strategies Inventory – High School Version (LASSI-HS) scores (the LASSI-HS is a diagnostic instrument to measure learners' perception of their use of study strategies and provides norms for learners in Grades Nine to 12). At an early stage, the training addressed *goal-setting*. This included long-term and short-term goals (e.g., specific, measurable and realistic goals), as well as the development of a time-frame (e.g., a time-table and work schedule to guide daily activities). After learners had completed an activity on goal setting, and how to reach them involving a fictional learner, learners were given a homework assignment to set their own goals and plan their execution. There-after, the programme addressed *self-monitoring* (which required learners

to check their progress by means of daily diary entries), and *self-evaluation* (checking whether they needed to adjust plans or actions, and in what way). The programme also addressed *concentration* and *learning strategies* to enhance memory (in terms of how the short- and long-term memory functions), and *cognitive strategies* for enhancing memory, for example, focusing on headings and sub-headings, using summaries, diagrammes, mind maps and the SOAR technique. The SOAR technique refers to selecting the main ideas or key points of a text (S); organising the material in a format that will be easy to remember (O); linking it to what is already known (A); and implementing strategies to retrieve information from the long-term memory (R). For retrieving information, mnemonics (e.g., acronyms and acrostics) were practised. To enhance *self-efficacy* beliefs, the learners were trained to identify reasons for achieving or not achieving goals. This included reflecting on tests in which they had done well, as well as on those in which they had achieved poorly, writing reasons for the performance in each case, and classifying them according to controllable (e.g., regular homework or study) and uncontrollable conditions (e.g., luck). *Test preparation* and *test-taking* strategies were also addressed in terms of what to do or what not to do before and during test writing. For example, the learners were instructed in the importance of a good night's sleep before an examination and how discussion of tests with peers just before writing them increased anxiety. They also practised breathing exercises to relax, and how to monitor time according to the marks allocated to questions.

It was hypothesised that the SRL skills of the learners who participated in the above-mentioned intervention programme would significantly improve. In this regard, the next section explains the method, followed by the findings and the conclusions.

Method

Research Strategy and Design

Research that seeks to transform society calls for approaches that engage participants as co-researchers (Wood, Seobi, Setlhare-Meltor & Waddington, 2015). For this reason, a participatory action research (PAR) approach was deemed appropriate to develop SRL in a selected group of Grade 10 learners. PAR is “a participatory, democratic process concerned with developing practical knowledge in the pursuit of worthwhile human purposes [...] It seeks to bring together action and reflection, theory and practice, in participation with others, in the pursuit of practical solutions to issues of pressing concern and more generally the flourishing of individual persons and their communities” (Reason & Bradbury, 2001:1). Of particular importance to the project were the concepts of *genuine* participation, which valued the

learners' voices, and *worthwhile* action (Burgess, 2006). The design sequentially integrated both quantitative and qualitative procedures, as will be explained.

Setting and Participants

Ethical clearance was obtained for the study, and all relevant parties granted their permission for the research. Although children can learn SRL skills at any stage, we decided to engage secondary school learners whose learning requirements were more sophisticated than primary school learners (Dent & Koenka, 2016). The selected urban public school had limited resources, and served learners who performed poorly from low-income households. This offered an opportunity to combine educational work with action to benefit learners and advance social change (Brydon-Miller, Greenwood & Maguire, 2003). We purposefully selected Grade 10 learners, because their coursework is significantly more demanding than in previous grades, and the SRL skills could be reinforced during the remaining years at school. We were granted permission to engage two intact Grade 10 classes (of about 35 learners each) for the project which slotted into the normal school roster. One class functioned as an experimental group (programme implementation) and the other as comparison group (no programme implementation) in a quasi-experimental pre-post-test design to collect quantitative data. This design for PAR is recommended by Marti (2016). The pre-test allowed us to measure the learners' perceptions of their current study strategies, while the post-test enabled us to measure change. Thus, the design was sequential (pre-test, participation, post-test).

