# South African Journal of Childhood Education

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Aims and Scope:
The South African Journal of Childhood Education (SAJCE) provides a forum for the dissemination of research in childhood education and development. The journal is interdisciplinary in scope and seeks to stimulate the exchange of ideas about research and practices in a variety of educational settings:

- Developing the theoretical foundations of research in childhood education
- Research on education of children in the Global South
- Child development in Africa – success stories and challenges
- Comparative studies from developed countries

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Editorial

School and childhood

In this first issue of the SAJCE as an accredited journal of the South African Department of Higher Education and Training we have a new responsibility: While creating ample space for articles that forward solidly argued ideas and philosophies, we also have the responsibility of bringing empirical evidence to the table. Some of this evidence may come from an extensive study of the literature that reports from studies elsewhere, or from in-depth qualitative studies of what happens on the ground in education. Other evidence may come from the analysis of data that were sourced and prepared for the purpose of both descriptive and inferential statistical analysis. We need all of these.

Educational research has been criticised for its dearth of research that captures change – specifically change in learning processes and learning outcomes. This is what education in schools is primarily tasked to do. It is our brief to report on how a society’s institutions are engaging with this task and how its young are responding.

As founding editor it is my duty to fulfil the promise to publish research of what happens in schools and other places of learning and instruction. As a follower of the ideas of Lev Vygotsky, I believe that learners thrive on good instruction. By that I do not mean that teachers ‘download’ information and procedural commands in class, but that they invite, explain and encourage the learners to get to know the signs and symbols of their sociocultural environment. For me the central tenet of Vygotskian theory is this semiotic mediation – the encounter with, and the use of, the symbols that make it possible for children to thrive in their environment. I believe it can happen in schools, despite the many obstacles that these institutions face. I think good education systems are activity systems in which schools flourish, and that a caring, forward-looking society can educate its youth through schools, even though many of these have become very fragile.

In the first two articles in this issue authors report on qualitative work that gives the reader a picture of the learning of teachers, children and student teachers outside classrooms and university lecture rooms. Petersen writes about student teachers who have just embarked on the journey of their education at university and who are challenged to face the harsh social conditions of the children they will teach in future. She reports on the power of role play and simulation as tools for an experiential learning of social justice. Joseph and his co-authors write a moving ethnographic account of a traditional game used by students of education. These finely crafted articles mirror what is admirable in this type of qualitative research, which interprets data artfully.

The next group of articles takes us to the chalk-face of education. Herholdt and Sapire argue, in an insightful large-scale analysis of errors in a mathematics tests for grade 1–4 learners, that much can be learned from such an analysis of data from intervention and control schools. Chirwa and Naidoo also report on school research. In four primary schools in Malawi they found that teaching life skills for HIV prevention
faces both structural and social constraints, begging the question of how this all important topic can be mediated in such challenging settings. Mdluli and her co-authors also take the reader into classrooms, where they have captured the usability of workbooks supplied by the education authorities. They make a strong argument for teacher learning that goes beyond only receiving the books and for the need to train teachers for optimal use of this potentially helpful tool. Kok and Van Schoor also take the reader to classrooms, but this time to the university, where they investigated foundation phase teachers’ knowledge of the science concepts they will have to teach, suggesting an integrated pedagogical approach for their future practice. They found resistance to the idea of integration in a science-technology-society and reflect on the implications. Esterhuizen and Grosser also venture into the classroom. They report on an intervention that aimed to improve grade R learners’ executive functions, using methods developed by Feuerstein and his collaborators, which still prove to be fruitful for this type of work.

In a previous issue of the journal, Caroline Fitzpatrick argued the importance of executive functions as indicators of readiness to learn in school. She expands on her earlier work in the second volume of SAJCE in an article that emphasises the need to focus on the socioeconomic status of young children when designing interventions to promote executive functions in preparation for formal education.

Dixon and co-authors investigated teachers’ experiences of professional development, unpacking the “implications of teachers constructing themselves as ‘workshopped’ and its relation to workshops as vehicles through which knowledge is acquired”. The article echoes what many teacher educators and teachers may be saying about this conventional way of bringing new ideas to the profession.

In the article by Rousseau the reader is invited to grapple with the author on how the different knowledge forms for a grade R teacher qualification can be integrated. She intimates an epistemological struggle, which is also what the last two authors, Du Plooy and Zilindile, tackle in a different context – namely the philosophical search of a great South African educationist, Wally Morrow. Morrow wrestled with the notion of “epistemological access” in education. The authors apply this notion to initial access to school and leave the reader wondering about the revolving door syndrome: How many of the young children who have access to formal education have full access to its resources, which can open real doors to their future as citizens in a competitive country? How many of them will be fulfilled adults, earning a liveable income, and recall their early years of schooling as the real foundation phase of their education?

Editorial regards
Elizabeth Henning
Johannesburg
June 2014
Childhood education student teachers responses to a simulation game on food security

Abstract
This paper provides an account of student teachers’ responses to a simulation game about food scarcity and how the game served as a conversation starter regarding the influence of food scarcity on educational provisioning. The simulation game was utilised as part of a suite of activities during an educational excursion for first years in primary school teacher education. In this investigation data were generated via video recordings of the simulation game itself, summary notes of the key points of the discussion session during the game, and students’ learning portfolios. Analysis of the various data sets indicate that student teachers’ engaged with the game both viscerally and cerebrally, with the game providing a powerful concrete introduction to the issues of food scarcity and unequal distribution of resources. Most student teachers were able to relate the lessons learned from the game to the classroom and educational situation. In addition, I found that the simulation game as method can assist students in their activity of learning to look at education as an equity and justice issue.

Keywords: Simulation game, pre-service teacher education, food scarcity, childhood education, educational excursion
Introduction

This paper reports on the use of simulation game as method, utilising the topic of food security, with student teachers in childhood education. The game to which I refer forms part of a set of activities during a three day educational excursion. The student retreat is part of a compulsory first year course in which students and a few lecturers work intensively together in a context outside of the formal university environment. My aim with linking the simulation game to an issue such as food scarcity is twofold. It is firstly to start conversations with student teachers about the influence of food scarcity on the learning of young children. It also serves as a means of prompting reflections and discussions about the influence of wider social and economic factors on educational provision. As a teacher educator I have a particular interest in emphasising principles of equity and justice in education. These principles are aligned with combating forms of oppression of individuals as members of various groups, whether they be ethnic, racial, linguistic, socially stratified by class, or as other groups that are rooted in particular institutional and societal structures (McDonald & Zeichner 2009).

Engaging student teachers in childhood education with the issue of food scarcity

Food is a basic need for each individual’s everyday survival (Dubois 2006). For young children in primary school, getting access to enough food is critical as this stage is the second most rapid and intensive period of growth and development after in vitro nutrition (Dubois 2006:1504). According to Maxwell and Smith (1992:8) the concept of “enough food” is captured in different ways in the literature and refers to a “minimal level of food consumption” required for basic survival (Reutlinger & Knapp 1980). During primary school, rapid changes in children’s caloric and nutrient needs must be fulfilled in accordance with the different intensive developmental phases (such as physical growth, brain wiring, organ development) that characterise childhood (Dubois, Farmer, Girard & Porcherie 2006). Researchers in this area have found that poor childhood nutrition can alter children’s physical and cognitive development and even mild malnutrition can have lifelong effects. For children, being hungry increases hyperactivity, school absenteeism and tardiness, and decreases psychological functioning. Additionally, the impact of poor food security has long lasting effects such as anaemia, which in turn leads to other problems such as altered growth and delayed puberty (Lozoff, Jimenez & Smith 2006) and slower development in the areas of “language learning and motor skills” (Fleisch 2009:35). Factors such as these affect young children’s physical and cognitive development and school achievement (Sarlio-Lähteenkorva & Lahelma 2001).

One of the biggest problems in the world today is that food access is not equal for everybody (Reutlinger & Knapp 1980; Dubois et al, 2006) with more and more people not being able to purchase the food they need. Additionally, more people are becoming increasingly anxious about these issues. This is what is known in the literature as “food insecurity” or “food poverty” (Dubois et al 2006:1504), with the
main factor for food insecurity being identified as poverty. In South Africa, Fleisch (2009:32) notes that “more than 60% of children live in poverty and that this affects nutrition, creating problems such as stunting, micronutrient deficiencies and short-term hunger”. Research has also shown that food insecurity is transmitted from one generation to the next. Food scarcity (and poverty) is thus a clear issue of inequity and injustice (Sarlio-Lähteenkorva & Lahelma 2001).

A great number of teacher education programmes are concerned with how students can be made aware of issues associated with injustice (Darling-Hammond, French & Garcia-Lopez 2002) and teaching for equity. Many students will have come to the study of teacher education without clearly understanding their role in confronting and addressing injustice on educational provision and student learning. Food scarcity is one such issue in childhood education. In a mixed group of student teachers there will generally be some who acutely understand such an issue from their own life experiences, and there will be others who will find it hard, as they may have been beneficiaries of a system which produced much of the injustice (Darling-Hammond 2006). When student teachers have not had much personal experience with food scarcity it can be difficult for them to understand its impact on school children’s lives and learning. As Kumashiro (2000:4) argues, students come to school with “partial knowledges”, in which they may not know much about marginalised groups in society, also referred to as knowledge of the other, or have what he calls “mis-knowledge, a knowledge of stereotypes and myths learned from the media, families, peer groups, and so forth”. Although Kumashiro was referring to school children, I would argue this is equally applicable to first year student teachers learning how to be teachers for young children.

Equally, I am motivated by Guyton’s view (2000:11) that there remains “a great need for focused attention on what can contribute to social justice (in) teacher education”. Thus, in line with the varied means that are used to integrate ideas and principles of justice and equity into programmes in the teacher education literature (Zeichner 2009), such as reading, writing, and discussing autobiographies and literature (Abbate-Vaughn 2008:41), and through action research (McIntyre 2003) this simulation is my attempt to sensitise first year student teachers to a particular orientation of justice at the beginning of their education. I deliberately use the simulation game as an experiential learning strategy which places student teachers in the shoes of the other and allow them to be on the receiving end of marginalisation and discrimination though a beginning understanding of food scarcity.

I also wanted to find a way of inserting the language and discourse of food scarcity (and in a broader sense of social injustice) into a course that serves as student teachers’ introduction to the teaching profession, so that it would frame ensuing work in their programme. As Zeichner and Teitelbaum (1982:98) argue, both the moral and technical aspects of teaching need to be emphasised at the very beginning of new teachers’ education to prevent such issues from becoming marginalised later in their programmes. In South Africa, where the quality of childhood education is increasingly being viewed as vital for the education system as a whole, addressing awareness of an
important issue such as an influence of food scarcity on educational provisioning with student teachers for this phase of education cannot be ignored.

The simulation game provided a vivid, authentic experience by which beginner student teachers could begin to converse about and reflect on the effect of food scarcity on childhood education. I also wanted to foreground a vital issue (such as food scarcity in childhood education) at the point at which students first began thinking about what their roles as future teachers would entail, which is a central focus of the education excursion curriculum. In my view, the educational excursion provides the optimal time to start discussions with students about the “complex moral and ethical issues associated with their work” (Zeichner 2009:55). Thus, although I acknowledge that the process of understanding and change in ways of thinking about the world is a protracted one, and not likely to be achieved through one exercise, I believe that an early awareness of the influence of food scarcity on childhood education is paramount for teachers of young children so that early conversations about teaching for equity in education can begin and can filter student teachers consciousness and developing philosophies and pedagogies. This, I would argue is vital: That I, as a teacher educator, am to help make student teachers aware of how an issue such as food scarcity in the wider social and economic context links with education and their future roles as teachers. I am also fulfilling my brief as teacher educator. A simulation game about food scarcity gives the students an opportunity to recreate dramatically what they will realistically encounter in many of the classrooms. Some children will be hungry and suffer neglect and bias. Of the different types of play and drama available in the educational arena, simulation and role play are seen as powerful tools (Henning 1981).

A description of the simulation game on food scarcity

The simulation game’s structure and characterisation requires a venue with a display table that can be viewed by all students, and smaller work areas for group discussions. Students, on entry to the venue, randomly receive a passport which categorises them as citizens of one of three groups of countries. The first very small group (approximately 1% of students) will be citizens of industrialised, developed countries like those in Western Europe and the USA. A second, still relatively small, group (usually about 2% of students) will be citizens of an emerging economy (a developing country such as South Africa or India also known as newly industrialised countries). The third group, with the largest proportion of students (approximately 97%), will represent citizens of underdeveloped, so-called third world countries (e.g. Zimbabwe or Bangladesh). Based on the passport and the country it denotes, each student receives a predetermined amount of money in fictitious world dollars ($Ws). Those from so-called developed countries receive $W50, those from newly industrialised countries receive $W15, and the ones from developing countries receive a $W1, a few cents or no money at all.

A table is set with a variety of food items such as sandwiches, chocolates, fruit, biscuits, cakes, soft drinks and a very limited amount of unbuttered bread and/or dry crackers. The items range in price from a sandwich priced at $W8, to a soft drink at
$W5, and a slice of bread or a cracker at $W1. Students are invited to purchase items using their issued $Ws before returning to their respective predetermined discussion groups (which are made up of citizens from different countries) with what they have purchased. In essence, based on the prices and the $Ws issued, a student from a developing country will only be able to afford a slice of bread or a cracker, that is, until the supply runs out; a student from a newly industrialised country will be able to afford a sandwich and a soft drink or a piece of fruit and a biscuit, while citizens of a developed country will be able to purchase a number of basic and luxury food items.

After this exercise, in the company of their discussion groups, students are asked to study the contents of their plates and the plates of others in their group for a few minutes and reflect on their emotional reactions to the simulation. The following prompts are provided:

1. How did you feel about your own situation (circumstances) in the game?
2. How did you feel about the situation (circumstance) of others in your discussion group and the wider class?
3. What are the lessons you can learn from the simulation game for your role and task as a future teacher?

Thereafter, the session leader facilitates an open discussion of the issues that arise and concludes with a short PowerPoint presentation, which visually contrasts the contents and costs of an average family’s weekly grocery items from a variety of contexts (different countries), approximating those in the simulation game.

**Situating a simulation game within the context of an educational excursion**

The education excursion (also known as an immersion field trip) is part of a first year course that focuses on the personal and professional development of student teachers. During the excursion student teachers from various backgrounds (different racial, language, religious and cultural groups) share common sleeping and recreational areas for one week and learn about each other’s commonalities and differences. Situating the simulation game around food scarcity within the context of an educational excursion with its expanded curriculum and often playful, social tone (De Beer & Henning 2011) creates unique opportunities for critical thinking and for extending student learning (De Beer, Petersen & Dunbar-Krige 2010). There is a growing body of research showing that simulation games are increasingly entering formal education and being used in educational settings (Dempsey, Lucassen, Haynes & Casey 1998). For instance, during simulations students use one process to acquire knowledge about another and so they function as epistemic devices (Fisher 2006:420). This is in line with the views of Warren (1999, cited in Jakubowski 2003:25), who describes an educational excursion as a critically responsive component of experiential education.
In addition, the context of the excursion environment in an isolated environment where students are entirely dependent on the ground personnel and university staff for all their basic needs provides a level of interaction that is not possible in a university classroom. As students are supplied with all meals at the camp, the suggestion at the beginning of the simulation that they will not be provided with lunch and will have to consume what they get to buy, lends a measure of authenticity to the game and students reactions within it. The excursion activities are also framed by the conceptual framework guiding the overall teacher education programme of this university. This framework expresses a commitment to the education and training of “caring, accountable, critically reflective educational practitioners who are able to nurture and support learning in diverse educational contexts” (Gravett, 2009:1). It is precisely these features which make the context of the excursion as important as the content of the activities during the excursion, an issue I draw on most advantageously in the simulation game.

Research questions
The following questions guided this study:

1. What are first year childhood education student teachers’ responses to a simulation game about food scarcity?
2. How does a simulation game serve as a conversation starter about the influence of food scarcity on educational provisioning in childhood education?

Methods
I collected data from three student groups of approximately 150–180 students in each), studying in childhood teacher education programmes. This included student teachers from the foundation phase and the senior phase teacher education programmes in the 2013 excursion. Data on the student teachers’ reactions are captured via video recordings of the simulation game (approximately 40 minutes in duration). Video diaries and video recorded observations have been used for many years in a number of disciplinary areas (FitzGerald 2012:2) and are increasingly being used in education in the South African context (De Lange, Mitchell & Stuart 2007:19). Video data is useful for capturing how people interact with each other and the outside world. In the case of this research it was especially useful in enabling me to collect, share and analyse complex processes of student teacher interactions in the context of the simulation game as video captured in situ can contain a great richness of information, often revealing subtle yet important incidents relating to the interactions between people (FitzGerald 2012:4). The video data thus captures both student teachers’ verbal reactions, as well as non-verbal data like facial expressions and the nuances of their responses during the discussion sessions. Data were also collected in the form of flip chart summary notes of the key points of the discussion session after the simulation game. A third set of data comes from student teachers’ learning portfolios, where
specific reflection activities focus on the simulation game for their learning. Portfolios are submitted about four weeks after the excursion.

For the video data I used methods of qualitative analysis associated with visual data, although I did not use any CAQDAS (Computer Assisted Qualitative Data Analysis) packages such as Transana for this purpose. Capturing much of the data on video tape allowed me to apply a type of “retrospective analysis” (Edwards & Westgate 1987:86–87), which would not have been possible during the simulation game and discussions afterwards. This permitted openness to the data analysis process and provided for fuller categorisation of the data. The video footage also provided context, and multiple viewings of the same video sequences also showed how the sequence of events, including taking turns, occurred and how a specific utterance gained meaning because of its position in the communication flow (Bowman, 1994; Henning, Van Rensburg & Smit, 2004). I used a technique of analysis, taking both verbal and non-verbal interaction into consideration, which is derived from grounded theory and which meant that codes were categorised for their goodness of fit. This method can be described as qualitative content analysis, but also had elements of discourse analysis (Petersen 2007:170). I have used this method before, finding that it is helpful specifically because it deals with multimodal data. I did not, however, code every single episode or utterance, but scrutinised whether the data answered the questions of the inquiry. This is known as a “manifest approach” (Erickson 2006:180), where interactions that focus on particular subject or pedagogical content using critical incidents are selected and analysed. Critical incident analysis is commonly used in teacher education for encouraging reflective practice through analysis of videotaped lessons during micro lessons and it comes almost naturally to teacher educators who work with video regularly. In particular, I concentrated on incidences of “disputational talk”, for instance where there were high levels of disagreement and “exploratory talk” where student teachers were encouraged to develop shared understanding through reasoned discussions, challenging ideas and examining/evaluating evidence (Mercer 2008:3).

The flip chart summaries and student portfolio data were analysed according to generic principles of qualitative content analysis (Merriam, 1998; Charmaz, 2002; Henning et al, 2004) and then coded, after which recurring themes were identified. In applying the analysis tools to search for prominent discourses and recurring themes, I worked with both the visual and written data and searched particularly for signifiers of how the students responded to the simulation game and how they described the influence of the simulation game on their ideas regarding food security on childhood education and teaching for equity. I also looked for evidence of the dominant discourses students used to describe themselves and their situations in the various parts of the simulation game, correlating this with the visual indicators of students’ experiences as captured in the video data. The results of the analysis processes were discussed and verified with two colleagues with whom I work closely in the excursion.
Ethics

As students were identifiable on the video recordings and in their portfolios, I worked with a code of ethics captured in the ethical clearance certificate of the Faculty of Education. This guaranteed students’ confidentiality, minimised risks and provided for voluntary participation as indicated in signed consent forms. To protect students’ identities, video data and portfolio data are stored away from public fora and no student details are identified in reports emanating from the research.

Findings

First, I found that the simulation game provided a novel and powerful concrete introduction to the issue of food scarcity and unequal access to resources, as well as its influence on childhood education and teaching for equity. Students’ reflective discourses reveal highly emotional responses to their involvement and is linked to their positioning in either the camp of the alienated and excluded or that of the bountiful. In the game, for those who did not have access to financial resources there was a gradual shift from a discourse of alienation and despair to one of anger and resentment. For those with sufficient funds the overwhelming discourse was that of guilt and shame, balanced equally with gratitude that they were better off than the majority.

Second, most students were able to relate the lessons learned from the simulation game to the classroom and educational situation, particularly with respect to food scarcity and its impact on educational provision. Others were able to make the conceptual shift to other aspects of equity and/or social injustice in society and its impact on educational provisioning. In the next section I report on each of these findings briefly and use descriptions from the video data and excerpts from the flip charts and the students’ written reflections to illustrate the points I make.

In a role play about abundant food or nothing: The play becomes a visceral experience of inequity

The simulation game provided a powerful authentic emotional and cognitive introduction for students to the issue of food scarcity, perhaps because it dealt with such a basic need. Given that practically all the students found themselves citizens of countries where they had to survive on less than $W1, and were consequently only able to purchase a slice of bread or a dry cracker or when these had run out, no foodstuff, they were able to experience first-hand how an unequal distribution of resources impacted them. This is aptly reflected in the students’ facial and verbal expressions captured on video both during the game and in the discussion afterwards.

Thereafter, when students were prompted to share their reflections on how the simulation game influenced them on both a personal and professional level, their responses are equally evocative and reveal a sharp awareness of the injustice of some participants having access to resources and others not. In terms of the verbal responses, most students reacted on a personal level first. For those without access
to financial resources, their discourse over the course of game shifted from one of alienation, hopelessness and despair to that of anger and resentment. For instance, students first used words such as “hopeless”, “desperate”, “sadness”, “humiliated”, “ashamed”, “deprived”, “frustration”, “excluded” and “devalued” to describe their feelings about their situations. Examples of students’ verbatim expressions captured on video included:

I feel sadness and humiliation that I have nothing on my plate today (video data cohort 2).

Those of us sitting over here feel deprived and devalued as people, we have nothing (video data cohort 3).

Students’ facial expressions in the group of have-nots are evident in the close-up shots taken in their groups while they are examining the contents of each other’s plates. Expressions of shock, annoyance and/or anger predominate, with students frequently glancing back and forth between their own meagre plates and the plates of those who were able to purchase many items. Towards the end of this period of time, there is evidence of angry glares towards those with full plates, with growing murmurings of discontent. For those with sufficient funding their facial expressions start off somewhat gleeful (as evidenced by the smiles on their faces) when they realise how much they have in comparison to the others and quickly change when they are exposed to the baleful glares of less fortunate students. Often most of these students then put their heads down and refuse to meet the gazes of the majority who have little or nothing. At the point at which students have compared the plates in their own smaller groupings, their attention tends to shift to those in other groups around them to see if they can spot which group has someone with something substantial.

After a short period of time the noise level in the video recording increases and the voices of students who have little are clearly audible with snatches of words such as “unfair”, “disgusting” and “greedy rich people” clearly standing out above the general murmur of voices. When probed during the reflection time, students’ descriptions of how they feel also change in tone and word choice and became more aligned with a discourse of anger and resentment. This is encapsulated in the following student remarks:

I feel extreme anger at the greed of others (video data cohort 3).

I am disgusted at how they eat in front of us; we are also hungry people (video data cohort 3).

I am envious of what they have – it can drive one to desperate measures (video data cohort 1).

I feel excluded and inferior. Am I not good enough to have what they have just because I come from a poorer country? (video data cohort 2)

I cannot accept my situation because I cannot accept being hungry when others have so much on their plates (video cohort 3).
Some students who received $W1 revealed how they tried to find creative ways of dealing with their situations. These included pooling their resources and stealing $Ws from other students, many of whom also only received $W1. For instance, students said the following:

We banded together to survive; it empowered us, but even when we put our money together it was still not enough to buy anything from the table. Those with money had taken it all (video data cohort 1).

We felt justified in resorting to stealing from those who have more (video data cohort 3).

For those with sufficient funds the overwhelming discourse was that of guilt and shame, balanced equally with gratitude that they were better off than the majority: I feel so sorry for those that do not have anything, while my plate is so full (video data cohort 2). Another refused to get drawn into the discussion by stating that: People must learn to face the reality of inequity in society – some have and some do not. That’s life (video data cohort 3).

Moving from and understanding of food scarcity to broader issues of equity and justice

Finally, in the general discussion session and in the reflective portfolio exercises completed after the excursion, most student teachers were able to relate the lessons learned from the simulation game to the classroom and educational situation. The initial focus was mainly on the issue of food scarcity on educational provision. This is encapsulated in the following student accounts:

Children cannot learn when they are hungry. What if children in my class come from circumstances like this where they don’t even have food? (video data cohort 2).

When there is no food there are unforeseen arising circumstances for children – it leads to health issues and even sexual exploitation in order to survive (student reflective journal entry).

With further discussion most student teachers were able to make the conceptual shift to other aspects of inequity and injustice in society and its impact on educational provisioning. This is evidenced by the following comments:

I have begun to realise the impact of a lack of resources on children and their ability to learn (student reflective journal entry).

Teachers must have an awareness of social justice issues and how it affects children’s education. We cannot treat all the children the same – they do not come from the same circumstances (video data cohort 3).

I have a constant awareness of how various factors intersect in children’s lives and what this means for the teacher’s job. It directly affects the teacher’s level of care and accountability (student reflective journal entry).
We have a moral imperative to teach our students about the circumstances of others in the world and the social injustice in societies (student reflective journal entry).

This game points me to take note of other ways in which social injustice manifests in the school environment and how it influences children. I can think of a few things – wealth, cognitive ability, education of the parents, etc (student reflective journal entry).

**Discussion**

In present-day South Africa, where there are huge inequities in society and between race groups, it becomes incumbent upon teacher educators to draw student teachers’ attention to factors that influence children’s learning very early on in their training. Using an issue such as food scarcity in a simulation game provides a catalyst for conversations about teaching for equity and justice, especially in a country where it is conservatively estimated that 60% of children are classified as poor (Hall & Woolard 2012:32). Tied to this is the fact that almost 26% of the poorest 20% of children experience food insecurity (where children sometimes or often go hungry) and live in poverty without adequate access to sanitation, housing, water, electricity and the like (Meintjies & Hall 2012:82). There is evidence that many students in the first year cohort at the institution at which the study was conducted are impacted negatively by financial constraints (Van Zyl 2012:25), which implies that some would have had experience of food scarcity. The simulation game allows such students the opportunity to verbalise how this feels without personalising it outside of the game. On the other hand, for those student teachers with little experience of food scarcity, the simulation game enables them to experience this issue first-hand.

To my mind the value of the simulation game as a concrete experience helps establish a starting point for conversation around the impact of food scarcity on education and teaching for equity and the role of the teacher in this regard. Kumashiro, Pinar and Ladson-Billings (2009:xxv) contend that teaching for justice involves preparing students to succeed in whatever context they find themselves and highlight several overlapping approaches to challenging oppressive practices in schools. One in particular refers to the role of educators in challenging the broader, and often invisible, dynamics in society that privilege certain groups and disadvantage others. It is my contention that the simulation game provides a pedagogical tool for teaching students to experience how one factor, namely food scarcity, can impact children’s learning. Situating this conversation very early in student teachers’ study programme, and within a course which aims to provide students with an overall view of the various aspects of teaching as profession, I hope to encourage them to adopt and develop a more critical orientation when they engage with their course material. During the excursion the foundation is also established for student teachers to begin thinking of the type of teacher they wish to become. I would argue that experiences such as simulation gaming food scarcity could position student teachers towards viewing teaching as a moral act (see for instance the work of Noddings 1984) in which
an awareness of inequity and injustice is paramount. This seems to be borne out in student teachers’ reflective journal entries, extracts of which are included as evidence in this paper. To me, the experiences of the game provide student teachers with a lens and a language – that will develop in their training as teachers – that they will be more aware of how “differential access to resources” affects school children’s learning (King & Castenell 2001:13). Thus, both the timing of the intervention in the students programme in their first year of study as teachers and the use of simulation game as pedagogy, speak to the imperative that King and Castenell (2001:11) refer to as “re-inventing teacher preparation towards an early understanding of social justice in education”. This is also likely to help students understand what Cochran-Smith and Zeichner (2005) refer to as the pervasive influences of other social justice issues such as race, class and culture on schooling.

One downside of focusing students’ attention on an issue such as food scarcity is that it can constrain students’ elaboration on other factors that impact children’s learning. For some student teachers in this study this one-dimensional view of the simulation game could be attributable to a variety of factors. One could be the powerful visceral impact of the simulation game and its focus on food scarcity. Another could be the students’ relatively young age and inexperience in extending the conversation about food scarcity to other matters of injustice. It could also be because an awareness of and conversations about injustice and inequity are often not an explicit focus of study at school level, and student teachers may not have a well-developed enough language to describe their experiences and this impact sufficiently. These are the aspects that teacher educators need to work on consistently in their programmes. Although justice and equity often do not feature prominently in the discourse of many teacher education programmes, ultimately, as Zeichner (2009:56) entreats, teacher educators “must not exhibit moral cowardice and back off from the task of preparing teachers to be advocates for social justice for all children”.

**Conclusion**

Many students enter teacher education with the belief that all children are similar and can be taught in the same way. Teacher education programmes commonly try to counter these ideas with courses on social justice, equity and multiculturalism, sometimes taught theoretically and sometimes linked to the school practicum. Research on exemplary teacher education programmes argues that work in this area cannot be limited to reading and discussions in class alone. It requires sustained input from teacher educators. It means teaching student teachers to move beyond their own “cultural lenses” (Delpit 1995:151) so that they learn through their own experiential lenses in which they put themselves in the shoes of the other and “understand the meaning of that experience for learning”. Grimmett and MacKinnon (1992:389) refer to this type of learning as the development of “pedagogical learner knowledge” – knowledge of learners, the factors that affect their lives and circumstances which impact teaching and learning. For student teachers it is learning to consider the experience and perspectives of those whose lives are plagued by food scarcity,
inequity, injustice and discrimination. This is not easy for students who have not had those experiences.

In this paper I described how I used simulation game in an effort to begin the conversation around teaching for equity and helping student teachers confront the issues that they are bound to encounter in practice. Experiential learning opportunities such as a simulation game allow student teachers to be confronted with the realities of poverty and injustice through an issue such as food scarcity, so that it surfaces authentically (Darling-Hammond 2006:242) and so that it creates the tensions that must be worked through to get them to new levels of awareness. I am in agreement with Cochran-Smith (1991), Darling-Hammond (2006) and others that teacher educators are moral change agents, which means we have a responsibility to find ways of starting the conversations about teaching for equity and justice early and powerfully in teacher education programmes, providing opportunities for students to learn about it experientially so that it does not get lost. The simulation game described in this paper is one such effort on my part as a teacher educator.

References


De Beer, J.J.J. & Henning, E. 2011. Retreating to a Vygotskian stage, where dramatical


**Endnotes**

1. The research activities associated with the educational excursion are supported by a National Research Foundation Thuthuka grant.

2. The creation of the simulation game is credited to professor Josef de Beer, a colleague in the Faculty of Education at UJ, and the First year and PGCE excursion coordinator.
Masekitlana re-membered: A performance-based ethnography of South African black children’s pretend play

Abstract

The extensive empirical research inspired by Piaget and Vygotsky’s theories of make-believe play has been criticised for restricting data to Western, urban, middle-class children. We seek to redress this bias by researching the traditional black South African Pedi children’s game Masekitlana. Our data relies on embodied memories enacted by Mapelo (one of the authors), and interviews with two other informants. The analytical framework draws upon ‘emergent methods’ in ethnography such as performance ethnography, auto-ethnography and memory elicitation through ‘bodynotes’ within a Vygotskyian orientation to play. The findings show that Masekitlana shares features common to all pretend play, but also exhibits others unique to it including:

i) extended monologue,  
ii) metacommunicative frames for realistic thinking, and  
iii) a complex relation between social and solitary play.

These findings support Vygotsky. However, ‘the long childhood’ of Masekitlana suggests that the stages theory of Piaget, as well as Vygotskyian ideas that have come down to us via Cole and Scribner and Valsiner, require revision in the light of Bruner’s two modes of cognition and Veresov’s reinterpretation of the theatre movement within which Vygotsky’s central ideas are embedded.

Keywords: Masekitlana, pretend or make-believe play, performance ethnography, adult memories, Vygotsky’s theory of play, auto-ethnography
Introduction

Though children in all societies play games, ‘make-believe play’ also known as pretend play, role play, symbolic play, or socio-dramatic play (Ariel, 2002; Berk & Meyers, 2013; Bruner, Jolly & Sylva, 1985; Goldman, 1998; Pelligrini, 1982; Singer, 1973; Smilansky & Shefatya, 1990) is of special importance as one variety of play through which children recreate familiar situations by role playing characters, representing everyday scenes, miming actions and narrating a story. The pioneering study by Piaget (1962) of his own children’s pretend play, followed by Vygotsky’s extension and critique of Piaget’s views on play (Vygotsky, 1933; Bruner, Jolly & Silva, 1985), established a universal theory that play is the leading developmental stage of preschool children in all societies. The mind develops when children internalise the perspectives of other people through role play. The use of symbolic play, including language, thus transforms children’s everyday reality through their imaginative representations which they themselves direct like playwrights. The Piagetian and Vygotskyian syntheses and differences thus shifted the commonplace perception of play as a trivial pursuit. However, the data these scholars drew on focussed upon Western children, usually middle-class urban children. Other scholars began to challenge this Eurocentric bias by studying child play in non-Western societies and from rural and lower socio-economic groups (Berk, 2009; Göncü, 1999).

Methodologically, they criticised the decontextualised research of children divorced from their everyday contexts. This led to the shift from elicited and laboratory contexts that studied children isolated from their families and peers, to the study of children in naturalistic contexts such as at home and on the playground. Similarly in Africa, several scholars (especially since the 1960s, after independence from colonial rule), began to focus on African children’s play and found that the presumed ‘absence’ of pretend play in African societies was a deficit view arising from the imposition of play found in Western contexts (Grieve, 1992; Kekae-Moletsane, 2008; Modikwe, 2010; Odendaal, 2010; Reynolds, 1989; Reynolds, 2005).

These Afrocentric studies unfortunately suffer from some shortcomings in their attempt to redress the Eurocentric bias: they tend to homogenise play into European and non-European, and cluster the latter under the label ‘African children’s games’ without distinguishing between physical games, pretend play and games with rules. Odendaal (2010:9), though identifying a black children’s variety of make-believe play called Masekitlana, following the pioneering research of Kekae-Moletsane (2008) nevertheless proceeds to classify it as a “stone game”. Such clustering, while levelling the playing fields as it were between west and east, does little to reveal the developmental stages that African child go through in developing mind.

One consequence is that the validity of Piaget’s and Vygotsky’s universal hypotheses about play as a developmental stage cannot be tested. Furthermore, the Afrocentric approach taken by Odendaal (2010:9) argues that since “Masekitlana is a form of indigenous knowledge” it should be studied through “an indigenous psychological approach”. Such an approach, while seeming to have the flavour of a culture-sensitive ethnography, could veer towards nativism and cultural lock-in. We
would rather argue for a partnership between the Afrocentric focus on African genres and Vygotskyian-oriented ethnography, represented by Rogoff, Mosier, Mistry and Göncü (1993). Such a partnership should be critical but open, thereby allowing the co-construction of a universal theory that retains within it the rich diversity of cultural forms of play.

A notable exception to the relative paucity of studies of African children’s pretend play is Kekae-Moletsane’s 2008 study of African children’s play, where she describes for the first time the traditional make-believe play called Masekitlana played by black South African Pedi children. As this game is the central focus of our paper we will return to her description of it, and our own research, later in this paper.

A Vygotskyian orientation

Because of the limitations of both Western and Afrocentric studies of play outlined above, there is a need for empirical research on play to be grounded in a strong developmental theory. We argue that the Vygotskyian perspective on play provides such a theoretical orientation, as pointed out by several play researchers (see especially Berk, 2009; Harris, 2000; Nicolopoulou, 1993). Though Vygotsky’s own theory of play (in Bruner et al 1985) lacked the empirical support of primary data, his ideas served to provide theoretical insight and inspiration. As Nicolopoulou (1993) argues, Vygotsky’s theory of play should draw from his more general ideas of child development. She shows convincingly that Vygotsky’s ideas were oriented to a study of play in a cultural context, and suggests an ethnographic direction such as opened up by the anthropologist Geertz (1973). However, as Rogoff, Mosier, Mistry and Göncü (1993) point out in their critique of Nicolopoulou, it is strange that Nicolopoulou omits mention of cultural variations in play in different cultures. Such variations would highlight significant differences in the way pretend play is culturally transmitted. Such a cross-cultural study of play would in fact enrich the cultural historical theory of Vygotsky, as well as offer a corrective to some of his hypotheses derived from either secondary data or primary data from elicited/experimental contexts of Vygotsky’s followers (Fleer, 2012; Hedegaard, Edwards & Fleer 2012; Göncü, 1999; Medina & Martinez, 2012; Rogoff et al, 1993). These studies need to be conceptualised by:

the double move approach [which] gives a more prominent position to children’s personal knowledge and interest, as well as to children’s family and community background (Chaiklin & Hedegaard 2009:193).

This approach allows personal knowledge, which includes play, to be harnessed for children’s attainment of scientific or school knowledge.

Aim of the current research

The aim of the research reported here is to describe the traditional African game called Masekitlana from a Vygotskyian, ethnographic perspective using the memory of the key informant, Mapelo’s childhood play. Mapelo is also a teaching colleague, fellow researcher and author. Masekitlana as an African variety of pretend play was first
suggested by undergraduate students doing a course on Vygotsky’s theory of private speech (see Joseph & Ramani 2011 for a fuller description). The course introduced students to the key ideas of Vygotsky but included a small-scale research project on private speech. Several cohorts of students from 2008 to 2012 went to their villages across Limpopo, where Sepedi is mainly spoken, to carry out field observations and interviews. The data they returned with motivated the team of teachers (the present authors) to more systematically research Masekitlana using the students’ data and views as hypotheses.

Methodology

Emergent methods in anthropology

The cross-cultural sensitivity that Rogoff et al (1993) and Göncü (1999) advocate can work best if play researchers take advantage of the cutting-edge techniques of data elicitation and analysis in the recent advances in ethnography, often referred to as ‘emergent methods’. Performance-based ethnography draws upon the methods conventionally used in the humanities, especially theatre studies, and applies these methods to genres, or ‘art forms’ as they are referred to, that are normally studied analytically in the social sciences. These art forms include “dance, film, plastic arts” (Finley 2005:684). Rarer is the treatment of children’s activities as performances such as Dyck’s 2010 research of children’s sport, and the study by Davis and Davis (2010) of the everyday activities of children. Performance ethnography is thus ideally suited for genres where cognition is embodied through action and enactment. However, performance ethnographers would argue that all human activity is performance, that the concept of performativity applies to any “stylised repetition of communicative acts” (Alexander 2005:414), and that, in fact, “all the world’s a stage”. Pretend play certainly, being so close in form to theatrical performance, is obviously an appropriate genre for a performance-based ethnography.

Performance data: Written notes, ‘headnotes’ and ‘bodynotes’

The concept of a text has taken on a much broader meaning than the written text, as Marinis (2006:232) reminds us, so that one can now talk about “a textual approach to performance” within semiotic theory.

In the present research into Masekitlana, performance is treated as part of a conventional ethnographic procedure, namely as a resource for interviewing the player/performer. Conquergood (2006:119–120) notes the dichotomy of performance/practical knowledge and propositional knowledge that segregates manual from mental labour, privileging the latter which he calls “apartheid knowledge that plays out inside the academy”. Performance-based ethnography helps to overcome this false dichotomy, and through that, levels down senior staff (often non-African language-speaking individuals in South Africa) and their junior African language-speaking counterparts, who remain closer to their everyday performative knowledge. This is the case with the present team of authors.
We find Skinner’s three kinds of data relevant for this study. Skinner (2010:120) refers to “headnotes”, “written notes” and “bodynotes”. Skinner coins the terms “bodynote,” “headnote” (“memories of field research”) and “written notes” (the conventional field notes). While written notes are explicit, ‘headnote’ and ‘bodynote’ are “the unseen” (2010:121). The ‘bodynote’ is the co-construction of the memory of the performer (research subject) of physical movements such as in dance (that is the object of the research). Skinner (2010:112) claims that this physical movement “is a form of knowing itself” and perhaps what he means is that knowing is ‘embodied’ knowledge. Such knowledge is of course tangible, but tacit. Such tacit embodied knowledge is made explicit and thus recoverable as knowledge when the informant/performer's memory is stimulated by the performance (such as dance). The dialogue between researcher and research subject around the performance data is what Skinner is referring to as ‘bodynote’. Skinner (2010:120) sums up his position succinctly: “Memory can be enacted physically through the unleashing of bodynotes.”

Skinner’s views of remembering through performance is closer to those play researchers who argue for the creative role of adults’ remembering their childhood. We have referred to some of the scholars in anthropology earlier who have written in the same publication as Skinner, significantly titled The ethnographic self as resource: Writing memory and experience into ethnography (Collins & Gallinat 2010). Dyck (2010), writing about children’s sport, uses his own childhood memory of games as an entry point, as do the twin researchers Davis and Davis (2010) of their shared childhood. But play researchers also engage with children in play (see Kelly-Byrne, 1989; Paley, 2004). For such participative performance-based research to happen they point out the importance of recalling their own childhood. Childhood memories of play are thus indispensable in the study of child play, in addition to observations of actual play. Adults who had emotionally invested in and who immensely enjoyed childhood play usually also vividly remember, and there are adults who no longer play children’s games, but are able to re-enact them (Thomas 1958). Years of teaching young children and observing their ‘fantasy’ play in her classroom has convinced Paley (2004) that though researchers initially find it difficult to leave the world of factuality to enter the child’s world of fantasy, once entry is gained understanding soon follows.

Research questions

We now list the original questions that motivated this research, and which were stimulated by the undergraduate students’ field work in their own rural communities:

1. Is Masekitlana a form of fantasy/make-believe play among Pedi children?
2. From what age do children start playing Masekitlana and at what age do they stop?
3. How do children learn to play Masekitlana? Do they learn it from adults/parents or from peers?
4. What is the relation between the solitary form and the social form of the game?
5. Does Masekitlana have rules? In which ways are the rules of Masekitlana different from the rules of other games?

6. Is Masekitlana pure fantasy (even though it may draw upon reality), or is it reality-oriented?

In addressing these questions, we hoped to provide a sociocultural analysis of Masekitlana and to theorise it as a developmental stage, following a Vygotskyian-oriented ethnographic analysis.

**Sources of data**

The three informants in this paper are Mapelo (one of the authors of this paper), Pamla (a former student on the Vygotsky course and mother of a six-year old daughter) and Mosima (a female high school student). The first two informants are adults who played this game as children, and are therefore ex-players. Mapelo’s data are memories of her childhood play, whereas Pamla’s are her observations of her daughter starting to play the game. Only Mosima (the adolescent high school student) currently plays the game. Her data is drawn from her current experiences, and also from her observations of her six-year old niece to whom she has taught the game.

We rely upon the data from Mapelo, treating Pamla and Mosima’s data more selectively either to complement or problematise Mapelo’s perceptions. Data from other sources include the impressionistic field notes of six undergraduate students who observed children playing Masekitlana in their villages in the Limpopo province. The students’ data were insightful and used as a source of hypotheses to launch the main research. We also include as data the shared memories of the childhood play of the authors. These data were not used for analysis but for doing a collective auto-ethnography to establish common ground and empathy among ourselves.

These different sources, some highly planned and structured and the others used more spontaneously and responsively, are summarised in the table below.

<table>
<thead>
<tr>
<th>Data source</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>1</td>
<td>Six students’ responses to a questionnaire on private speech, as part of a third-year module on language and cognition.</td>
</tr>
<tr>
<td>2</td>
<td>Auto-ethnographic accounts of childhood games played by the authors, focusing specifically on pretend play.</td>
</tr>
<tr>
<td>3</td>
<td>Re-enactment of Masekitlana by Mapelo, which was video and audio taped, and transcribed.</td>
</tr>
<tr>
<td>4</td>
<td>Ethnographic interviews of Mapelo based on the video of her performance.</td>
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</tbody>
</table>
As pointed out earlier, Mapelo’s performance and the interview of her by the other three authors of this paper are the main sources of data, with the other two informants enriching and sometimes provoking Mapelo to probe her memories deeper. Mapelo’s performance of Masekitlana closely resembles the way children still play the game, except that her themes and content are adult themes, and her verbal fluency is that of an advanced Sepedi speaker. She is also partly pretending to play pretend play, for a semi-authentic audience, namely her co-researchers. Pamla is not only a mother, but also a postgraduate student and former student on the Vygotsky course, and is therefore able to understand the theoretical significance of our interview questions. Mosima is the only informant who currently still belongs to the period of childhood and actually still plays the game. She also reports being taught by her older sister and has in turn recently taught her six-year-old niece. Like Pamla, Mosima brings a current understanding of the game, in contrast to Mapelo, who represents a childhood of an earlier period, one that she recalls through performance.

Though our paper relies mainly upon Mapelo’s accounts of Masekitlana, significant convergences and divergences between her and the other two informants help to provide a fuller description of the game.

Description of Masekitlana

As the first published account of the game Masekitlana, and reflecting an insider’s observations of play within her own community, Kekae-Moletsane’s (2008:368) description deserves extensive quotation:

[Masekitlana] is a monologue play, played by one child at a time, alone or while other children are listening attentively. During play children usually relate stories about things that worry or excite them, things they imagine, their wishes, things they detest, things about people they detest, and things around them. Players need only two small stones. Masekitlana players hit one stone with the other several times while relating their stories. The pace, frequency and the way the stone is hit differ. When the players relate stories or events that interest them, they hit the stones softly, at a slow pace and infrequently. They speak softly with a sweet tone. Their facial expressions show happiness in the form of smiles or laughter. When the players relate aggressive incidents, and sad or depressing stories, they hit the stones very hard, frequently, and show aggression and anger on their faces. They usually shout and yell while talking. They also display anger and sadness on their faces to the extent that they sometimes frown or cry. The game involves many emotions, such as happiness, excitement, anger, sadness and aggression. When the storyteller stops telling a story, comments, remarks, suggestions and questions are usually posed or made by the listeners. If an interesting story has been told, the usual comments and remarks are: “That
was great! What a lucky girl! I wish I had been there”. In the case of a sad story, the listeners’ comments, questions or suggestions are: “Poor child! Shame. Where is she now?” In some cases the children become so emotional when playing Masekitlana that they cry or stop playing without finishing their stories. In such cases the usual remarks, comments and questions are: “What happened afterwards? What else? What did he do? Don’t worry, he will be safe” and so on. Here the listeners give support and act as counsellors or therapists.

It is clear from the above account that Masekitlana is an advanced form of socio-dynamic role play or pretend play. It has most of the essential features of pretend play that characterises Western urban middle-class children’s pretend play – imaginary situations represented through role play, use of symbolic resources such as stones for characters, gestures to represent actions and emotions, and improvised language used in narrative fashion.

Kekae-Moletsane’s account of Masekitlana is a background to her main research involving a young boy traumatised by the violent murders of his mother and grandmother by his father, which, tragically, he witnessed. Kekae-Moletsane used Masekitlana as a form of therapy to help the boy come to terms with his tragedy. Her pioneering research launched a spate of research on using Masekitlana for therapeutic purposes (Modikwe, 2010; Odendaal, 2010).

Apart from some minor differences, Kekae-Moletsane’s account corresponds in the main with the data we have uncovered. Mapelo writes, based on her memory of her own childhood play, as follows:

Masekitlana is a story-telling game in which the narrator uses stones as characters to enact a story, which often includes a complex plot and conflictual situations leading to a satisfactory resolution. Each time a character speaks, the stone representing the character is struck on the ground. Girls usually sit in a circle and take turns telling a story. The game is frequently played by young girls between the ages of 4 and 15, with younger children, both boys and girls, being part of the audience.

It will be noticed that Mapelo’s account is more sociological, referring to factors such as gender, age and taking turns. These observations emerge from her memories of her own play in naturalistic settings.

In the light of our understanding of Masekitlana, Kekae-Moletsane’s account suffers from some limitations. The boy’s monological performance is an instance of solitary play rather than social play. The child is very young in terms of the more mature social element of Masekitlana, and his motives are primarily related to trauma. The audience is the therapist who elicits this solitary play. Such elicited data is used for therapeutic ends, and tells us little about how such play will develop into mature play with motives beyond the primary one of expressing and overcoming pain. In fact researchers following Kekae-Moletsane provide a textbook definition of Masekitlana as “a traditional South African game that is usually played by distressed children” (Eloff & Ebersöhn 2004:175). Though Odendaal (2010:8) adds “This is not to say that this game is solely played by distressed children” the norm for the game is that it is usually played by distressed children, a point that Mapelo and all the female students on the Vygotsky course strongly disagree with:
We seem to disagree, as it is played by all the children who are both happy and sad. It is a game that is played daily in the communities (Mapelo interview, July 27, 2011).

These critical observations on therapeutically-driven studies of make-believe play opened up a new direction for the present team of researchers – the study of Masekitlana in non-laboratory settings such as homes, classrooms and the outdoors, and which included normal children, rather than only traumatised children using a Vygotskyian cultural historical theory rather than a clinical theory with Africanist underpinnings.

**Analysis and findings**

In keeping with performance ethnography and cultural historical activity theory, we examined the data for aspects of Masekitlana such as settings, age, rules, cultural and historical transmission, self-regulation and motives.

We present our findings, into which we weave insights from Mapelo’s re-enactment of Masekitlana and the interview with her, which was based on the joint viewing of her video recorded performance, converting in the same session ‘body notes’ into auto-ethnographic accounts. We also draw upon observations made by Pamla and Mosima.

**Masekitlana is a complex socio-dynamic (CSD) mode of make-believe play**

The playing of Masekitlana requires a number of semiotic resources: drawings to represent homes, stones to represent characters, gestures, intonations and language to role play these characters. Language, moreover, has to be deployed in a narrative style where all the elements of drama come in, most notably plot, climax and resolution. Berk (2009) and Nicolopoulou (1993) refer to such socio-dramatic play as complex to distinguish it from early socio-dramatic play where actions predominate and narrative is yet to emerge.

CSD play partly derives its complexity from the environment, but mainly from the maturity of the player. Mapelo points out the flexibility of Masekitlana where stones are chosen according to availability. But it is clear that mature players will choose different shapes, colours and textures of stones or sticks with some a priori idea of these characters representing social types. There is therefore social generalisation implied by such choice that very young players are unlikely to possess. Variations in choice of stones could of course be a matter of local diversity and not something typical of all mature players. Mapelo’s account of variations of choice of stones may therefore not extend to children in other settings, but the freedom to increase sophistication of ‘symbols’ remains a generalisation that applies to mature players benefitting from certain environments that favour such choice.

The weaving of a story through deployment of multimodal semiotic resources (drawings, stones, and gestures) turned out to be so complex to us who observed Mapelo’s performance as to suggest a degree of being planned. We got this impression from her fluency, speed and absence of exploratory in-frame talk (there
were no instances of, for example, “Now, let me see what should happen next”). Plannedness was also inferred by the duration of her performance. The first time her play went on well beyond half an hour. The second time we had to request her to shorten her presentation to about five minutes. Furthermore, her first performance was not recorded properly, and when asked to re-enact it, she surprised us by claiming she couldn’t remember her story and preferred to tell a new story. In other words, her performance was improvised. While improvisation is a key criterion of pretend play and is used to distinguish it from such games as early role play which mimics real persons and games with a priori rules like chess, soccer, Marabaraba etc., it seemed to us initially that Masekitlana must have been rehearsed much like a play written beforehand and then enacted. Once our scepticism was dispelled we realised that Masekitlana is unlike other pretend play in that a single player engages in an extended monologue. This monologue is protected by rules of non-interruption which we will describe in the next section. Monologue makes an even greater demand upon the competence of a player than, say, dyadic pretend play. The former requires complete self-regulation, whereas the latter is co-constructed and has features of mediation by others.

The complexity of all CSD play, as in Masekitlana, is explained developmentally, rather than just structurally, by sociocultural theorists. Nicolopoulou’s claims (1993) that CSD is the basis for more decontextualised activities (such as story reading and writing) is in keeping with Vygotsky’s developmental view:

At first, in a child of preschool age, action dominates over meaning and is incompletely understood; a child is able to do more than he can understand. It is at preschool that there first arises an action structure in which meaning is the determinant (Vygotsky in Bruner et al 1985:550).

Vygotsky adds that “towards the end of development in play, what had originally been embryonic now has a distinct form, finally emerging as purpose and rules” (in Bruner et al 1985:553).

However, as Vygotsky astutely notes about preschool action, “the action is not a sideline or subordinated feature; it is a structural feature” (Bruner et al 1985:550). In other words, complexity is the outcome of the retention and incorporation of the props of earlier play. The child achieves mastery of complexity through self-regulation, which Vygotsky points out is the pathway to internalisation of activity/performance as inner thought.

**Rules of the game and rules of symbolisation**

Mapelo points out that although “the stories are not planned” and “the narrator just goes with the flow as she plays along”, there are rules. During the monological performance the audience is not allowed to interrupt with questions or comments (according to Mosima, one of our informants). But according to Mapelo “the audience is allowed to ask and comment during the game but they are not allowed to tell the narrator what to say next or how the story should end”. This rule of non-interruption appears to flow from the centrality of the monological role play which ensures that
the player, and not the audience, is centre stage. The audience tends to obey the rule because among them are aspiring performers queuing for their turn. Mapelo asserts:

For instance some children prefer to only observe, but others want to play all the time. It is only fair for these that they be given a chance, but supposing I as a player go and do something else, they’ll be very angry. The rule-breaker could also be punished by deliberate interruptions when her own turn came. (Mapelo interview, July 27, 2011).

This *quid pro quo* expectation arises from the unstated view ‘I listen to your story; you have to listen to mine’

It is interesting that the rule of non-interruption is linked to taking turns, but furthermore that it occurs in a structured form, i.e. after the performance, in what we would like to term ‘the commentary’. In terms of frames there is little tolerance for commentaries during performance itself unless a procedure is flagrantly violated by the player, observes Mapelo, commenting on an error in her own performance which she staged for us. The error lay in her not sticking to the same stone for the character she chose at the beginning of her narrative. The audience could interrupt to correct the player in such cases. We prefer to call such errors as violations of ‘rules of the game’.

However, these are not the only kinds of rule. There are rules that relate to matching symbol to reality. A drunken man for instance must be role played as staggering and speaking in a slurred voice. A mother must sound like a mother and behave like one. A child must be mimicked through a high-pitched, squeaky voice etc.

Bigger stones are used to represent older people and the smaller stones younger children. Sticks are also used to represent (weak) male characters in the story. The sticks in this case are chosen because they are easily broken. The female character, usually a stone … will sometimes crush the stick and the female audience will be cheering with victory (Mapelo interview July 27, 2011).

She also describes choice of shapes, textures and colours of stones to represent characters: smooth, beautiful stones for young women, for instance. The correspondence is not only between suitable objects to represent characters, but actions to represent emotions related to how a female player feels about how men treat women in the society they observe around them.

The audience during the ‘commentary’ usually praise good representations of reality, and occasionally criticise poor representations. Mapelo says: “The audience compliments and often ask ‘What would have happened to so and so if you had continued the story?’” This often leads to the narrator continuing the story in a speculative fashion. The audience and performer could then engage in co-constructing such a reality.

The rules of Masekitlana suggest that children develop cognition through self-regulation of their social realities through the rules of play. This is in keeping with Vygotsky’s theory of symbolic play in contrast to Piaget’s.

Piaget (1959:264) sees the early speech of the child and symbolic play as being ‘egocentric’, “because the subject does not sufficiently differentiate between himself
and the outer world but projects into that world the content of his own subjectivity”. In later works Piaget (1962:168) also asserts:

Symbolic play … has for the two to four year old child … as its sole aim satisfaction of the ego, i.e. individual truth as opposed to collective and impersonal truth.

‘Collective play’ according to Piaget (1959:168) “either has no effect on the egocentric symbolism or, when there is imitation, it enhances it”. Accommodation or the modification of internal schemes to fit reality applies only to ‘adapted thought’ as in games with rules (marbles, hopscotch etc.), which are transmitted socially from child to child and thus increase in importance with the enlargement of the child’s social life’ (Piaget 1959:59).

It is only in these mature forms that lead to rational thought that “a state of permanent equilibrium between assimilation and accommodation” is arrived at (Piaget 1959:287). In short, in play (as in dreams) the child “loses the sense of reality” (Piaget 1959: 62).

Vygotsky (1987:78), in contrast, points out:

The child’s egocentric speech is not divorced from reality, activity or adaptation … but constitutes a necessary feature of the child’s rational activity, or adaptation.

Vygotsky saw the balance between assimilation and accommodation (that Piaget restricted to games with rules and rational knowledge) as applying to both rational thinking and to ‘autism’ (symbolic play). In one of his most insightful and comprehensive statements he pointed out:

The zigzagging development of thinking and fantasy that is reflected in the fact that any abstraction is at one and the same time a flight from life and a more profound and accurate reflection of life – creates a potential for studying realistic and autistic thinking (Vygotsky 1987:78).

In opposition to Piaget, who ignored the activity of the child as a means to realistic thinking, Vygotsky (1987:79) pointed out “what we have in mind is … reality as it is encountered in practice”. Make-believe play promotes “voluntary intentions, real-life plans and volitional motives” (Vygotsky 1987:102).

The unique feature of Masekitlana is that peer regulation happens through the commentary of the listeners through their reality-oriented critiques, which are of three kinds:

i) Story grammar (genre features of stories)

ii) Rules of the game (Searle 1969:33)

iii) Rules representing behaviour in the real world

Masekitlana then, requires the operation of three kinds of rules: generic rules of storytelling (rules of the genre), rules of the game (particular to each game), and rules of symbol-reality convergence (reality-oriented rules). Rules of the game in Masekitlana are similar to games with a priori rules like marbles, Marabaraba, soccer and chess, which Piaget gave more attention to as being more adapted to reality
than fantasy play. The last of the three rules occur during improvised role play of real characters and events in their generalised form when incorporated into the imaginary situations created by the child so typical of pretend play. The fact that these three kinds of rules of Masekitlana are embedded in the local cultures of the Pedi people explains perhaps why Mapelo and Mosima refer to Masekitlana as ‘a cultural game’ independently of each other. We interpret this to mean that Masekitlana has to be learnt through a cultural process unlike other make-believe games which are learnt quickly and almost spontaneously.

The ‘cultural game’ perspective of insiders encourages us to hypothesise that cultural transmission of some kinds of fantasy play must be examined within “child-structured play”, a term used by Schwartzman as cited in Goldman (1998:102) for play that is directed by children and excludes adults. CHAT (Cultural Historical Activity theory) scholars (Berk, 2009; Medina & Martinez, 2012) have argued that this absence of child-structured play in Vygotsky’s theory of play, reveals a gap in his theory of mediation which tended to emphasise the role of adults, despite his inclusion of the phrase more capable peers as mediating agents. This gap has been redressed in the last two decades (see Göncü & Gaskins, 2007; Hedegaard, 2012). Medina and Martinez (2012:97) further show that within child-structured play, there is a distinction between “individualistic and collectivist cultures” as reflected in Dutch and Andalusian children’s play respectively. Masekitlana falls within child-structured collectivist cultural forms of play where

the value of seeing themselves integrated into a group was more important than their individual interests and was the motive for children to organize their acts (2012:111).

Children within these cultures also serve as collective mediators and historical agents, transmitting their games without much adult intervention in what Rogoff et al (1993:151) term “guided participation” or scaffolding that more expert children provide to novices. Broadly then, ethnographic studies of play support CHAT that cultural tools and social formations are historical in nature, but contribute significantly to the finding that communities of children have a stronger agency in the shaping of their own games and the transmission of these games across time than previously thought. This is certainly the case with the communities of Pedi children who play Masekitlana. This local variety of children’s make-believe play is consistent with Hedegaard’s 2012 synthesis of Vygotsky’s cultural historical approach with Leontiev’s activity approach.

**Solitary and social play**

An early hypothesis given by students in their field observations was that Masekitlana exists in two versions: solitary play and social play. The relation between the two was not suggested. However, based on Vygotsky’s general law that socially-mediated activities are the precursors of solitary private speech that is then internalised as inner thought, we speculated that there must exist a stronger relation between Masekitlana in the child alone, and in the child-with-others situation. The data support this view. Mapelo recalls she first started playing Masekitlana at the age of 4:
I remember because we had this sand; they were extending the day care centre, we would dig, mould houses. At that time we were not telling stories. It was more about beautiful homes, stones, no plot or ending. (Mapelo interview, July 27, 2011)

Mosima says that the solitary and social play are the same game, emphasising that “older children never play alone”. (Mosima interview, August 15, 2012) In the solitary version she says: “The young child may be able to teach herself”. Mapelo too agrees that solo play is ‘rehearsal play’ (Mapelo interview, September 12, 2012) for the social play that will come later when the child has mastered the rules (of the two kinds we have identified). “When young children become confident they play with others” affirms Mosima (Mosima interview, August 15, 2012).

While the above descriptions suggest a move from very young solo play, to mature adolescent social play, this is only one part of the socialising process of play. Where or from whom does the child learn Masekitlana? The young child observes older children playing when s/he is part of the audience. The young child could be a boy or a girl, but usually only older girls are players. Once they observe in silence how Masekitlana is played, they seclude themselves to play a simple version of the game. This solitary play might be equated with private speech, but accounts suggest that they lack the unselfconsciousness of private speech.

Mosima points this out in her six-year old cousin Charlene, who “can tell a kind of story but can’t pronounce words properly; Charlene is still learning (Sepedi)”. She adds:

Most children don’t like adults (to observe them play) because adults will laugh at them “cause they can’t pronounce the language... ’cause if you miss a single word they are going to laugh at you ... if someone comes she stops playing, saying “Ha, mum, go!” (Mosima interview, August 15, 2012).

Pamla says the same about her six-year old daughter, who plays by herself in the yard in front of the house, within the line of vision, but out of earshot of her mum (Pamla interview, August 10, 2011). Mosima reports she overheard solitary speech of one child of three years: “She got stones but she can’t build houses. But she’s talking. If someone comes, she stops as she can’t pronounce properly” (Mosima interview, August 15, 2012). Mosima’s account suggests that the child is self-conscious about her performance, showing that the child knows the difference between immature and mature play. Though very young children (3–7 years) develop solitary play as silent participators in social play, they take some time before they become social performers. Moreover, there are some exceptions. A very precocious child might say:

I want to play Masekitlana, will you come and listen? The older [sic] will collect stones and do the drawings ... and arranging (of the rooms and sofas) and the four year old will tell the story (Mosima interview, August 15, 2012).

This kind of adult-supported social play is rare, the solitary form of play being the norm in very young children. Rare also is the ‘teaching’ of Masekitlana by an adult (parent, uncle, cousin). Young children appear rather to acquire or appropriate the rules of this game by participating as silent, observing, and absorbing members of the audience.
Thus their social participation provides the basis of their later solitary play, or to use Vygotsky’s (1987:211) well-known concept of the ZPD (Zone of Proximal Development):

> What lies in the zone of proximal development at one stage is realized and moves to the level of actual development at a second. In other words, what the child is able to do in collaboration today, he will be able to do independently tomorrow.

So, whereas Piaget presented child development chronologically as egocentric speech to social speech, Vygotsky (1987:75) reversed this order from “social speech to egocentric (private) speech to inner speech”.

This position of Vygotsky in its most general form is his general genetic law of cultural development, stated as follows:

> Any function in the child’s cultural development appears on stage twice, that is, on two planes. It firstly appears on the social plane and then on a psychological plane (Vygotsky cited in Veresov 2004:5).

However, Veresov (2004:2) criticises Western scholars like Cole and Scribner (1978) and Valsiner (2000) for the way they interpret Vygotsky’s terms ‘stage’ and ‘plane’. Veresov (2004:6) argues for understanding these terms in the context of the “language of the Russian theatre”, where “on the stage” and “on two planes” are not metaphors ... [but] literally the place in the theatre where actors play. Scene has two planes – the front plane (also called “the first plane”) and the back plane (often called “the second plane”). According to theatre’s traditions, main events of the performance should happen on the front plane of the scene [...] So, it means that on the stage of our development, the category appears twice – inter-psychologically (on the first, front plane) and then intra-psychologically (on the second, internal individual plane). Therefore there are no two levels in development, but there are two planes of one stage, two dimensions of one event (Veresov 2004:7).

Veresov’s rejection of the limited views of Cole and Scribner (1978) and Valsiner (2000) is, in our view, an important attempt to restore Vygotsky’s view of ‘drama,’ ‘dramatic collision’ and its resulting dialectic (the zigzagging alluded to earlier in this paper) in the place of the linear, abstraction of internalisation that Cole and Scribner and Valsiner present. Veresov sees this as a misrepresentation of Vygotsky. For reasons of space, we can only present a very sketchy account of Veresov's (2004:3) deeply reasoned restoration of Vygotsky's dramatic view, or as he calls it, “the hidden dimension” of the ZPD. The hidden dimension (namely drama) better captures the way the public and solitary forms of Masekitlana play themselves out in children’s lives. In other words, solitary play is itself a performance. Methodologically as well, Vygotsky’s theatre-oriented cognition on the one hand, and the performance-oriented study of genres by ethnography on the other, provide a powerful synergy of these two paradigms, to study play.

**Motivation as an outcome of mastery**

The long duration of a single monologic performance – anywhere between fifteen minutes to an hour – moreover one of spontaneous, unrehearsed storytelling made us
speculate about the source of the child’s motivation. Kekae-Moletsane’s therapeutic research draws upon the initial emotions of repressed feelings that are projected by the traumatised child in his expression, intonation and clashing of stones in socio-dramatic play. Death, hunger and separation are often the motives identified. The child thus derives emotional release and overcomes trauma through role playing these repressed feelings (Vygotsky’s ‘unfulfilled wishes’). This suggests that once the child is ‘cured’ she would stop playing Masekitlana. This is not the case, as even Kekae-Moletsane’s therapeutic case study (2008) shows the cured child wants to continue play, apparently for the sake of play. The adult memories of play of Mapelo and Mosima are always joyful ones, even when the play was about sad or gruesome events. Odendaal (2010), however, following Kekae-Moletsane, is puzzled why children narrating sad or scary events nevertheless seem like they are enjoying their self-narrative.

Our data suggests a different explanation. Unlike her, Mapelo’s older cousin preferred to tell scary tales of witches, based on the belief of ‘real’ witches in their village.

She would choose three black stones for three black cats that represented the witches. She would choose a stone for a hyena believed to be roaming the village at that time, terrorising the villages so that at night children who had to fetch water felt afraid to do so. We didn’t enjoy her stories, but we were sitting there [listening] feeling miserable. At the end of the story we would say we would never again listen to her stories, but we kept on coming back to hear more. (Mapelo interview, July 27, 2011).

The cousin who was older than her audience relished the fear she so inspired in the younger ones. Her competence in tuning in to the ‘real’ stories and creating fantasies out of them through her masterly narrative style suggests that the ‘enjoyment’ of the performer and audience must come from emotions other than the primary one of overcoming unfulfilled desires.

We suggest that much of the motivation comes from mastery of behaviour of the characters represented realistically through deployment of the symbolic resources such as stones, drawings and story sequence. These motivations appear similar to what we will term ‘secondary motivations’ that Vygotsky argued superseded “immediate impulse” (Vygotsky in Bruner 1985:548), or what we term ‘primary motivations’. These primary motivations can be inferred from Vygotsky’s position that

towards the beginning of preschool age, unsatisfied desires and tendencies that cannot be realised immediately make their appearance, while the tendency to immediate fulfilment of desires, characteristic of the preceding stage is retained.

[But] ... every advance from one age stage to another is connected with an abrupt change in motives and incentives to act (Vygotsky in Bruner 1985:538).

The advance from initial motives that propel the child to the more advanced motives is brought out by Vygotsky’s reliance (in Bruner 1985:549) on Spinoza “that an affect can be overcome by a stronger affect”. This view of Spinoza in the realm of play is stated by Vygotsky forcefully as “the essential attribute is a rule which has become an affect” (in Bruner 1985:549). Vygotsky (in Bruner 1985:549) concludes: “In short
play gives a child new desires”. The mastery of rules of the game, a goal motivated by primary motives from an earlier stage, once attained becomes a motive itself. The CHAT tradition that emerged from these insights of Vygotsky is best represented by Hedegaard (2012), Fleer (2012) and Medina and Martinez (2012).

Vygotsky (in Bruner et al 1985:552) famously sums this up in this well-known quotation: “In play the child stands taller than itself in real life”. Play creates a higher reality out of the mundane, which not merely represents reality but also the child’s aspirations for its future. This is shown in Mapelo’s preference for suitable endings: The child performing Masekitlana often has to end a social crisis in favour of the underdogs, and show justice that must be achieved. If this is not done, the audience feels disappointed and expects the performer to suggest a different ending. Those players who do not satisfy the audience risk losing their popularity, whereas popular players are those who satisfy their audience’s cravings and thereby get larger audiences returning for their next performance. Motivation in storytelling is thus socially directed, and socially stimulated, lifting the child out of its primeval motives towards social motivation, or as Davydov (1995:41) put it “a person has … desires of a humanitarian nature”, which get transformed through activity into needs.

The teacher researcher Paley (2004) notes that adults might be able to enter the child’s world of play by following the rules of play, but find it very difficult to understand the feelings of the child. She is here referring to secondary motivations. Vygotsky’s own theory of child development ends on the relation between emotions and motivation, and much of it was theorised in his ideas on play. However, as Vygotskyian scholars (Leontev 1945, 1977, 1978; McInerney, Walker & Liem 2011; Hedegaard 2012) note, the centrality of advanced emotions and motivations is the cornerstone of Vygotsky’s entire theory, but nevertheless remains under-theorised. The study of Masekitlana, like make-believe play of children in other societies, provides evidence of advanced motives, which are vital clues for a theory of human motivation that goes beyond the theory proposed by Freud, and continued by Piaget’s claim, that according to Vygotsky (1987:77), “knows of no adaptation to reality, because pleasure is the only spring of action.” Leontiev (1979), on the other hand, derived motives solely from the reality-oriented goals of the child and implicitly devalued the child’s initial desires in an attempt, we think, to depart from the subjectivism espoused by the psychoanalytical tradition. Leontiev goes too far here in excluding what Hedegaard (cited in Fleer, 2012:91) refers to as “the interest the children bring” to an activity. Hedegaard’s dialectic (2002, 2009) between initial interests and goals has profound implications for formal education. We take this up in our conclusion.

Age range

Children between the ages of 3 and 16 play Masekitlana. We believe this wide age range is quite unusual. Pretend play is supposed to give way to realistic (scholastic, scientific, imitative) thinking according to Piaget, or to use his words “the ludic symbol is evolving towards a straightforward copy of reality” (1962:137). Vygotsky (in Bruner 1985:549) on the other hand, sees such play as yielding realistic thinking, i.e. “subordination to a
rule in the renunciation of something he wants” such as candy, and that furthermore claimed that play does not just disappear as Piaget predicted. It was this perception of reality through rules resulting in the child’s “self-determination” that Vygotsky attributed to Spinoza and Piaget (Vygotsky in Bruner 1985: 549). It was this also that led him to claim a developmental status for pretend play or to use his term a “leading activity” of the pre-school child (Vygotsky in Bruner 1985:552). Mapelo does agree that Masekitlana peaks at about 7 or 8 years, but the data from the three informants and the students show the continuation of the game into adolescence. Moreover, Masekitlana is a parallel activity to both scientific reasoning (school subjects) and to games with a priori rules like Marabaraba, Kgati and soccer. This suggests that Masekitlana is not limited strictly to a stage (at least in terms of the upper end of the age limit), but is rather a mode of representing reality. The theories of Bruner (1976) best capture the trajectory of Masekitlana from early childhood to adolescence. Bruner argues for two modes of representing reality, namely the narrative and the scientific, neither of which is superior to the other – they are separate, but complementary.

This picture of complementarity challenges both Piaget and Vygotsky's theories, but is complexified once we examine the play of Masekitlana in actual contexts. Masekitlana is a traditional make-believe game played in rural and township localities of black South African communities. In big cities and suburbs there is a considerable lessening of play. Mapelo, who has the experience of having lived in early childhood in a village, and then shifted in her secondary school years to a big city suburb, sees Masekitlana differently from Mosima, who has lived all her life in the rural part of Limpopo. Mosima is sure that Masekitlana is played by high school girls, because she still plays it as a high school girl. Mapelo is surprised at Mosima’s claim, assuming that the game is either not played beyond primary school, or else goes underground among older girls, by which is meant that older girls do not play the game in public places like the playground, but in the teacherless privacy of classrooms during breaks. Mapelo concedes that her view may come from the fact that age differences in the play of Masekitlana may arise from the differing geographical factors of rural and city areas. Urbanisation, with TV, computer games and commercial toys, she laments, is leading to a loss of culture. Mosima, on the contrary, claims that the effects of modernisation on rural children are being absorbed into the game. Her cousins see TV programmes and use super heroes from the Sepedi programmes in their Masekitlana role play. Mapelo speculates this may be because rural parents still regulate the amount of TV viewing of their children, unlike urban parents who tend to have much less control. These socio-geographical differences aside, it seems plausible that make-believe games such as Masekitlana are alternative and parallel modes of representing reality to the ‘realist’ scientific mode, and do not disappear with early childhood. The realities they represent are moreover different: One represents social behaviour, the other is knowledge about objects in the natural and physical world.

It is quite possible that games such as Masekitlana might offer a better balance of the assimilatory and accommodating aspects than school (scientific) knowledge alone, even though the latter is regarded as cultural capital. The educational implications of
this balance is that make-believe games such as Masekitlana, rich as they are in the ‘what if’ or hypothesising and predicting functions (often associated only with realistic thinking), could be turned into cultural capital if incorporated into the curriculum. But this requires a major rethinking of curriculum in terms of Bruner’s (1986:12–13) parallel modes of the construction of reality, what he terms “the paradigmatic or logico-scientific mode [...] and the narrative mode”. Bruner (1986:11) is clear that the two modes of thought “though complementary, are irreducible to one another”, “each providing distinctive ways of ... constructing reality”. Of the two, the more mysterious is the narrative mode, focussing on verisimilitude in contrast to the scientific mode’s testing of hypotheses to establish truth through facts. Bruner (1986:13) stresses the role of narratives in the development of imagination through “good stories, gripping drama, believable [though not necessarily ‘true’] historical accounts”. He might have added ‘and sociodramatic play’. All these genres fall within the narrative mode, the criteria for validity being “not truth but verisimilitude ... of lifelikeness” (1986:11). Bruner’s two modes offer different but equal routes to a full-blown curriculum, which is currently lopsidedly in favour of the scientific mode. It resonates with Veresov’s (2004) restoration of the ‘drama’ approach of Vygotsky, that Western representations of Vygotsky have omitted due to their unfamiliarity with the Russian legacy of theatre and art that Vygotsky was immersed in.

**Masekitlana: An African embodiment of CHAT**

Masekitlana is a cultural variety of the make-believe play of South African Pedi children. The different functional stages of play, such as the purely motor functions of imitations that Piaget identified in very young children – drawings representing people’s homes, using stones to represent characters, and then telling a story impersonating these characters, with all the features of plot such as sequence of actions, climax and resolution – show Masekitlana to be a multi-staged, multimodal game of a complex kind. Its unique feature is the extended monologue, a feature protected by child audiences and players through the rule of non-interruption that is enforced during performance. The high level of competence that monologue demands of players explains why novices (preschoolers) go through the sequence of being ‘recruited’ as part of an audience where they observe the older children perform, retreat into solitary play where they rehearse and finally emerge as players at a later age. The most advanced players are adolescents.

These findings support Vygotsky’s theory of the precedence of social activities as the source of self-mastery through solitary play. However, the ‘long childhood’ of Masekitlana implied by our finding that this is a multi-aged, multi-staged game ranging from 3 years to 16 years necessitates a reconsideration of Vygotsky’s developmental stage theory (as popularised by Cole & Screibner and Valinsder, and correctly criticised by Veresov) in the light of Bruner’s more plausible two modes of cognising reality. Bruner’s ideas are also echoed in the Bakhtinian notion of multivoicedness (Holquist 2002), internalised as advanced human thinking. Our findings on Masekitlana support these theories, but in turn such theories need to inform and be informed by
ethnographic performance-based studies to yield richer descriptions of the semiotic resources that underlie the apparent simplicity of such play.

**Conclusion: Therapy, community health, and pedagogic implications of Masekitlana**

Though this paper has focused upon theorising a monologic variety of the Pedi children’s fantasy play, one that may also be played in other African ethnic groups, there are practical social benefits, not only for its use in psychotherapy as shown by Kekae-Moletsane and her team, but also for community-initiated early childhood development in local contexts.

Play researchers within the CHAT paradigm who identify a role for youth is summarised by Berk and Winsler (1995:78) as follows:

Older siblings and cousins serving as first playmates and also as caregivers while mothers tend to new babies or work responsibilities.

Such a role is in harmony with the African ‘family’, where siblings play a major caregiving role.

However, there is a need to go beyond both therapy and individual household care to recognising the youth as cultural preservers of the heritage of children’s play for the well-being and happiness of young children. Reynolds, like Berk, argues for an “implicit pedagogy” that she draws from the political struggle of the youth in forging their identity in a South Africa in transition:

> Many young people in southern Africa rejected the established order imposed by undemocratic governments, and in doing so they had to stand against much of the order represented by parents and other authorities at the local level. They drew on material and symbolic means in rejecting the definition of the real imposed on them (our emphasis).

> The political identity of the body is usually learned unconsciously, effortlessly and very early ... What is “remembered” in the body is well remembered (Reynolds 2005:97).

The convictions of these scholars in the power of the youth echo the belief of this paper: the memory of youth of their own childhood, recovered through body-notes of enactments, will enable them to be re-membered back into their communities. Remembering through remembering will enable youth to restore more fully the mythic culture of children by creating new zones of proximal development for the child’s existing spontaneous play, which to recall Vygotsky, has within it the maturing “buds or flowers of development” (Veresov 2004:1, citing Vygotsky) Here play, as Vygotsky (in Bruner et al 1985:552) put it so well, enables the child to “jump above the level of his normal behaviour”.

For formal schooling, both preschool and primary school, the role of older peers in being ‘scaffolders’ for young children is argued as the best route by play researchers (see Berk & Winsler, 1995; Göncü & Gaskins, 2007).
Older siblings from some ethnic-minority families may be particularly adept at such scaffolding ... in classrooms with a multicultural mix of children (Berk & Winsler 1995:79).

The relevance of play forms such as Masekitlana as a resource that can be used by African children to teach children in South African urban schools from dominant language groups such as English and Afrikaans should be obvious. However, for schooling purposes, play needs to be developed within the concept of the “double move” that Hedegaard puts forward based on Davydov’s ideas on “theoretical thought” (1990:249). Davydov extends Vygotsky’s educational theory (1987:212) that the everyday knowledge of the child must be connected with scientific, theoretical knowledge, and that instruction is only useful when it moves ahead of development. One way for doing this, as already suggested, is to extend spontaneous play through older children serving as models. Additionally, we suggest that classrooms be used as sites to implement what Fleer and Quinones (2009:86) “term children as researchers”, where the children are required to study, as ethnographers, the generic features of their own play.

If fantasy play is ‘a child’s work’, as Paley (2004) puts it in the title of her famous book A child’s work: The importance of fantasy play, then schools must both continue and extend play, through advanced storytelling and child-friendly research.

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References


An error analysis in the early grades mathematics – A learning opportunity?