Data Collection and Analysis

Before the intervention, both classes wrote the pre-test of the LASSI-HS. Although the instrument was standardised in the United States (US) (Weinstein & Palmer, 1990), an expert academic in the field of study skills judged it useful for our purpose, since the items were relevant, and the learners would not be compared to learners elsewhere, but to themselves (in a pre- and a post-test). A pilot study with a small group of learners revealed no problems. The 76-item questionnaire consists of 10 measures. The *cognitive skills* measured include information processing (INP) to assess to what extent learners can use elaboration and organisation strategies to link new material to what they already know. Methods such as verbal and visual elaboration, reasoning, and comprehension self-monitoring, are important. The *selection of the main ideas* (SMI) refers to learners' ability to distinguish between important and less important concepts in a text. *Study aids* (STA) measure how learners focus on headings and subheadings and use summaries, diagrammes, and studying with peers. *Meta-cognitive strategies* focus on self-monitoring (SFT),

which determine learners' review and comprehension techniques and include revising, paraphrasing or summarising notes, anticipating possible examination questions, checking their own insight, connecting related information, and knowing what is still needed to be fully in command of the work. *Test-taking strategies* (TST) assess how learners prepare for and take a test. *Concentration* (CON) measures the extent to which learners pay attention by listening and taking down notes, despite distractions. *Motivational abilities* are determined by attitude (ATT), which determines learners' interest in their studies, and the extent to which they are actively involved in their work. *Motivation* (MOT) assesses learners' conscientiousness and acceptance of responsibility to work towards reaching their goals. *Anxiety* (ANX) measures to what extent learners are worried, as indicated by a low self-efficacy and negative outcome expectations. *Resource management skills* measure time management (TMT), such as the ability to create and use time schedules to reach prioritised goals, and to deal with distractions and procrastination. A score above the 75th percentile level on the LASSI-HS indicates relative strength in that area; a score between the 50th and 75th percentile level implies a need to improve the particular skill; and any score below the 50th percentile indicates a significant weakness, where the skill should be improved as a matter of priority. The Statistical Package for the Social Sciences (SPSS) was used to analyse the quantitative data.

The comparison group only wrote the pre- and post-LASSI-HS tests, while the intervention programme was implemented by the main researcher with the experimental group. The intervention was executed over a period of ten weeks (involving 10 short action research cycles), once a week for 30 minutes during school hours, as well as in the afternoons for as long as was needed. The primary researcher had been working in the field of SRL for several years, and thus possessed practical experience and skills. Nonetheless, she assumed the role of co-learner. Each session/cycle involved an explicit exposure to strategies, followed by task-related assignments for the learners.

During programme implementation, qualitative data were collected through the participating learners' diaries. They were required so as to reflect on and note in a journal their experiences of each session, as well as their study and learning activities at home, according to given prompts (e.g., what worked well and what did not work well). During each session, class discussions provided learners with the opportunity to report on previous learning. The researcher/s reflected on these discussions. At the end of the tenth cycle (before post-testing), two males and two females with the lowest pre-LASSI score (more than seven scales below the 50th percentile) and another two males and two females

with the highest pre-LASSI score (seven scales above the 50th percentile) were selected for in-depth interviews. The qualitative data were analysed thematically to allow for systematic identification, organisation and understanding of patterns of shared meaning across data (Braun & Clarke, 2012).

Findings

Quantitative Data

The pre- and post-LASSI-HS mean percentile scores of the experimental group and the comparison group are presented in Table 1 (Moseki, 2013:125).

Table 1 indicates that before the intervention the SRL characteristics of the learners in both classes were comparable since neither group had a mean score above the 75th percentile on any of the scales. According to the learners' views, they needed to attend to their use of time (TMT), maintaining focus (CON) and self-testing to ascertain if the task-requirements were being met (SFT). They also needed to pay attention to how they used study aids for learning, such as headings and summaries (STA), and their thought-processes for making sense of new information (INP). The learners in both classes indicated a lack of motivation (MOT), which impacted on their self-discipline and willingness to make an effort to complete academic tasks. They tended to worry about their academic performance (ANX), and therefore needed to prioritise the development of skills within the motivational component (ATT; MOT; ANX). The learners also needed to acquire the ability to identify the main ideas in a text (SMI), prepare for tests and demonstrate their new knowledge (TST).