Abstract

Error analysis is the study of errors in learners’ work with a view to looking for possible explanations for these errors. It is a multifaceted activity involving analysis of correct, partially correct and incorrect processes and thinking about possible remediating strategies. This paper reports on such an analysis of learner tests. The tests were administered as part of the evaluation of an intervention project that aimed to teach mathematical problem solving skills to grade 1–4 learners. Quantitative error analysis was carried out using a coding sheet for each grade. A reliability coefficient was found for each test, as were item means and discrimination indexes for each item. The analysis provided some insight into the more common procedural and conceptual errors evidenced in the learners’ scripts. Findings showed similar difficulties across intervention and control schools and highlighted particular areas of difficulty. The authors argue that this analysis is an example of large-scale error analysis, but that the analysis method could be adopted by teachers of grades 1–4.

Keywords: Mathematical error analysis, mathematical pedagogy, elementary school, foundation phase, assessment, mathematics
Background: Teachers learning from child assessment in national tests

South African learners are now required to write annual national tests, which have become known colloquially as ‘the ANAs’. The teachers are meant to use the test results to inform their teaching. The Department of Basic Education (DBE) published the outcomes of its qualitative analysis of the results in the Annual national assessment: 2013 Diagnostic report and 2014 framework for improvement (DBE 2014). In the diagnostic section of this report the analysis appears to be what Ketterlin-Geller and Yovanoff (2009:3) term “skills analysis”, i.e. the analysis of learners’ item level responses to determine their mastery of specific mathematical reasoning skills. However, in the introduction to the section 2014 ANA framework for improvement, the diagnostic analysis is described as the investigation of “common errors” and “misconceptions” of learners. This description matches what is generally termed “error analysis” (Ketterlin-Geller & Yovanoff 2009:4). The diagnostic analysis conducted by the DBE did not investigate whether error patterns differed across different language (and cultural and socio-economic) groups. In its report the DBE specifies that all schools are expected to customise the broad framework provided by the DBE into grade and subject specific improvement plans (DBE 2013). The ultimate aim is to improve learner achievement by focusing on remedial interventions targeting common errors and misconceptions evident in learners’ responses to the national tests (DBE 2013). Two questions immediately come to mind if this is the status quo: 1) How are teachers to analyse ANA and other test scripts productively, and 2) how are they to use the tests to inform their teaching? Error analysis is central to answering both of these questions.

Error analysis, also referred to as error pattern analysis, is the study of errors in learners’ work with a view to finding explanations for these reasoning errors. This multifaceted activity can be traced back to the work of Radatz in 1979. Not all errors can be attributed to reasoning faults; some are simply careless errors (Yang, Sherman & Murdick 2011), identified as “slips” (Olivier 1996:3), which can easily be corrected if the faulty process is pointed out to the learner. Slips are random errors in declarative or procedural knowledge, which do not indicate systematic misconceptions or conceptual problems (Ketterlin-Geller & Yovanoff 2009). Error analysis is concerned with the pervasive errors (or ‘bugs’) which learners make, based on their lack of conceptual or procedural understanding (Ketterlin-Geller & Yovanoff 2009). These authors explain that such mathematical errors occur when someone who makes this type of error believes that what has been done is correct – thus indicating faulty reasoning. Such errors are systematic (Allsopp, Kuger & Lovitt 2007) and persistent and occur across a range of school contexts (Nesher 1987). Yang et al (2011) point out that systematic errors might be the result of the use of algorithms that lead to incorrect answers or the use of procedures that have not been fully understood.

Error analysis, however, does not just involve analysis of learners’ correct, partially correct and incorrect steps towards finding a solution, but also implies the study
of best practices for remediation (McGuire 2013). This would require of the teacher a good knowledge of mathematical content, as well as a good grasp of learners’ levels of mathematical understanding (McGuire 2013). In the Data Informed Practice Improvement Project (DIPIP) key aspects of error analysis were found to span three of the domains of teacher knowledge as described by Ball, Thames and Phelps (2008) and Ball, Hill and Bass (2005), viz. common content knowledge, specialised content knowledge and pedagogical content knowledge (Shalem & Sapire 2012). Similarly, McGuire (2013) argues that the ability of teachers to remediate common learner errors and misconceptions underlies Shulman’s (1986) definition of pedagogical content knowledge. Hill, Ball and Schilling (2008) further include the ability to anticipate learner errors and misconceptions in their understanding of pedagogical content knowledge. Hill et al’s (2008) division of pedagogical content knowledge into knowledge of content and students, knowledge of content and teaching, and knowledge of curriculum is useful to explain that activities such as error analysis, which require pedagogical content knowledge, involve more than just pedagogy; they involve a well-grounded understanding of the learner and how a learner learns.

When Shulman (1986) first proposed his theory of teacher knowledge, in relation to pedagogic content knowledge, he suggested that a teacher’s knowledge of learners’ levels of understanding contributes to an awareness of the process of learning mathematics as well as knowledge of the mathematical concepts that learners struggle to grasp. Authors such as Sousa (2008) and Ashlock (2006) focus on the contribution of error analysis and other efforts to grasp learners’ levels of mathematical understanding to the teacher’s own knowledge of the underlying cognitive processes involved. From the above, it is clear that error analysis is interwoven with teachers’ content and pedagogical content knowledge, as well as teachers’ knowledge of mathematical cognition and conceptual development. On the whole, error analysis helps teachers to understand some of the thinking of the learners. This, in turn, may assist teachers to adjust their pedagogy as well as classroom and assessment practices, which may ultimately lead to improvement of learner achievement (Franke & Kazemi 2001). Borasi (1994), for example, has documented the positive effects on learner achievement of an integrative teaching approach which made use of error analysis.

Several researchers (Riccomini, 2005; Sherman, Richardson & Yard, 2005; Yang et al, 2011) reached the conclusion that error analysis is an important skill for teachers teaching mathematics to non-native speakers of English. Even though there is no agreement between researchers (see Carey, 2004; Gelman & Butterworth, 2005) as to whether or not language is the cause of mathematical difficulties for learners learning in a language other than their home language, Yang et al (2011) highlight the need for a curriculum that supports systematic mastery of mathematical vocabulary, conceptual development and comprehension. We argue that this finding makes error analysis even more relevant to the South African context, where the majority of the learners learn mathematics in a language other than their home language from grade 4 onwards.
Unfortunately, research has shown that teachers are often not equipped to design and implement teaching interventions based on the errors made by learners (see Riccomini 2005). Russell and Masters (2009) note in their paper presented at the annual meeting of the American Education Research Association that during error analysis, teachers may neglect the conceptual understanding of learners in favour of procedural correction. Ketterlin-Geller and Yovanoff (2009:6) further point out that teachers might find it difficult to distinguish between “slips” and “bugs”. These are legitimate and real concerns regarding the diagnostic value of error analysis and should be considered and addressed within teacher training programmes.

The error analysis described in this article was done using learner tests developed by the project management team (not the researchers) and administered as part of the programme evaluation of an intervention concerning the teaching of mathematical problem solving skills in grade 1 to 4 classrooms. The tests were administered in three languages, i.e. isiZulu, siSwati and English, according to the school’s medium of instruction in the specific grade. The majority of the grade 1 to 3 learners wrote the tests in their home language, whereas all the grade 4 learners wrote the tests in English. English is the home language of only a very small minority of the learners in the sample. The research was conducted in two provinces in South Africa. Although it presents an example of large-scale error analysis, the methodology could be adopted by teachers and used by them to perform error analysis using the work of the children they teach. Thus, as practitioner researchers, teachers could inform their own practice.

**Methodology**

A quantitative error analysis was done after the development of an error analysis coding sheet for each grade. The coding sheets were used by markers to code every item in the test according to the types of answers given by learners. The codes were developed by the mathematics expert in the evaluation team and refined after initial coding of a sample of scripts to include as many of the varieties of errors made by learners as possible. The criterion for inclusion of an error was what the expert deemed to be ‘incorrect mathematical reasoning’. A team of nine markers was trained on the use of the coding sheets. Markers were recruited from the ranks of teachers, district officials and graduate students specialising in mathematics. Coding was quality assured by the project manager. After marking the first set of tests, any issues that emerged were discussed and agreement was reached on consistent implementation of the codes. After that each marker coded her or his first pack of actual tests; this was again followed by a discussion of issues that emerged during the coding activity. Coding and discussion was an iterative process that continued until all tests had been coded. A minimum of 10 percent of all tests was moderated by the senior marker.

**Data capture and analysis**

The coded responses and biographical data of the learners were captured by a team of capturing specialists. The data were captured using a ‘restricted entry method’ in
order to ensure complete accuracy in the data capturing process. Consistency checks and verification procedures were included to further ensure the accuracy of the data captured. The data preparation and analysis followed using SPSS Statistics data analysis software (version 21). Each of the learner datasets was imported into SPSS. The data were then ‘cleaned’, which involved screening for invalid cases, duplicates, outliers and missing data. Reliability analysis was carried out on each grade level test, providing a reliability coefficient for each test as well as item means and discrimination indexes for each item. Items were screened to ensure that each one contributed to test reliability. Items with a negative effect on test reliability were flagged and considered for deletion prior to the analysis.

A detailed analysis of results was carried out utilising SPSS Statistics. Learner performance was analysed with respect to group (intervention or control group), type of support received (group A or B), province, school, language of instruction and age of learner. Overall means were calculated for the whole test, as well as for word problem type items only. Using the coding, descriptive statistics were used to analyse the learner errors in conjunction with learner material given to the teachers in the intervention schools. Qualitative notes were added to the findings using a random sample of learners’ scripts taken from the greater sample of coded tests.

Findings: The process

The error analysis methodology employed for the purpose of the evaluation report is instructive in itself. In developing the error codes, it became clear that even though the mathematics expert and the selected markers were relatively good at predicting the types of errors learners were likely to make, they often did not list all the possible errors. This lead to the need to add additional codes after the coding of an initial sample of scripts was completed. The markers did not anticipate finding certain types of errors, such as reversals and rotations of numerals and digits within numbers, in the higher grades (i.e. grades 3 and 4), but these errors were found to be quite prevalent.

Since markers were recruited from a pool of teachers, district officials (i.e. mathematics curriculum advisors) and graduate students qualified as specialists in mathematics teaching with relevant experience in teaching mathematics and references from reputable sources, accuracy of marking was expected to be high. This was, however, not the case, at least not in the initial stages of marking. Intensive training and discussions were needed before a high level of agreement between markers was reached. The processes of quality assurance, discussions of issues and training became iterative and were judged to be essential for maintaining high levels of consistency in the marking. This indicates the relative unfamiliarity of error analysis to teachers, teaching students and district officials; the indication was confirmed through anecdotal discussions with markers.

It was found that the quality of data that can be expected from error analysis is limited by the overall quality of the test construction, as well as by the quality of specific test items. It stands to reason that poor functioning test items would yield
less valuable data regarding learners’ performance than items that function well. For the purposes of this article we adopted the definition of a good test item as found in Gregory (2000), i.e. an item that measures the construct that it is supposed to measure, that discriminates well between weak and strong learners and that is free from bias. In this analysis, a curriculum-based scholastic achievement test was used, which highlighted another factor that influenced the data that could be extracted through error analysis, namely, the effect the conceptual model that underpins the South African curriculum has on the selection of knowledge to be tested in a curriculum based test. For example, addition, subtraction, sharing and grouping, halving and doubling are just a few of the concepts taught in the first school year according to the Curriculum and Assessment Policy Statements (DBE 2011). This leads many of the scholastic tests developed by the DBE (and others) to include only one or two items per concept or skill. Such tests do not adequately capture the conceptual development of learners, nor do they elicit all the common errors associated with a specific construct. In psychometrics this is termed construct under-representation (Downing & Haladyna 2004) and it limits the validity of diagnostic inferences made from the specific measure. We, however, argue that despite the often very apparent limitations of the tests used in South African schools, error analysis could still be considered a worthwhile and beneficial activity, even if it just makes the teacher aware of the limitations of the specific test or test item in yielding valuable data and the need for further investigation through e.g. the use of cognitive diagnostic tests.

Findings: Learner errors

The findings of the error analysis are presented in a series of tables, each of which represents a step in the error analysis process. The first step in analysing a learner test would be to determine the difficulty level of each of the items. This shows (based on the results) which items learners found more difficult and less difficult. In a well-constructed test the progressive difficulty of items would be indicative of the phases of mathematical conceptual development through which learners pass. In this case, as in many other examples of scholastics tests in South Africa, the tests did not contain a sufficient number of items to systematically test learners’ conceptual development in any one construct. The test rather covered a wide variety of concepts and skills at just one juncture (or very seldom two) in conceptual development, e.g. the grade 1 test only contained two addition items (the first, $6 + 2 + 2 = \square$ and the second $9 + 8 = \square$). In a test designed to reflect conceptual development, item difficulty levels could be used by teachers to set priorities in order to plan the progressive development of concepts effectively. Note that the number of test items per grade differs, but that for each grade difficulty level 1 is the most difficult item.
<table>
<thead>
<tr>
<th>Difficulty</th>
<th>Item content grade 1</th>
<th>Item content grade 2</th>
<th>Item content grade 3</th>
<th>Item content grade 4</th>
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<td>Operations</td>
<td>Patterns</td>
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<td>Operations</td>
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<td>Patterns</td>
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<tr>
<td>5</td>
<td>Operations – problem solving</td>
<td>Operations</td>
<td>Geometry</td>
<td>Measurement – time operations</td>
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<td>6</td>
<td>Number</td>
<td>Number</td>
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<td>Operations – problem solving</td>
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<td>9</td>
<td>Data</td>
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<td>Patterns</td>
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<td>Operations</td>
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<td>Geometry</td>
<td>Measurement – time</td>
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<td>17</td>
<td>Operations</td>
<td>Geometry</td>
<td>Operations</td>
<td>Operations – problem solving</td>
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<td>18</td>
<td>Operations</td>
<td>Geometry – symmetry</td>
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In terms of mathematical curricular content areas, there was a spread of difficulty levels across all of the content areas in all grades. For example, the shaded cells are those items in which learners achieved over 40 percent as a raw score in the test. Achievement in the different learning areas does worsen from grade 1 to 4, but in all grades there were ‘easier’ and ‘more difficult’ items from each content area. It can be deduced that there are still many areas of weakness in learners’ performance across the curriculum and much can still be learnt from the errors evidenced in these tests. We argue that the vast spread of areas of difficulty might be the result of a curriculum requiring the teaching of a vast variety of concepts and skills from grade 1 onwards, as opposed to devoting more intensive teaching to the basic concepts that form the foundation for mathematical understanding and development.

The second step is to focus on the ‘correct methodologies’ of the test-takers. This is a positive step that gives insight into what is working rather than leaping straight into what is not. The addition of this step incorporated skills analysis with error analysis. In this study it was seen that not all learners showed their working (in spite of being encouraged to do so) and as a result it was not always possible to identify methodologies learners used or the conceptual level on which learners functioned. However, limited information on which items learners were able to do well does become clear when one focuses on questions learners got right. Evidence from the error analysis revealed, as is to be expected, that learners were using unit and group counting methods, vertical and horizontal algorithms and diagrammatic representations to find the solutions to questions involving operations.

The third step involves the identification of whether a ‘correct’ methodology was used, but in such a way that it lead to a final answer that was incorrect. This can be seen as a ‘step in the right direction’ and gives insight into work which can be honed, not necessarily starting from scratch. Ashlock (1994) termed this category of error “defective algorithms”.

The fourth step is to identify the extent to which questions were not attempted, since this reveals areas of weakness in which no knowledge appears to be present and full attention to these topics is required.

The fifth and final step is to identify the most commonly occurring errors per item. One can go into great detail here, which would yield a rich overview of learner errors, the underdeveloped concepts on which they are based (where relevant) and ideas for how to address these errors. This step is left to the end, since it is the most complex and it builds on the earlier steps. A focus on learner errors also reveals that some of the children’s thinking cannot be classified according to some or other predetermined category as decided by the team expert. These errors we coded as “other incorrect answer”. A prevalence of such errors could be a sign of general confusion, which does indicate a need for further clarification of the topic by the teacher. It could also indicate a need for the child to be assessed with alternative tools, preferably a standardised diagnostic instrument that can produce a very detailed description of the level of conceptual development of the child. Other alternative assessment methods,
such as talk-through-the-problem approaches, are also very useful in gathering further information regarding the conceptual understanding of a specific learner.

Some of the learner errors are shown here by way of example, since it is not possible to record all of the errors noted in the full report. These examples are taken from the qualitative sections of the report where learners’ work was shown with a view to raising questions as to the curriculum requirements.

Examination of the grade 1 learners’ scripts showed that very little tangible ‘workings’ were done on the part of learners. The working processes were frequently done with some manipulatives or drawings of little sticks or circles (serving as counters). This indicates that these learners are still relying on count all and count on/back strategies in problem solving, despite a curriculum requiring grade 1 learners to exhibit understanding of place value by the end of the second term. In the opinion of the authors, this is an example of where the conceptual model underpinning the South African curriculum does not take cognizance of the research in the field of mathematical cognition.

An example of learner’s work from the grade 1 script shown below in figure 1 illustrates the mechanical use of unit counting with little or no understanding. We argue that this is an expected result when the teaching of operations commences before learners have mastered ordinality and cardinality of number, which would enable them to grasp the part-part-whole principle (see Ehlert & Fritz, 2013; Ricken & Fritz, 2009). This type of application of procedures without the necessary conceptual understanding is also mentioned by researchers such as Wisniewski (1990) as a cause of systematic errors.

In this example, which is most disturbing, the learner has drawn units (in the form of circles) all over the paper. This learner only answered one question correctly in the test. There is no logic or reasoning apparent in the illustrations, though presumably the learner has been led to believe that illustrations of units are meaningful and may earn some credit in a test paper or, at the very least, should be shown. The excerpt from this learner’s script shows a response to the question “Calculate: 6 + 2 + 2 = □”. The working shows 6 circles and two symbols beneath the circles which could possibly be numerals to represent the twos; the drawings have some relation to the question, but no further working and no solution to the question is given.

**Figure 1: Extract 1 from grade 1 script, learner A**

Excerpts from grade 2 learners’ work add to the insight gained from the grade 1 scripts into learners’ use of unit counting in their solution of mathematical operations.
The excerpts illustrate that many learners drew counts (either with sticks or circles), but these did not necessarily correspond to the answers then given or the questions being answered. This raises the question of whether learners truly understand the mathematical concepts needed to perform operations or are they merely going through the motions of some or other method they has been taught?

The extract shown in figure 2 is an example of unit counting that has not worked although it got ‘close’. One needs to think about the frustration which must surely be felt by a learner who has taken such care to draw so many units (not clustered in any systematic manner according to place value, which is possibly why the count went wrong in the end). The question needs to be asked – has this learner had the opportunity to master the principles of cardinality and decomposition of number before being faced with the concepts of class inclusion and embeddedness or was this learner merely taught a method to solve addition problems? It is clear from the learner’s responses that the learner is still making use of counting all or counting on strategies at the end of his/her grade 2 year.

**Figure 2: Extract 1 from grade 2 script, learner C**

The next two extracts shown in figures 3 and 4 consist of three different examples of calculation in grade 2 level addition, subtraction and multiplication as specified in the curriculum. There is no consistent use of counting and the counting does not always lead to the correct solution. The answers vary in the extent to which they correspond to the working shown – some do have connections, but others seem to come out of the blue or are related to the question itself (for example performing the incorrect operation on the numbers in the question).
Examples taken from learners’ scripts in grade 3 begin to give insight into the use not only of unit counting, but also of numeric vertical and horizontal algorithms. From these examples we can see how evidence of learner errors in the numeric calculations lends itself well to meaningful explanations which teachers can use to guide the learners in the correct use of place value when doing calculations in higher number ranges.
The first pair of extracts shown in figure 5 illustrates horizontal working or breaking down of numbers in some way. Errors arise in both extracts. There is logic that can be identified in these methodologies and an observer can work out the learners’ reasoning shown in this working. To give meaningful explanations, a teacher would have to take time to get into the heads of the learners and work out their mathematical reasoning. The teacher could then start to address the errors that have resulted from the learners’ working. Working horizontally has, to an extent, enabled learner H to get very close to the correct answer in the addition question, but not so in the subtraction question. Learner I, although having given horizontal working, demonstrates the well-known errors which learners make when operating on numbers that involve regrouping if the learners do not understand place value and how to work with it. The question arising from these extracts is: What would be required to consolidate the learners’ understanding of decomposition of number in order to move them beyond their current level of understanding?

Figure 5: Extract 1 from grade 3 scripts, learners H and I

The second pair of extracts in figure 6 gives insight into learners’ incorrect use of the vertical algorithm. Here it is evident quite quickly what has gone wrong; a teacher could meaningfully engage with these learners to explain how and where their calculations went wrong and how to address the errors identified. The same errors involving poor use of place value and regrouping using place value can be seen as in figure 5, but because of the structure of the algorithm, what the learners have done is clear and a teacher can pinpoint the errors and address them. When addressing these
errors, teachers can devise explanations which are meaningful to the learners on how to use place value to regroup and add or subtract correctly.

The extracts in figure 6 also give evidence of unit counting by all three learners in the multiplication question. In the case of learner L, the learner’s working is inaccessible and meaningless in all three of the questions and the answers given bear no resemblance to the circles drawn by way of working in the spaces provided for learners’ work. In the case of the unit counts used by learners J and K, there is some order which can be interpreted, but the working still did not yield the correct answers.

**Figure 6: Extract 1 from grade 3, learners J, K and L**

The next extract shown in figure 7 present an example of grade 4 learners’ work. The extracts show that unit counting at this level is not helpful. Both of these extracts are from the same learner’s script. In the first extract, the learner clearly and neatly shows his or her working using the vertical algorithm for subtraction, but makes several errors. The numeric calculation does not appear functional as a working model; rather it is more of a written record for working that has been done on the side using unit counting. The understanding of place value and the way in which it is used when subtracting from a 3-digit number (regrouping and breaking down) is evidently not yet in place (only required by CAPS the third term of grade 4); the learner did not manage the ‘borrowing’. This learner cannot even compute 15-8 and 12-7 mentally and has used circles and crossing out (unit counting) to do these calculations. It should be noted
that 12-7 should actually have been 11-7, since the tens were broken down when 15-8 was computed. Again, is this evidence of teaching a method of problem solving before the learner is conceptually ready? In spite of these complications, based on learners’ errors, the teacher could identify the need to teach decomposition and place value before proceeding with vertical algorithms.

**Figure 7: Extract 1 from grade 4 script, learner V**

![Image of grade 4 script](image)

The progression of extracts from the grade 1 to the grade 4 scripts has been presented to indicate how error analysis can be used as a starting point for answering two questions: At what level of conceptual understanding is the learner functioning; and what actions are needed from the teacher to assist the learner to progress to the next level of conceptual understanding? In the process of attempting to answer the above questions, other important questions arise. Are teachers teaching methods of problem solving at the expense of conceptual understanding? Does the curriculum expect learners to perform at levels for which the learners are not conceptually ready? Does the current structuring of our tests allow for in-depth error analysis? These questions provide evidence of how error analysis can assist teachers to think critically about teaching practices.

**Discussion**

It is not possible to reduce the error analysis findings easily. The details of the spread of errors discussed in the project report could not be included here. This, however, does not mean that the details regarding errors are deemed unimportant. Quite the opposite.

Across the grades, the percentages of learners whose answers could not be coded according to any particular mathematical reasoning were high. Such answers are probably indicative of general lack of understanding/knowledge of the content covered in the particular item. These percentages were highest in grade 4 and followed
a similar pattern across the control and intervention groups in all grades. This means that many of the learners who wrote the tests did not exhibit identifiable mathematical reasoning when answering, which makes it difficult to address the misconceptions underlying their errors. This further indicates the need for standardised diagnostic mathematics tests, as well as teacher training in the use of alternative methods of assessment (e.g. talk-through-the-problem approaches), which could illuminate the conceptual understanding of learners.

The analysis of the percentages of learners who did not attempt to answer each item goes further to providing insight into areas of difficulty. The pattern of learners who ‘did not attempt to answer’ the questions was similar for control and intervention groups, revealing common areas of difficulty which need attention. Highest percentages of questions not attempted in grades 3 and 4 related to fraction concept – in which diagrammatic wholes were provided. This is interesting when considered in the light of the findings of quite a few researchers – that teachers also tend to struggle with fractions (Ball, 1990; Mok, Cai & Fung, 2008; Yim, 2010). Across all grades there were very slightly higher percentages of learners who avoided the geometry items.

An analysis of the ‘partially’ incorrect answers gives insight into content/skills that could be developed in learners. Across all of the grades these partially correct answers indicate that learners were aware of the correct operation that needed to be done, but did not complete the operation correctly. This indicates some conceptual understanding, despite the presence of procedural error(s). This can at least be seen as a step in the right direction, with the learners having skills that need to be honed rather than taught from scratch. Errors in the formation of numerals should be noted – in several questions the inability of learners to write numerals correctly was seen (particularly in grades 1 and 2) and this should be addressed as a matter of urgency, since learners cannot progress if they cannot even write their numerals correctly. The two grades in which there was the greatest evidence of answers indicating partial understanding were grades 2 and 3.

There were errors evident in all of the mathematical content areas covered in the test and they were prevalent in these areas to such an extent that they all warrant attention. Of particular concern is the very poor performance on items in which the measurement of time was involved. Learners (across both groups) did not seem able to tell the time using analogue clocks or to refer to a calendar in a meaningful way. Many of the errors made by learners in both the control and intervention groups are common errors made not only by South African learners, but also by learners internationally. These errors (often based on misconceptions) are seen by some as a natural part of the learning process (Nesher 1987). The majority of these errors are of a conceptual nature, although many procedural errors were also noted. It is important that teachers are made aware of such errors and how to address them, since they would then be empowered to enable their learners to grow out of these misconceptions and reach a full and correct understanding of the foundational mathematical concepts assessed in this test.
Many of the errors point to a learner’s use of a problem solving method despite a lack of conceptual understanding. Whether this is the result of poor or no conceptual teaching, teaching of concepts and skills for which learners are not yet ready or an unreasonably fast pace required by the curriculum, is open to debate.

Conclusion
The ANA tests now written annually in South Africa will go no further than quantifying and monitoring the problem which we already know exists in our schools (one of the said purposes of the ANA, but not the only one) unless the scripts are taken up and used by teachers for self-evaluation purposes. This study clearly shows how much can be learnt if learners’ scripts are analysed with regard to learner errors, even when limitations are imposed by less than ideal test construction and a fast paced curriculum that often requires learners to master skills for which they are not conceptually ready.

An analysis of learner errors does require mathematical content and pedagogical content knowledge on the part of teachers, but it would also serve to broaden teachers’ knowledge of mathematical cognition and concept development. We would recommend that teachers pick up their learners’ test scripts (including the ANA scripts) and start to sift through them, question by question, noting both correct methodologies and errors learners make and that teachers then follow up (at their own pace, but with due diligence) any methods or errors which they themselves cannot explain. In this way, one step at a time, teachers’ mathematical content and pedagogical content knowledge will be developed. Teachers will also be able to adapt their teaching to address the errors which they note are prevalent in their learners’ work and work towards the goals they set for themselves on an annual basis regarding the achievement of their learners. Teachers may even become aware of which items in their assessments and tests yield better data regarding learners’ difficulties, which in turn may lead to improvement in teachers’ assessment practices.

We further recommend that the DBE (and other stakeholders) take a more rigorous approach to the error pattern analysis in the ANA and other testing programmes. This would include investigating whether the common errors made by learners are similar across language and cultural groups. It further entails that in their reporting, the descriptions of common errors are supported by research findings and reference is made to the cognitive developmental research which should underpin mathematics teaching. In short, in an effort to avoid over emphasis on procedural correction to the detriment of conceptual understanding, learner errors must not just be superficially described, but must be embedded in the knowledge of why, when and how learners learn mathematics and make the mistakes they often make. We would hazard to say that such an in-depth analysis of learners’ responses to test items would probably lead to a reconsideration of the test construction processes followed in the ANA and other curriculum based tests that are used for diagnostic purposes as well as of the content and pace required by the curriculum.
Acknowledgments

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References


Endnotes

1. See volume 3(1) of this journal, which comprises a number of articles on the topic of a suitable diagnostic tool for South African children, as well as Ketterlin-Geller and Yovanoff (2009) for a description of the benefits of diagnostic assessment in structuring remedial teaching plans.

2. In this table we refer to curriculum discourse and not to the concepts that were tested by the various items. This, therefore, is a table of item difficulty according to content area. These are not conceptual categories. The tables giving learner errors (conceptual/procedural) were also given in the project report.
Structural and social constraints in the teaching of Life Skills for HIV/AIDS prevention in Malawi primary schools

Abstract

The Ministry of Education in Malawi introduced a life skills education program with the intention to empower children with appropriate information and skills to deal with social and health problems affecting the nation, including the fight against HIV infections. This study investigated factors affecting the teaching of the life skills education in four primary schools in the Zomba district, Malawi. Cornbleth’s (1990) notions of the structural and social contexts and Whitaker’s (1993) identification of key role players in curriculum implementation framed the study. Data was collected through interviews with teachers and principals and observations of teachers’ lessons. Findings suggest that the teaching of life skills is constrained by a variety of social and structural contextual factors such as the poor conditions under which teachers are working; greater attention given to subjects such as maths and languages; the cascade model of training teachers and the short duration of training; the inaccessible language in teachers guides; hunger and poverty of learners; lack of community support for sex education; both teachers and learners being infected or affected by the AIDS/HIV pandemic; teachers felt it is inappropriate to teach sexual education to 9 and 10 year old learners. The structural and social barriers to effective life skills education within the current framework indicate the need for alternative sex HIV/AIDS education complementary to the primary school curriculum.

Keywords: Life skills education program, curriculum implementation, factors influencing curriculum implementation
Introduction

Malawi is a country plagued by social and health problems, such as drug and substance abuse, juvenile delinquency, teenage pregnancies and the HIV/AIDS pandemic. About 16.4% of Malawians of between the ages of 15 and 49 years are HIV positive (National AIDS Commission 2004:20). These social and health problems are on the increase among the youth who are nevertheless regarded as a window of hope for the poverty-stricken nation (Malawi Ministry of Education 2000:6). The social and health challenges demand that the young people be empowered with appropriate information and skills to enable them to effectively deal with these situations. According to Yankah and Aggleton (2008:465) “life skills education has been advocated as a key component of HIV and AIDS education for young people” for the last 20 years.

In 1999 Malawi’s Ministry of Education, Sports and Culture and the Malawi Institute of Education, with United Nations International Children’s Education Fund (UNICEF) support, developed a life skills curriculum that was piloted in 24 primary schools. Following the successful trial testing in 2000, the Ministry of Education directed that the subject should be implemented in all classes of the primary education cycle (standard 1–8) as a non-examinable subject. Life skills education was thus introduced in Malawian primary schools as a way of empowering children with appropriate information and skills in the fight against HIV infections and AIDS and for them to deal with various other everyday social and health problems affecting them.

Life skills are defined as “the skills that enable learners to understand themselves, the world and their place in it” (Malawi Ministry of Education 2000:92). Life skills education on the other hand is defined as

an interactive process of teaching and learning which enables learners to acquire knowledge and to develop attitudes and skills which enable them to cope with challenges of life (Malawi Ministry of Education 2000:92).

Life skills education aims to

continue and extend the development of the skills that the learners bring from home with a focus on the promotion of the holistic development of the learner (Malawi Ministry of Education 2000:92).

The life skills education program aims to teach learners to organise and manage their lives, to develop team spirit regardless of cultural and religious backgrounds, to avoid diseases such as sexually transmitted diseases (STDs) and HIV/AIDS, to develop positive self-esteem, to cope with the problems of adolescence and to prepare them for the world of work (Malawi Ministry of Education, Science and Technology 2000). Life skills education thus aims to nurture learner development physically as well as socially, emotionally, intellectually, creatively and spiritually. Such holistic development is

essential for the learners’ healthy living as individuals, and members of families and societies which form the basis for all other learning (Malawi Ministry of Education, Science and Technology 2000:92).
Yankah and Aggleton (2008:466) note that a recent review of life skills work in southern Africa concluded that life skills programs in general are too simplistic to offer any valuable solution to the complex needs of African young people.

There are, however, initial indications that the realities in primary schools make the teaching of the curriculum difficult. According to Malawi Institute of Education's report on the monitoring survey of the implementation of life skills education in standards 5, 6, 7 and 8 conducted in 2006, life skills education is taught for the benefit of visitors only. As the report puts it, “Teaching of life skills education on the days of data collection seems to have been prompted by our sending information about our visits” (MIE 2006:15). Other challenging circumstances which adversely affect the teaching of life skills education have been documented. They include lack of instructional materials (MIE 2006:20) and the unprofessional conduct of the teachers.

The aim of this study was to investigate life skills education at four primary schools and identify social and contextual factors that influence the teaching of life skills education program in the Zomba district of Malawi. Furthermore, this study sought to understand how different role players (including teachers, learners, principals, district officials and the community) affect curriculum implementation within this context. It addresses the following question: What are different role players’ perceptions, views and experiences with effective delivery of the life skills curriculum?

**Conceptual framework**

This article draws on Cornbleth’s (1990:27) conception of curriculum and Whitaker’s (1993:30) elaboration of Cornbleth’s ideas. Cornbleth (1990) distinguishes between a technocratic and critical conception of curriculum and argues for a conception of curriculum as a contextualised social process, as an ongoing social activity that is shaped by a local context. These contexts are “structural and social” (Cornbleth 1990:27). Structural context refer to the school organisation and the individual classroom environment. Whitaker (1993:30) identified key role players involved in the structural context of the school organisation as the school principals and district officials. The key role players in the structural context of the classroom environment are the teacher and the learners. Social context on the other hand refers to the school environment at large in which a curriculum is implemented. This environment includes social, political, economic and demographic conditions and demands and priorities of different groups of people who have some role to play in the education activities of an individual school (Cornbleth 1990:27). In elaborating on Cornbleth’s ideas, Whitaker (1993:30) identified key role players involved in the social context of the school environment at large as the learners and parents or the community members of a school. Learners are also role players in the social context of the school environment at large because learners come from the community. The learners bring some of the strengths and constraints to their learning situation from their homes or communities. The learners’ home background in terms of the social conditions of the communities where these learners come from is one of the major determinants of a learner’s success.
Literature review

Literature on the teaching of life skills suggest that the subject is different from other subjects in that it is particularly concerned with teaching of values. Values are however not learned as other curriculum subjects. Values are better taught by living them. For example, Krilik (2008:3) argues that “values are learned as they do not pass from parents to children in the form of DNA”. Learners learn values through observing and imitating their teachers’ behaviours (Jansen 2008:4). Teachers thus need to be role models of good behaviour if they wish their learners to develop the desired values. Thus having a subject like life skills which teach children what’s wrong or right may not be a guarantee that the children are going to behave accordingly. The teaching of values in life skills need to be reinforced by teachers’ professionally appropriate behaviour if children are to develop the desired values. This position is confirmed by Prinsloo (2007:160) who found that life orientation programs made little impact on the learners when teachers were not exemplary role models. This means that the teacher’s conduct may undermine what they try to teach. Prinsloo (2007:160) adds that

> teachers’ own self-discipline, diligence, and high moral standards are important requisites for the successful implementation of these life orientation/life skills education programs.

[...]

> morality defines a person’s behaviour as good or bad, right or wrong, and teachers whose behaviour is regarded as bad and wrong by learners are unable to be successful facilitators in the programs.

These arguments imply that some teachers who teach learners values in life skills education may be undermining the program through their conduct.

Research of life skills education in Southern Africa Development Community (SADC) countries have identified the following constraints as undermining the successful teaching of the program: Superficial training of teachers to teach the subject, the subject not being examinable in national high-stakes examinations, conflict between sexual education and culture, HIV/AIDS status of teachers and learners and poor management of curriculum implementation, including shortage of textbooks. In Zimbabwe the superficial training due to the cascade model of training teachers (Rembe 2006:10) constrained implementation of the life skills program. Life orientation is not being taken seriously by teachers in South Africa because it is not an examinable subject (Rooth 2005:60). In some cases, it was not being taught at all despite the fact that it is included on the timetable while in other schools, it was not even included on the timetable. The non-examinable status of the subject has also been noted as another factor which undermines its implementation. Whitaker (1993:40) asserts that

> due to the great value given to public examination certificates by communities and schools, teachers have tended to concentrate on subjects that are examinable and are thought to promote academic excellence.

Community resistance to sexuality education in life orientation is another constraining factor. The discomfort that teachers feel about teaching safe sex practices
contributes to lack of or scant attention to its teaching. According to Rooth (2005:180), teachers omit teaching HIV/AIDS issues in the life skills program, thus avoiding the most crucial issues. Lowe (2008:75) reports the devastating effect of HIV/AIDS on schooling in Africa including Malawi. According to Lowe, large numbers of children are orphaned by HIV/AIDS in Malawi. Some of these children are also infected with HIV/AIDS themselves. The orphaned children are usually relegated to the grandparents, or to other more distant relatives, who have less interest in their education than in their free labour. Children exploited for their labour is a common phenomenon in Malawi. Lowe reports that lack of food and illness are the major reasons for poor attendance at school.

Similarly, Prinsloo (2007:160) found that many teachers in South Africa are not able to handle issues of HIV/AIDS and they avoid engaging pupils on the subject because they are not comfortable to teach that which affect them and their learners.

The management of curriculum implementation has been identified as an important condition for a curriculum to be effectively implemented (Mahlangu 2001). The successful implementation of a curriculum requires the more difficult task of maintenance of the curriculum, rather than just introducing it in the schools. The instructional leadership of the principal is crucial for successful implementation (Ornstein & Hunkins, 1993; Prinsloo, 2007). School principals, regarded by Ornstein and Hunkins (1993;319) as curriculum and instructional leaders should “spend time visiting teachers in the classroom and plan staff development programs”. Prinsloo’s (2007) study found that lack of commitment by some school principals to make life skills education a success in their schools undermined the successful implementation of the program in South Africa.

Literature has also identified shortage of textbooks and large classes as impediments to the teaching of life skills for HIV/AIDS prevention. For example, Lowe (2008:175) and Kadzamira (2006:50) speculated that lack of learning resources, especially textbooks, affects the successful implementation of the curriculum in Malawi. Lowe found that there was a high pupil to textbook ratio in the schools involved in his study. Similarly, Kadzamira noted that the primary school system in Malawi lacks teaching and learning materials, especially the rural primary schools.

Literature has further identified large class numbers as affecting the quality of teaching of curriculum subjects (Lowe, 2008; Prinsloo, 2007). Lowe argues that classes over 60 reduce the ability of teachers to teach and pupils to learn. Lowe (2008:19) further asserts that “in sub-Saharan Africa, the World Bank (1998) has recommended that classes should be no larger than 40 in the primary school”. Similarly, Prinsloo (2007:161) indicates that overcrowding in the classrooms in South Africa acts as a barrier in the process of teaching life orientation. Prinsloo quotes one teacher involved in his study as arguing that

to take care of 40 or more learners at the same time in a short period is a difficult task [and] it leads to teachers failing to create an atmosphere of personal trust between themselves and individual learners.
Large classes are particularly of concern in life skills education compared with other subjects, because this subject deals with development of social skills and changing of attitudes and values in learners. Development of skills and changing of attitudes requires a teacher to give each learner individual attention to ensure that the learner develops these skills.

This study seeks to add to the literature on life skills education in the SADC region by investigating the views, perceptions and experiences of different role players in the teaching of life skills for HIV/AIDS prevention in Malawi primary schools.

Methodology and data collection

A qualitative research approach and a case study method was decided on for this study. Qualitative research is interested in gaining insight into and understanding of a phenomenon. One of the assumptions of qualitative research is that multiple realities are socially constructed through individual and collective definitions of a situation (McMillan & Schumacher 1993:40). The present study assumed that the different role players contribute to the enacted curriculum. In so doing, they adapted, transformed or interpreted a curriculum to suit their situation.

This study used a collective case study approach. In a collective case study, a single case is studied in depth, which could be an individual, a group, an institution, a programme or a concept (McMillan & Schumacher 1993). The case study method enables the study of things in detail (Denscombe 2003:70). With case studies, it is possible to gain a unique perspective of a single individual or group (Denscombe 2003:70). This study is a case study because it focused on six teachers and principals in four schools. It sought to investigate life skills implementation with specific teachers within specific contexts. It used collective case study in that six teachers were studied in-depth. Stake (2000), refers to a study extending to several cases as a collective case study. Stake (2000:437) further argues that in a collective case study, individual cases are selected because it is believed that comprehending them will lead to better understanding of, and perhaps better theorising about, a still larger collection of cases. The use of multiple cases in this study created opportunities for within-case and across-case approaches of data analysis to be done.

Sampling method and sample size

The Zomba district was selected because it benefits most from many educational agencies. The local national curriculum development centre pilots its educational innovation programs in the district’s schools. Also, the centre uses the district’s schools to identify teachers’ needs in the implementation of curriculum innovations. The centre also pilots its in-service teacher education programs in the schools of the district. Most program activities related to the improvement of the quality of education conducted by the Faculty of Education of Chancellor College, on the University of Malawi’s main campus, are piloted in the schools of Zomba district. The Malawi National Examinations Board, located in the district, also pilots its related program.
activities in the schools of the district. The primary school teachers of the district therefore are privileged to learn from the three educational stronghold institutions located in the area. The chances therefore are that the schools in Zomba district are likely to implement curriculum innovations more successfully than schools in other districts in the country. It is likely that if schools in Zomba district face challenges in implementing the life skills education curriculum, then challenges in schools in other districts may be worse.

The district further provides good context for evaluation of an education program, because the rural and urban schools in the district provide, to a certain extent, a picture of schools and classrooms in Malawi. It is likely that any implementation challenges or successes related to physical facilities may also apply to schools in the other remaining 27 districts.

School sample
Four state schools were selected for the study. Two schools referred to as Bango and Chaje are located within a rural area and are poorly resourced in terms of basic resources such as electricity, telephone access, sanitation, school infrastructure and seating facilities. Bango was chosen on the basis of being a high performing school in the national examinations compared to the other three schools in the sample. It seems likely that the high performing school has good teachers and if such a school is having challenges in teaching life skills education, then the other schools in the district which are not as high performers may have greater problems or challenges in teaching the subject.

The remaining two schools, Madzi and Ndiwo are located in the urban area and are adequately resourced in terms of basic facilities such as electricity, sanitation facilities, school infrastructure and seating facilities. Ndiwo is located at a Teacher Development Centre (TDC), where teacher professional development activities take place. It seems likely that the presence of the TDC would positively affect a teacher’s knowledge, perceptions and understanding of life skills education and teaching practice of the subject.

Teacher sample
In all six teachers were studied in the research. The choice to study standard 4 was also purposeful. Standard 4 was the first targeted class for life skills education because statistical figures showed that this was typically the terminal class for most children and it was important that children be equipped with the necessary skills for them to prevent contraction of HIV/AIDS before they drop out of school (Ministry of Education, Science and Technology 2000:23).

The Ministry of Education attaches a lot of value to standard 4 life skills education for the reason which has been stated above, hence the particular need for the subject to be effectively taught and achieve its objectives in this class.

At both Ndiwo and Chaje schools, two teachers are allocated to teach Standard 4 on account of the large class sizes. The teachers assist one another in class management
and do team teaching. Four Life skills teachers were interviewed and two lessons of these teachers were observed. All life skills education teachers in standard 4 were included regardless of whether they were trained in the teaching of the subject or not.

Teachers’ ages ranged from 30 to 40 (two teachers withheld their ages). Five of the teachers in this study were females and only one was male. All the teachers had minimum qualifications for their positions as teachers in the primary school and were relatively experienced. Five had more than 10 years, and one less than five years, experience. Only two teachers were trained in the normal training program of the teaching of the subject. The sample teachers’ biographical information is presented in table 1 below:

Table 1: Teachers of life skills education biographical data

<table>
<thead>
<tr>
<th>Teacher</th>
<th>Gender</th>
<th>Age</th>
<th>Professional qualification</th>
<th>Teaching experience</th>
<th>School where teaching</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chimtengo</td>
<td>Male</td>
<td>40</td>
<td>T2*</td>
<td>16 years</td>
<td>Rural school</td>
</tr>
<tr>
<td>Nasibeko</td>
<td>Female</td>
<td>unknown</td>
<td>POE**</td>
<td>20 years</td>
<td>Urban school</td>
</tr>
<tr>
<td>M’thiko</td>
<td>Female</td>
<td>unknown</td>
<td>POE**</td>
<td>17 years</td>
<td>Urban school</td>
</tr>
<tr>
<td>Chiutsi</td>
<td>Female</td>
<td>35 years</td>
<td>T2*</td>
<td>2 years</td>
<td>Rural school</td>
</tr>
<tr>
<td>Wakwathu</td>
<td>Female</td>
<td>33 years</td>
<td>T2*</td>
<td>11 years</td>
<td>Urban school</td>
</tr>
<tr>
<td>Leka-leka</td>
<td>Female</td>
<td>35 years</td>
<td>T2*</td>
<td>15 years</td>
<td>Urban school</td>
</tr>
</tbody>
</table>

* a teaching certificate for those who entered teacher training as holders of Malawi School Certificate of Education (Form 4).

** Professional Officer Extended. A teaching certificate awarded to those who did a three year Diploma in Education course at the University of Malawi.

Two methods were used to collect data in the study, namely, interviews and classroom lesson observations. Twelve lessons were audiotaped and transcribed. In addition to tape recording, field notes were also written in shorthand. There were three types of interviews conducted in the study. These were pre-observation interviews, followed by post-observation interviews, as well as interviews with principals. Initial interviews with standard 4 teachers were used to investigate the nature of the career development of the teachers and their perceptions of their job, the goals of the life skills program, their working practices in the teaching of the program and challenges facing the teaching of the program and how they were coping in their work. Immediately after completing lesson observations, follow-up interviews with the teachers were conducted. The lessons provided a common base for further probing the teachers’ views of their classroom practices. The follow-up interview data triangulated with the pre-lesson observation interview data to increase the reliability and validity of the data of the study.

Interviews were also conducted with principals to find out about the support provided to the teachers of life skills education, the status of the subject at the school...
and in the community and the standard of teaching of the life skills teachers. The data from the interviews with school principals was triangulated with data from teacher interviews and lesson observations to add to the reliability of data.

Data analysis
Data were analysed both inductively and deductively. Using deductive analysis, the interview and class observation data were coded by posing questions against data in order to come up with themes. The questions which were posed against the data were:

- What is this incident about?
- What is the main concern of the participants?
- What category of Cornbleth’s (1990) and Whitaker’s (1993) factors affecting curriculum implementation does this incident indicate?

Inductively, data was analysed using the thematic content analysis method (Stake 1995:437). Stake describes this method of data analysis as a way of analysing data by organising it into categories on the basis of themes, concepts or similar features. Using this model of data analysis, the interview and class observation data were categorised into themes. The themes used were broadly related to the different factors that influence the implementation of a curriculum identified by Cornbleth (1990) and Whitaker (1993).

Findings
The study revealed that teacher-related, learner-related and school context shape the implementation of the life skills education for HIV/AIDS prevention in Malawi. These findings are presented in the following sub-sections.

Teacher factors

*Teachers' understanding and practice of life skills program*
All the teachers in the sample were able to identify the goals of life skills education. Simply knowing the goals of the program is not sufficient for teaching life skills education successfully, as evidenced by classroom observations of lessons. One of teachers taught a lesson in which she discussed ways of getting money. She linked this discussion to the prevention of HIV/AIDS, one of the goals of life skills education. She did this by asking her learners to discuss how some ways of getting money can lead one to contract HIV/AIDS. This prompted her learners to identify the risks associated with prostitution, for example contraction of HIV/AIDS. In the other lessons observed, teachers focussed more on developing language and comprehension than learners’ life skills. The following excerpt from one of the lessons illustrates this:

Teacher: Please listen to this story and I will ask you questions to answer at the end.

Kwame was a prefect at Mkute school. He was in charge of social activities in the school. One day, on a Saturday, a band was hired to play music at the end of the
month. The school was near a trading centre. Some students in the school had friends at the centre.

During the dance, Kwame spotted one vendor from the trading centre who appeared to be drunk. Kwame took the responsibility of making sure that there were no intruders during the dance. He worked hard to find out who had invited the vendor to the dance...

The questions posed: “How many people are mentioned in the story? Which day of the week did this story take place? Where did the story take place?” tested learners’ comprehension skills and did not move into substantive information on the topic.

**Discomfort with sex education topics**

Two teachers in the sample feel that there is a mismatch between the age of learners and some content in the life skills program so they skip teaching some content in the program. For example, Chiutsi feels that the material on sexual relationships is not suited to 9–10 year olds and it is against her culture to talk of human sexual reproductive organs and sexual intercourse with young children. She has therefore chosen not to teach about sexual relationships as she remarked

> it is not good for a grown up person like me to be talking about sexual relationships and sexual intercourse to small children like these. I skip the content which deals with sexual intercourse. This material is not suited to the age of the children.

**Teacher’s methods in teaching life skills education**

Teachers’ Guide for life skills for standard 4 advises the use of a variety of participatory methods. However in the lessons observed, teachers mainly used just group discussion. For example, Nasibeko describes the way she structures her lessons as follows:

> I introduce the lesson by explaining the topic of the day. I then put learners in groups, with one of the learners as a leader in each group. I give them work to do. I tell them to report to the whole class what they have discussed. I then summarise the main points from the group reports.

The other teachers’ lessons followed a similar pattern. They started their lessons with a recap of the previous lesson. They then put learners in groups for a short discussion of some topic. While learners were still in their groups, the teachers tended to ask questions which usually called for chorus or short answers from the learners.

**Teacher health status**

One of the principals explained that

> some teachers are infected by HIV/AIDS themselves, or they have family members or colleagues suffering from the disease. It becomes very difficult for such teachers to teach about HIV/AIDS.

This view was not corroborated by all the teachers. One of the teachers responded:

> I would still teach HIV/AIDS if I was infected or affected because it is my job as a teacher to do so. I would not teach only if I fell very ill and cannot manage to come to school.
The discrepancy may arise because HIV/AIDS is an issue of confidentiality and teachers have choice to disclose their status.

Teacher absenteeism

Many teachers are absent themselves due to HIV/AIDS related illness. Investigations also revealed that this increases other teachers’ workloads, resulting in some subjects, including life skills education, not being taught. This was explained by Chimtengo's principal:

Teachers who are infected tend to be absent from school for lengthy periods of time. Their colleagues find themselves having to carry the burden of teaching extra classes. The teachers who take care of their ill colleague's classes usually just take care of few subjects such as mathematics and English in their colleague's class. Sometimes it is difficult to find replacements for teachers who are unable to discharge their duties because of ill health.

Teacher development (training) in the teaching of life skills education

Only two teachers in the sample underwent a two day training program for the teaching of life skills. One of these two teachers, experienced a personality clash with the trainer and as a result admits: “I was not attentive. I did not like the training because the trainer kept swearing throughout”. Lack of training of the three untrained teachers affected the way they approach the teaching of the subject. For example, Chiutsi pointed out that: “I teach the subject in the same way I teach other subjects, as I was not trained in the teaching of the subject”. It has been shown that one of Chimtengo’s lessons was aimed at teaching language skills rather than life skills.

In contrast to the untrained teachers, the trained teacher, Wakwathu, followed two of the key practices advocated in the life skills curriculum material. Wakwathu explicitly addressed two goals of the life skills program; to equip learners with appropriate information about the social challenges facing them, and help them develop the necessary skills for them to deal with these challenges. Wakwathu’s lesson covered HIV/AIDS as a social challenge facing her learners and assertiveness as a skill.

Chiutsi’s remarks and Chimtengo’s practice in the teaching of Life skills show that untrained teachers in the study did not always employ appropriate approaches for the teaching life skills education. They therefore adopt the methods they use in teaching other subjects as a coping strategy in teaching Life skills. Teaching Life skills in the same manner as any other subject may result in Life skills lessons ending up as a medium for teaching and learning other academic skills more than life skills, as evidenced from Chimtengo’s lesson. This results in the lessons deflecting from the goals of life skills education. This can undermine the implementation of the program.

Learner factors

Prevalence of HIV/AIDS

Teachers identified the prevalence of HIV/AIDS in the community as a hindrance to the teaching of life skills. Chimtengo feels that presence of learners in class who
are affected and infected by HIV/AIDS makes the teaching of HIV/AIDS sensitive. Chimtengo explained:

> there is prevalence of HIV/AIDS in this area. I have some learners in my class who have been orphaned by HIV/AIDS and they look infected themselves. Other learners have sick parents and relatives suffering from the disease. It is sensitive to teach about HIV/AIDS as the affected children become uncomfortable. I therefore do not go into details on an HIV/AIDS topic.

One teacher in the sample thus omits teaching some issues in the program, such as HIV/AIDS, as he feels that it is not appropriate to teach things that may affect learners and their families directly. The prevalence of HIV/AIDS affects learners and poses a challenge to one of the teachers who chooses not to teach issues of HIV/AIDS. This results in the teacher not addressing the most crucial issues in the life skills curriculum.

**School context factors**

**Team teaching**

Initial investigations in the study revealed an enabling context for implementation of life skills in the urban schools in this study. Two teachers were allocated to a class in both urban schools. Teachers in the urban schools also utilised their pairing as class teachers to do team teaching. In the observed lessons, Wakwathu taught, while Lekaleka assisted with keeping learners quiet and listening. This may facilitate learning, as learning experiences are maximised in a well-managed class. They shared topics basing on their strengths in the content knowledge of the topics. This can contribute to the successful implementation of life skills education. The learners in urban schools were more active in their participation in the lessons. They articulated their thinking better, both in their responses to the questions posed to them by their teachers and the questions which they in turn asked their teachers. Children in urban areas are generally better socialised to schooling and more used to participation than their fellow learners in the rural schools.

While the allocation of two teachers per class eases the problems associated with large classes in the urban schools, teachers in the rural schools claim large classes undermine their effectiveness in the teaching of life skills education. Chimtengo indicated:

> I had too many groups because of large number of learners. This made me to reduce the time for consolidating the feedback from the groups. I wanted all the groups to present before time was up (to mark the end of the lesson).

Large classes make teachers reduce the amount of time they spend on tasks. Spending less time on tasks affects the learning from a lesson and this undermines the implementation of life skills.

**Local community’s support**

Our investigations revealed that the schools in the urban communities offer a more supportive context for the implementation of life skills education in the urban schools. Wakwathu’s principal remarked:
Parents encourage the teaching of life skills here. They tell us in the meetings [Parent and Teacher Association meetings] that they learn a lot from their children, from what the children learn in life skills, especially about HIV/AIDS. Life skills does not only help the children. It also benefits the parents.

This suggests that urban communities check what their children learn in the program. Although it is not conclusive, these remarks also suggest that there are urban parents who support their children academically at home in the subject.

While urban communities seem to encourage the teaching of life skills, rural communities seem to negatively affect the teaching of life skills in the rural schools. Some parents and community members objected to illustrations of sexual reproductive organs. Chiutsi’s principal cited his own mother as one of those parents objecting to illustrations. He explained how his mother confronted him about the illustrations:

When my mother saw some illustrations in my children’s books, she confronted me as to why I could give pupils books with such obscene pictures in them. She said that she brought me up properly herself and did not allow me to be exposed to such obscene things. She told me not to allow my children to be reading such books.

This also suggests that the parents may even discourage their children or wards to read these books. The members of the community at rural schools also view life skills education as estranging children from their cultural roots. Chimtengo explained:

The chief came to enquire what we teach the children as most of them are refusing to enrol at initiation schools. The children tell their parents that they are taught not to go to initiation schools as initiation practices put their lives at risk.

Such complaints by the members of the community about life skills education may result in the parents not encouraging the teaching of the subject in their school and not supporting their children academically in the subject in their homes. This can undermine the implementation of life skills education.

*Mixed classes*

The teachers saw mixed classes (boys and girls) in life skills together as a challenge to the teaching and learning of the program. For example, Nasibeko explained:

Some girls and boys feel shy to express themselves openly on issues of sexual relationships. I would prefer to have boys taught on their own and girls on their own as well, so that they become free to contribute to class discussions.

Teachers feel that teaching sexual development to boys and girls together affects the quality of class discussions and consequently the quality of learning of life skills education. Teaching boys and girls separately is viewed by some teachers as a way of promoting learning in life skills lessons. This would require the Ministry of Education’s permission for teachers to implement their idea of teaching boys and girls separately in life skills.
Shortage of textbooks

In observed lessons where teachers used textbooks, more than six learners shared one textbook. The shortage of textbooks resulted in many learners sitting quietly and just listening to their friends without making much contribution to what was going on in the lessons.

Two teachers in the sample consider the Teachers’ Guide for life skills for standard 4 to be overloaded. They feel that there is too much content to be covered compared to the amount of time. Chimtengo remarked: “There are too many activities in a lesson. A lesson is only 30 minutes. In a lesson, there are not less than five activities. I move quickly to finish the activities”.

School principals’ support

School principals in the sample claimed that they provide support to the teaching of life skills by ensuring that teachers treat life skills as a subject as valuable their other subjects, ensuring availability of needed resources and assisting teachers in the areas in which they find problems in the teaching of life skills. Some of the teachers however seem not to take their principal’s advice seriously. For example, Chiutsi remarked: “This subject just adds to workload. It is not examined. It is better for one to concentrate on teaching the examinable subjects”. While school principals’ encouragement may facilitate its successful implementation, the way teachers treat the subject can negatively affect the teaching of the subject. Some teachers of life skills are giving most attention to examinable subjects at the expense of giving similar attention to the teaching of life skills education.

Most teachers in the sample confirmed that their principals do their best to ensure that resources such as chart papers and textbooks are available at their schools for teaching life skills. For example, Chimtengo remarked that: “The principal requests for some textbooks from the curriculum development centre, the Malawi Institute of Education”. Wakwathu pointed out that “the principal buys some chart paper” and Nasibeko indicated that “the principal goes to the neighbouring schools to borrow some textbooks for us”.

Wakwathu’s principal showed evidence of professional support he provides to the teachers of life skills education. On his office pin board was a school based in-service teacher development program for teachers of all subjects for the year 2008. In confirming her principal’s claim, Wakwathu explained:

The principal is helping me in those areas in which I am finding problems in the subject. He sometimes helps me to isolate relevant social difficulties facing learners which certain topics in the curriculum materials are intended to convey. These social difficulties are sometimes not explicit. He also works out with me how best to approach some of my lessons.

Wakwathu’s remarks also suggest that the program’s training on its own is not enough for a life skills-trained teacher to teach the subject successfully. There is also need of school-based support to complement the knowledge from the training.
School-based principal support therefore is important for effective teaching of life skills education.

**Supervision of the teaching of life skills’ education by education officials**

The urban schools received more frequent supervision and support for the teaching of life skills from the Primary Education Advisors than rural schools. Wakwathu’s principal explained:

> The advisor monitors the teaching of the teachers in all subjects and identifies the problems which the teachers are facing. He then invites the teachers to the Teacher Development Centre and helps them in the areas they are finding problems in teaching the subject.

The rural schools received less supervision and support from the district officials. Chiutsi’s principal remarked:

> Since January [2008] the Primary Education Advisor has only come to this school twice. Although they come to see if teachers are in class teaching, they do not advise teachers how to teach the subject [life skills].

The role of the district supervisors is perceived as coercing the teachers to be in class teaching. However, they offer limited support in teacher development and curriculum implementation.

From this sample there appears to be greater district support for urban schools compared with rural schools. Urban schools received frequent courses in the teaching of life skills education, whereas rural schools did not have these courses.

**Discussion and conclusion**

The different role players’ perceptions, views and experiences resonate with the findings of researchers in other SADC countries. This study found that most of the teachers did not teach content on sexual practices because they felt that the content was not suitable for younger children. The teachers thought that younger children become confused when they are taught about issues of sexual relationships, as they do not understand sexual matters at that age. Older learners feel shy to express themselves openly on sexual matters in the presence of the opposite sex. This affects the quality of class discussions and undermines the implementation of the program. In this regard Rooth (2005:180) found that sexuality education in life orientation in South Africa conflicts with traditional community values. Prinsloo (2007:160) found that many teachers in South Africa are not able to handle issues of HIV/AIDS and they avoid engaging pupils on the subject because they become uncomfortable to teach that which affects their learners. Not addressing HIV/AIDS issues in life skills education undermines the implementation of the program.

Teachers who are infected and affected by HIV/AIDS are reluctant to teach about an issue which influences them personally. Infected teachers get very sick from the disease, and absent themselves from work. Other teachers have to take care of their classes, so they concentrate on teaching a few (examinable) subjects such as
mathematics and English, leaving out subjects like life skills education. The findings of this study concurs with Ratsatsi (2005). Ratsatsi speculated that a curriculum’s alignment to teachers’ beliefs is an important condition for successful implementation of a curriculum. Ratsatsi (2005:18) argued that if a teacher feels that a curriculum’s content contradicts his/her beliefs, it is quickly dropped or radically altered. Lowe (2008:21) argued that a teacher’s personal social circumstances, such as personal or family health restricts that teacher’s ability to implement a curriculum effectively. Lowe argues that teachers in Malawi are generally dedicated and hard-working people who do their best under extremely difficult circumstances, but many are constrained by social circumstances such as caring for sick children, personal ill-health, including HIV/AIDS.

Teachers give more attention to examinable subjects such as mathematics and languages and neglect life skills education which is not examinable. In this regard, Rooth (2005) found that life orientation is not being taken seriously by teachers in South Africa because it is not an examinable subject. In some cases, it is not being taught at all, despite the fact that it is included on the timetable. In other schools, it is not even included on the timetable. The findings further concur with Whitaker’s (1993) argument. Whitaker identified non-examinable status of a subject as one of the factors which undermines its implementation. Whitaker (1993:40) asserts that due to the great value given to public examination certificates by communities and schools, teachers have tended to concentrate on subjects that are examinable and are thought to promote academic excellence.

This study found that rural communities consider that life skills education estranges children from their cultural roots by discouraging the children to attend initiation schools. Parents in rural communities are also opposed to illustrations on sexual development in the learning material and discourage learners from reading such content. Teachers and school principals on the other hand believe that these cultural beliefs dilute school learning by reinforcing sexual relationships, the very issues which life skills education confronts. Children get opposing messages, and are confused and torn between two worlds.

The additional insights that this study uncovered relate to differences in rural and urban communities’ attitudes towards teaching sexual topics to primary school children. While the urban schools in the study were more tolerant of HIV/AIDS education, and parents indicated that they also become informed of such topics through their children’s work, the rural schools parents were more resistant to such topics being taught in schools. It also seems like younger teachers are more willing to teach these topics. The allocation of two teachers to larger classes seemed to be enabling better implementation of the curriculum. However, this attempt to enable the teaching of the HIV/AIDS curriculum is severely hampered by structural and social constraints such as the shortage of textbooks, the reluctance of teachers to teach some topics, the resistance from communities and high rates of HIV/AIDS infection in the district. Notwithstanding the glimmer of hope in terms of the greater tolerance of the urban school teachers and community that this study has revealed, there are
significant challenges facing the teaching of the life skills curriculum in the schools studied. Given the advantageous location of the schools in the Zomba district with reference to ongoing curriculum support from the district officials and from the MIE, one could speculate much weaker attention being given to HIV/AIDS education in other schools in Malawi. In terms of improving the effectiveness of school based life skills education in Malawi, the following recommendations are made:

- That the two day cascade model of training be reviewed and replaced by a more sustained program in which training is conducted by subject specialists and not school principals.
- That factors such as the interest of the teacher and competence in life skills education be considered before allocating it to teachers.
- That HIV/AIDS education be taught to single-sexed groups of learners.
- That a more comprehensive approach to HIV/AIDS prevention is needed, including addressing the challenging area of cultural norms and beliefs.

Attention must also be given to teachers’ beliefs that it is inappropriate to teach sexual matters to children of the young age of 9–10, which results in the teachers omitting the very issues that the life skills curriculum has sought to address. Furthermore, this study shows that school-based HIV/AIDS education cannot be relied on. These findings add an additional component to Yankah and Aggleton (2008), who hold that brief periods of instructions, including school interventions are not very effective in changing attitudes and practices, and that programs taught by youth organisations other than the school may be more effective.

References


**Endnotes**

1. The National Curriculum Development Centre in Malawi and the Malawi Ministry of Education’s implementation arm of educational policies in primary, secondary schools and teacher training colleges.

2. A similar program to life skills in Malawi is called life orientation in South Africa.

3. Pseudonyms were used in this study
The use of workbooks in South African grade 3 mathematics classrooms

Abstract

The poor performance of South African learners on national and international benchmark tests in mathematics and literacy has prompted the South African Department of Basic Education (DBE) to devise intervention strategies, one of which is the provision of workbooks for learners. This paper is based on a case study of six grade 3 teachers’ use of DBE workbooks. Data from classroom observations and interviews are reported and analysed in relation to literature on mathematical and pedagogical resources. The key finding is that teachers use the workbooks in disparate ways as a resource and that the majority of the teachers in the case study use the workbooks in ways that do not resonate with the DBE’s intentions. We argue that the provision of resources alone may not lead to improved teaching and learning in primary school mathematics classrooms and that pre-service and in-service teacher education programmes need to include a focus on how resources such as workbooks can be utilised optimally.

Keywords: workbooks mathematical resources, transparent resources, visible, invisible resource, primary mathematics, structured / unstructured resource


Introduction

A range of studies has shown that South African children lag behind their international counterparts in mathematics and language assessments (Shepherd 2011). In an attempt to address poor learner performance, the Department of Basic Education’s (DBE) intervention strategy introduced in 2011 included the production and distribution of workbooks as additional support for teachers (DBE 2011b). These workbooks have been designed to support the teaching of mathematics and improve learner performance (Fleisch, Taylor, Herholdt & Sapire 2011). Fleisch et al (2011) describes the workbooks as 128 carefully structured and sequenced mathematical worksheet-type activities which teachers can use to enhance teaching and improve learning of mathematics. Each worksheet consists of a two page spread. The DBE suggests that a teacher uses four worksheet-type activities per week in an eight week term.

However, on closer inspection, it becomes clear that the extent to which the layout of the workbook helps to support teaching and learning is debatable. The logic behind the sequencing of the worksheets is difficult to follow. For example, worksheets 65–71 deal with place value and number patterns. Worksheet 68, which deals with map work, is misplaced within the remaining worksheets which deal with number concept. We are of the view that children need more than one encounter with a topic such as map work to make sense of it and that one single exposure randomly placed does not make ideal conditions for conceptual development. Furthermore, the workbook does not have an index. This means that teachers need to search laboriously through the entire book each time they wish to locate a worksheet that addresses a particular concept and at the level at which they are teaching it. Additionally, the worksheets do not address all the concepts prescribed in the Curriculum Assessment Policy Statement (CAPS) (DBE 2011a). One example of this is Geometric Patterns, for which not a single worksheet has been designed.

The training manual accompanying the DBE workbooks suggests when to use work cards (which contain mathematical problems) and learners’ exercise books and workbooks, in combination with other resources, some of which are already in classrooms – such as counters and flard cards (flard cards are used to show how numbers are formed /made up of hundreds, tens and units) – or those still to be made by the teacher (DBE 2012). The assumption underlying the use of workbooks is that the prescribed lesson and exercise [will] ensure that teaching proceeds at the correct pace required to cover the curriculum and, most important[ly], that children [will] work from the text, reading and writing [and in the case of mathematics, calculating] everyday (Fleisch et al 2011).

Teachers need to understand the nature of mathematical and other resources and also how they can be used effectively to enhance learning. This paper presents stories of six teachers using the DBE workbooks followed by reflections on and discussion of findings emerging from these reflections.
Research design

The research was a case study of the classroom practices of six grade 3 teachers; one from Limpopo Province and five from Gauteng. A case study can be defined as an on-site investigation that involves the study of a phenomenon within its real life environment using a variety of sources of information (Yin 2003). The data were collected from both classroom observations and interviews. The interviews were in-depth, semi structured face-to-face interviews and were conducted individually with each of the six teachers who participated in the study. This methodology was chosen to enable researchers to gain a detailed understanding of how the six teachers use the DBE workbook. Of the six teachers who participated in the study, three are from Gauteng schools which are located within the province’s Gauteng Province Literacy and Maths Strategy (GPLMS) project. This project was set up to offer support to teachers in low performing schools through the provision of detailed lesson plans. The lesson plans contain conceptual explanations, definitions and worked examples, which loosely resemble those in learners’ books. The lesson plans also offer the teacher suggestions for chalkboard notation for each lesson (GDE 2012).

The data collection activities focused on how the six teachers used the DBE workbook as a resource in their mathematics lessons. The data collected and analysed aimed to respond to these two questions:

- What do teachers perceive the purpose of the DBE workbook to be?
- How do teachers use the DBE workbook?

The analysis of the classroom observations and of the interview transcripts provided insights into the use of a workbook as a resource in teaching and these are discussed in the final section of the paper.

Workbooks as tools for the classroom

While there is very little literature on the effectiveness of a workbook as a mathematical resource, Fleisch et al (2011) conducted a study in which the effectiveness of a workbook was compared to the effectiveness of a textbook. These authors concluded that there was no significant difference in learner performance between learners who used workbooks and those who used textbooks as resources. Thus, the provision of a resource such as a workbook or a textbook on its own does not guarantee an improvement in understanding of concepts and meaning making in mathematics. Uttal, Scudder and DeLoache (1997:45) argue that providing learners with mathematical resources in mathematics classes does not guarantee that they will understand concepts and make the necessary mathematical connections. While the provision of a workbook within the South African context may help to address some teaching and learning needs, we agree with the view that the provision of a resource like a workbook is not a guarantee that learner performance in mathematics will improve.

Lockheed and Verspoor (1991:57) argue that for any resource to be effective there has to be training on the use of that resource. Therefore, for teachers to optimally use
the workbook, training on the use of the workbook and other resources is essential. The DBE Workbook Training Manual (DBE 2012) suggests that teachers use the workbook in relation to other resources, yet the training these teachers have received focuses predominantly on the exclusive use of the workbook.

While resources to teach mathematics play an important role in education, it is important to note that resources on their own may not lead to improved learner performance. The physical presence of a resource in a mathematics classroom does not on its own lead to learners discovering mathematical concepts and making meaning of the mathematics. Drews (2007:29) argues that for a resource to be effective there has to be a dialogue between the teacher and the learner while using the resource as a medium of explanation or demonstration, thus as a tool. This dialogue encourages thinking that could help to surface the mathematics that is embedded in the resource. Therefore, when choosing a resource, it is important for teachers to make some pedagogical decisions about why they choose a particular resource at a particular time and how they will use it to help learners to make sense of the mathematics. Bottle (2005:84) points out that when teachers select physical resources they should envision the extent to which the mental images that children form will be helpful in structuring their thinking.

The mathematics embodied in resources led Drews (2007:21) to classify mathematical resources as either structured or unstructured. Askew and Selinger (1998:13) describe structured resources such as cuisenaire rods, unifix cubes, Dienes blocks and abacus as “commercially produced objects specifically designed to embody a particular idea”, while Drews (2007:25) sees unstructured resources as “everyday objects’ such as counters, sticks and beads that can be used for counting and measuring”. For some authors in the field of teacher education, resources are not limited to physical objects. They also include less tangible classroom pedagogic resources such as teachers’ knowledge (Hoadley & Jansen 2009), prescribed tasks and textbooks (Berger 2004), and online texts (Remillard 2005). While it has been argued that resources such as workbooks and textbooks play a critical role in assisting teachers to develop understanding of topics in the primary school (Harries & Spooner 2000:46), Liebeck (1984:16) sees workbooks as offering “pictures and symbols rather than ‘concrete’ experiences and language”. Constant exposure to pictures and symbols in the absence of relevant accompanying actions and language may create problems for learners. An over-reliance on workbooks may give learners the impression that mathematics is only located within workbooks and not in the real world (Drews 2007:24). This limitation in learner understanding could become silently malignant if the teacher does not employ other methods of teaching and assessing.

Atkinson (1992:13) further highlights the need for actions to be used alongside workbooks to facilitate learners’ understanding of concepts. In other words, the relationship between workbooks and real life experiences needs to be mediated by the use of actions in combination with other mathematical resources, and by the use of language. The use of workbooks needs to be accompanied by actions which help learners make connections between words, pictures, and symbols so that they may
make connections between the abstract and concrete (Haylock 2010:19). The view that resources on their own do not lead to learners making sense of the mathematics is supported by other researchers who argue that teachers’ instructions when using resources are of vital importance (Uttal et al 1997).

Adler (2000:216) proposes that a mathematical resource should be transparent by being simultaneously both visible and invisible. The visible function of a resource includes the physical presence of a resource in the classroom which can aid meaning making. The invisibility function of a resource includes invisible aspects such as time (for example pacing, sequencing of activities and teacher time) and language (for example learners’ verbalisation of tasks and teacher talk), which support the understanding of mathematics. A workbook as a resource needs to be visible in the classroom so that children can see and use it. In addition, this resource also needs to be invisible so that children can focus their attention on making meaning in mathematics. This notion of transparent resources challenges the way that many teachers use and understand workbooks as resources. Adler (2000:219) cautions that the introduction of a new resource can have both intended and unintended consequences. She asserts that a new resource in mathematics classrooms frequently become overly visible. It becomes the object of attention and the invisible functions of the resource become less of a focus in meaning making.

We return to the literature reviewed on workbooks and other resources for mathematics teaching in the final sections of the paper. In the next section we tell a classroom story about each teacher. In order to find a focus for each teacher’s story the authors discussed and compared the data that emerged from the observations and compared this to the responses that teachers gave to each of the interview questions. A pseudonym has been given to each teacher.

Stories of workbooks in the (mathematics) classroom

Teacher Samantha

Teacher Samantha works in a rural school in Limpopo province. She uses Sepedi as the language of instruction while teaching her grade 3 class a mathematics lesson on counting in twos. Each learner has his or her own workbook, with text written in Sepedi, to work from. In one of the lessons observed, learners worked with two activities on pages 38 and 39 of workbook 1.

For activity one there were four columns. In the first column 23 pairs of socks had been drawn. In the next three columns children were asked to answer the following questions: How many socks? How many pairs of socks? How many are left? Each question was placed on top of a column with an empty space underneath. The learners needed to provide an answer to these questions in this space.

In activity two, learners used the picture of socks provided to answer the questions in the columns. In task one there were 16 pairs of socks, with 1 extra single sock drawn, and learners were required to write down the answers to the three questions that were asked in the previous activity in the various columns. The subsequent task, as
before, required learners to establish how many socks, how many pairs of socks and how many socks were left by counting the number of pictures of pairs of socks for the numbers 20, 37, 28 and 43. However, some children did not know what to do and could not complete the tasks as expected. In an attempt to aid their understanding the teacher instructed them to count the socks in ones. Even with teacher Samantha’s help there were some children who could not cope. She moved from one learner to another to ensure that they were answering the questions correctly. In cases where learners were unable to give the correct answers, she would assist them by counting the number of socks in the picture in ones. Some learners struggled to answer correctly and to complete the tasks in the one hour lesson.

After this lesson was observed Samantha was interviewed. When she was asked what resources she used she stated “the resource that I used was the workbook from the department”. When asked what the purpose of the workbook was she replied “something which you use during the lesson to show the learner”, and when asked to describe how she used the resource in the lesson described above she stated “first I wanted them to count in two's [as well as] write, [then develop their] hand and eye coordination [and] pointing when counting”.

In the lesson described, the workbook was central to both the teacher and the learners. Importantly, both the teacher and learner had access to a mathematical workbook that was in their mother tongue. Throughout the lesson the teacher did not supplement the workbook with any other resources. She asked the learners only the questions that appeared in the workbook. Learners were then called upon to write the answers in the workbook. It was apparent that some learners provided incorrect written answers to the questions. In those cases, the teacher would verbally suggest an answer after discussion, and learners would then correct the answer. In her interview teacher Samantha affirmed that the workbook was something that was used throughout the lesson. Although she alluded to the presence and the value of using other resources none were evident in her classroom. Interestingly, teacher Samantha indicated that what was important to her was that the learners counted in twos, yet when they provided incorrect answers she counted in ones. There was no evidence in either the lesson or the interview that she was aware of the importance of teaching learners how to count in twos, or that she knew how to do this effectively.

**Teacher Mary**

Teacher Mary is a teacher who was not trained as a foundation phase (grades 1 to 3) teacher, but who has been teaching FP classes for 20 years. She is currently the head of the phase in a previously disadvantaged school, which is now a GPLMS school. She used the English DBE workbook. During one of the observed lessons her focus was on the understanding of place value and expanded notation in the number range from 500 to 600. At the beginning of the lesson she used the chalkboard to explain the concepts of place value and expanded notation. This was done so the learners would be able to complete the tasks in the workbook. While teaching, the teacher stated that “different groups will be given different questions”. However, the teacher
gave the same activities to all the learners in the classroom. In her explanation at the chalkboard the teacher connected her lesson to previous lessons that she had taught. She supported the teaching of the lesson with the use of flard cards, base ten blocks, number chart and work mats which she had made and which enabled learners to count out numbers. After the teacher had taught the new concept, learners worked in their workbooks.

Throughout the rest of the lesson the learners worked independently and the teacher moved around to assess whether learners were struggling. In some cases, where this was so, she would discuss a solution with them. In other cases learners would come up to her and she would provide solutions to their concerns. From the interview with the teacher the following became evident. Teacher Mary based her lesson on the requirements of the lesson plans that were provided by the district office of the provincial education department. She then indicated that she would supplement the activities in the workbook with activities that did not come from the department of education. The teacher said, “over and above teaching the lesson plans, I incorporate my own [worksheets] if I see that the kids are unable to manage with what has been done in the lesson plans”. She then mentioned that the workbook is used “to reinforce what was taught for the day”. She had noticed that the same concept was found on different pages in the workbook and stated that a teacher needed to make selections because “the concept, place value might be on page 2 at the beginning of the workbook and again on page 10 of the workbook”. Teacher Mary used the workbook to reinforce the concept for the day: “I don’t just give them the book and say, ‘right start’, because you have to reinforce with something that the children have been exposed to for the day”.

Teacher Mary was also clear that she viewed “the DBE book as a resource” to be used in conjunction with other resources. According to her, she used the workbook “everyday” and went beyond what the guidelines require: “I don’t just stick to the pages they require”. Another function of the workbook for this teacher was to “use it a lot for the ANA (Annual National Assessment) preparation”. Teacher Mary also mentioned that she used the workbook to identify learners’ errors as she marked their workbooks. According to her the workbook needed to be mediated in that “you do not just say like any other resource or any textbook, it’s not the kind of thing that you give a child and say, ‘ok start’”. She also stated that the workbook was “structured” and aligned well with the “CAPS document” and therefore covered “those concepts that you’re supposed to cover within the term”. For teacher Mary the workbook should be used as a guideline. In her view, teachers must themselves select the most appropriate activities. She stated. “I make my own selections”. Importantly, while referring to the workbook she mentioned “it is not a crutch”.

While the workbook is central to teaching and learning in teacher Mary’s classroom and is used every day, it is used in conjunction with other resources in order to reinforce concepts.
Teacher Boni

Teacher Boni is an experienced foundation phase teacher within a GPLMS school who used the English version of DBE workbook 2 in her class. At the beginning of the first lesson observed, she asked children to turn to page 2 of the workbook. There was no evidence of a lesson plan or any reference to a lesson plan in this lesson and the subsequent lessons. Teacher Boni asked learners to count numbers on the grid on page 2 from 500 to 600. Learners struggled with this initial activity. In the second lesson learners confused numbers 506 and 560 as they stated the number names. Their teacher brought in a different number sheet, which was not from the DBE workbook, with numbers 400 to 405. She asked learners to say the number names of the numerals on this sheet. This activity was aimed at helping learners to understand the difference between 506 and 560. After reading out these numbers, the teacher drew a grid with numbers from 500 to 600 on the board, and counted in ones. Subsequently, she circled numbers 506 and 560. She then asked the learners which number came first. Learners responded that 506 came before 560. She then asked learners to do the activity at the bottom of page 3, which required learners to order numbers from the biggest to the smallest. In the second set of numbers there were numbers 506 and 560 and again learners displayed confusion in terms of ordering these numbers. In the third lesson, teacher Boni did not make use of the workbook. She used activities that she had designed to reinforce mental mathematics activities. The activities required learners to break down numbers like 12, 17, 107 and 511. Thereafter, they needed to identify the value of the underlined digits in 721, 346, 427, 807 and 890. Teacher Boni asked questions about the value of the underlined numbers and learners responded to her questions. In a situation where a learner gave an incorrect answer, she repeated the question and asked a different learner for the answer.