The results of the LASSI-HS post-test indicated that the views of the two groups were dissimilar after the intervention. The comparison group continued to demonstrate a pressing need to develop skills in four areas, namely ATT, MOT, SMI and TST. In contrast, the LASSI-HS post-test mean scores of the experimental group were above the 50th percentile in all areas after the intervention. Moreover, in five instances there was a statistically significant improvement ($p < 0.05$), indicating that, according to the learners' assessment, the intervention programme had the greatest impact on their attitudes, motivation, time-management, information-processing and selection of the main ideas in a text (ATT, MOT, TMT, INP and SMI). In all these areas the mean scores were above the 60th percentile, while "selection of the main ideas" (SMI) was the skill that improved the most (t -value of 3.146). This suggested that these learners believed they had become significantly more skilled at recognising important information to focus on when preparing for tests. In summary, the gains of the group were related to the learners' motivation (ATT and MOT), resource management (TMT), and their cognitive skills (INP and SMI). With regard to the

meta-cognitive strategies of concentration (CON), test-taking (TST) and self-testing (SFT), the

improvements were not significant ($p > 0.05$).

Table 1 The pre- and post-LASSI-HS test scores of the groups

Scale	Test	Comparison group				Experimental group			
		Pre- and post-test scores				Pre- and post-test scores			
		M	SD	t-value	p	M	SD	t-value	p
ATT	Pre-	43.14	19.37	1.006	> 0.05	37.2	21.60	2.636	< 0.05
	Post-	48.26	23.01			52.971	28.03		
MOT	Pre-	46.63	26.71	0.292	> 0.05	42.486	23.61	2.171	< 0.05
	Post-	48.43	24.82			54.571	22.96		
TMT	Pre-	54.63	27.41	0.879	> 0.05	59.429	26.65	1.447	< 0.05
	Post-	60.57	29.12			67.714	20.91		
ANX	Pre-	49.86	21.27	0.296	> 0.05	49.029	21.48	0.876	> 0.05
	Post-	51.57	26.84			53.829	24.29		
CON	Pre-	58.06	29.79	0.370	> 0.05	55.857	29.82	1.104	> 0.05
	Post-	60.51	25.66			63.429	27.54		
INP	Pre-	56.69	25.45	1.777	> 0.05	60.857	25.94	2.056	< 0.05
	Post-	67.43	25.13			74.029	27.63		
SMI	Pre-	38.6	25.09	1.469	> 0.05	36.657	25.42	3.146	< 0.05
	Post-	47.71	26.8			56.6	27.58		
STA	Pre-	54.49	26.8	2.467	< 0.05	61.857	27.01	1.381	> 0.05
	Post-	69.77	25.03			70.829	27.33		
SFT	Pre-	61.97	25.66	0.876	> 0.05	58.943	25.01	1.881	> 0.05
	Post-	67.17	23.95			70.371	25.81		
TST	Pre-	37.06	26.71	1.972	> 0.05	38.686	27.90	0.997	> 0.05
	Post-	49.71	26.98			45.543	29.60		

Qualitative Data: Reflections on Programme Effectiveness

The qualitative findings gave voice to the views of learners (who had high and low scores) of what had worked in the programme. Where quotes are provided to illustrate findings, the following symbols were used for ease of reference: boy (B) or girl (G), followed by an identifying number (1 to 8); high (H) or low (L) pre-test achiever; and whether it was interview (I) or diary (D) data.

The learners' views on what was satisfactory highlighted the motivational value of the programme, and how they had learnt effective goal-setting within specified time frames. At the start of the programme, they tended to state vague, distal and unrealistic goals, for example, "My own house [...] working as a pilot, and having a good healthy family" (B4L, D). Through the programme they learnt to set proximal goals coupled with a study-time schedule. This was illustrated by how they reflected on and recorded their actions; how they aligned their actions with their goals; and how they professed to study according to a time schedule. For example: "I've learnt to manage my time and to study. Even when writing exams, I didn't study. I now study and hope to obtain good marks" (B3L, I).

In respect of their meta-cognitive strategies, the highly achieving learners in particular gained insight into which methods worked best for them, how to monitor themselves by means of self-testing and how they could use this information to improve their current ineffective strategies. For example,

What has changed is that now, I do time management. When I get home I know what to do,

and I can study. After school I sometimes stay with my classmate and we do group-work together (G4H, I).

Tomorrow we write Life Science. So, it's fine. I am doing everything to check myself. Now, it is different from when you study without recording your work.

It goes better when you study and record what you have done, because I can see where I am. (B2H, I)

Regarding cognitive skills, the qualitative data revealed how some learners implemented the information processing strategies that they had acquired, such as linking new information to what they already knew (G2H, D), and by using organisational learning strategies, for instance mind maps and the SOAR technique: "I do the mind mapping, and then I make like sort of an essay [...] and then I write the essay according to the mind map [...] and then I do self-assessment" (B3L, I).