During the interview, teacher Boni was asked how she planned her lesson and how she incorporated the workbook into her planning. She responded by saying “I use the workbook to take out some activities and incorporate these activities in my lessons so that children can see that I get these activities from the workbook”. When asked about the resources she used she said “I use the DBE workbook as a resource” and when asked about her reasons for choosing to use the workbook she said “I use the workbook for integration and reinforcement purposes”. When asked when she uses the workbook, she said “I only bring in the workbook after I have taught a concept”.

From the classroom observations of this teacher’s lessons it was evident that the workbook was used throughout the lessons in conjunction with additional worksheets which were not from the DBE workbook. However, the additional number sheet did not use the same number range as the number range the teacher worked with from the DBE workbook. As a result the workbook and the additional worksheet did not help learners to understand which of 506 and 560 is the bigger number. The exchanges in teacher Boni’s lessons were mostly characterised by teacher questions and learner responses. Throughout the lessons, the teacher made no reference to the GPLMS lesson plan or her own lesson plans, though she indicated in the interview that she incorporates activities from the workbook into her own lessons. While teacher
Boni stated that the workbook is a resource which she uses only after she has taught a concept in order to integrate and reinforce the concepts taught, in practice she used the workbook as more than just a supporting resource. Thus there were significant differences between her espoused and enacted practices.

**Teacher Violet**

Teacher Violet is qualified as a senior primary teacher and is located within a GPLMS school. She has been teaching foundation phase for 4 years. She used the English version of DBE workbook 2 in her class. Though this teacher was observed for the first time on the same day as teacher 3, she started her first lesson by asking learners to open to page 7 of the workbook which dealt with counting from 601 to 700 as she walked to the chalkboard. As learners were counting, teacher Violet observed that some learners were not identifying the correct number names. Where learners were struggling, she drew the grid with numbers from 601 to 700 on the board and pointed to the numbers as learners counted aloud. In situations where learners made mistakes, the teacher corrected them by saying the correct number.

Teacher Violet then moved to the second activity within the workbook that focused on place value and requested the learners to count the 100s, 10s and 1s. Subsequently, learners were asked to look at the three number lines in the workbook and were expected to fill in the blank spaces for numbers in the range 600 to 700. Learners were later asked to order numbers from the smallest to the biggest. Similar to teacher Boni’s class, learners struggled to see the difference between 650 and 605. When learners provided incorrect answers, the teacher copied the activity directly from the workbook onto the board and provided the answers. On the second day the teacher moved on to the activity with the number range from 600 to 700 using pictures of Dienes blocks. Learners needed to look at the picture of blocks and to write the addition number sentence. In a situation where learners could not provide the correct answer, she provided the answer or asked another learner to do so. On the third day she skipped pages 8 and 9 of the workbook and focused on the next activity on pages 10 and 11, which involved the use of a number line on which learners were expected to fill in the blank spaces. Some learners could not do the activity successfully. She then drew a number line as represented in the workbook on the board and together with the learners filled in the blank spaces.

In the interview, teacher Violet was asked to describe the resources she used in her teaching. She responded “I did not use any resources but only a workbook”. Subsequently, she was asked how she used the workbook and responded “I used it to develop counting from 500 to 600 and from 600 to 700”. When teacher Violet was asked why she chose to use the workbook she indicated “I used the workbook because we were told to use it”. She was subsequently asked why she skipped pages 9 and 10 of the workbook. She responded “because these pages are based on map work and I do not know how to teach map work”. In addition the teacher was asked how she incorporated the workbook into her lesson plans. She responded “I do not have any lesson plans as I am waiting for a new set of lesson plans from GPLMS”.
In all the lessons observed, teacher Violet copied activities directly from the workbook onto the chalkboard and made no reference to a lesson plan. The workbook served as the basis for her teaching as there was no evidence of lesson plans. There was no evidence of the use of any other resource other than the workbook and the chalkboard. What is concerning about this story is that teacher Violet does not consider a workbook to be a resource for her teaching, does not understand some of the content in the workbook, and thus chooses to omit it, and has chosen to wait for lesson plans to be provided rather than devising her own.

Teacher Sinah and teacher Mpho

In this school, the two teachers who were observed planned together and used a very similar approach in their teaching. For this reason their practices are described together in one story.

Both teachers are experienced teachers who teach in the medium of English. In the lessons observed both teachers and all of the learners had access to English workbooks. Both teachers began their lessons by asking the learners to take out their DBE workbooks so that they could check their homework from the previous day. In the lessons observed, the learners worked sequentially through the workbook completing worksheets 65, 66 and 67 in succession. Concepts covered in the three worksheets were counting in ones (500 to 600 and 600 to 700), place value concepts in the same number ranges (sequencing numbers, placing numbers on a number line and expanded notation) and number patterns (in the 1s, 2s and 5s patterns).

Almost every learner had completed their homework. Learners marked their own books. Those who had not done or brought their homework were allowed to look in their partner’s books while they marked their homework. The teachers went through each task in the workbook with the whole class. For the counting in ones tasks the learners counted from the grids that they had completed. For marking the remaining questions, one learner was invited to copy answers from his/her worksheet onto the chalkboard. The rest of the class ticked off their answers based on what the learner had written on the board. When learners’ responses were incorrect, they inserted the correct answer above the incorrect answer in their workbooks. In using this approach no resources other than the DBE workbook and the chalkboard were used. Most learners got all their answers right. This part of the lesson took about 40 minutes.

Immediately after marking the homework the teachers asked the learners to write in their diaries that they would need to do the next two pages for homework.

Thereafter the learners spent about 10 minutes on their Mental Maths tasks which were sourced from SA Teacher documents provided by the district office. On each of the days the teachers wrote the answers to the Mental Maths questions on the board before the learners arrived in the morning. First the learners swapped books for marking the Mental Maths work that had been done in class on the previous day. After marking the Mental Maths tasks the learners copied and completed the ten questions to be done as part of the maths lesson. Once the Mental Maths had been done teachers began teaching the lesson they had planned.
The concept taught was based on the schedule provided by the district office in a document called the Plotting grid. The Plotting grid suggests sequence and pacing of teaching in the maths curriculum. In each lesson observed, during this part of the lesson, both teachers worked on the concepts of number patterns and geometric patterns and used concrete shapes and activity cards to assist them. At the same time they set independent tasks for the different ability groups.

The lesson observations were followed by interviews with each teacher. From the interviews the following became evident. The teachers do not see the DBE workbook activities as being part of the mathematics lesson. In discussion, when describing the sequence of their activities they said that they begin with the DBE worksheet activities and once these have been checked they proceed to teaching their maths lessons. The teachers agreed that since the Plotting grid was designed by the district office to “guide [them] on which concepts to cover on a weekly basis” it was the main driver for selection and pacing of teaching. Additionally, they were required to do some Mental Maths and use the DBE workbook. Because these requirements overloaded the maths lesson, the school had decided to use the workbooks for homework. This new approach was a departure from the approach the school had followed previously where teachers developed and set homework which would reinforce the work that was taught in the class.

When assigning the homework teachers Sinah and Mpho would say to the class “go and do these pages” without checking whether the pages related to what had been covered in class or not. In the interview, teachers Sinah and Mpho said “Learners are expected to read the instructions for themselves and do the work on their own, without the teacher explaining and doing everything for them. [This is our way of] training them for the ANA”.

When asked about how the learners coped in interpreting the tasks set both teachers agreed that “their parents have to assist them”. Teacher Sinah revealed that her “good ones [sic] do their homework but the weaker ones [often] tell you that their parents were not there or are busy [and could not help them]”. Teacher Mpho admitted that some children reported that parents complained that “your teacher is giving me problems, there’s a lot of work, I can’t help you” and that some parents did the homework for their children. She explained that she “realised that [the parent] was writing the homework [because] it wasn’t in their [the child’s] handwriting”. Teacher Sinah reported similarly.

From the observations and interviews it became evident that the workbooks were used exclusively for homework on a daily basis. The homework or workbook activities were treated as an aside and not part of the main maths lesson for which teachers Sinah and Mpho prepared thoroughly. The workbook activities were not mediated. Parents were required to mediate the homework and in some cases they even completed the tasks for their children. With these teachers believing that they needed to simultaneously use the multitude of disparate district and government documents offering support on how to negotiate the mathematics curriculum, their approach was uncoordinated.
Discussion

The discussion is divided into three parts. Firstly, we discuss what the teachers in our study perceived the purpose of the DBE workbook to be. Secondly, we consider how these teachers used the DBE workbook, and finally we suggest some implications of our findings for pre-service and in-service teacher education programmes.

Teachers’ perceptions of the purpose of the workbook

Findings from our analysis of both the classroom observations and the interviews indicate that the teachers in this study used the workbook for different purposes. These include reinforcement, integration, homework, compliance with the demands of the education department and ANA preparation. According to Fleisch et al (2011) the DBE workbook was designed to assist with coverage of content. Most of the teachers appeared to have covered the content required by the official documents at a particular time in the school year but they used the workbook in very different ways.

How teachers used the workbook

Atkinson (1992) states that additional resources should be used to complement workbooks and that these are critical for developing mathematical meaning and understanding. Four of the teachers used the workbooks in isolation from other mathematical resources, while one of the two teachers who used an additional resource used it inappropriately because the number range in the workbook did not match the number range in the additional number sheet. Only one teacher selected additional resources which matched the concept and activities in the workbook task. These additional resources were flard cards, base ten blocks, number charts and working mats. Some of the teachers seemed to think that the use of the workbooks alone was sufficient for the development of mathematical meaning and understanding. However, Drews (2007) argues that if learners only use books to solve mathematical tasks these learners develop the idea that mathematics only exists in a book. Workbooks, like other books, offer pictures and symbols only to the exclusion of concrete experiences and extended discussions which are crucial in mathematics teaching and learning. Furthermore, when other resources are absent a lack of actions prevents learners from making connections between symbols, pictures and words (Haylock 2010).

Adler (2000) suggests that resources should be used as transparent resources (both visible and invisible) so that learners can make sense of their mathematics. Yet, in several of the classrooms it can be argued that the use of the resource became too visible as the workbook became the most important object of attention rather than the mathematics itself (Adler 2000). In other words, in these classrooms workbooks are used by learners in class, or for homework activities, but their mathematical understanding is not developed. Only in one teacher’s classroom (teacher Mary) does both the invisible and visible use of a resource become evident. The teacher ensured that she used the workbook “everyday” to teach. This is the visibility function. The resource was available for her and the learners to touch, see and use. She also used
this resource in conjunction with other resources to support the teaching of concepts. She selected and sequenced activities from the workbook according to topics and concepts she wanted to develop. This is the invisibility function which goes beyond having and using the resource “everyday”. In teacher Mary’s class, the workbook became a transparent resource with a dual function in the sense that it was used every day (visible function) and was also used to develop mathematical understanding which requires pacing and coverage of the curriculum. Thus, most of the teachers in this study used the workbook as a provider of activities for the classroom (a visibility function) without selecting, pacing and sequencing activities accordingly to support development of various mathematics concepts (an aspect of the invisibility function).

Another way teachers used the workbook was to select worksheets to use for covering a particular topic. One teacher worked with page 7 of the workbook and decided to skip pages 8 and 9, because these pages focused on map work which she said she did not understand. She moved to pages 10 and 11 which followed on from page 7 in continuing to deal with numbers. Her decision raises some questions about the ways in which concepts are grouped in the workbook and about her own mathematical knowledge. We argue that for a workbook to be optimally used, it has to be pedagogically sound. As it is, the DBE workbook is designed with various activities on the same concept located in different parts of this resource. Fleisch (2011) has pointed out that classroom teachers are faced with many challenges, which include challenges relating to curriculum coverage, pacing and sequencing. Based on our understanding of the challenges teachers face, we argue that teachers need a workbook that is characterised by activities that are carefully selected, sequenced and differentiated to assist them to deal with challenges of curriculum coverage, sequencing and pacing.

Five of the teachers used the workbook in isolation from any activities or resources with teacher – learner dialogue restricted to teachers asking closed questions, learners providing answers and filling in answers in the blank spaces in the workbook. Drews (2007) argues that for a resource to be effective its use has to be accompanied by mental activity which includes dialogue between the teacher and learners, and Haylock (2010) further suggests that there has to be a connection between talk, concrete items and actions in order to bridge the gap between the resource and the mathematics embedded in the resource.

In some of the lessons observed, the workbook was used for homework purposes. Learners were directed to pages in the workbook to go and work on at home. The responsibility of teaching the content in the workbook shifted to parents or other caregivers. As pointed out in the stories of teachers Sinah and Mpho, some learners managed to do the work and others got parents to do the work for them. This practice of using a workbook for homework poses a challenge for parents, because they are not trained to mediate the mathematical knowledge within the resource. As noted by Lockheed and Verspoor (1991), for a resource to be effectively used training on its use is vital.

Classroom observations indicate that in some classes where a workbook was used for homework there was no relationship between the homework (DBE workbook
activity) and the maths lesson that was taught. Teachers in these classrooms explained that the school’s approach was that workbook tasks did not need to be mediated because at the grade 3 level learners need to work independently. This unmediated use of the workbook is contrary to the intention of the DBE (2011b).

**Conclusion: A need to define a clear purpose for the workbook**

When the purpose of a resource (in this case the workbook) is not clear, teachers struggle to use it to assist learners to develop mathematical concepts and understanding. Furthermore, the lack of clear purpose results in teachers using the workbook for a multitude of reasons other than those intended by the designers.

**Use of the workbook in conjunction with other available mathematical resources**

Any resource in the mathematics class should be used in conjunction with other resources in order to optimally develop mathematical concepts. Resources used in isolation from other mathematical resources do not enable learners to develop a connection between ideas. Teachers need to strive to make resources transparent in the classroom, so that the workbook, although a new resource in the classroom, fades into the background and so that mathematical meaning and concept may become central for both teaching and learning.

**Implications for pre-service and in-service teacher development programmes**

The findings of this paper raise important issues for in-service and pre-service mathematics teacher educators. Teacher education needs to take cognisance of the generally low levels of mathematical conceptual understanding of foundation phase teachers in this country (Fleisch 2011) and make a more concerted effort to raise these levels.

While the efforts of the DBE to produce workbooks to ensure curriculum coverage should be applauded, the efficacy of this intervention needs further thought. Access to resources is not enough. Teachers need to be know how to use resources, how to exploit the affordances of each resource they have and when and how to use them, either alone or in concert, in order to promote optimal mathematical understanding in their learners.

We also suggest that when a new resource is distributed to serving teachers, such distribution should be accompanied by workshops for all the teachers. In these workshops teachers should have opportunities to work with the resource in conjunction with other relevant resources and to learn from both the workshop facilitator and one another.

**References**


A science-technology-society approach to teacher education for the foundation phase: Students’ empiricist views

Abstract

Teacher education for South African foundation phase education requires student teachers to be prepared for teaching science concepts in an integrated programme in a learning area known as life skills. This study examined the challenges faced by university teachers of foundation phase student teachers in the development of science modules/courses. The national curriculum for this subject aims to strengthen learner awareness of social relationships, technological processes and elementary science (DBE 2011a). We developed an integrated numeracy, science and technology module for foundation phase student teachers, based on the science-technology-society (STS) approach to teaching science concepts. Students’ understanding of science concepts was assessed, using a project method in which they solved a problem derived from children’s literature. Then students’ views of this integrated approach to teaching science concepts were gathered. The negative views of the foundation phase student teachers towards the integrated STS approach was thought to indicate an empiricist view of the nature of science that could impede their future teaching.

Keywords: Foundation phase, science teacher education, science-technology-society, project method, nature of science
Introduction

In this study the object of inquiry was pre-service teachers’ knowledge of and views about an integrated pedagogy for science teaching in the first years of school. Some South African research suggests that South African student teachers need to be better educated to teach the curriculum effectively, and that large numbers of teachers in the country have insufficient content knowledge and limited effective teaching strategies (Fleisch 2008:123). Sibaya and Sibaya (2008:86), for example, found that newly qualified teachers from University of Zululand did not feel equipped for the demands of teaching. Adler, Moletsane, Pournara, Taylor and Thorne (2009:39) reported a notable absence of research on primary mathematics and science teacher education:

We do not know enough about the kind and quantity of domain knowledge primary teachers need, and in what ways such knowledge is effectively developed – and international literature is also lacking in this area... Hence a first component of a research agenda for mathematics and science teacher education is to examine the practices of teacher education itself, attending to the ... breadth and depth of domain knowledge, subject content and pedagogy and how ... these play out.

Fakudze (2004:277) observed that teachers, especially in non-Western settings, need pre-service and in-service programmes with instructional strategies to help them present science in ways that take into account the learners’ social and cultural backgrounds. Because foundation phase teacher education requires preparing student teachers in South Africa to teach science concepts in an integrated life skills programme, this study was motivated to examine the challenges faced in developing science teacher education modules for the preparation of these future teachers.

Background of the study

The purpose of South Africa’s Bachelor of Education degree (grades R–3) is to develop qualified classroom teachers who can demonstrate focused knowledge and skills in teaching a particular phase or subject (DHET 2011). The country’s foundation phase teachers have to teach a life skills programme, which integrates many traditional subjects and includes science and the technological process. The Curriculum and Assessment Policy Statement (CAPS) for this subject area in the foundation phase aims to strengthen learner awareness of social relationships, technological processes and elementary science (DBE 2011a). By implication, science teacher educators of foundation phase student teachers are required to prepare their students with the pedagogical content knowledge (PCK) to teach science in an integrated manner.

The aim of the study on which we report in this article, was to investigate how science concepts can be learnt by way of an integrated STS approach, and the views of student teachers about learning science concepts with this approach was also investigated.
Views of the nature of science: Implications for science teaching

Adler et al. (2009: 33) recommend that research in teacher education focus on the specific demands of teaching when there is an epistemological shift from science as product to science as process, with emphasis on investigation and the societal context of science. How teachers view science has an impact on whether they teach it as product or process.

Tsai (2006:364) defines the traditionally empiricist perspective on science as the assumption

that scientific knowledge is a discovery of an objective reality external to ourselves and discovered by observing, experimenting or application of a universal scientific method.

This view can generate two dangers according to Tsai (2006:365). First, a pedagogical danger of rote learning of facts, methods and problem-solving procedures and, second, that science is considered as “infallible and a body of facts”. Teacher education that emphasizes the empiricist perspective of science would not prepare future teachers for teaching science as a process or the societal context of science.

Lemke (2001: 300) observed that it falsifies the nature of science (NOS) to teach concepts outside their social, economic, historical, and technological contexts, and, as Tsai (2006:363) makes clear, constructivist views (epistemologies) of science emphasise the progressive development of scientific understanding and recognition of technological, contextual and cultural factors that may have an effect on understanding and developing science concepts. The South African foundation phase curriculum implies the need for such a constructivist approach, as its key science process skills are listed as inquiry skills (DBE 2011a) and, Charlesworth and Lind (2013:67) point out inquiry-oriented instruction “reflects the constructivist model of learning”.

According to Tsai (2006: 364), the international literature suggests that many teachers still hold empiricist-aligned views about the NOS. Research is not available for the views of South African foundation phase teachers or student teachers, even though such views affect the approach they take when teaching science in their classrooms. Although our research did not specifically examine the student teachers’ views on the NOS, we argue that these can be deduced from their views on being taught science concepts by means of the STS approach.

Science concept development and assessment during design and technology teaching

Science concepts constitute part of the knowledge needed for teaching design and technology (D&T). Rauscher (2010:85) observes that although technology education is perceived simplistically as applied science, it is in fact a cognitive system comprising a separate body of technological knowledge. Although an important source of knowledge for technology, science is one of several areas of relevant
knowledge-generating activities. The D&T classroom requires learners to apply science concepts, but Sidawi (2009:285) finds that such application can be difficult. To succeed, they need conceptual understanding of science concepts and the ability to recognise the abstract rules that apply to new situations. For such learning of science concepts to occur, Sidawi (2009:283) suggests that teaching, learning and assessment of these concepts take place within a specific context.

Children’s understanding of science concepts is based on their range of experiences and interactions, and on the development of concepts’ that help to explain the phenomena. Situated cognition theory defines learning as the knowledge and skills obtained in contexts that reflect the ways in which knowledge and skills are used in real life. Genuine understanding comes from the situations in which learning occurs. As children construct meaning from their own experiences, they often reach an incomplete understanding, known as an alternative concept. Through exposure to increasing sets of experiences, and through the interactions of social learning, they may start to develop concepts that relate more closely to the scientifically accepted view (Campbell 2013:27).

Besides conceptual knowledge, learners also need procedural knowledge. Teaching science through D&T means that the design task provides the context for applying science knowledge, which in turn provides part of the content needed for performing the design task (Sidawi 2009:285). Doppelt, Mehalik and Schunn (2008:71) compared science concept development, using design-based learning and scripted inquiry. They found that middle school learners had superior performance in terms of knowledge gain, engagement and retention if taught science concepts through a design-based rather than a scripted inquiry approach. Cajas (2001:718) admits that clarifying which ideas about technology are relevant to science education has been difficult, and that researchers need to investigate further how technological ideas and skills are learned and how they can be best taught. Oxman (1999:113) says that the simplest model of cognitive activity during the stages of the design process is a problem specification, solution type and resultant form or designed product. She cautions that measuring learning by assessing only the designed product does not include a learning increment, and she presents various models of design learning that represent improved cognitive reasoning. Based on varying methods of assessment, she could record observations of changes that occurred in the students’ thinking about design, their growing skill in dealing with the complexities of design thinking, and the dynamic progress of their performance. Cajas (2001:722) uses a bridge project to illustrate teaching issues that had been raised when introducing a conception of technology that goes beyond artifact into understanding of technological ideas such as failure (of structures due to forces), properties of materials, selection of materials, and understanding trade-offs and constraints. Cajas (2001:726) and Campbell Ginns and Stein (2002:36), agree that the curriculum and understanding it thoroughly is vital to underpin teachers’ approach to technology education in the classroom.

We argue that new goals of assessment in science focus on the link to the broader social context, but that practice has not yet caught up. The inadequacy of research
on appropriate assessment strategies for science education is especially important for South African learners, who continue to perform poorly on standardized written tests for mathematics and science. Gopal and Stears (2007) note that these tests cannot know the experienced curriculum of classrooms. Constable (1993) further argues that there will be no standardization of D&T assessment until there is consensus about what a good D&T activity is, and highlights the challenge of standardising the assessment of D&T tasks for seven year olds.

In this study the designed product was assessed using a rubric with criteria based on science concept application during the design process.

The process approach to science and technology education in the foundation phase

In helping children to construct knowledge, the teacher can prepare a child’s science experience in many ways, for instance, through a process skills approach, guided discovery learning, inquiry learning, interactive, problem-based learning and a project approach (Campbell 2013:60). Two types of process skills are suggested by the Curriculum and Assessment Policy Statement Life Skills Foundation Phase policy document (DBE 2011a), namely the inquiry process and the technological process. In using a process skills approach, a teacher helps children to develop science knowledge while developing skills and processes to be able to undertake their own investigations (Campbell 2013:60). Examples of science teaching for young children as a process of inquiry are given by Abruscato (2012), Charlesworth (1988), Morris (2004), Kousaleos Martin and Rogers (1988) and Campbell, Froschl and Sprung, (1986). These authors advocate the planning of science activities which develop the natural curiosity of young learners. Careful planning allows for the investigation of science concepts while developing science process skills. Once the teachers initiate the inquiry, young learners are encouraged to do further investigations independently. This study, on the other hand, focuses on learning science concepts while following the technological process.

Teachers responsible for technology education (which includes teaching the process of technology) in South African schools generally lack formal training in this field, and have neither the relevant content knowledge, nor the methodology to teach the design process (Rauscher 2012:19). Our view is that they require high quality curriculum materials and professional development courses to improve their content and pedagogical knowledge. They also need opportunities to interact with other teachers. Research on learning at schools and the knowledge of teachers should be at the heart of the science/technology interaction (Cajas 2001:726). Investigating teacher education, Rauscher (2010:87) reported on the extent to which knowledge-generating activities were applied by Bachelor of Education students in two technology education modules at the University of Pretoria, but did not make it clear whether these student teachers were being taught for a specific school phase. A study of technology education teacher training programmes at several South African universities by Poole, Reitsma and Mentz (2013) describes the knowledge, skills and
values that such teachers need and identifies the shortcomings of these programmes. They recommend the inclusion of opportunities to practice technology subject skills and teaching processes to develop appropriate teaching strategies by technology teachers. During the present study, the inclusion of a project as an assessment task ensured the application of technological skills and processes.

International research on teaching the technological process in early childhood education (ECE) settings found that existing curricula offered little support for teachers to figure out the nature, aims and pedagogical means of ECE technology education. Siu and Lam (2005), Ebach, Endepohls-Ulpe, Ikonen, Rasinen, Stahl-von Zabern and Virtanen (2009) and Chatoney, Endepohls-Ulpe and Turja (2009) all note that teacher education focus is needed for this kind of technology education to improve. There is, however, a useful body of knowledge for developing foundation phase student teacher curricula. Milne’s (2013) comprehensive literature review highlights D&T challenges faced by young learners entering formal education, and the need for curricula to be evaluated for their effectiveness in providing teachers with the content and pedagogical knowledge to apply the technological process (as well as the scientific inquiry process) in foundation phase classrooms. The present study describes the views of foundation phase student teachers on teaching science and technology processes in an integrated module.

Integration of science and technology processes
Whereas the foundation phase education policy for life skills does not overtly advocate an integrated approach, it implies an integration of science, technology and social issues in stating, as a specific aim, that the life skills programme should expose learners to a range of knowledge, skills and values that strengthen their awareness of social relationships, technological processes and elementary science (DBE 2011a). The document also advocates a constructivist approach which the teaching of the scientific and technological processes would ensure. Tsai (2000:203) is encouraged that recent practice of STS instruction has shown potential for explicating the constructivist epistemology of science for learners.

Children’s literature can provide a starting point for integrating social issues within science and technology, and an opportunity for teachers to turn everyday events found in storybooks into meaningful curricula for young learners (Freeman, Feeney & Moravcik, 2011; Waks, 1993). Understanding the problem in the story leads young learners to design and make the solutions. The nature of D&T is that these solutions are open-ended (Campbell et al 2002:37), and the teacher would therefore facilitate the building of different products.

It is because there are so few trained teachers of technology education in South Africa, and because the process approach to teaching science and technology is specified in the foundation phase life skills curriculum, that the present B.Ed. (FP) module was developed, implemented, assessed and the students’ views of the integration of the two processes was sought.
Method

This is a case study of an integrated STS numeracy, science and technology module in a teacher education programme for the teaching of science concepts. It was conducted as a quasi-experimental intervention during which 44 groups, of four or fewer students each, completed a project. They had to follow the technological process to design and make a strengthened, insulated house for the ‘Country Mouse’, which, on returning from a visit to his cousin in town, found that he no longer had a house (Brett 2013). Design folios and model houses were assessed using a rubric with criteria for competence, as well as a checklist.

The project scores were statistically analysed with SPSS Statistics (version 21). A t-test for independent groups was used to determine whether there was a significant difference among the groups that scored above and those that scored below the mean. The result was used to decide whether this project could be used to distinguish between how student groups understood and could apply science concepts during the technological approach and those that could not.

At the end of the intervention, student views on the teaching of science concepts, using the STS approach, were obtained through individual interviews and focus group discussions, which were recorded and then transcribed. Data from the interviews and focus groups were organised into themes. The tool for analysing the qualitative data was typological analysis as described by Cohen, Manion and Morrison (2007:473).

Sampling

The sample comprised 168 second year foundation phase B.Ed. students from a rural-based South African university. The 168 students completed the project in groups of 4 or fewer and all student groups’ results for the design and making process were used for statistical analysis. Purposive sampling was utilised to select six students to interview individually. A further two focus groups of five students each further discussed their experience during the intervention. They were selected from the oldest and youngest in the class.

Assessment rubric and checklist for the design and make of the model house

The rubric and checklist are included (table 1 and table 2) to show how the design and the heuristic of the stages of the technological process were used to assess the application of the following concepts: Area, volume, and material properties such as insulation and strength. The science process skills of measurement and communication (through drawings and modelling) were also assessed. The group scores generated by the rubric and checklist were analysed statistically to decide whether the STS approach used did result in student teachers’ ability to apply science concepts during the technological process.
Table 1: Rubric for the assessment of the group work design of the mouse house (Total of 38 marks)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front page</td>
<td>A front page is provided with some decorations, but it is untidy or without colour.</td>
<td>A front page is provided that is relevant for the design of a mouse house, but little colour is evident and it is not very neat.</td>
<td>A front page is provided with relevant diagrams for the design of a mouse house. The diagrams are beautifully coloured.</td>
<td></td>
</tr>
<tr>
<td>Problem statement</td>
<td>Problem statement given, but not relevant to mouse house.</td>
<td>Relevant problem statement given.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design brief</td>
<td>Design brief given, but not relevant to making of mouse house.</td>
<td>Design brief given, which is relevant to making a mouse house.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Investigation: Size of mouse</td>
<td>Size of a mouse is given, but no evidence of information source given. Or information given is incomplete.</td>
<td>Length of average mouse is given, with evidence, but no reference for the information source.</td>
<td>Evidence of information found from a reliable source is given, with the correct reference. Only relevant information is given for the length, breadth and height of a specific species of mouse. Information is given as a scaled diagram.</td>
<td></td>
</tr>
<tr>
<td>Investigation: How do mice stay alive during the winter months?</td>
<td>Information given, but without evidence or reference.</td>
<td>Information is given with a reference or evidence.</td>
<td>Information is given with evidence and a reference. Only relevant information is given.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Evidence and reference for more than one source is given. Only relevant information is given.</td>
<td></td>
</tr>
</tbody>
</table>
### Investigation: What is the natural habitat of mice?

| Information given, but without evidence or reference. | Information is given with a reference or evidence. | Information is given with evidence and a reference. Only relevant information is given. | Evidence and reference for more than one source is given. Only relevant information is given. |

### Information given, but without evidence or reference.

### Investigation: How can houses be insulated?

| Information given, but without evidence or reference. | Information is given with a reference or evidence. | Information is given with evidence and a reference. Only relevant information is given. | Evidence and reference for more than one source is given. Only relevant information is given. |

### Information given with a reference or evidence.

### Information is given with evidence and a reference. Only relevant information is given.

### Evidence and reference for more than one source is given. Only relevant information is given.

### Specifications

| Only one relevant specification is given. | Only two relevant specifications are given. | Specifications correctly given for size of house, insulating materials and features such as a door and window. | Specifications correctly given for size of house, insulating materials and features such as a door and window. One other relevant specification is given. |

### Only one relevant specification is given.

### Only two relevant specifications are given.

### Specifications correctly given for size of house, insulating materials and features such as a door and window.

### Specifications correctly given for size of house, insulating materials and features such as a door and window. One other relevant specification is given.

### Initial ideas

| Only one initial idea drawing is submitted in the design folio or only one is drawn correctly according to scale. | At least two of the initial idea drawings are correctly drawn to scale. | All four members have submitted correctly scaled free-hand isometric drawings for a mouse house. Not all drawings show dimensions according to specifications. | All four members have submitted correctly scaled free-hand isometric drawings for a mouse house. All drawings show dimensions according to the specifications. |

### Only one initial idea drawing is submitted in the design folio or only one is drawn correctly according to scale.

### At least two of the initial idea drawings are correctly drawn to scale.

### All four members have submitted correctly scaled free-hand isometric drawings for a mouse house. Not all drawings show dimensions according to specifications.

### All four members have submitted correctly scaled free-hand isometric drawings for a mouse house. All drawings show dimensions according to the specifications.

### Development drawings – plan drawings

| The plan drawing is not drawn to scale or specifications. | The plan drawing is drawn either to scale or to specifications. | The plan drawing is correctly drawn to scale and according to specifications. | The plan drawing is correctly drawn to scale and according to specifications. Features such as the door and window are correctly shown on the plan. |

### The plan drawing is not drawn to scale or specifications.

### The plan drawing is drawn either to scale or to specifications.

### The plan drawing is correctly drawn to scale and according to specifications.

### The plan drawing is correctly drawn to scale and according to specifications. Features such as the door and window are correctly shown on the plan.

### Evaluation

| Questions are noted from the specifications. | Questions are answered in a checklist. | Questions are answered honestly with some notes on how the mouse house can be improved. | Questions are answered honestly with some notes on how the mouse house can be improved. |

### Questions are noted from the specifications.

### Questions are answered in a checklist.

### Questions are answered honestly with some notes on how the mouse house can be improved.

### Questions are answered honestly with some notes on how the mouse house can be improved.
Table 2: Checklist for the assessment of the group work mouse house

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes (1)</th>
<th>No (0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the house fairly sturdily joined together?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the cardboard neatly cut?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Are the sides of the house mostly vertical?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the length of the house correct according to the plan drawing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the width of the house correct according to the plan drawing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the height correct according to the specifications?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the house have a door?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the door the size as stipulated on the plan drawing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Does the house have a window?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the size of the window as stipulated on the plan drawing?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a form of insulation for the floor?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a form of insulation for the walls?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is there a form of insulation for the roof?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the overall appearance of the house mostly neat?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is the house neatly decorated?</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total (out of 15)</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Findings and discussion

The findings of the study are presented in two parts. Firstly, the assessment of the design folio and models using the rubric and checklist (tables 1–2) and, secondly, the students’ views on the learning of science concepts by means of the STS approach.

Analysis of assessment scores for the ‘mouse house’ project

Figures 1–3 illustrate the design and making of a mouse house by one of the groups, showing the application of science process skills during the project.

The results of the t-test for independent groups (table 3) show a significant difference between the high and low scoring groups ($p < 0.000$). It indicates that they performed differently in the application of science concepts such as insulation and strengthening in the design and making of their houses; measurement and understanding area and volume in their drawings (figures 1–3); communicating their understanding of dimensions and scale in 2D and 3D drawings (figures 2–3); and making accurately scaled models from their design drawings (figure 1). The t-test results confirmed our views that the project method for assessment of science concept application would distinguish between student groups who could apply science concepts during the solving of a technological problem and those who could not. They also suggest that slightly more than half of the student groups (25/44) seemed to benefit from the integrated STS teaching approach.
Figure 1: Photograph of one of the group-work-project mouse houses

Figure 2: The three-dimensional drawing of the group’s mouse house

Figure 3: The plan drawing for the group’s mouse house
Table 3: Difference between high scoring and low scoring groups

<table>
<thead>
<tr>
<th>Result group</th>
<th>N</th>
<th>Mean</th>
<th>Std. dev.</th>
<th>Std. error of the mean</th>
<th>t-test for Equality of Means</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above mean</td>
<td>25</td>
<td>67</td>
<td>6.746</td>
<td>1.349</td>
<td>9.021</td>
</tr>
<tr>
<td>Below mean</td>
<td>19</td>
<td>49</td>
<td>6.644</td>
<td>1.524</td>
<td>9.040</td>
</tr>
</tbody>
</table>

Analysis of student interviews on the use of the STS project as a teaching and learning approach

Three themes stood out from the transcriptions of the individual interviews and the focus group discussions: The use of the technological process; the need for practical classes; and the learning of science concepts through the use of the technological process.

First, all the students in the individual interviews could recall the stages of the technological process, such as researching the size of the mouse, drawing the plan and insulating and decorating the house.

Highlighting the need for research, student D commented: “We had to find the size of the mouse so we could make the house big enough”, and student B added: “We really had to do research – if we do not research we would talk generally and not always be correct”. Student B also highlighted the association of the project with real life (“learning about insulation has relevance for my own home”) and the broader implications of project planning with the words: “We realised that you had to have a plan to build a house”.

Second, the need for practical classes was highlighted by student C, who suggested that the lecturer “must continue presenting demonstrations, because we learn by seeing”, but added that it “would be good for students to do practical demonstrations”. All the participants felt that the schools they themselves had attended as learners had lacked the equipment to conduct science investigations, and only one felt that she had learnt to measure during her schooling (student H).

Third, all the students interviewed individually and during the focus group discussions felt that they would prefer to have science taught separately from technology. Student B felt that it was necessary to know when a scientific concept is being dealt with and suggested that: “The lecturer should make it more obvious when dealing with a science concept like energy transfer”. Student F said: “I am swimming in a sea of confusion”. Student I preferred to integrate science and technology herself, and student L agreed, but both added that the lecturer should guide the integration. Although all participants felt that science and technology were important subjects there were definite preferences for one or the other. Student F preferred technology to science because she was good at drawing. Student G preferred science to technology and gave two reasons: First, “...drawing confuses me”, and second, “I am familiar with science, but not technology”. These answers raised the importance of
previous knowledge, with the ability to draw as a deciding factor for whether or not the students enjoyed technology.

**Implications**

Findings of this study revealed that, whereas learning of science concepts took place and students were able to apply their knowledge in designing and building a structure, they retained their empiricist view of the nature of science.

Although this study did not specifically seek the views of student teachers on the NOS, these are implied in their views on being taught with the STS approach. Teachers’ views about the NOS will affect the approach taken when teaching science in their classrooms (Tsai 2006:364) and it would therefore be useful to review the module and to include ways of challenging the students’ thinking about the NOS. Their existing empiricist views may have developed from their own learning of science in primary school (Tsai 2000:203). Such views can result in teaching strategies that obscure scientific meaning and go against the grain of a constructivist epistemology, which is the position advocated in the curriculum policy. Further questions arising from our findings include the following:

- How can the teacher education programmes address the issue of student teachers’ empiricist views of science?
- How can student teachers be taught to plan (and implement) science concept development of foundation phase learners in their teaching in the life skills curriculum?

In reviewing and revising our module, we would now consider including 1) conditions and models of conceptual change and teaching strategies that facilitate conceptual change in young learners, and 2) inquiry-based practical classes for students to develop their understanding of science concepts, which includes an awareness of the role of social factors.

Introducing practical classes requires careful planning to ensure that students are ready to learn by way of a constructivist epistemology and concomitant teaching approach. An added benefit of practical classes would be to give the hoped-for change a greater chance of succeeding, as the students would be discussing their inquiry process and the change would happen in a social context as advocated by Lemke (2001) and Fakudze (2004).

Reviewing and revising the module in this way gives the researchers the opportunity to continue to research how science concepts are developed using the STS approach and how science concepts can be assessed during the integrated STS approach.
Conclusion
This study found that the project method for assessing the application of science concepts to be appropriate in a specific social context of mostly rural-based students. The study succeeded in eliciting the views of students about their experience of the STS approach to learning science concepts. The method was also found to be appropriate for assessing the application of science concepts, although most students viewed the integration of science and technology as confusing and would have preferred the science concepts to be taught separately – probably due to their strong empiricist views of science as a subject. Such views held by foundation phase student teachers are likely to undermine their future teaching of science in the integrated manner suggested by the curriculum. There is a need for further research on how to change most effectively the views of students from an empiricist to a constructivist one regarding the nature of science. Based on our findings, we suggest that models of conceptual change and teaching strategies that facilitate conceptual change should be included in student teacher training through our module, as well as practical classes for students to develop their own constructivist understanding of science concepts.