Qualitative Data: Reflections on Programme Inadequacies

Some of the poorly achieving learners did not find the programme effective. A contributing factor was that the SRL training did not start at the beginning of the school year. Moreover, not all learners were motivated to become self-regulated learners, as illustrated by the fact that some learners did not seek help when they needed it, or had a negative attitude towards time management. For instance, one learner said:

I just study when I have time, and when I do not have time, I do not study. I studied Mathematics for two hours. My study method presented me with questions, and then I answered them. I studied well, but I didn't understand [the mathematics]. I studied

Life Science for 30 minutes. The study method was a mind map [...] but I became tired. I then studied Life Science again for one hour and 30 minutes. My study method was a mind map [...] but I was not concentrating. (G3L, D)

Some learners prepared poorly for tests, since they were too ambitious in the goals they had set for themselves within the available time, or were not motivated to reach set goals. For example, one learner (G3L, D) wrote in her diary how she devoted less than an hour to prepare for Physical Science and Life Science tests. Others did not keep to their study schedules, because of responsibilities at home (B2H, I).

Learners had to select study strategies that suited their individual preferences. A highly achieving girl, for example, indicated that mnemonics to enhance the memorisation of names of historical figures or places was ineffective, since she was not creative. Other learners lacked insight into how to apply the information processing strategies, such as the SOAR technique, or how to select different strategies for different subjects (e.g., strategies that worked well for History did not work well for Mathematics). The learners therefore expressed the wish to acquire subject-specific study strategies, and handouts with various examples that could enhance their insight into the appropriate use of study skills. On occasion, learners became demoralised when they struggled to implement the skills, such as a learner who thought she could identify the main ideas in a text, but found that these differed from the test requirements (G4L, I).

Meta-cognition was a key challenge, in particular for poorly achieving learners. Their self-monitoring was affected by poor self-efficacy, which led to a lack of perseverance, inappropriate recording, and the lack of motivation for self-testing. One learner explained how she practised mathematics every day, and understood the questions, but during the examination she became confused: *"I think it's because I didn't read the question properly"* (G3L, I).

Discussion

SRL skills are crucial for effective lifelong learning which is necessary to address the challenges associated with developing economies in particular. Reflective notes recorded in diaries and discussions at programme sessions enhanced the participants' self-awareness of SRL skills. According to Table 1, their motivation and attitudes, which are important components of SRL (Wolters, 2003), developed significantly. This is an important finding in light of the relationship between SRL, motivation, and self-efficacy (Lavasani, Mirhosseini, Hejazi & Devoodi 2011). Although anxiety was handled better in general, possibly due to the use of breathing exercises and refraining from discussing tests with peers just before writing examinations, some learners still reported that they felt worried and

lacked motivation when they studied, which added to their nervousness during test-taking.

In social studies, the correlation between meta-cognition (goal-setting, planning, monitoring and controlling), and achievement is particularly strong (Dent & Koenka, 2016). However, this was the weakest aspect of the programme, since the intervention did not significantly improve the learners' abilities to set realistic goals when planning their studies, and to monitor and control their progress efficiently by means of self-assessment. Many learners set vague, distal goals when clear proximal task-oriented goals were required (Dent & Koenka, 2016). This may be attributed to the fact that schools do not normally encourage individual goal-setting, and this skill is not easily acquired by all learners during a 10-week period. When teachers set goals for learners, this dissipates the learners' agency and is not motivational, because the learners may aspire to different goals (Phillips, 2013).

Regarding resources, the participating learners indicated that the programme significantly improved their time management (see Table 1). The qualitative data, however, revealed that the poorly achieving learners in particular continued to manage their time inefficiently, to set unrealistic goals (a meta-cognitive skill) for the time they had available, and often lacked the motivation to keep to their planned schedules. It was clear that the time management section of the programme ought to be revised to practise this skill. Although the learners were given homework assignments on goal setting within available timeframes and were instructed on how to monitor themselves and adapt their plans if required, some learners required additional, individual attention to master these skills.