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References


Abstract

This study established the effects of a researcher-developed curriculum-based intervention programme. The intervention was grounded on principles of Feuerstein’s ideas about ‘mediated learning’. The aim of the intervention was specifically to address children’s executive functions, which are generally regarded as prerequisites for cognitive development. We studies a selected group of South African grade R learners (n = 20). A quasi-experimental design was employed to collect quantitative data on rotational basis from experimental groups A and B, by means of dynamic assessment with the Children’s Inferential Thinking Modifiability (CITM) test during pretest, post-test and delayed post-test occasions. The test data was intended to elicit the extent to which the intervention that had focused on enhancing executive functions had contributed to the participants’ application of cognitive and metacognitive skills and strategies. Qualitative data captured participants’ application of cognitive processes in the input, elaboration, and output phases of the designed learning process, as well as the characteristics of their inhibitory control functions. A striking finding was the improvement noted in the children’s application of the following executive functions, namely working memory, cognitive flexibility and inhibitory control.

Keywords: Cognitive development, executive functions, dynamic assessment, grade R learners, mediated learning, cognitive modifiability, Feuerstein

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Introduction

Many South African learners repeat grade 1, and only 46% of grade 1 learners reach grade 12 (Rademeyer 2008). According to the Wes-Kaap Onderwysdepartement (2006), retention in grade 1 could be attributed to inadequate school readiness programmes and learning problems related to poor cognitive development.

The effectiveness or not of additional pre-school interventions to improve cognitive development in grade R is no longer a debate: Pre-school intervention improves individual achievement and problem-solving skills (Anderson, Shinn, Fullilove, Scrimshaw, Fielding, Normand & Carande-Kulis, 2003; Rossbach, Klucznik & Isenmann, 2008; Rossbach, Klucznik & Kruger, 2008). Authors also agree that early intervention enables the young learner to monitor, detect and self-correct errors, and has the potential to improve the young learner’s capabilities and detect early developmental delays (Jeon 2004).

According to Barnett (2008) pre-school intervention and education not only prove to be of great social and economic value for a country, but also promote a child’s lifelong learning. Burger (2010) argues that early childhood intervention programmes have positive short-term, as well as long-term effects on cognitive development, especially with children from disadvantaged socio-economic backgrounds. Moreover, according to Karoly, Kilburn and Cannon (2005:1), early childhood education and intervention programmes promote holistic development, which include physical, emotional, social and cognitive development. In a longitudinal study, Reynolds, Temple, Ou, Robertson, Mersky, Topitzes and Niles (2007:730) found that individuals who were exposed to an early childhood intervention programme, showed higher rates of school completion and educational attainment. Young learners who participate in an early social and cognitive development programme transit to school more easily than those who are not exposed to such a programme (McFarlane, 2006; Smith, 2009; Swanson, 2006).

Although the cited studies provide evidence that early childhood education and intervention programmes can have a lasting impact on cognitive development, none of the studies have documented the effectiveness of infusing a mediated learning approach across the curriculum for enhancing cognitive development among grade R learners (preschool learners or kindergartners).

With Reuven Feuerstein (Feuerstein, Feuerstein & Falik 2010:25), we argue that cognitive development of grade R learners can be improved if mediated learning experiences are central to daily teaching and in the learning experiences that this creates. On this view mediated learning proposes that learners receive and process information in a systematic, exploratory and reflective way, develop a need for precision and accuracy, demonstrate spontaneous comparative and inferential thinking behaviour and acquire higher order thinking skills (Feuerstein & Feuerstein 1991:11). Although this appears to be a ‘basketful’ of premises of this approach, many years of research has shown that Feuerstein’s ideas have promoted an integrated,

We set out with this inquiry, wanting to have tentative hypotheses to guide the execution of the study:

- $H_0$: A mediated learning approach will have no statistically significant effect on the cognitive development of grade R learners.
- $H_1$: A mediated learning approach will have a statistically significant effect on the cognitive development of grade R learners.

**Cognitive development in grade R**

The strongest evidence for the importance of wholesome early childhood development, including cognitive development, comes from neuroscience. Brain cells grow rapidly during the early childhood development period (0–9 years), making this age period apposite to address problems related to cognitive development and to create healthy development conditions for all children (Lerner, 2006; Lerner & Johns, 2009; Rademeyer, 2007). Children in the grade R age group require well-developed cognitive and metacognitive skills and strategies to perceive, think, solve problems, understand and remember effectively, and purposeful attempts should be made to develop these skills (Bolani, Pissarra, Hendricks, Swanepoel & Opie-Jacobs, 2007:v). Goswami and Bryant (2010) support the importance of cognitive development at a very early age. In contrast to Piaget’s developmental stages of thinking, they argue that some structures for thinking are in place from a very early age, for example, an approximate number system and an object filing system for numbers (Henning and Ragpot, under review). Moreover, they endorse Vygotskian principles of development and learning, such as social learning (in the sense that all signs and symbols are semiotically mediated from a social and cultural source), collaborative activity that should take place in an authentic settings where a child’s out-of-school experience should relate to the child’s school experience and where the teacher can bring understanding about by means of thoughtful guidance (Goswami & Bryant 2010). Wright (2013:3) says that it is necessary to enhance the abstract reasoning of grade R learners, to which Brewer (2007:4–5) and Van Staden (2005:51) add the importance of active and interactive involvement in activities where teachers use sensory learning to enhance learners’ cognitive development.

The multidimensional nature of cognitive development is explained widely in the literature. Cognitive development is defined as change in mental, thinking and reasoning ability patterns involved in learning, attention, memory, language, thinking, reasoning and creativity (De Witt 2009:55–56). Changes in mental ability patterns require the development and use of cognitive and metacognitive skills and strategies, some of which relate to self-efficacy (Brewer, 2007; Wegerif, 2006), as well as motivational-affective factors (Tzuriel 2001:72) or “non-intellective” factors (Feuerstein & Feuerstein 1991:6). The control and execution of these aforementioned cognitive and metacognitive processes and motivational-affective factors are coordinated and
managed by a system of executive functions (Lezak, Howieson & Loring 2004:35), or according to Feuerstein, “cognitive functions” (Feuerstein, Feuerstein & Falik 2010:71–82). The acquisition of a combination of cognitive and metacognitive skills and strategies, as well as strategies to deal with motivational-affective factors, stands central to the authors’ conceptualization of cognitive development, which is clarified in figure 1 below.

**Figure 1: Conceptualisation of cognitive development**

Cognitive skills can be of lower order (skills for recalling information) and higher order (skills to classify, categorise, synthesise, analyse, and think critically and creatively and to evaluate information) (Brewer, 2007; Fisher, 2005; Sangwan & Chhikara, 2003; Wegerif, 2006). Cognitive strategies comprise complex actions, which require the execution of a number of steps, like problem-solving, decision-making and conceptualising (Brewer, 2007; Epstein, 2008; Lerner, 2006; Moseley, Baumfield, Elliott, Gregson, Higgins, Miller & Newton, 2005; Sangwan & Chhikara, 2003). Metacognition involves an individual’s awareness of and control over his or her cognitive processes when facing cognitive challenges. Metacognitive strategies help learners to become self-regulated learners who can plan, control and evaluate their knowledge and thinking (Fisher, 2005; Flavell, Miller & Miller, 2002). In this regard, Fitzpatrick (2012:8) emphasizes the importance of cognitive self-regulation processes to sustain commitment, engagement and persistence during learning, remaining focused on tasks and being flexible to adapt to different task demands. It would seem that an important part of being a grade R learner is to become self-effective – to learn to manage learning and participation for school life. To be an executive of oneself.

According to Lezak et al (2004:35) executive functions contribute to the effectiveness and functionality of cognitive and metacognitive processes. These functions are highly interactive and describe the way in which learners perceive sensory information, transform the information, store, retrieve and use the information in order to cope successfully with cognitive challenges (Esterhuizen
Executive functions are therefore critical and intrinsically related to effective cognitive development and change. With this in mind our research is centred on improving the three dimensions of executive functions, namely, working memory, inhibitory control and cognitive flexibility (Best & Miller, 2010; Diamond, 2006; Miyake, 2009; Miyake, Friedman, Emerson, Witzki, Howarter & Wager, 2000), with the purpose of establishing how children’s improvement in the three dimensions may contribute to their overall cognitive development (execution of cognitive and metacognitive processes and motivational-affective development).

Another aspect of cognitive development that needs mention is working memory. With age, the capacity of children’s working memory gradually increases to enable them to retain and manipulate information that is required for complex thinking (Luna, Garver, Urban, Lazar & Sweeney 2004). Working memory plays an important role in being successful with task completion and problem-solving (Blair & Diamond 2008) because different sets of information are attended to and integrated or discarded and some information is inhibited. Inhibitory control involves the development of good thinking dispositions such as the capacity to master and filter thoughts, resisting temptations and distractions, avoiding impulsive working ways and being able to pay selective and focused attention (Diamond, 2006; Ritchhart & Perkins, 2008). Inhibitory control furthermore involves the application of strategies to ‘manage’ motivational-affective factors (Tzuriel 2001:72), or in Feuersteinian discourse, non-intellective factors, such as a need for mastery, frustration tolerance, fear of failure, confidence and vitality and alertness, that play an important role in cognitive development (Feuerstein & Feuerstein, 1991:6).

Frustration and disappointment might be experienced due to prior learning failures that often manifest as low self-concept and a lack of self-confidence. In addition, learners often withdraw from instructional communication and lack the willingness and persistence to complete a task successfully. Fitzpatrick (2012:11) argues that underdeveloped executive functions in young children may lead to limited engagement in the classroom. Also, a lack of inhibitory control strategies can manifest in working behaviour that is often characterised by sporadic responses, guessing behaviour and blaming others for mistakes (Benjamin, 2009; Feuerstein et al, 2002:140–141; Tzuriel, 2001:50–55, 72–73). The third dimension of executive functions, cognitive flexibility, refers to the ability to adapt to different task demands and applying different cognitive and metacognitive skills and strategies (Diamond 2006).

The executive functions or “cognitive functions” (in Feuersteinian discourse) play important roles in the input, the elaboration and the output phases of the learning process (Feuerstein et al 2010). Feuerstein et al (2010:71–73, 74–75, 76–81) argue that impaired executive functions affecting the input phase manifest as deficiencies regarding the quantity and quality of data collected by an individual when confronted with a specific problem. In addition, learners will demonstrate vague perception, unplanned and impulsive behaviour, possess poor verbal tools to discriminate between objects and establishing relationships between events, and difficulties with labelling objects. Moreover, learners will have trouble with spatial orientation,
temporal concepts and conservation of constancies (Feuerstein et al 2010:71–73). Problems in the elaboration phase manifest in an inability to perceive, define and solve a problem, and deficient verbal potential will restrain learners from expressing their thoughts (Feuerstein et al 2010:76–81). Impediments in the output phase involve inadequate communication of final solutions to problems, trial and error responses and impulsive behaviour (Feuerstein et al 2010:74–75). The results of information processed in the elaboration phase are not conveyed clearly and precisely, facts are not thought through before reporting them, and information is not conveyed with confidence (Feuerstein 2007).

Tzuriel (2001) argues that the best way to assess cognitive development is through a teach-test-teach approach referred to as dynamic assessment. Dynamic assessment theory posits that learners should be engaged in active and flexible instruction, during which teachers observe how well the learner can learn under favourable conditions. Dynamic assessment utilises a scaffolded approach which, according to the authors, provides a better measure of intellectual potential that a static test; dynamic assessment enables the altering of cognitive functioning while observing changes in learning and problem-solving (Lerner, 2006:72; Snow & Van Heme, 2008:425). We applied dynamic assessment principles to measure the extent to which a mediated learning approach altered the grade R learners’ cognitive functioning, specifically their executive functioning abilities.

**Mediated Learning Experience (MLE)**

Mediated learning is, in Feuersteinian discourse, a teaching approach that focuses on intentional intervention to specifically enhance the executive functions that are critical to the effective application of cognitive and metacognitive skills and strategies such as memory and cognitive flexibility (Feuerstein & Feuerstein, 1991:3; Feuerstein et al, 2010:25; Tzuriel & Shamir, 2010:49).

The theory on mediation is rooted in the perspectives of Vygotsky, Nyborg and the Neo-Piagetians (Cèbe, 2002; Nyborg, 1993; Vygotsky, 1986). These authors agree on the importance of mediation in cognitive development, the importance of task-intrinsic motivation and shared activity during learning (Haywood 2003). The authors’ perspectives differ with regard to the role of the teacher during mediation, as the work of Vygostsky illustrates – the central tenet being semiotic mediation (Vygotsky 1978:52), in other words, meaning of signs, symbols and tools are mediators that the teacher uses as person mediator. The teacher can play a low-key role in guiding learners to ‘discover’ information and solve problems on their own (neo-Piagetian) (Cèbe, 2002; Paour, 1992), or a dominant role (Nyborg and Feuerstein) (Feuerstein & Feuerstein, 1991; Nyborg, 1993; Vygotsky, 1986). The Vygotskian concept of mediation involves two kinds of mediation. Firstly, a human mediator is required to apprentice a child with cognitive tools for enhancing thinking processes. Central to equipping learners with cognitive tools is social interaction and communication that aid the acquisition of verbal tools and self-regulation that are important determinants of development.
Esterhuizen & Grosser – Improving some cognitive functions

(Vygotsky 1986). Nyborg (1993:) refers to mediation as teaching that fosters intelligent inquiry, and teaching that provides optimum conditions that will contribute to learners acquiring the prerequisite skills, strategies and dispositions for future learning, and enable the transfer of acquired skills, strategies and dispositions.

In contrast to the theories of mediated learning, neo-Piagetian mediation theorists argue that teachers/mediators construct their interactions with learners in the classroom to help learners to reduce their dependence on an external mediator, thus promoting self-mediation (Cèbe, 2002; Paour, 1992). The mediator in neo-Piagetian terms plays a directing role, rather than an instructing role, and therefore favours questioning to stating. For neo-Piagetian mediation practitioners it is important to enable and encourage the transfer and application of knowledge and skills.

We conceptualised mediation according to the widely known perspective of Reuven Feuerstein (Feuerstein & Feuerstein, 1991; Feuerstein et al, 2010). We argue that this theory combines the theories on mediated learning, as it departs from the premise that the teacher should initially play a dominant role in purposefully mediating cognitive tools, but gradually shifts towards self-mediation, where the learner has to start working independently from the mediator, appropriating the tools and using them. A learner deprived of initial, purposeful teacher-initiated mediated learning opportunities might continue to respond in an unsystematic, disorganised and even chaotic approach to learning, not learn rapidly when exposed to new experiences and will not be able to modify their performance in flexible and adaptable ways (Deutsch 2003).

To round off this section of the article, we reflect on the premise of Reuven Feuerstein’s theory of mediated learning. Although there are limitations to his views, there is much one can take from his ideas about, “structural cognitive modifiability”. According to his theory, deficient or fragile cognitive processes in children can be modified through an interactive process of mediation that is directed at what some would refer to as ‘self-direction’ (Feuerstein et al 2010). The notion of “cognitive modifiability” goes beyond the idea of the learning of fixed sets of facts, rules and procedures, but emphasises the development of essential skills, strategies and dispositions that are critical to transforming ways in which learners interact with others, how they approach learning, how they deal with cognitive challenges and how they can become more confident and motivated to learn and achieve (Bransford 2010:xii). Fitzpatrick (2012) would refer to this as executive functions training. There is agreement in the literature that once the essential skills, strategies and dispositions are fixed, they should be kept intact by structuring learning environments that support the continuous growth of the skills, strategies and dispositions (Bransford 2010:xii).

Method

Research framework

As the purpose of this research was trying to solve a problem that required an integrated understanding of different types of data, a pragmatic research framework that combines the collection of quantitative and qualitative data was utilised. We
collected quantitative test data of children’s application of cognitive and metacognitive skills and strategies in their grade R year. We also gathered qualitative observation data on the nature and quality of the participants’ executive functions in the input, elaboration and output phases of the learning process.

Participants

Due to time and logistical constraints involved in conducting a postgraduate study, as well as the intensive nature of the mediated learning approach, we involved one willing grade R class with twenty learners from a primary school in a town in the Free State province. All the learners in the grade R class were involved in the pretest. Based on the pretest results, we identified the sample, which comprised ten learners who were purposively selected based on their test performance and randomly assigned to experimental group A or B (both numbering 5 learners each).

The sample was heterogeneous regarding gender and more or less homogeneous regarding pretest performance, socio-economic background (middle-class), ethnicity and culture (white, Afrikaans speaking) and age. The selection of the participants was made as follows: Four learners who obtained the highest pretest scores (four males), four learners who obtained average pretest scores (four females), and two learners who obtained the lowest pretest scores (two males).

In each of the performance groups, two learners were randomly allocated to an experimental A and an experimental B group, except the learners who obtained the lowest pretest scores. In this group, only one learner was allocated to the experimental A and experimental B groups respectively, as they appeared to need more intensive, individual mediation than the other learners did. Both experimental groups, on rotational basis, received the intervention in pairs, and therefore we purposively selected learners who had more or less the same achievement level in the first pretest to form groups. Consistent with the view of Benjamin (2006), we chose to work with a small sample, as it is argued to be more beneficial for administering cognitive development programmes intensively. Moreover, the learners were very young and not familiar with a mediated learning approach, and we aimed to give each learner intensive, individual attention during the intervention.

Research procedure

Similar procedures guided the administering of the various test sessions. No mediation was given during the test occasions, except for minor focusing and regulation of behaviour. The post-test was administered directly after the implementation of the intervention in order to examine cognitive improvement and the effects of the mediational approach (Tzuriel 1990).

The quantitative study can be described as a small quasi-experiment, and the qualitative part as an observation study, comprising observations in the form of structured running and anecdotal records. The observations took place during the test occasions, as well as during the implementation of the intervention. The first author
was the observer. Before the pretest was administered, all learners in the class \((n = 20)\) individually participated in the pre-teaching phase. We acquainted them with concepts and vocabulary in the test, after which they completed the pretest individually. Experimental group A was exposed to the intervention at the beginning of the school year in January for 12 weeks, while experimental group B received normal class teaching. Experimental group A then wrote the post-test to determine the impact of the intervention on their cognitive functioning. Experimental group B also wrote the post-test to determine if normal class teaching influenced their cognitive functioning in any way. Experimental group A then received normal class teaching for 12 weeks, while experimental group B received the intervention. Both groups then completed post-test 2 to establish the impact of the intervention on the cognitive functioning of group B. Four months after completion of the research, both groups completed a delayed post-test to determine whether retention of enhanced cognitive functioning took place. Pretest 2 was written after the three weeks school holiday in July to determine any cognitive changes in the absence of mediation (group A) and normal classroom teaching (group B).

**The intervention**

The learning outcomes for grade R learners in South Africa guided the development of the intervention activities. The activities focused on the application of the following executive functions: Paying attention, remembering, becoming flexible in applying skills and strategies for interpreting, classifying, categorizing, comparing, analysing, problem-solving, evaluating, inferring and deducing, imagining, critical evaluation and reflection (Department of Education, 2002; Department of Basic Education, 2011). The aforementioned skills and strategies corresponded well with the skills and strategies the learners had to apply in the Children's Inferential Thinking Modifiability (CITM) test. We designed the intervention by keeping the criteria for mediated learning and the key elements for improving the executive functions of grade R learners as identified by Papalia, Wendkos Olds and Duskin Feldman (2008), Patterson (2008) and Van Staden (2005) in mind. Participants had to categorise shapes according to colour and size on their own, and motivate their categorisations. Categorisation promoted the application of cognitive and metacognitive skills and strategies such as comparing, classifying, categorising and problem-solving, reflection, interpreting and evaluation. Perception activities focused on concepts of time and direction, similarities and differences, spatial relations and auditory perception and discrimination. As advocated by mediated learning theory, active and interactive involvement was central to all the learning activities. Learners were requested to walk, crawl and hop on shapes to determine the characteristics of shapes, manipulate shapes and form various shapes with pieces of string. Transfer activities expected of participants to apply principles, rules and strategies acquired during the intervention to new and similar tasks. Verbal and numerical problem-solving activities involved the application of conservation skills by manipulating objects such as unifix blocks, counters and parts of shapes, which had to be arranged to form wholes. Mastering basic concepts involved
in identifying size, length, position or shape, were included in the intervention. Number concept activities developed simple adding and subtraction strategies by using various counters. Participants were confronted with scientific concepts related to their world of experience, for example people, animals, plants, seasons and the weather, as well as spatial relations. Memory and creative thinking strategies were attended to throughout the intervention. Not only were participants expected to remember concepts, rules, principles and strategies, they also had to remember the categorisation of 24 pictures according to different types of animals, transport, shapes, plants, clothing and furniture. Participants were continuously encouraged to reflect on their responses in order to correct their own mistakes, and become aware of their own thinking. Language development involved listening to instructions, explaining answers, communicating thoughts, identifying letters, rhyme words, and beginning, middle and end sounds of three-letter words. Symbolic thought was encouraged by asking the participants to create representational drawings.

Throughout the intervention, attention was paid to advancing inhibitory control functions such as increasing frustration tolerance, experiencing delight in successful task completion, nurturing feelings of competence, eliminating fear of failure and encouraging the need for mastery (Feuerstein 2007).

The test and intervention sessions took place early in the morning, between 8:00 and 9:00, in a quiet, familiar classroom at the school of the participants.

Data collection

The CITM test involves a dynamic assessment (test-teach-test) procedure that attempts to assess learning strategies and accessibility to mediation, the utilisation of higher-order concepts and operations and the application of a variety of cognitive and metacognitive skills and strategies to solve problems. The teaching phase took place during the implementation of the intervention. The pretest phase followed after the participants were presented with example problems similar to those in the test, and the basic rules and strategies of solving inferential problems were clarified. The CITM test comprises twelve figural problem-solving “sentences” where participants had to determine the correct place of different picture objects. The solving of the problem “sentences” required systematic, exploratory behaviour, control of impulsivity, spontaneous comparative behaviour, planning, inferential hypothetical thinking, inductive reasoning and concurrent consideration of more than one source of information (Tzuriel 2001:82). We utilised the measurement/research version of the CITM. A score of 1 was given for a correct answer and no score was given for an incorrect answer. A gain score was then computed by deducting the score of the pretest from the score of the post-test (Tzuriel 2001:66–67).

Both researchers acted as observers during the administering of the CITM and the implementation of the intervention. One of the researchers administered the CITM and implemented the intervention and therefore participated as observer. This researcher became part of the intervention in an attempt to improve the cognitive development of the participants. The intense nature of her involvement allowed for
the utilisation of anecdotal records of all behaviour or events related to the cognitive functioning during the input, elaboration and output phases of the learning process, as well as strategies for inhibitory control which each participant displayed. The other researcher acted as a complete observer who compiled structured, detailed, continuous and chronological accounts of individual participants’ behaviour in relation to predetermined criteria linked to the application of cognitive and metacognitive skills and strategies, as well as executive functions as they occurred. The structured running records and the anecdotal records were compared and conclusions made based on the interpretation of both sets of records.

Rigour
The current authors received training in the principles of dynamic assessment and the application of the CITM. The CITM can be presented to diverse groups of multicultural learners in mainstream education (Tzuriel, 1990; Tzuriel, 2001). The clinical and empirical validity of the CITM have been established by Benjamin (2006) and Tzuriel (2000 and 2001). Previous assessments measured Cronbach alpha coefficients of .85 and .89 respectively (Tzuriel 2001:82).

We ensured prolonged engagement by staying in the field until data saturation occurred, and guaranteed referential adequacy by utilising structured observation in the form of running and anecdotal records. Predetermined criteria that guided our observations ensured objective and selective attention to the learners’ actions. We observed the nature and quality of change regarding the participants’ application of executive functions in terms of retention, resistance, flexibility and generalisability (Feuerstein et al 2002:526–530).

We found peer briefing helpful where we spoke to knowledgeable colleagues in the field with whom we reviewed our insights and analyses. Member checks were continuously done to correct obvious errors in our findings.

Ethical issues
We obtained permission from the Free State Department of Education, the principal of the school and the teachers and parents of the grade R learners. Participants, their parents, the teachers and the principal were informed about the aim and process of the research, why certain learners were chosen to take part in the research, as well as the possible benefits the research holds for the learners. All results were dealt with confidentially and no names were attached to participants in the writing up of the research findings.

Results
The CITM test results focused on the participants’ application of cognitive and metacognitive skills and strategies when confronted with problem-solving tasks. The analysis of the group data focuses on a comparison of test results between and within each of the experimental groups A and B, by means of the Wilcoxon signed-rank test.
Quantitative data analysis

Table 1 compares the mean ranks for the test results of experimental group A and B to determine whether the differences noted between the two groups were statistically significant. According to Leech, Barrett and Morgan (2005:59), if the difference between means was not statistically significant, it is best not to make any comment about which mean was higher, because the difference could be due to chance. Likewise, if the difference was not significant, Leech et al (2005) recommend that effect size is not discussed or interpreted.

Table 1: Differences between test results for experimental group A and B

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<tr>
<th>Group</th>
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<td>5.10</td>
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</table>

Note: Statistical significance: \( p < 0.05 \)

Only the pretest 2 results revealed a statistical significant difference between group A and B, as \( p < 0.05 = 0.028, r = 0.693 \). We argue that group A obtained the better result after the intervention, which implies that the intervention contributed to improving the application of the cognitive and metacognitive skills and strategies of group A. Pretest 2 was completed three weeks after the completion of the intervention, and we believe that group A retained the cognitive and metacognitive skills and strategies that they acquired during the intervention.

Although group B also benefited from the intervention (see table 3), no statistical significant difference between the post-test 2 results of group A and B, \( p > 0.05 = 0.141 \), was noted. Post-test 2 was written after the intervention with group B, and although
both groups benefited from the intervention, one group did not seem to benefit more from the intervention than the other group. The delayed post-test results of both groups showed improvement in comparison to their pretest results, but without a statistical significant difference between the two groups, \( p > 0.05 = 0.671 \). Moreover, the results of both groups did not indicate a decline in performance.

No statistical significant difference was evident between the pretest results, which confirms that the groups were equally effective in applying cognitive and metacognitive skills and strategies at the onset of the study, \( p > 0.05 = 0.249 \).

There was no statistical significant difference between the results of post-test 1, \( p > 0.05 = 0.116 \). Although experimental group A had received the intervention, statistically they did not do significantly better than experimental group B, who only received normal class teaching, as indicated by the comparison of the post-test 1 results.

The large standard deviations noted for experimental group A can be linked to the poor performance of one of the participants, participant 5, whose results could be regarded as outliers.

Table 2 compares the differences between the pre- and post-test results within experimental group A.

**Table 2: Comparison of differences between test results within experimental group A**

<table>
<thead>
<tr>
<th></th>
<th>Mean rank</th>
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<th>p</th>
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<td>n</td>
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</tr>
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<td>.000</td>
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<tr>
<td>post-test</td>
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</tr>
<tr>
<td>Pretest 1</td>
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<td>17</td>
<td>.000</td>
<td>3.000</td>
<td>-2.023</td>
</tr>
<tr>
<td>Pretest 2</td>
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<td>24</td>
<td>5.000</td>
<td>2.50</td>
<td>-1.677</td>
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Statistical significant differences occurred between post-test 1 and pretest 1, $p < 0.05 = 0.042$, $r = 0.643$. The participants performed better in post-test 1 than in pretest 1, and we concluded that the intervention contributed to this statistical significant difference.

Pretest 2 yielded better results than pretest 1, with a statistical significant difference of $p < 0.05 = 0.042$, $r = 0.643$. Pretest 2 was written after the intervention and after post-test 1, and the improvement in the pretest 2 result implied that the initial improvement in the application of cognitive and metacognitive skills and strategies acquired during the intervention noted in the post-test 1 result was retained.

The participants performed better in the delayed post-test than in pretest 1, with a statistical significant difference, $p < 0.05 = 0.043$, $r = 0.640$. Moreover, this result confirmed that the statistical significant improvement noted between pretest 1 and post-test 1, after the implementation of the intervention, was retained in the absence of mediation.

No statistical significant differences were noted between pretest 1 and post-test 2, post-test 1 and pretest 2, post-test 1 and post-test 2 and between pretest 2 and post-test 2. A possible explanation for this observation could be that prolonged exposure to practice and application of the cognitive and metacognitive skills and strategies that were acquired during the intervention is needed to contribute to further statistical significant improvement in the application of the skills and strategies. Before post-test 2, the participants had 12 weeks exposure to normal classroom teaching, during which they could apply the skills they acquired in the intervention. The time might not have been adequate to contribute to statistical significant improvement in the application of the skills and strategies during post-test 2. The same argument might be true for the absence of statistical significant differences between pretest 2 and the delayed post-test, post-test 1 and the delayed post-test and between the delayed post-test 1 and post-test 2. It is noteworthy that in the four months absence of normal class teaching and mediation, the application of the skills and strategies that were improved during the intervention were retained.
Table 3 below summarises the differences between pre- and post-test results within experimental group B.

**Table 3: Comparison of differences between test results within experimental group B**

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<td>3.000</td>
<td>-2.023</td>
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</tr>
<tr>
<td>Post-test 1</td>
<td>5</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post-test 2</td>
<td>5</td>
<td>10</td>
<td>.000</td>
<td>3.000</td>
<td>-2.023</td>
<td>0.043*</td>
</tr>
<tr>
<td>Delayed post-test</td>
<td>5</td>
<td>30</td>
<td>.000</td>
<td>3.000</td>
<td>-2.023</td>
<td>0.043*</td>
</tr>
<tr>
<td>Delayed post-test</td>
<td>5</td>
<td>30</td>
<td>.000</td>
<td>3.000</td>
<td>-2.023</td>
<td>0.043*</td>
</tr>
<tr>
<td>Post-test 2</td>
<td>5</td>
<td>25</td>
<td>.000</td>
<td>3.000</td>
<td>-2.023</td>
<td>0.043*</td>
</tr>
</tbody>
</table>

Note: Statistical significance: $p < 0.05$

The participants performed better in post-test 2 after the implementation of the intervention than in pretest 1. This difference was statistically significant, $p < 0.05 = 0.041$, $r = 0.645$. We concluded that the intervention contributed to this statistical significant difference.
The difference between the delayed post-test and pretest 1, resulted in a statistical significant difference, $p < 0.05 = 0.043$, $r = 0.640$, related to effectiveness and efficiency with which the participants applied cognitive and metacognitive skills and strategies during the delayed post-test. We argue that the intervention contributed to the effectiveness and efficiency of the improvement noted in the application of cognitive and metacognitive skills and strategies. Moreover, the statistical significant difference noted between pretest 1 and post-test 2, after the implementation of the intervention, was retained.

The difference between the delayed post-test and post-test 1 indicated a statistical significant improvement in the delayed post-test, $p < 0.05 = 0.043$, $r = 0.640$, which we contribute the improvement to the intervention programme. More importantly, the result confirmed the retention of the skills and strategies acquired during the intervention in the absence of mediation.

The participants performed better in post-test 2 than in pretest 2, with a statistical significant difference of $p < 0.05 = 0.043$, $r = 0.640$. Post-test 2 was written after the intervention, and the results confirm that the improvement that was noted can be linked to the implementation of the intervention.

We noticed a statistical significant improvement, $p < 0.05 = 0.043$, $r = 0.640$, in the application of cognitive and metacognitive skills and strategies of the participants in the delayed post-test as compared to pretest 2 (before the intervention). Remarkably, the statistical significant difference noted between pretest 2 and post-test 2 after the implementation of the intervention was retained.

The participants performed better in the delayed post-test than in post-test 2, with a statistical significant difference, $p < 0.05 = 0.043$, $r = 0.640$. Furthermore, this result led us to believe that the statistical significant difference noted between pretest 1 (before the intervention) and post-test 2 (after the intervention) was retained in the absence of direct, purposeful mediation.

No statistical significant differences were noted between post-test 1 and pretest 1, pretest 2 and pretest 1, and pretest 2 and post-test 1. We concluded that the 12 week classroom teaching that preceded post-test 1 and pretest 2 apparently did not provide purposeful opportunities for the development and application of cognitive and metacognitive skills and strategies. We are unsure as to why no statistical significant difference was noted between post-test 1 (before intervention) and post-test 2 (after intervention). One possible explanation might be that this group of participants required more than 12 weeks to become effective in the application of the cognitive and metacognitive skills and strategies. Our argument might hold true if the statistical significant difference between the delayed post-test and post-test 1 is considered. In the four months absence of mediation the application of the skills and strategies in everyday situations possibly aided their retention.
Qualitative data analysis

With the observations we established whether the intervention also improved the effectiveness and efficiency with which the participants processed information during the input, elaboration and output phases of the learning process.

We analysed the data using deductive as well as inductive approaches, and linked the interpretations to a 9 point scale that depicts the extent and nature of required mediational intervention (RMI), on a continuum from 0–9, to generate maximum cognitive modifiability or change (Feuerstein et al 2002). It was important to establish whether the intervention enabled learners to move from dependency on a mediator (levels 1–3), to average levels of dependency (levels 4–6), to autonomy during the execution of learning tasks (levels 7–9).

Observations: Input phase

Table 4 reports on the observation results for the ten participants at the onset of the research and after the intervention process.

Table 4: Input phase

<table>
<thead>
<tr>
<th>Participant</th>
<th>RMI: Pre-intervention</th>
<th>RMI: Post-intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Participant</td>
<td>1 2 3 4 5 6 7 8 9 10</td>
<td>6 6 9 8 1 7 6 9 6 4</td>
</tr>
<tr>
<td>RMI level</td>
<td>0 0 2 0 0 0 0 0 0</td>
<td>6 6 9 8 1 7 6 9 6 4</td>
</tr>
</tbody>
</table>

During the pretest, the participants lacked systematic thinking behaviour and precise and accurate working methods. The verbal receptive tools to gather, process and express information were not intact, manifesting in a lack of precision and accuracy in completing tasks. Participants worked impulsively, which resulted in activities completed incorrectly. Our observations indicated that the executive functions in the input phase appeared to be emerging, and that the learners are not ready to respond effectively to cognitive learning tasks.

As the intervention progressed, the participants started to react more quickly to a stimulus and considered different possibilities for solving problems. They used tracking and visual scanning to determine answers. During the post-test and delayed post-test, all the participants, except participant 5, progressed and were able to reflect on their answers and make corrections on their own. Although impulsivity characterises the working ways of young learners (Lerner 2006), our observations correlate with Feuerstein’s opinion (in Lerner, 2006; Tzuriel, 2001) that a mediator can replace a learner’s impulsive working ways with self-regulation that involves planned, systematic and comparative behaviour (Feuerstein et al 2010).

It appears as if the processing of information in the input phase improved among the participants, as the degree of RMI progressed from high to low. In addition, they...
appeared to be more able to apply cognitive and metacognitive skills and strategies without assistance. More importantly, we noticed some permanence of change and more control and flexibility in the participants’ ways of working. They were better able to apply newly acquired functions to wider contexts (Feuerstein et al 2002).

**Observations: Elaboration phase**

Table 5 summarises the observation results for the ten participants before and after the intervention process.

**Table 5: Elaboration phase**

<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMI: Pre-intervention</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>RMI level</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Initially, the participants could not identify a starting point or cue when solving problems and did not work according to rules. They could not distinguish between what was relevant or irrelevant to the task they had to complete and often provided poor or no responses to tasks. We concluded that their spontaneous comparative behaviour and planning strategies were apparently still emerging. At times, the participants were eager to complete activities and made mistakes, because they did not reflect on their answers. This observation concurs with the literature that emphasises the emergent nature of metacognition in the young learner between the ages of four and six (Botha, 2003; Robson, 2006). During the course of the intervention, participants started to select relevant information in order to solve a problem, and compared options before deciding on a final answer. It seemed that purposeful mediation taught the learners to become more effective in processing information, sequencing steps in learning and moving from dependent and concrete learning to more independent and abstract learning (Feuerstein et al 2010).

Effective processing of information in the elaboration phase also appeared to be emerging. We noticed some permanence in the changes that took place regarding the restraining of impulsivity, flexibility to change and adapt to new task demands and the application of the emerging cognitive functions to wider contexts (Feuerstein et al 2002:526–527), except for participant 5.

**Observations: Output phase**

In table 6, we report on the observation results for the ten participants before and after the intervention process.
Initially, many of the participants demonstrated egocentric behaviour, which could be linked to the fact that they were still very young (Papalia et al 2008). They could not separate the task from their own world of experience, and had to be reminded to focus on the task. The participants experienced problems with internalising visual changes of directions, relations and connections. As the intervention progressed, they became more skilled in recognising relations among objects, like similarities and differences, for example.

Because the participants lacked precise and accurate working methods during the input phase at the onset of the study, trial and error behaviour, impulsivity and inadequate communication of solutions to problems initially characterised their mental activity in the output phase. Not one of the participants, except participant 5, demonstrated blocking behaviour (rejecting the mediator’s attempts to teach) and an inability to respond. We carefully concluded that the strategies to process information in the output phase were not yet fully developed and therefore did not manifest in observable ways.

Except for participant 5, all of the participants who initially required a high degree of RMI (levels 0–3) appeared to become more autonomous and independent in formulating their own rules and working strategies during the course of the intervention.

**Observations: Inhibitory control factors**
In table 7, we report on the observation results specifically for the inhibitory control functions before and after the intervention process.

**Table 7: Non-intellective factors**
Initially, the participants needed a lot of motivation to persevere and their attention spans sometimes fluctuated. A high level of attentiveness and interest was absent during the completion of tasks, and we undertook purposeful efforts to enhance their interest and attentiveness by working on concrete and authentic tasks. Only four of the participants, participants 3, 4, 6 and 8, who appeared to be functioning at a moderate RMI level (levels 4–6), seemed to have some previously learned strategies and rules available for dealing with emotional, motivational and attitudinal aspects related to learning.

Participants had to be encouraged to persist and to complete activities successfully. Often frustration was present when participants experienced problems in the completion of challenging tasks. Through mediation, we aimed to encourage their intrinsic motivation and persistence by requesting them to keep on trying and highlighting the importance of being successful in task completion. Throughout the intervention, their independence emerged and they became more aware of their own thinking, and prepared to take on challenging tasks. Their determination to complete tasks and to correct their own tasks increased, which could be regarded as a sign of intrinsic motivation emerging.

The participants never rejected meditational attempts or withdrew from learning, except for participant 5, who demonstrated extreme blocking behaviour (rejecting the mediator’s attempts to teach) and an unwillingness to become involved in activities. It could be that this participant’s passivity and lack of attentiveness and interest could be related to fear of failure or negative learning experiences encountered in the past (Tzuriel 2001). Participant 5 displayed no perseverance, and could not work independently. Sometimes he did not even want to try working on a task. He preferred practical work, where he could manipulate objects, but wanted to complete tasks on his terms and did not care if he completed the tasks correctly or not. His attention fluctuated and he sometimes got aggressive if things did not go his way, therefore exhibiting a low frustration tolerance. He clearly wanted to avoid tasks involving academic demands. At the end of the study, seven participants were observed as being at levels 7–9 in terms of their RMI to deal with emotional, attitudinal and motivational factors during learning. A change in the nature and extent of mediation required was noticed. An increase in learner autonomy and a decrease in depending on the mediator was noticed (Feuerstein et al 2002).

Throughout the intervention, progression was noted in terms of the participants’ actions which were initially very mediator-dependent, but became more spontaneous.

**Discussion**

The research findings highlight the practical benefits of the specific mediated learning intervention with a sample of grade R learners. There is evidence of enhanced cognitive functions that benefitted the application of cognitive and metacognitive skills, and that eliminated motivational-affective factors that can influence learning and achievement. Our research extends previous research by suggesting a novel
approach to teaching grade R learners that infuses the teaching of thinking directly into subject content and does not treat it as an additional add-on to the curriculum.

The statistically significant improvement noted in the application of cognitive and metacognitive skills and strategies confirms that the intervention had improved the cognitive flexibility of the participants and contributed to the improvement in test results. This observation is consistent with Feuerstein’s theory that mediation enables learners to know how to select and focus on relevant stimuli, become more responsive and ultimately to benefit from learning (Feuerstein 2007; Feuerstein, Klein & Tannenbaum, 2005; Fraser, 2006; Haywood, 1994; Peña, Gillam, Malek, Ruiz-Felter, Resendiz, Fiestas & Sabel, 2006). The mediated learning approach with young learners provided opportunities for enhancing the learners’ ability to sequence events and steps in problem-solving, nurtured transcendence from dependent and concrete learning to independent, abstract learning, improved the manipulation of symbols and words, and increased the ability to describe concepts and words (Feuerstein 2010:272–273). From the research findings we conclude that mediated learning transformed the ways in which the learners approached learning, dealt with cognitively challenging tasks and influenced their becoming more confident and motivated to learn and achieve.

Throughout the intervention, it appeared that the participants’ need for mastery improved, thus supporting Benjamin (2009:2), Feuerstein (2007:23–24) and Tzuriel (2001:50–55, 72–73), who report on the importance of mediation to improve inhibitory control. The need for mastery and determination to complete tasks successfully developed throughout the intervention and could have been present in the subsequent test occasions, which contributed to the progressive improvement noted in the test results. The participants’ planning of their work improved, confirming the findings of Feuerstein (2007) and Lomofsky (2007), which state that mediated learning will decrease anxiety to fail and enable learners to develop strategies, search for alternative answers and work in a more systematic manner. The participants adopted a more planned way of work, which they possibly transferred to the test situation and may have contributed to the improvement in the results.

Our initial observations correlate with what Benjamin (2009:2), Feuerstein (2007:23–24) and Tzuriel (2001:50–55, 72–73) affirm, namely that emergent or deficient executive functions manifest as unplanned and impulsive behaviour. This could be reversed to systematic behaviour through mediation, and therefore supports Feuerstein’s theory of cognitive modifiability (Feuerstein et al 2010). Furthermore, our findings confirm the establishment of thinking behaviour due to mediation that ensures self-regulation, remembering the application of rules, principles and strategies, which contribute to diminishing impulsivity in the learner (Lerner, 2006; Lerner & Johns, 2009; Tzuriel, 2001). Another striking finding that emerged from our observations supports Feuerstein’s view that impulsive, emotional reactions can be reinstated by logical, objective and more controlled responses due to mediation (Feuerstein 2007).
We deduce from the observations that it was possible to teach the learners to become more effective in processing information through a process of mediation (Feuerstein et al 2010). Throughout the observations the participants’ efficiency level, as well as precision and energy, improved remarkably. Participants also worked in a more controlled manner and were more flexible in applying learnt strategies and rules to wider contexts, which possibly contributed to the progressive improvement noted in the various test results of the participants. Extreme impulsive behaviour was reduced and flexibility to change was evident (Feuerstein et al 2002).

The learners who took part in the study started to internalise the cognitive and metacognitive skills, strategies and functions mediated to them, and these apparently became integrated mechanisms of change within the learners (Benjamin, 2005; Tzuriel, 2001). Learners became able to use the familiar to interpret the unfamiliar (Lidz, 2003; Tzuriel, 2001), and their willingness, enthusiasm and persistence to continue with challenging work increased (Deutsch, 2003; Feuerstein 2007). Learners became more able to assess and reflect on their own progress and change (Deutsch, 2003; Feuerstein et al, 2010). Our findings confirm that mediated learning supports the development of learners who are autonomous, confident and in control of their own learning (Lerner, 2006; Lomofsky, 2007).

The participants performed better on recognition than on recall, which is in line with what literature declares regarding preschoolers’ memory ability (Papalia et al, 2008; Patterson, 2008). The more familiar participants became with the objects and problem-solving strategies they used during the intervention, the better they recalled them. Mediated learning appeared to be effective for enhancing all three dimensions of executive functions, namely, working memory, inhibitory control and cognitive flexibility. In the case of participant 5, we argue that his poor verbal skills, inadequate visual motor and visual perception abilities could have contributed to the problems he experienced with cognitive functions in the input, elaboration and output phases of the mental act.

Based on the data, we reject $H_0$ and accept $H_1$ due to the statistically significant differences in the pre-, post- and delayed post-test results after the implementation of the intervention within both experimental groups A and B. The intensive nature of the mediated learning approach during the intervention, the individual attention and support given to participants, and the numerous opportunities for nurturing the executive functions that positively influenced the application of cognitive and metacognitive skills and strategies, and reduced the negative influence of motivational-affective factors, possibly contributed to the improvement in the cognitive development of the learners. An interesting finding that emerged is that once cognitive and metacognitive skills, strategies and cognitive functions become fixed, they are retained over time.
Limitations

It is possible that other results could have been different if the intervention was implemented over a longer period than 12 weeks. We acknowledge that the experience that we gained during the implementation of the intervention with experimental group A could have advantaged group B and influenced the outcome of their post-test results.

The CITM test could have posed a limitation to the research for learners who prefer verbal to visual learning, especially during the test phase, where no mediation is provided and verbal interaction is absent.

Aspects such as motivation, maturation, concentration and the implementation of the intervention in two separate sessions could have influenced the results. In addition, the intervention might have been more effective with individuals, as group work can pose disadvantages to progress and achievement.

The small geographically and culturally bound sample complicated the generalisation of the results, and the research design is only suitable for the formulation of tentative hypotheses.

Conclusion

This study aims to be a first step toward new research opportunities involving controlled, true-experimental studies with larger, diverse groups of participants to claim conclusively that the mediated learning improves cognitive development in grade R.

The research findings add to a growing body of research examining the impact of additional curricular interventions to improve cognitive development in grade R. In particular, our research findings alert teachers to the effectiveness of mediated learning as a novel curriculum-based teaching approach with preschool learners. Furthermore, mediation seems to be indispensable for enhancing the executive functions that are fundamental to the application of cognitive and metacognitive skills and strategies when processing information. Mediated learning provides learners with learning opportunities that are dynamic and supportive, and fosters continued engagement in learning that leads to sustainable and ongoing independent learning (Bransford 2010:xii).

In order for learners to perform better academically and to acquire important skills, their cognitive development should be purposefully nurtured as early as grade R. Early identification of cognitive difficulties can lead to early intervention, which in turn could decrease and even prevent failure at school.

Although our research was conducted on a small scale, we argue that it is important for international reading to attract potential research in other similar and dissimilar contexts related to the under-researched field of mediated learning with grade R learners.
References


“We are workshopped”: Problematising foundation phase teachers’ identity constructions

Abstract

The new Minimum Requirements for Teacher Education Qualifications (MRTEQ) document outlined by the Department of Higher Education and Training (DHET) envisages a particular type of teacher. These teachers need to be, amongst other things, reflective, committed, critical practitioners with sound content knowledge (DHET 2011). It is with this in mind that a remark made by a foundation phase teacher in Limpopo raised several questions for the research team investigating communities of practice in the foundation phase. The fact that teachers considered themselves to be “workshopped”, where something is done to them, is in opposition to the kind of teacher envisaged by government, which sees teachers as pivotal to educational transformation. This paper unpacks the implications of teachers constructing themselves as “workshopped” and its relation to workshops as vehicles through which knowledge is acquired. Using Halliday’s (1994) systemic functional linguistics (SFL), two instances of this statement used by teachers are analysed. We consider how the mode of the workshop currently presented as a form of professional development is inimical to knowledge acquisition and how it may even negatively impact a teacher’s ability to reflect on pedagogical gaps.

Keywords: Workshop, foundation phase teachers, identity construction, discourse analysis
Introduction

“We are workshopped” is a claim made by a foundation phase teacher during a recent interview in Limpopo province. Over a number of years, in a number of research contexts and across provinces each of the three authors has heard this statement in conversations with teachers. It seems to have entered into teacher discourse and become an accepted and naturalised way for teachers to express their experience of attending workshops in the context of ongoing teacher education. It is the nature of this statement that caused us to pause and reflect on its meaning and implications for practice.

This statement “we are workshopped” troubles us. Janks (2010:61) argues that people make:

Lexical, grammatical and sequencing choices in order to say what they want to say. All these selections are motivated: they are designed to convey particular meanings in particular ways to have particular effects. Moreover they are designed to be believed.

Janks’s argument is the starting point for this article: To interrogate what has become a commonplace statement by considering the meaning conveyed in this phrase, what effects it has and the implications of believing this particular statement. We draw on data from foundation phase teachers who used this statement in conversation with us and read it against recent literature on teacher identity and policy documents such as Norms and Standards for Educators (DOE 2000) and the Minimum Requirements for Teacher Education Qualifications (MRTEQ) (DHET 2011) that present an idealised construction of the teacher. We argue that the representation of teachers in these documents is in contrast to the passive “we are workshopped” identity articulated by the teachers we interviewed. Furthermore, this aspect of their articulated identity is not concomitant with the kind of teacher this country requires for educational transformation and, in addition, raises questions about the efficacy of the workshop as a mode of delivery for in-service professional development.

We begin by discussing some of the literature on teacher identity and the ideal teacher as constructed in policy documents. We use Halliday’s (1994) systemic functional linguistics (SFL) as a tool to analyse the statement “we are workshopped” and then examine two examples of the ways in which teachers, one from Limpopo and one from Gauteng, use this statement in ways we believe exemplify its common usage.

Teacher identity and agency

Poststructuralist literature contests the notion of a unified, fixed, essentialised identity. Rather, identity is foregrounded as dynamic, fluid and multifaceted (Blackledge & Pavlenko 2002). Identity is maintained by social and material conditions, but these conditions can lead to contradictions between the different identity positions that people take up (Woodward 1997). There may also be a mismatch between the collective and the individual (Welmond 2002). With regard to work on teacher identity in the South African context, Jansen (2001:242) cites the work of Drake, Spillane and
Hufferd-Ackles who describe teachers’ identities as “their sense of self as well as their knowledge and beliefs, dispositions, interests, and orientation towards work and change”. Thus, the way teachers feel about themselves professionally, emotionally, and politically (Jansen 2001) may shift based on the social and cultural conditions under which they work, and other identity positions they take up in their lives. Their teacher identity may also be in tension with official representations in policy documents.

The statement “we are workshopped” flags identity issues which alert us to the importance of exploring teacher identity in the South African educational landscape. We read this statement as an expression of teachers’ working conditions and its lexical and grammatical construction as evidence of how this affects them professionally, emotionally and politically. In fact, Sachs (2005:15) asserts:

Teacher professional identity ... stands at the core of the teaching profession. It provides a framework for teachers to construct their own ideas of “how to be”, “how to act” and “how to understand” their work and their place in society. Importantly, teacher identity is not something that is fixed nor is it imposed; rather it is negotiated through experience and the sense that is made of that experience.

The sense teachers make of attending workshops has, we contend, played a mediating role in our participants’ construction of their identities. This claim resonates with Welmond (2002:42) who argues that teacher identity refers to both the personal experience of teaching and role of teachers in a given society. It includes both the subjective sense of individuals who engage in the occupation of teaching and how others view teachers. A workshop potentially provides personal experiences for teachers, but the types of workshops presented also give clues about how teachers’ roles are collectively envisaged in a society. The state’s view of teaching and the role of the teacher are embedded in presented workshops.

There is little doubt that state apparatus, in this case its teacher development programmes, has played some part in the construction of identity held by the subjects of this paper. Welmond (2002:43) makes the case:

Because the development and maintenance of a mass education system are important functions of modern nation-states, the role that the state reserves for teachers is a critical factor shaping teacher identity. Of all the forces that influence teachers, the state's objectives for education are perhaps the most determining ones.

The state’s objectives and expectations for teachers are set out in the Personnel Administrative Measures (PAM) document. It explicitly states that ongoing professional development is expected, and core professional duties include attending “meetings, workshops, seminars, conferences, etc” (DOE 2003:5). Other roles are outlined in a number of other policy documents and an examination of these documents lends credence to Jansen’s (2001) claim that conflict can exist between the policy representations of teachers and their personal identities as practitioners. Furthermore, he suggests that this identity conflict might lie at the heart of the implementation dilemma in educational reform. The vision of this reform can be seen in the South African policy documents which contain idealised images of teachers.
Gilmour and Soudien (2009) take this argument one step further in their consideration of the current state of education. They argue that the national curriculum, which began its roll out in 1998, envisioned a teacher that does not exist. The reality is in fact a “deprofessionalised corps operating in schools” (Gilmour & Soudien 2009:288). If this is the case, then it will take more than idealised policy constructions of teachers to counter this kind deprofessionalisation. We would argue that although this ideal teacher constructed in the policies may not fully exist in reality, many teachers embody aspects of a professional teacher identity.

**Idealised constructions of the teacher in policy documents**

Since 2000 all teachers, both newly qualified and experienced, are required by policy documents to meet a set of minimum requirements. Teachers are expected to take on seven roles of the teacher which were first articulated in the *Norms and Standards for Educators* (NSE) document (DOE 2000). Ongoing educational review has led to the NSE being replaced in its entirety by the *National Qualifications Framework Act 67 of 2008: Policy on the Minimum Requirements for Teacher Education Qualifications* (MRTEQ) (DHET 2011).

The MRTEQ (DHET 2011:7) acknowledges that “teaching is a complex activity that is premised upon the acquisition, integration and application of different types of knowledge practices or learning”. It highlights the need for competent teachers who are able to adapt to changing contextual situations and disregards what it labels a technicist approach based purely on skills that rely on the evidence of demonstrable outcomes as measures of success. As such, the various types of knowledge that underpin teachers’ practice are encapsulated in the notion of integrated and applied knowledge. By explicitly foregrounding knowledge, reflection, connection, synthesis and research, the document gives renewed emphasis to what is to be learned and how it is to be learnt (DHET 2011).

The seven roles of the teacher contained in the NSE have been retained in the MRTEQ. Their order has, however, been rearranged with the role of phase specialist being given priority (table 1). We argue that this reorganisation is significant in reshaping and reprioritising aspects of teacher identity.

**Table 1: Roles of the teacher educator**

<table>
<thead>
<tr>
<th>Norms and Standards for Educators (DOE 2000)</th>
<th>Minimum Requirements for Teacher Educators (DHET 2011)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning mediator</td>
<td>Specialist in a phase, subject, discipline or practice</td>
</tr>
<tr>
<td>Interpreter and designer of learning programmes and materials</td>
<td>Learning mediator</td>
</tr>
<tr>
<td>Leader, administrator and manager</td>
<td>Interpreter and designer of learning programmes and materials</td>
</tr>
<tr>
<td>Scholar, researcher and lifelong learner</td>
<td>Leader, administrator and manager</td>
</tr>
</tbody>
</table>
The roles, the document argues, continue to be useful tools to assist in the design of learning programmes which, in turn, result in the development of teachers who are able to contribute to the collective work of educating children in a school at different stages of teachers’ careers (DHET 2011). However, for the purposes of this paper, only four roles are described and interrogated in relation to the statement “we are workshopped”.

Firstly, the teacher as the specialist in a phase, subject discipline or practice is someone who is:

Well-grounded in the knowledge, skills, values, principles, methods and procedures relevant to the phase, subject, discipline or practice. The educator will know about different approaches to teaching and learning (and where appropriate, research and management), and how these may be used in ways which are appropriate for the learners and the context. The educator will have a well developed understanding of the knowledge appropriate to the specialisation (DHET 2011:49).

This role is a demanding one for any teacher. It envisages a teacher who has in-depth subject and phase knowledge and keen insight into planning, implementing and, in this case, managing the relevant learning programmes at the foundation phase level. This role suggests that the teacher has more than a superficial general knowledge of relevant subject matter. Teachers are also required to have deep insight into how children learn and be fully aware of contextual factors that might impact learning. In fact, this role requires the foundation phase teacher to be both a phase and subject expert. It alludes to a proactive teacher; one who can take initiative to ensure that learners are both stimulated and challenged in the classroom by employing a variety of suitable teaching strategies.

The second role we interrogate is that of learning mediator. This role is described as follows:

The educator will mediate learning in a manner which is sensitive to the diverse needs of learners, including those with barriers to learning; construct learning environments that are appropriately contextualised and inspirational; and communicate effectively, showing recognition of, and respect for the differences in others. In addition, an educator will demonstrate sound knowledge of subject content and various principles, strategies and resources appropriate to teaching in a South African context (DHET 2011:50).

This definition requires a complex set of skills and mastery. We note that learning mediation is framed in terms of difference and diversity before the final sentence, which explains the concept of learning mediation. Effective mediators promote learning through the use of a variety of strategies and teaching and learning resources.
This in itself is a complex act; mastering effective classroom talk that presents sound content in a meaningful way is a daily challenge. Placing diversity first in this explanation potentially backgrounds the importance of learning. We are not arguing that understanding diverse needs and being sensitive to cultural differences is not crucial, nor should they be separated from the daily teaching, but rather that mediation of learning, which is the name of this role, is a complex act that should be foregrounded. Sensitivity to culture and diversity are not unique to this role and should be reflected in all the roles.

Teachers’ deep knowledge and ability to plan should manifest themselves in the third role, interpreter and designer of learning programmes and materials. This is outlined as such:

The educator will understand and interpret provided learning programmes, design original learning programmes; identify the requirements for a specific context of learning; and select and prepare suitable textual and visual resources for learning. The educator will also select sequence and pace the learning in a manner sensitive to the differing needs of both the subject and the learners (DHET 2011:50).

This too, is a demanding role for teachers. It also suggests a contradictory role which has to be delicately negotiated by teachers. On the one hand, they are required to be able to follow a predetermined learning programme. On the other hand, teachers are expected to be designers of original learning programmes. Deciding when to follow and when to design a programme requires, we suggest, a lot of initiative and fortitude. Teachers are also required to select and prepare appropriate learning and teaching support material, sequence and pace lessons in accordance with the subject requirements and the needs of the learners. We would argue that this role is a nuanced one that, in reality, demands that a teacher be a spirited, creative, flexible and independent thinker who can adjust to ever-changing classroom contexts.

Teachers also have to fulfil a community, citizenship and pastoral role. MRTEQ states:

The educator will practice and promote a critical, committed and ethical attitude towards developing a sense of respect and responsibility towards others. The educator will uphold the Constitution and promote democratic values and practices in schools and society. Within the school the educator will demonstrate the ability to develop a supportive and empowering environment for the learner, and respond to the educational and other needs of learners and fellow-educators. Furthermore, the educator will develop supportive relations with parents and other key persons and organisations, based on a critical understanding of community and environmental issues. One critical dimension of this role is HIV/AIDS education (DHET 2011:50).

This role could be seen to underpin the other roles. It envisages that teachers will behave in ways that are far removed and much more demanding than merely being the passionate and nurturing teacher who loves children (Day & Kington 2008). It requires the teacher to be both a role model and a teacher of democratic values and practices; a person who teaches for democracy, through democratic practices. In fact, this requires a teacher who is able to promote those identified dispositions in children such as responsibility, perseverance, curiosity and trust that support and enrich learning
(Carr 2001). The success of this role requires cultural awareness and an understanding of diversity, although it is not explicitly stated. In short, this role creates the image of a proactive teacher who can take the initiative, negotiate difficult learning terrain, reflect critically and work collaboratively with all members of the school community.

In taking on these roles, we argue that teachers need to negotiate their individual identities in relation to the collective and social and material conditions under which they work.

**Analysing the statement “we are workshopped”**

In thinking about the statement “we are workshopped”, we felt that it was important to define what the word workshop means. In its original usage, workshop was used as a noun. It is the room or place in which items are made (Corpus of Contemporary American English 2013). In its modern usage it also refers to a “usually brief, intensive educational program for a relatively small group of people that focuses especially on techniques and skills in a particular field” (Corpus of Contemporary American English 2013). Workshops are described as instances where a group of people usually work collaboratively in an interactive or hands-on way. In an educational setting a workshop’s aim may be to improve an aspect of practice in an interactive way.

The term is ubiquitous in educational settings, but the meaning appears to have shifted. Informal conversations with teachers and presenters, in fact, reveal that such training/short courses are often not the interactive group collaborations that define a workshop, but more often a transmission model of training with large numbers of teachers attending. This was evidenced by the initial CAPS training in Gauteng. Thus, the way the word workshop is currently used colloquially, we would define as, some form of input for teachers to improve knowledge and skills that are not necessarily delivered in an interactive mode for a small group. And, we would argue, this mode of presentation is ironically at odds with the concept of learner-centred education.

The construction of this statement was interesting. We used aspects of Halliday’s SFL to analyse the statement and interrogate its meaning. Language, for Halliday (1994:xvii), is a “system for making meaning”; a social semiotic resource that people use. Rather than foregrounding an analysis of syntax and surface structures, SFL emphasises the choices made in producing linguistic structures during communicative acts. Halliday (1978) argues that language transmits, maintains and can change the social order.

Understanding that the “lexical, grammatical and sequencing choices” teachers make are motivated (Janks 2010:61) and that these particular choices then negate other choices, provides some insight into how teachers construct their professional identities.

Halliday (1994:101) posits that the framework he provides for analysing clause structure (in this case, “we are workshopped”) is important because it provides the “frame of reference for interpreting our experiences of what goes on”. This
framework has three aspects: The process (what is going on), the participants (the who or what of the process) and the circumstances under which the process happens.

In terms of the participants in this clause, the participants are referenced by the pronoun “we”, which implies that the speaker sees herself as part of a group. When these workshops comprise a group of teachers coming together for a particular purpose, it is unsurprising that the speaker identifies herself as belonging to this group. A second set of participants, those who run the workshop, are absent in this construction. But, in the second example from teacher interviews that we present later in this paper, this speaker made a different lexicogrammatical choice by saying, “they workshoped us”, which introduces the missing nominal group. This group is also referred to using a pronoun. “They” refers to the DOE officials who run the workshops. Workshops are seldom run by groups. Workshops are usually run by an individual presenter/facilitator. It could be argued that the use of “they” and “we” constructs an us/them binary. In this construction the workshop presenters represent the education department which is set against teachers as another group rather than different stakeholders who all attended a workshop in different capacities.

The use of pronouns in the two constructions reveals the working of power relations where the “they”, the education department, does things to the “we”, the teachers. Fairclough (1989:33) notes that:

Institutional practices which people draw upon without thinking often embody assumptions which directly or indirectly legitimize existing power relations. Practices which appear to be universal and commonplace can often be shown to originate in the dominant class or the dominant bloc, and to have become naturalized (original emphasis).

Going to workshops organised and run by the department is what teachers are expected to do – the practice of attending these often compulsory events is a part of teachers’ discourse. The fact that the presenter is not named, although workshops can be and are run by other organisations and experts apart from the education department, could imply a number of things. It might be that the audience who hears this statement knows that the absent participant/s (or the “they”) is/are connected to the department because they are likely to form part of the group referenced by the pronoun “we”. The lack of specific reference to who runs the workshops may indicate a lack of knowledge of workshop content and/or presenters’ identities. This was the case with Miss G, the teacher we discuss later in the paper.

In analysing the processes involved (what is done), the use of the verb “are” indicates a relational process, a process of being. In the teachers’ grammatical construction, the use of the verb “are” implies a relational process: x = y (Halliday 1994). This means that the x, “we”, is in essence the outcome of the workshop rather than the people involved in a workshop who collaboratively or interactively make something or improve skills or practice. When “workshopped” is used as a verb it usually implies that something (like a play) is worked on to produce a particular outcome (e.g. an adapted play). What is implicit in this particular usage is that people interact together to create an outcome. (“We workshopped the play to perform for
a school audience”). But, in the workshopped construction, the use of the present passive implies a lack of agency. Something is done to the group.

We would argue that there are possibly traces of the older meaning of workshop present here. In this usage of workshopped, what is made are the teachers. They are what emerge from the workshop, rather than skills or techniques or new practices they have learned. This is also evident in the construction: “They workshopped us”. The image of teachers being constructed or reconstructed, worked on, rather than working together, works to position teachers as disempowered rather than empowered.

One concern that may be raised about our interpretation of this statement that constructs the teacher as passive and dependent rather than active and independent, relates to language usage. It could be argued that for second language speakers of English this statement may be a turn of phrase. But we have heard this statement across language and race groups. In discussions with African language speaking colleagues about how this sentence would be said in African languages, it appears this statement is not a direct translation into English. This sentence is not a grammatically incorrect translation from these African languages. Rather, it is a reflection of how teachers from different racial and linguistic backgrounds construct their experience of the workshop as disempowering, and thus it raises questions about the professional identity of many teachers in this country. It also raises questions about the type and quality of training that is made compulsory for them to attend.

In addition, neither of the statements (“we are workshopped” and “they workshopped us”) contain any information about the circumstances (time, place, manner) in which these workshops take place. This information could easily be given by teachers. The fact that no reference is given to circumstances within these sentences, we argue, is important for teachers. The lack of specific circumstances could be seen to be indicative of a process that holds little value for teachers in increasing their own knowledge base and skills, and thereby contributing to a strong professional identity. Or, as reflected in the use of the simple present tense, the repeated action may in fact be a mundane and forgettable event that does not stand out as worthwhile. This point is strengthened when one considers pronoun choice and the absence of names of workshop presenters.

Data set and analysis

In January 2013, when reviewing data collected in an ongoing research project into foundation phase teacher development, the authors were struck by a remark made by one participant that she “had been workshopped”. Further reflection by the authors revealed that over a period of at least five years they had all heard similar remarks being made by research participants in a number of different research projects located within the foundation phase (Excell, 2011; Dixon; 2011; Wits School of Education, 2009). In all these instances we had heard this statement in informal conversations with teachers and it re-emerged in semi-structured interviews.
The four research projects mentioned above were all investigating specific aspects of foundation phase pedagogy. All the projects were qualitative in nature and the number of participants varied from six in the smallest project to eighty three in the largest of these projects. In all projects data collection followed a similar pattern. After obtaining permission and ethical clearance for the research, we began with classroom observations. The observation periods varied in length. In all of the projects specific foundation phase lessons were observed. The researchers took detailed field notes during the observations. The observations were guided by the specific foci of the projects. In the two instances we present here the observation instrument was informed by the notion of productive pedagogies (Hayes, Mills, Christie & Lingaard 2006), which builds on the work of authentic pedagogies done by Newmann and Associates (1996). The observation schedule that provided the basis for the classroom observations was adapted from one used in an Australian study entitled, In Teachers’ Hands (Commonwealth of Australia 2005). After each classroom observation, participants in all the research projects (n = 108) were invited to take part in an individual semi-structured interview. Common to all interviews were questions centring on teachers’ perceptions of themselves and their views of curriculum development and implementation, as well as their own professional development. However, as already mentioned, it was only during our current research project that the remark “we are workshopped” struck a particular chord. We were then challenged to go back and retrospectively review previous data sets from the other three research projects to explore other instances of this usage when the participants had made reference to being “workshopped”. This exploration, we thought, could provide insight into the effect and implications of the usage of this statement.

Twenty transcripts which contained references to workshops were identified. It is important to note that in none of the interviews was professional development through workshops a focus – rather this was unsolicited and raised by the teachers themselves. Had such a question been posed the incidence of this statement may have been higher across all the data sets. But what the data highlights is the usage of the statement in teacher discourse, particularly when teachers talk about professional development.

We present two examples of teachers’ particular use of this statement: One experienced grade 2 teacher from Limpopo (Mrs L) and one relatively inexperienced grade R teacher from Gauteng (Miss G). The data selection was influenced by the fact that the teachers are located in different provinces, and that despite their different backgrounds, training and experience they both talked about being “workshopped”. In addition, Miss G was interviewed in 2009, and Mrs L in 2012, which we contend depicts a particular state of being that appears to be consistent over a period of time. In the first example we consider the way in which Mrs L describes her experience of a workshop. In the second instance we examine the way in which content from a workshop was taken up by Miss G. In choosing only two examples we do not aim to make generalised claims about teachers’ experiences of workshops. These examples
illustrate the ways in which specific experiences of the workshop are represented and the implications of these experiences which, we argue, should be interrogated.

Mrs L’s workshop experience

Mrs L has been teaching for 19 years. What was striking in her interview was her strong identification with her pastoral role. During the interview she stated she became a foundation phase teacher because she “likes working with small kids. I’m patient and small kids need a patient somebody.” She further commented on the importance of laying a strong foundation to ensure children reach their academic potential. Like many foundation phase teachers, her professional identity is framed by a nurturing component (Anning, 1997, 2006; Day & Kington, 2008).

The pastoral role is not sufficient. Mrs L identified elements of other roles of the teacher when she said “it’s important to know the curriculum, to know the kids and their background”. She also discussed the importance of her own continuous learning:

You must keep on learning. Don’t say that I’m teaching the small kids and then you relax and ... don’t do anything ... You must keep on reading ... They keep on sending us the ... the different types of policies and if you don’t read them [the policies], you won’t be able to walk step by step with them [the children] in terms of the ever-changing education.

Despite her implicit acknowledgement of the roles of the teacher in terms of being a specialist in disciplinary and curricula knowledge, a learning mediator and lifelong learner, she admits to being overwhelmed by curricula changes and alternative pedagogies:

The education system is confusing us. Training ... OBE, [happened] out of the blue ... We start doing this and I’m not trained to do that thing. It becomes very difficult... We are trained for three days or for a week ... I think we have the knowledge; it’s just the government is confusing us by ever changing the knowledge – we have got the knowledge – immediately when they introduced the new education system they must train us – train enough. The knowledge we have got, it’s just that the government is confusing us... When we are still busy doing this they change ... adjust, and then they change to a new thing altogether ... They are confusing us ... Every five years ... [they the government] politicise education ... They keep on confusing us (our emphasis).

There is a tension in Mrs L’s explanation. She states that she thinks she has the appropriate knowledge (“I think we have the knowledge”), but in the face of ongoing change they have confused her. Importantly, it is interesting that the passive construction re-emerges in the rest of her discourse. Mrs L makes five references to her confusion. Firstly Mrs L blames the system for her confusion – “the education system is confusing us”. She then blames the government for the confusion (“the government is confusing us”, “they must train us”, “they keep on confusing us”), because they “change to a new thing altogether”. Then she emphasises her discomfort with change by expressing it as a continuous state, “they keep on confusing us”. The binary construction between us (the teachers) and them (the department) is apparent. Mrs L uses the first person pronoun to express what she understands about the group (“I think we have the knowledge”). Her use of the third person pronoun places her
as a member of a group who has continuously been confused by them. Although she mentions it being necessary to read the policy documents, her insistence on training is seen as a panacea for confusion rather than an opportunity to draw on the knowledge and skills of a phase specialist.

Mrs L’s remarks appear to indicate a loss of confidence and insecurity within her classroom. For example she references a normalised teacher-centred pedagogy that forms part of her teacher identity: “[We] are used to standing in front, most ‘specially in foundation phase – and teaching them”. This practice is challenged during workshop training:

We teach them and somebody comes and says you must not spoonfeed these kids, you must give them work to do. Just imagine …. A grade 2 foundation phase learner needs to be spoonfed.

Her comment reveals an understanding of learners as passive receivers of knowledge and constructs them as dependent, needing to be given work. The role of learning mediator and phase specialist envisaged in the documents (DHET 2011) is at odds with her own idea of “how to be” and “how to act” like a teacher (Sachs 2005:15).

Rather than address these different identity constructions, the workshops appear to cover pedagogical practices without engaging teachers’ beliefs or the theories underpinning desirable practices. This is made evident by Mrs L feeling that she was unable to articulate her views on spoonfeeding in the workshop. If the mode of delivery for a workshop was aligned with its original definition, then its collaborative nature would have enabled teachers to engage in discussion. We suggest that the mode of the workshop and the environment created may in fact compromise teacher knowledge and confidence, and thus their professional development.

An inability to express opinions can create a sense of dependency. When asked what would assist her to provide quality teaching, Mrs L replied “more workshops”. She stressed the importance of “the workshops, when they, they workshop us (our emphasis).” She talked about needing facilitators to provide more support:

then when they did the follow-up it’s then that they help us. But if they don’t come, I don’t know whether what I’m doing it’s the right thing. When they come they sit down like we do and then they ask me to give them my file and they page through. Then they see what I am doing. If I’m not doing something correctly then they correct me. Then they tell me that on this day, on this date, we’ll be back to see whether you have improved, that thing helps a lot.

When Mrs L was probed further in the interview, one-on-one follow-ups appeared to be more valuable than the workshops. But she also noted that this type of support is infrequent and unreliable. We contend that when workshops do not adequately address the consequences of shifting teacher knowledge and practice, the result may be confusion. Confusion undermines the way teachers feel about themselves and their conditions of work (Jansen 2001) thus inadvertently reinforcing old practices, and creating a discourse of disempowerment. Mrs L’s interview reveals a committed, caring teacher who is not sure how to be, act or understand her work (Sachs 2005:15).
But, she was not averse to personalised attention to improve her understanding and classroom practice.

**Miss G implementing workshop training**

Miss G was teaching at a government primary school for three years. She was one of two grade R teachers, each with a class of 48 children. This study was conducted in 2009 when schools were following the Revised National Curriculum Statement (RNCS) (DOE 2005). It was during classroom observations and the subsequent interview that the particular incident relating to the statement “we are workshopped” took place.

Miss G presented a movement ring (similar to a physical education lesson) to all the grade R children. She took approximately 70 children onto the rather sparsely grassed playing field. On a hot November morning the hatless children participated in this ring, which lasted for over 45 minutes – a long time for any teacher-guided grade R activity. Miss G instructed the children to make a ring by holding hands and forming a large circle of which she was part. Because of the location (outdoors) and the size of the ring, it was very difficult for the children to hear and therefore follow any instructions. The children did their best to follow, often copying other children. There was no break between the different activities and children were not really given sufficient time to explore any of the suggested movements fully. Many children became restless and inattentive, some started crying and others ceased to participate. But the ring carried on until its planned completion. There were enough different activities to form the basis of a term’s movement rings; especially if concepts and skills inherent in each activity were fully explored. For example, this movement ring included creative dance, locomotor and non-locomotor movements, educational gymnastics, as well as music, which are all components of an early childhood programme.

It was during the interview (when probing aspects relating to curriculum development) that Miss G made a remark in relation to a workshop held in her district that she had recently attended. She commented: “We were workshopped with LO4” (Learning Outcome 4). Initially it was difficult to place the remark in context, because all eight designated learning areas comprising the RNCS (DOE 2005) had a range of learning outcomes. When asked which learning area she was referring to she could not name it. After further probing, Miss G said this outcome was related to the movement ring. She was asked if she was referring to the Life Orientation learning area (in this learning area, physical development was described as the number 4 learning outcome). She could only repeat that, “they said we should do these things to meet LO4”. She then stated, “at the workshop we [grade R teachers] have been shown many different movement activities that we can do with the children”. It transpired that Miss G had incorporated every activity that had been demonstrated at the workshop into the observed movement ring.

Based on her account, the workshop’s aim was to support and improve her practice and appears to have specifically met three roles of the teacher educator (phase

From the observation and interview it is apparent that Miss G is struggling to meet these roles. Her inability to connect LO4 to the curriculum indicates her lack of understanding of the curriculum as a phase specialist. Therefore the workshop was seemingly not successful in supporting teacher professional development. Miss G also did not appear to have a deep understanding of the value of movement in early learning (Gallahue & Donnelly 2003). This would be expected phase knowledge for a grade R teacher. A lack or limited knowledge of the curriculum and understanding of how children learn (learning mediator) has a knock on effect, as her programme design took on a one-size-fits-all approach. These misconceptions cannot all be addressed in a single workshop.

This incident raises questions about workshop design and teacher needs:

• What are the assumptions made by workshop designers about what teachers should already know and understand? (Was a knowledge of movement in early learning assumed?)

• What are teachers’ assumptions about the outcomes of workshops they attend? (Will they get practical advice for lessons or just information about curriculum changes?)

• How does the situation arise that a teacher can attend a workshop, yet not know what it was about? (Was the content not made clear, was the mode of delivery inappropriate or do teachers think there is no benefit and “zone out”?)

This is a teacher who attended a workshop, who felt that she had learned something. She showed some initiative and tried to implement it for an observed lesson. But it became apparent that the workshop had not made it clear how to explicitly sequence and pace these activities, i.e. how to appropriately implement the content over a period of time. Had the workshop been run in its correct format, these issues would likely have been addressed, even if not explicitly, because teachers would have planned together. It is possible that when teachers’ experience of workshops is that which gets done to them they then do the same to their learners, falling back into a teacher-centred role.

What emerges for us from Miss G’s experience is her misunderstanding of content appropriate for teachers and content appropriate for children. As a mode of delivery, workshops should be practical applications of theorised pedagogy. But when this term has come to mean a (mass) transmission model of curriculum change, not a model of refinement and improvement of practice for professional development, then confusion is understandable. We would argue that what teachers think they are getting (practical ideas for teaching) is not what facilitators are delivering (mass transmission), and this results in confusion where teachers like Miss G take the workshop content and transpose it directly into their teaching. Teachers’ roles are undermined if they believe they are only at workshops to receive input.
In Mrs L’s case a real workshop model would have interrogated the notion of spoonfeeding. She is not completely incorrect in her assumption; there are times when rote learning and spoonfeeding might be appropriate in the foundation phase, for example, when learning Dolch words. But it is not appropriate if it is the only pedagogical approach. If teachers are workshopped, rather than participants in a workshop, the knowledge they do have is silenced. Participants do not have a chance to explore and build on their understandings of good pedagogy. For an experienced teacher to feel she had no voice to express her opinion means that inexperienced teachers like Miss G might also not be in a position to ask for clarification, let alone express dissent. This has implications for the ways in which teachers feel about themselves professionally and emotionally (Jansen 2001), and how receptive they are to change.

Conclusion
What we have tried to show in our analysis of the statement “we are workshopped” and the examples of these two teachers’ experiences are the consequences of being workshopped. There is repeated mundanity in the choice of tense, the use of the passive and the change of workshop into a verb. The meaning that results from this specific wording (Halliday 1994) reveals that teachers who used this statement construct themselves as dependent. The binary us/them construction of the department doing things to the teachers also points to a power relationship that potentially undermines, rather than supports, the kind of teacher the department holds as ideal. The experience of attending workshops by the teachers in our examples do not work to empower them or let their voices be heard, but reinforce a passive identity construction. There seems to be a gap between what is provided and what teachers need.

We are not suggesting that all workshops are transmission modes, or are ineffective in meeting the needs of teachers. Nor are we suggesting that the onus is solely on the department to empower teachers, because that would imply that teachers have no agency in negotiating their own professional identity. We are also not suggesting that all teachers lack agency, or lack agency all the time. What we do want to highlight is, what we think is, a disturbing trend captured in teacher discourse around professional teacher development. By believing things are done to them they undermine their ability to meet the roles of the teacher desired by the department.

The mode and content of current teacher professional development needs to be critically assessed. This assessment needs to take what teachers say about how professional development is offered seriously, because what they say conveys particular meanings with particular effects (Janks 2010). The effects of a teaching corps who use language to express a lack of agency is in no one’s best interest.
References


Dixon, Excell & Linington – “We are workshopped”


Endnotes

1. We are not arguing that this is the first instance in which this statement is made. But, that it has been identified as occurring within this data set at this particular time. Further research would need to be done to establish when this statement entered into teachers’ discourse.
Caroline Fitzpatrick

Bridging the gap between advantaged and disadvantaged children: Why should we be concerned with executive functions in the South African context?

Abstract
Reducing the economic and social burden associated with poor academic achievement represents an urgent concern in South Africa. Increasingly research suggests that child characteristics in kindergarten play an important role in charting courses towards academic success and educational attainment by early adulthood. Although math and reading skills are important predictors of later achievement, executive function skills which underlie children’s ability to focus attention and become autonomous, self-directed learners also play a key role in later adjustment to school. Disadvantaged children perform more poorly on tests of achievement and executive functions. Furthermore, executive functions have been found to partially account for the relationship between socioeconomic status and later achievement. It is possible to target executive functions in at-risk children using specific interventions. These programs are generally cost-effective. It is proposed that increasing efforts towards promoting executive functions in preschool-aged children represents a promising strategy for reducing economically based disparities in the education and eventual life chances of individuals.