Self-assessment according to some standard to monitor progress is crucial for SRL (Pintrich, 2000a). Without self-assessment learners do not know how they are progressing towards their goals. During the programme, learners were asked to monitor themselves using a diary to assess progress. Unfortunately, learners often find it easier to assess the work of others rather than their own because they cannot distance themselves enough from their own products in order to evaluate them objectively (Reinholz, 2016).

Although test preparation and test-taking strategies were addressed during two sessions (what was important and what should be avoided), the programme did not effectively enhance the learners' test-taking strategies or their ability to deal with distractions. It was thus evident that meta-cognition was too complex for all the learners to develop the skill in the limited time in which it was addressed. Previous studies in other parts of the world have also expressed concern over individuals' meta-cognitive capacities (Wood et al., 2015).

Cognitive skills are the tools that learners use to understand and recall learning material, and their

correlation with academic achievement becomes progressively more important in secondary school. According to the participants, the intervention programme significantly improved their information-processing skills and their ability to focus on important course content when preparing for tests, such as identifying main ideas in a text (see Table 1). As an example of deep processing, the learners started to implement the SOAR technique, which required them to link new ideas in a text to the information that they already had. They also began to apply organisational strategies: mind maps, and cognitive strategies in instances which required rote learning, for example, mnemonics to memorise the names of public figures. In respect of these cognitive strategies, learners need to understand that different subjects require different study skills (Lai & Hwang, 2016). Strategies that are useful for history, such as mind mapping, are not effective for mathematics. Mathematics is defined, sequential and static and thus best learnt through repetition. Social studies, on the other hand, is open and dynamic and best learnt through elaboration techniques, such as mind maps (Dent & Koenka, 2016). The nature of the teachers' assessment tasks also encourage either deep or surface processing, although one would expect to see more tests that require deep processing in secondary school. Another cognitive skill is the ability to identify the main ideas in a text. This skill enables efficient study (Boekaerts, 2002) and correlates significantly with academic achievement (Dent & Koenka, 2016). The intervention was particularly successful for teaching learners how to select the main ideas in a text but the qualitative data indicated that some learners with low scores (see Table 1) needed more support to acquire this skill. In developing countries, many learners are at risk of failure. However, interventions based on a SRL framework may, in the long run, benefit all learners, including those at risk (Cleary, 2006).

The study also showed that learners needed to acquire the cognitive skill of using study aids effectively. Poorly achieving learners demonstrated little evidence of the successful use of study aids, such as focusing on headings/sub-headings; the effective use of summaries and diagrammes; or when to seek help from others. By seeking help from others, supporting networks are formed. This finding is valuable, since the effective use of aids and other kinds of support to study correlates significantly and highly with academic achievement in all contexts (Dent & Koenka, 2016).

Conclusion

This study was limited by its use of a self-report questionnaire, which measured the learners' perceptions of their study skills and not their actual abilities. However, this is balanced by the use of qualitative methods and by its collective, dynamic

nature. It merged action and reflection and linked the theory and practice of SRL.

The aim of the study was to improve the SRL skills of a group of Grade 10 learners from a poor socioeconomic urban environment. Although school access was granted for a limited period of only ten weeks, the intervention had considerable practical significance for many participating learners. Due to its participatory nature over the ten weeks, the relationship among participants was strengthened, allowing for a supportive network to develop, which they could draw on in future. On an individual level, the project led to a greater self-awareness in the learners and improved their time management, attitudes and motivation, as well as their use of cognitive strategies, such as information processing and the identification of key subject matter in texts. A key finding was that further action research cycles, which focus on meta-cognition in particular (relating to concentration, self-assessment and test-taking), are needed. We also realised that additional *individual* interaction with some learners over a longer period of time would be beneficial for subject transfer. Future research could focus on these two issues in particular, and include other grades.

SRL skills need to be fostered continuously in classrooms, preferably by means of PAR. To this end, teacher-training programmes need relevant instruction in PAR and meta-cognition in particular. Improving the SRL of all learners could enhance their academic achievement in key subjects, and support their lifelong learning. This is crucial for developing economies and for the transformation of societies.

Authors' Contributions

MM conducted the empirical investigation and analysed the quantitative and the qualitative data. She also provided some of the literature and the theoretical framework which were presented in her thesis on which this manuscript is based. SS, who was the supervisor of the study, wrote the article and updated the literature.

Notes

- i. This article is based on the doctoral thesis of MM Moseki.
- ii. Published under a Creative Commons Attribution Licence.
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