Keywords: School readiness, academic achievement, executive functions, socioeconomic status, preschool interventions

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Introduction
Poor achievement and high school dropout represent urgent social concerns in both
developed and developing countries. In particular, poor educational achievement
in a population is associated with reductions in a country’s human capital formation
(Heckman 2007). On an individual basis, poor academic attainment undermines
personal success, health, well-being, and ultimately reinvestment in society (Card,
North America, the average lifetime cost to society per high school dropout is
estimated at over 150 000 American dollars. There are several reasons for this. Youth
who drop out of high school go on to pay on average three times less taxes over
their lifetime and require and use more social services (Bowlby 2005). Individuals
who are less successful in school also tend to suffer more health problems because
they engage in more risky health-related behaviours (Freudenberg & Ruglis 2007).
Consequently, on a national level, the cost to the medical system of a high school
dropout is on average three times greater than that of an individual who persists to
high school completion. Furthermore, poorly educated individuals are more likely to
be involved in and arrested for crimes, which incur further costs on the justice system.
For these reasons, economists estimate that increasing graduation rates would
therefore translate into substantial savings in the criminal justice system. Given the
high human and economic cost of underachievement, the prevention of academic
failure and dropout has become important from a social policy standpoint.

School readiness
Promoting children’s readiness to learn at kindergarten may represent one of the
most efficient ways to decrease dropout and the important social costs it engenders.
Research has shown that the process leading up to high school dropout does not
emerge in high school, but rather can be traced all the way back to kindergarten
(Alexander, Entwisle & Horsey, 1997; Entwisle, Alexander & Olson, 2005). This finding
has led to an increased interest in school readiness, which refers to child cognitive,
psychosocial, and physical preparedness to meet the challenges of the classroom
at the time of school entry (High, 2008; Zuckerman & Halfon, 2003). Inherent in the
concept of school readiness is the idea that if we can somehow make sure children are
well-prepared to learn by the time they begin first grade, we can prevent them from
falling behind, and set them off on a trajectory of academic success.

Not all children arrive at school equally well prepared to learn on the first day
of class (Duncan, Brooks-Gunn, Dowsett, Claessens, Huston, Klebanov, Magnuson,
Huston, Klebanov, Pagani, Feinstein, Engel, Brooks-Gunn, Sexton, Duckworth & Japel,
2007; High, 2008). As a result, research on school readiness has several important
areas of application. First, developing empirically validated early assessments of child
skills that predict later achievement allows us to better identify children who run
the risk of experiencing later academic difficulty. Second, school readiness research
has shed light on the relative importance of different academic skills to later child
achievement. Finally, research which has examined how school readiness skills predict success above and beyond socioeconomic and family factors helps inform the development of interventions that are likely to be effective with children facing socio-demographic risk.

One of the most important studies of school readiness was conducted by Duncan et al (2007). Methodologically, this piece represents a benchmark for school readiness research because of its large sample size and rigorous control of potentially confounding variables. This study followed over 36,000 children from six longitudinal data sets in Canada, the United States, and the United Kingdom. The authors examined a comprehensive set of kindergarten school readiness indicators including child intellectual (math and reading skills) and behavioural characteristics (attentiveness, internalising and externalising problems, and social skills) to assess which skills would be most predictive of children’s academic success in the second grade.

Remarkably, the results were consistent across all six longitudinal data sets. Kindergarten number knowledge was the strongest and most consistent predictor of later achievement in both math and reading, followed by early reading skills and attention skills. When a meta-analysis was conducted on the pooled data sets, the results remained robust. The inclusion of a large number of control variables in this study helped researchers estimate the unique and relative importance of school readiness skills, above and beyond a number of potentially confounding child and family characteristics. Results revealed that the associations observed in Duncan’s study could not be accounted for by child ethnicity, sex, age, birth weight, maternal language or number of siblings. Nor were they explained by maternal age, education, depressive symptoms, parental aspirations for their child’s education, socioeconomic status, presence of children’s books in the home, neighbourhood quality or children’s enrolment in daycare. In sum, children’s kindergarten math, reading and attention skills predicted achievement two years later regardless of the types of homes children came from.

Surprisingly, other school readiness indicators suspected to be important for academic success (child social skills, aggression and emotional distress), did not reach statistical significance. Recently, Duncan’s 2007 study has been replicated with more diverse samples from Canada and the United States (Grissmer, Grimm, Aiyer, Murrah & Steele, 2010; Pagani, Fitzpatrick, Archambault & Janosz, 2010; Romano, Babchishin, Pagani & Kohen, 2010). In addition to replicating Duncan’s results, researchers have also expanded these findings to show that kindergarten fine motor skills also represent key independent predictors of later achievement in elementary school (Grissmer et al, 2010; Pagani et al, 2010).

**Promoting the mechanisms of learning**

Because of strong empirical evidence for their involvement in later achievement, there has been a strong emphasis on increasing children’s knowledge of numbers and vocabulary prior to school entry. Although this represents a worthwhile pursuit,
a focus on content knowledge without considering the mechanisms of learning is likely to miss the boat developmentally speaking (Blair 2002). When surveyed, a large proportion of kindergarten teachers in the United States reported that close to half of their students are ill-prepared to meet the challenges of the classroom. Most teachers specifically identified problems with children’s ability to focus attention, sit still and follow instructions in the classroom. In contrast, fewer teachers identified children’s lack of skills in math and reading as problematic (Rimm-Kaufman, Pianta & Cox 2000). Furthermore, teachers tended to report that children’s ability to self-regulate behaviour, pay attention and effectively manage behaviours are among the most important student skills (Rimm-Kaufman et al 2002). Poor self-regulation on the behalf of children also contributes to growing rates of teacher burnout and may be responsible for high rates of expulsion from preschools and psychotic drug prescriptions given to very young children (Gilliam & Shahar, 2006; Hastings & Bham, 2003; Olson, Crystal, Huang & Gerhard, 2010). In sum, how teachable young children are in the classroom may play an important role in early academic success. For this reason, neuroscientists increasingly suspect that efficient strategies should include components that foster child self-regulation and strong learning skills that enhance the acquisition of knowledge (Bierman, Domitrovich, Nix, Gest, Welsh, Greenberg, Blair, Nelson & Gill, 2008; Blair & Diamond, 2008).

Executive functions

Which skills are likely to underlie children’s ability to manage their own behaviour and attention in the classroom? Research in the field of neuroscience has highlighted the importance of cognitive skills known as executive functions for helping individuals exercise control over their own behaviour. Executive function skills are mediated by the prefrontal cortex and undergo considerable development between the ages of 3 and 5 (Garon, Bryson & Smith, 2008; Marsh, Gerber & Peterson, 2008). These skills are involved in self-organisation, emotion regulation, the monitoring and changing of ongoing behaviour, the ability to plan future behaviour and the ability to develop effective strategies when faced with novel tasks and changing situations. Executive functions are central to children’s ability to adapt to new situations and engage in goal-directed, deliberate or effortful behaviour. For these reasons, they are critical for child adjustment in the elementary classroom setting.

Three main components of executive functions are inhibitory control, working memory, and attention (Garon et al 2008). These skills are correlated, yet remain dissociable from one another (Miyake, Friedman, Emerson, Witzki, Howerter & Wager 2000). Inhibitory control allows children to override automatic responses in favour of more adaptive, goal-directed or effortful behaviour. Working memory helps children keep information online during problem solving tasks. As a result, working memory is an important contributor to children’s ability to keep time, represents meaning during reading activities and holds units of information in mind while solving math problems. Finally, attention shifting and control play a role in helping children hold and refocus attention towards relevant stimuli.
Poor executive function ability in children is likely to manifest itself in a number of noticeable ways in the classroom. For example, some children may keep disorganised desks and messy lockers. Such children may also engage in more risky thrill-seeking behaviour. Children with lower levels of executive functions have a hard time sitting still, following sequential instructions and managing time. Poor executive functions are also associated with difficulties in controlling impulses to lash out when frustrated, interpersonal communication and social problem solving. Consequently, poor executive functions are often accompanied by difficulties cooperating with others and poor relations with peers (Lee, Lahey, Owens & Hinshaw, 2008).

Preschool executive functions deficits are linked to a greater risk of developing psychopathologies. Difficulty with inhibitory control is considered a central factor in childhood attention deficit hyperactivity disorder (ADHD) (Barkley 1997). Other research has provided evidence that poor frontal lobe functioning and executive functions may underlie the poor behavioural restraints observed in conduct disorder and more severe antisocial personality disorder (Moffitt, 1993; Moffitt & Henry, 1989). Finally, poor executive functions have been shown to play a role in the development of anxiety disorders (Airaksinen, Larsson & Forsell, 2005; Tucker & Derryberry, 1992).

Executive functions and school readiness

Executive functions in young children are likely to play an important role in helping children acquire the skills they need to succeed upon transitioning to formal schooling. There is a strong link between preschool executive function skills and kindergarten performance in math (Blair & Razza, 2007; Bull & Scerif, 2001; Butterworth, Varma & Laurillard, 2011; Cirino, 2010; Fitzpatrick & Pagani, 2012). Other research suggests a strong link between child executive functions and the ability to spell, compose, edit and understand written content (Altemeier, Abbott & Berninger, 2008; Altemeier, Jones, Abbott & Berninger, 2006; Blair & Razza, 2007). Finally, executive function skills are also important for helping children meet the social and interpersonal demands of kindergarten and elementary school classrooms.

Better executive functions at school entry can also favour children’s classroom engagement (Fitzpatrick & Pagani, 2012; Razza, Martin & Brooks-Gunn, 2010). Classroom engagement refers to children’s ability to remain on-task and successfully adapt to the demands of the classroom environment. An engaged child works autonomously, follows directions, completes tasks on time and works cooperatively with other children. Consequently, classroom engagement skills are likely to require inhibitory control, working memory and attention shifting skills. When considered as school readiness indicators, classroom engagement has been found to predict achievement and psychosocial functioning above and beyond math and reading skills (Fitzpatrick & Pagani 2013).

The development of executive functions

Executive functions develop as the prefrontal lobes mature during childhood and early adulthood (Marsh, Gerber & Peterson 2008). Even though the prefrontal
cortex develops well into the twenties, it undergoes rapid improvements during the preschool years (Shonkoff & Phillips 2000). Brain development prior to age 5 culminates in children’s increased ability to exercise wilful control over behaviour and to delay gratification (Mischel, Shoda & Rodriguez 1989) and to understand the inner states of others through the acquisition of theory of mind (Sabbagh, Xu, Carlson, Moses & Lee 2006). Although genes provide the basic blueprint for brain expansion and the development of executive functions, these skills remain highly sensitive to early environments and experiences (Shonkoff & Phillips 2000).

Unfortunately, the home environments of disadvantaged children differ systematically from the environments of their more advantaged peers (Duncan, Kalil & Ziol-Guest 2013). Children that grow up poor experience more family instability, stressful life events and harsh and/or inconsistent parental discipline. They are also more likely to be victims of child abuse and neglect, and are exposed to more violence in their homes (Duncan & Brooks-Gunn 1997). Finally, disadvantaged children are read to less, watch more television, attend poorer quality daycares, have lower quality diets and are exposed to more pollutants in the air they breathe and water they drink (Evans 2004). Each of these factors has been shown to have an adverse effect on brain functioning. The cumulative experience of these risk factors is therefore likely to significantly undermine neurocognitive development.

Educational and cognitive inequalities between children who grow up in poverty and their more affluent peers are evident early in life (Bradley & Corwyn, 2002; Duncan, Yeung, Brooks-Gunn & Smith, 1998). By age 2.5, disadvantaged children have smaller vocabularies, perform more poorly on tests of general cognitive ability, and have lower scores on tasks that require executive function skills (Hackman & Farah, 2009; Noble, McCandliss & Farah, 2007). These differences widen by the time children enter school, persist in the elementary school years and take their biggest toll on high school graduation rates (Duncan & Brooks-Gunn 1997).

Enhancing executive functions
Although executive functions are not typically targeted through interventions, they can be. Computerised training, classroom instruction and curriculum, aerobic exercise, mindfulness training and martial arts have all been found to have a positive effect on child executive functions (Bierman et al, 2008; Diamond, Barnett, Thomas & Munro, 2007; Flook, Smalley, Kitil, Galla, Kaiser-Greenland, Locke, Ishijima, Kasari, 2010; Kamijo, Pontifex, O’Leary, Scudder, Wu, Castelli, Hillman, 2011; Klingberg, Fernell, Olesen, Johnson, Gustafsson, Dahlstrom, Gillbert, Forssberg & Westerberg, 2005; Klingberg, Forssberg & Westerberg, 2002; Lakes & Hoyt, 2004; Lillard & Else-Quest, 2006). It is noteworthy that physical training and martial arts, which are not traditionally thought to improve cognitive performance, were linked to the development of executive functions. This suggests that recent tendencies to reduce time devoted to physical education in schools may not be ideal for the promotion of executive functions. Furthermore, a common general finding, which emerged from the evaluation of these interventions, is that they tend to be most beneficial for children considered at higher
risk (Diamond & Lee 2011). These include children with initially lower levels of executive function ability, children from disadvantaged families, children with ADHD, as well as boys (Diamond & Lee 2011). Consequently, targeting executive functions appears especially promising for equalising inequalities in achievement between advantaged and disadvantaged children.

**Conclusion**

Old wisdom dictates that “a stitch in time saves nine”. Today, research confirms this old adage. Economics and the neuroscience of early brain development have shown that for every dollar invested in a high quality preschool interventions, a return of 9 dollars can be expected (Heckman 2006). From a public policy perspective, investment in preschool children therefore represents a rather lucrative investment of taxpayer dollars. Well-designed and carefully implemented preschool programmes hold the greatest potential for reducing socioeconomically-based disparities in achievement, which fuel the intergenerational transmission of poverty. In particular, targeting executive function skills, which underlie the ability to learn and exercise self-control, can benefit later professional and personal success. The successful implementation of these interventions may therefore represent our most promising strategy for reducing a number of expensive social problems including high school dropout, employment, and involvement in crime.

**References**


Integrating different forms of knowledge in the teaching qualification Diploma in Grade R Teaching

Abstract
From a view of multiple types of knowledge for a blend in teacher education, the paper discusses the need for epistemological diversity in the types of knowledge for grade R teacher education. I claim in this article that for epistemological diversity, innovative mixes of knowledge are required and that they have to be explicated. The argument of the article is that the decisions made by teacher educators when constructing a curriculum for a new grade R qualification are especially challenging because of the narrow purpose of the qualification. The paper offers an analysis of various models of knowledge types and mixes, outlining each one's purpose. Finally, the paper provides an epistemological distillation in a conceptual framework which can guide the process of curriculum making, offering all participants a chance to contribute to the layers underneath the patina of the painting that offers life to the curriculum.

Keywords: Curriculum, policy, knowledge mix, knowledge types, teacher education, conceptual design, diploma in grade R Teaching, collaboration
Introduction

*If teaching is an art, then the colour palette is the knowledge mix.* – Dr. Whitfield Green, Acting Director of Teacher Education, Department of Higher Education and Training

The educational climate in higher education is currently driven by a Department of Higher Education and Training (DHET) call to develop curricula according to the Minimum Requirements for Teacher Education Qualifications (MRTEQ) by 2015. This comes in response to educational challenges in this sector, for example the need to reinvigorate qualifications, to align qualifications to the Higher Education Qualifications Framework (HEQF) criteria, to promote closer links between theory and practice, to encourage active knowledge and to motivate applied knowledge sensitive to context (DHET 2010:6). Central to the debate around different types of knowledge in a teacher education curriculum are the many different interpretations of what constitutes appropriate knowledge and knowledge mixes for teacher education and how to package them. A new qualification, the Diploma in Grade R Teaching, hopes to address the needs of many practicing, but unqualified or underqualified, grade R teachers. These teachers may well be confident about their way of teaching. However, they have not been trained as students of teaching and may not have the pedagogical content knowledge (PCK)(Shulman 1987:8) and subject content knowledge to inform their practice.

Narrow focus, broad context

The purpose of the new qualification, the grade R diploma in teaching, is specific and stated as a focused programme in the Government Gazette of 15 July 2011 (DHET 2011:44):

*... to develop teachers who can demonstrate general principles, as well as focused knowledge and skills appropriate for Grade R teaching. The qualification requires a depth of specialisation of knowledge, together with practical skills and experience in a Grade R classroom teaching context ... [and] students are expected to gain experience in applying such knowledge and skills in the context of working with Grade R learners in a school.*

A challenge arising from these requirements is to bridge the gap between theory and practice (knowing and doing), while teaching to the reality of the context. Korthagen (2001:2) points out that universities generally use propositional knowledge as their basis, assuming that the student teacher will be able to apply such knowledge. While the emphasis on knowledge in the Minimum Requirements for Teacher Education Qualifications (MRTEQ)(DHET 2011) is identified as one of the major shifts which necessitate current redesign and implementation of curricula amongst higher education institutions, there is a danger that policy compliance becomes the main driver for curricula. The emphasis on a variety of types of knowledge may encourage the perception that the design is an end in itself, thereby negating the continual cycle of curriculum design, implementation and evaluation. The DHET policy provides the criteria for accreditation but it does not necessarily reflect the disparate voices of
the stakeholders. However, the reference to “integrated and applied knowledge ... understood as ... the condition for ... fusing together and expressing different types of knowing in the moment of practice” (DHET 2011:10) implies a firm commitment to the interconnectedness of theory and practice. Green (2011) stressed this point when in September 2011 he pointed out, during an information session with higher education institutions in the Western Cape, that the knowledge mixes adopted by a programme “will enable the roles and competences within a qualification [... ] if teaching is an art, then the colour palette is the knowledge mix...”

Since the broad South African context is characterised by diversity regarding teacher qualifications and experience, language usage, socioeconomic and cultural background, facilities and resources, the knowledge mix for a responsive teacher education curriculum will require sensitivity of curriculum designers. No one would disagree that teaching is a complex activity and the choices made about the different types of knowledge and the knowledge mixes (the colour palette Green refers to) created in the course of the design is no easy matter. To try to include as many types of knowledge as possible will result in overload and lack of depth, which is already a problem in undergraduate generalist foundation phase teacher education. The dualistic purpose of teacher education, namely educating student teachers to educate learners, adds to the complexity.

While the design of a new qualification has the advantage of starting with a blank canvas, the new Diploma in Grade R Teaching poses its own challenges. It is essentially a qualification with a sell-by date – it is envisaged that all teachers responsible for grades R–3 will ultimately have a B.Ed. degree in Foundation Phase Education. Currently many grade R teachers or practitioners are underqualified or unqualified, and it is surmised that improved teacher qualifications will not only have a positive effect on the quality of teaching and learning in grade R, but also impact positively on the rest of foundation phase and beyond (SAIDE 2011). However, without careful planning the diploma could fall into the category which Warford (2011:257) refers to as a “quick-fix teacher-proof” training scheme “hatched at the height of accountability movement(s)”. There is little doubt that South African education is currently experiencing an accountability movement with international, national and regional tests to measure our learners’ and teachers’ competence in predominantly mathematics and language. Both universities and governmental departments are spending huge amounts of money on quality assurance. The announcement of a new qualifications framework for universities can probably be seen as part of the accountability movement. An important question is, however, whether the accountability movement is primarily focused on the fiscal needs of the country or whether it is aimed at improving general wellbeing of its citizens and their environment – a situated wellbeing with transformative overtones. Samuels (2009:743) warns that the priority of policies is measurable output.
The need for a wider lens

A wider lens may recognise the interdependence of policy, research, theory, practice and the integration thereof, resources, the personal construct of teaching of individual teachers and the importance of the school and the community context. Warford’s (2011:257) plea for a reconceptualising of the professional mission of teacher educators “from knowledge transmission to cultural transformation” is a case in point. Sadovnik (2001:689) reminds us of Bernstein’s (1977) differentiation between weak and strong classification where strong classification refers to a curriculum that is highly differentiated and separated into traditional subjects, whereas weak classification refers to a curriculum that is integrated and where the boundaries between subjects are fragile. Such flexibility may allow a knowledge mix that is responsive to both policy requirements and the complexities posed by the particular educational and social context in which the curriculum needs to function. Looking at the curriculum design process from this angle, the importance of developing a shared vision may precede the selection of types of knowledge according to policy. The vision, translated into graduate attributes, becomes the canvas. It reflects the voice of a faculty.

I would argue that the design approach described in the previous paragraph could assist in avoiding the trap of instrumentalism, marketisation, inflexible accountability systems or the traditional technical-rational model warned against by various authors (Van Manen, 1977; Cochran-Smith and Lytle, 2009; Luckett, 2001, 2009; Korthagen, 2010). Loosely framed within the conceptual fabric of the vision of a faculty, the selection of different types of knowledge and knowledge mixes are framed in the complexities of different contexts, also of different university contexts. Such a curriculum is flexible enough to remain a work in progress with both staff and student involvement. In such a curriculum there is also constant dialogue that may require adaptations. A curriculum like this answers to the need for balance with different types of knowledge articulating with each other. In the process of knowledge development in an integrated way of working with teacher knowledge, doors open to innovative linkages and for a teaching reality in which the curriculum, teacher educators, student teachers, the students’ diverse teaching environments, as well as educational challenges in South Africa, all become active partners in knowledge creation. This may be a catalyst for a clear shift away from the traditional “received knowledge and curriculum” referred to by Cochran-Smith and Lytle (2009:2).

National policy and knowledge construction

The recent policy on Minimum Requirements for Teacher Education Qualifications (DHET 2011) creates an opportunity for universities to redesign their curricula for existing qualifications and/or design for new qualifications. How then to harness this opportunity to create fully responsive curricula? Since curricula for education change is a regular phenomenon in South Africa (since 1997 with the launch of Curriculum 2005 the school curriculum has changed three times), the question needs to be asked if the changes in the latest policy for teacher education are simply structural, with a view to
control. Previous reforms have been criticised by Luckett (2001:50) who warned against the danger of the international trends of instrumentalisation and marketisation of knowledge. She pointed out the emphasis on form, rather than content and cautioned that the what and the how was still left to the providers (Luckett 2001:52). While this provides universities with the autonomy to interpret the policy freely, it also assumes that universities will spend time and effort on the conceptualisation of the whole such as Luckett’s suggested solution of an “epistemically diverse curriculum” (Luckett 2001:49) with distinct possibilities of integration of different types of knowledge.

Some of the warnings regarding worldviews of instrumentalism and technical rationality are subtly addressed in the new policy. The policy states for instance that, “teaching ... is premised upon the acquisition, integration and application of different types of knowledge practices...” (DHET 2011:7). The policy also warns against a technicist approach relying simply on “demonstrable outcomes”, failing to take into consideration varied contextual challenges. The policy further refers the providers to six types of (anticipated) learning underpinning the acquisition, integration and application of knowledge: Disciplinary, pedagogical, practical, fundamental and situational. I would argue that these are knowledge types, and that types of learning cannot be described by a curriculum, but has to be embedded in a psychology epistemology. What the policy describes are types of knowledge according to a specific view of teacher learning. Teacher educators are encouraged to “encapsulate” all of these knowledge types “in the notion of integrated and applied knowledge” (DHET 2011:10). The policy further claims a shift of emphasis by having foregrounded what is to be learnt and how it is to be learnt. This, the policy indicates, is evident from the explicit placing of “knowledge, reflection, connection, synthesis and research” (DHET 2011:7) – an integrated, rather than classification and collection code in Bernstein’s (1971) terms. The foregrounding of types of knowledge for (types of) learning does indicate a break from the traditional curriculum structure, usually characterised by disciplines as organisers, as is typical of a positivist paradigm. The emphasis on types of knowledge and knowledge mixes also points at a shift away from the purely functional, where the competencies needed by the economy will dictate the outcomes. The plea for integration of theory and practice is another improvement, reminding us of the useful distinction made by Ryle in 1949 and sited by Rovegno (1992:69). Ryle wrote that there is a difference between knowing how to play soccer and actually playing soccer: Knowing that (an almost static form of knowledge) and knowing how (actively doing knowledge) are two very different things. The interdependent nature of the theory – practice relationship in the classroom and lecturing halls – constantly creates opportunities for new understandings (Lenz-Taguchi 2010:21).

Nevertheless, curriculum jargon can be manipulated to provide the correct words and ticks for the templates required by accreditation bodies. The authority of knowledge, packaged as a discipline, has long thrived and stood in the way of synthesis and connectedness in tertiary education. The choice of packaging is not always made transparent to either staff or students. As Samuel (2009:743) said, even curriculum policy is never neutral. An official policy such as MRTEQ (DHET 2011), interpreted and
then packaged by a few individuals representing staff, does not guarantee a pedagogic route relevant to the greater good of education. The choices we make as curriculum designers reflect our frames of reference, revealing our preferences in terms of values, assumptions, understandings and goals. The point is not to criticise these choices, but rather to highlight the need to reflect on our understandings as a staff and how we judge the efficacy of our approaches to curriculum (McKenna 2003:223).

**Faculty vision and knowledge construction**

In this section of the article I will narrow the focus of the discussion to examine the policy implications for a specific qualification – the Diploma in Grade R Teaching. Once a faculty or school of education has decided on its vision, there is a need to analyse how vision, general policy requirements and specific requirements for the intended qualification articulate. The policy document (DHET2011), does not actually prescribe a particular paradigm. However, the emphasis on concepts such as active knowledge, different types of knowledge, the notion of integrated and applied knowledge, transformation and the importance of reflection, could find a comfortable home in a constructivist epistemology. Although there is mention of the importance of context change and diversity (DHET 2011:7, 10), it is not foregrounded as structural determinants. If the epistemology in which the faculty’s vision is predominantly located, corresponds to that of the official policy, there is a better chance of congruency in the design.

**Tensions in knowledge construction: What is the purpose of epistemological diversity?**

The purpose of the diploma is also foregrounded by the policy. A certain tension can be observed here between the need for “focused knowledge and skills appropriate to Grade R teaching” and on the other hand, the need to be able to “demonstrate general principles” of teaching (DHET 2011:44). The candidate is required to train both as specialist and as generalist, presumably with the emphasis on school knowledge and pedagogical knowledge. The policy specifies that fifty percent of credits must be focused on developing grade R. However, this emphasis is somewhat misleading since a specialist in grade R cannot train with a lens exclusively trained on grade R. Within the context of South Africa there is hardly a typical grade R learner. Grade R is part of the foundation phase and as such the introductory year to formal schooling. Although the learners might be in more or less the same age bracket (4½ to 6), their socioeconomic background, the parenting they enjoy, their home language versus the language of learning and teaching, their learning environment and their teacher’s age and qualifications may all play a role in their ability to realise the aims of a grade R school curriculum. The inclusion of a knowledge mix grid adds to the frustration of the design team – while it is apparently meant to force a show of integration of types of knowledge, it contributes to fragmentation by forcing a superficial classification.
Reconceptualising the boundaries of knowledge

While a developmental approach will foreground stages of development and “school readiness”, a postmodern approach may foreground the diversity (Ryan & Grieshaber 2005:34). Ryan and Grieshaber (2005:44) also comment that postmodern theories provide student teachers with techniques for analysing knowledge that enable them to see how knowledge exercises power and therefore offer new insights into addressing issues of diversity.

They go on to say that tensions arising from this kind of discussion will offer new insights into coming to terms with diversity and so “generate new knowledges ... of what it means to teach young children in postmodern times”. Jennifer Sumsion (2005:213) is even more to the point when she says:

> If we are to transform early childhood education we need to create spaces in which we can critique constructively and challenge what we may have previously taken for granted.

That universities have been tasked to design and implement a diploma qualification for grade R teaching may be interpreted as a sign of more independence for the foundation phase sector from the general education and training band. Foundation phase teachers also need the academic depth of knowing why as well as what and how. Banks, Leach and Moon (2005:337) advocate a total reconceptualisation of the relationship between knowledge and pedagogy. They allude to the notion that novice teachers seem to focus primarily on didactics – a prescriptive type of pedagogy – which lack the flexibility of pedagogic knowledge. Here one is reminded of a warning sounded by Max van Manen (1977:209), pointing out that the emphasis on competency and performance based teacher education prevents “more consequential” questions to be asked regarding the quality and purposes provided by a curriculum. Perhaps a distinction between subject knowledge, school knowledge (subject knowledge transformed for school application) and pedagogic knowledge with the personal subject construct of the teacher at the heart of the dynamic interaction between these categories of knowledge, will take us closer to a curriculum responsive to the needs of the student teacher. Banks et al (2005:337) further argue that such a sophisticated and dynamic presentation of knowledge construction in teacher education reflects the “web and weave” of a teacher’s daily work and gives recognition to the complexity involved.

Hedges and Cullen (2005:67) agree with Banks et al when they argue that the developmental psychology and philosophical views, for example child-centeredness, may have neglected the importance of the subject knowledge of the teacher. Hedges and Cullen (2005:367) found the early years literature polarised on the role of subject knowledge, but quotes Anning and Edwards (1999) who found that teachers who are confident about their own subject knowledge, were better able to recognise learning potential in play-based experiences. A sociocultural perspective (Hedges 2004:36) shows that mediated and co-constructed learning in children’s play experiences is an “active, complex and contextualised process”. Hedges continues her argument by pointing out the importance of intersubjective pedagogical relationships in early
childhood learning. The knowledge and teaching of subject knowledge, against this background, becomes essential for the teacher, since she or he needs to take cues from the children's interest to effect an integrated and discovery pedagogy (Hedges & Cullen 2005:75). Hedges and Cullen's study, albeit limited to New Zealand, also reminds one that the Diploma in Grade R Teaching must make provision for a strong subject knowledge base from which to teach young children who are being prepared for grade 1 formal education – something that in-service practitioners who have not had the opportunity to study for a long time, might find particularly challenging.

Knowledge mixes

The MRTEQ (DHET 2011:11) makes a distinction between “general pedagogical knowledge” (that is knowing about, for example, learners, classroom management and assessment) and “specialised pedagogical content knowledge”. The policy also puts a high premium on supervised and assessed school-based experience. It states that learning from practice includes the study of practice (knowing that and knowing how). Practices must be analysed and theorised in “a variety of contexts” (ibid:8). Clearly a balance is needed between the study of practice and the actual doing in practice, ultimately aimed at a form of “practical wisdom” (Shulman 1998:520). Epistemological and ontological aspects of the art of teaching are integrated, recognising the limited power of the teacher educator, policy and curriculum to control the experiential learning of the student teacher. Instead of simply learning how to teach, the student must become a student of teaching.

One way of addressing the tension between a static knowledge collection code and an integrated code recognising active knowledge creation, is to look at the actual proportion of knowledge types in a curriculum. Figure 1 gives an example of how the proportions of various types of learning or knowledge could be assembled, depending on the purpose of the curriculum. The three segments on the left shows the aspects usually foregrounded in a traditional teacher education curriculum. These are representative of the so-called “expert knowledge” given to students fully cognitive in nature – knowledge that is “fixed, timeless and objective” in the words of Korthagen (2001:23). The five segments on the right could possibly be interpreted as Korthagen’s “knowledge of concrete particulars”: Flexible, subtle and “congruent to the situation at hand” (2001:25). However, the distinction between knowing that (reductionist and objectivist) and knowing how and why (contextual and subjectivist) is probably better suited to the purpose of the diagram. It shows us how a balanced knowledge mix can represent a diversity of knowledge. It also acknowledges the important role of the contextual and perceptual.
Finding balance through thoughtful debate, thereby working towards coherence through the design of curriculum, is indeed a far cry from the “jockeying for space” (Banks et al. 2001:338) of subject discipline communities often associated with curriculum design for teacher education. Here one is reminded of the comment that sustained inquiry and reflection is not something over which any one subject has the monopoly (Russell, McPherson & Martin 2001:44). If the question is whether the curriculum articulates as a coherent whole from the perspective of the student teacher, the design process has to be much more than disciplines establishing authority through credits and timetable practicalities. The process of curriculum design could, in fact, take a page from the ALACT model (Korthagen 2001) which prescribes that we should not begin with “us” (teacher educators), but rather with “them” (the student teachers and their needs). In the case of the Diploma in Grade R Teaching, this is a particularly pertinent aspect, since the diploma is in the first place meant for the in-service practitioner often lacking knowledge about why they are doing what they are doing. In order to “begin with them”, the curriculum may need to start with the experiences of the students, working gradually towards a reflexive paradigm, where alternatives in different contexts are investigated and acted upon.

However, beginning with the student teachers’ needs also relates back to the structure of the school curriculum to be implemented by the student teachers. The traditional subject boundaries of the school curriculum tend to dictate the structure

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**Figure 1:** Proportions of a knowledge mix for the Diploma in Grade R Teaching. (From Luckett [2001] and Korthagen [2001]).

**Mixing knowledges for a responsive curriculum**

- **Objectivist / Reductionist**
  - Specific specialised subject matter (Disciplines)
  - Foundations (Learning about content)
  - Educational Foundations (Pedagogy)

- **Subjectivist / Contextual**
  - Generalised Pedagogical (Optimal Learning Environments)
  - Reflexive (Meta-cognition, shifting systematically)
  - Specialised Pedagogical (PCN)
  - Student / Content (Learning about content)
of the B.Ed. and therefore the diploma for reasons of transfer and articulation. The question arises whether a teacher education curriculum can reflect a traditional composition of specified types of knowledge predominantly identified by a school curriculum, yet still serve the purpose of a progressive vision of education. I would argue that the potential for any teacher education curriculum to open spaces rather than filling them, to focus also on human enactment rather than different types of pure knowledge and to work towards a cohesive synergy rather than simply maintaining disciplinary boundaries, can become undermined if it is simply a question of filling old wineskins with new wine. The potential for a curriculum responsive to a “reality in process”, to borrow a term from Paulo Freire (1970:35), might be aborted in an overtly narrow vision of what the “specialised purpose” of such a diploma should be.

Rather than trying to interpret the official requirements in MRTEQ as a recipe for securing accreditation and conforming to quality assurance requirements, I argue that the mixing of the colours (types of knowledge), should become a process unique to the curriculum design and enactment of each faculty according to their vision for the teaching and learning of their student teachers.

**Working towards coherence in knowledge mixes**

While the policy lens provides curriculum designers in teacher education programmes with guidelines for the design of curriculum, the conceptual lens holds it together – it serves as cohesive device. Curriculum should function as a systemic whole of interactive aspects all directed towards quality teaching and learning.

I will now discuss the role of knowledge types as I see them applied to curriculum design for a teaching qualification. As a “scheduling device” (Rogers 1997:684), knowledge conceived as specific disciplines makes little contribution to an interacting whole, such as a curriculum. It does not reach out to the life world of the students who will study the curriculum. Because they will most likely see the knowledge as disciplinary and based at a university, I would argue that such knowledge may remain a static product removed from the active life and work of a faculty. There is a proviso, though, in the knowledge education project in teacher education. Rovegno (1992:69) contends that universities make the “fallacious assumption” that making connections between the reality of the classroom and the theoretical knowledge acquired at university will be a straightforward process for novice teachers. This lack of connectedness between theory and practice, the life world of the student and that of the “knowledge world” of the university poses a major challenge to the curriculum. It comes as no surprise that coherence is one of the characteristics of more successful programmes (Hammerness 2006). It is also one of the most difficult processes in curriculum design and implementation.

In the working group where I am located our aim is to find a conceptual framework for curriculum design and implementation in which the role of epistemological diversity and (mixed) knowledge construction are drivers. Yet an underpinning philosophy which guides our choices and holds the curriculum together is as important. Our
philosophy is to construct around the principles of connectedness, “less is more” and transformation (Robinson & Rousseau 2012).

The following table reflects some of the ways in which the literature has packaged knowledge in curricula for teacher education. Each model will be analysed against the following criteria:

- Clarity of purpose
- Function of the knowledge domain
- Knowledge diversity
- Connectedness of different types of knowledge
- Theoretical framework underpinning the model

| Table 1 |
|---------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
| **Purpose** | **Conceptualising curriculum change (Barnett et al. 2001)** | **A proposal for an epistemically diverse curriculum for South African higher education in the 21st century (Luckett 2001)** | **Developing fundamental principles for teacher education programs and practices (Korthagen et al. 2006)** | **Re-imagining teacher education: Connecting the spaces between vision, context and curriculum (Robinson & Rousseau 2012)** |
| | To conceptualise key patterns of change in the undergraduate curriculum. | To produce a “thinking tool” for an epistemologically diverse curriculum, with three challenges to SA curriculum designers: Instrumentalisation and marketisation of knowledge, postmodernism and scientism. | To generate principles of practice to guide responsive teacher education programs that will make a difference. | To design a theoretical framework for a curriculum of which a key design principle is to prepare reflective teachers for a changing world. |
| **Role of knowledge** | Three curriculum domains are identified: Knowledge, action and self. | Four interacting types of knowledge: Propositional (foundational), practical, experiential and epistemic. | Content knowledge is created around students’ experiences, questions and concerns. Three clusters of principles: Views of knowledge and learning Program structures and practices Quality of staff and organisation | A distinction is made between learning to know, to do, to be and to live with others (Delors Report 2001). |
| Knowledge diversity | The knowledge domain: Discipline-specific competences | Both practical and experiential knowledge focus on “doing”; the propositional and epistemic focus on the theoretical. Propositional knowledge and applied competence should be balanced by personal competence (experiential knowledge) and reflexive competence (epistemic knowledge). | Three requirements for change are clustered into “Views of knowledge and learning” where learning about teaching is characterised by: 1) Conflicting and competing demands 2) A view of knowledge as a subject to be created 3) A shift in focus from the curriculum to the learner | The different types of learning mentioned above are translated into graduate attributes, clustered as cognitive, performance, dispositional, motivational and reflective (Shulman, 1998). These can be linked loosely to these types of knowledge: Cognitive (knowing that), performance (knowing how) and personal/social (dispositional, motivational and reflective). |
| Connected-ness | Three interlocking circles, dynamic in its interaction according to the knowledge field it serves. The challenge is not only to ensure adequate representation and balance of the three domains, but that they are integrated. | The unit of design is the whole programme rather than separate modules. The idea is to produce knowledge workers, rather than knowledge collectors. | A synergy of teaching and learning is implied. It suggests an interconnectedness between the principles. | The image of a circle enclosing the types of learning, the core design principles and the graduate attributes, reflects a commitment to connectedness within an optimal learning environment. |
| Theoretical framework | The “performance” and “employability” focus is interrogated with emphasis on human and intellectual development. | The emphasis is on knowledge creation and a curriculum responsive to authentic and relevant contexts, with students taking responsibility for their own learning and with the potential for personal transformation. | The emphasis is on creating knowledge through experience rather than empirically generalised abstractions from practice. | A principle of “educating” teachers rather than “training” them suggests deeper levels of learning, including the dispositional. The authors identify with the idea of “value creation” rather than “knowledge transmission”. |

Each of the models described above gives us a sense of the types of choices faculties of education have to make, should they decide to embark on curriculum
design as a creative process with a reform agenda. In the next section we are going to look at some of the patterns emerging from the analysis of these four models.

Patterns of change in a teacher education curriculum

Curriculum is an ongoing project, even though it is occasionally given a push by a national initiative such as the one currently experienced in South Africa. Universities have the choice of considering such national initiatives as an unnecessary control mechanism or as an opportunity to interrogate the what, the why and the how of teaching and learning in their faculty. A number of issues are raised as challenges within the international and national scholarship around teacher education curriculum. Solutions abound in the form of different models looking at types of learning or types of knowledge. In spite of covering a period of 12 years, the examples of models we looked at have a number of commonalities.

Each of the models seems to be seeking ways of moving away from the traditional university emphasis on the cognitive, propositional knowledge and to steer clear of the all-consuming power of “marketisation” and “employability”. All the models discussed here acknowledge the importance of practical learning, while foregrounding the importance of authentic and different contexts where students are encouraged to create knowledge by using their judgement (informed by knowing that and knowing how) in the human and messy world of the classroom. There is a focus on the professional development of the student teacher, including the personal perceptual and social aspects. Students’ own unique teaching experiences can be compared with the patterns and regularities of empirically generalised abstractions from practice and so move towards a “practical wisdom” as part of a lifetime learning curve (Shulman 1998:520).

Another similarity between the models discussed, is the acknowledgement of the importance of both conceptual mastery and technical proficiency. The need for integration amongst the types of learning and knowledges is recognised. This implies the need for staff to collaborate towards negotiated understanding of the purpose and underpinning principles of their programmes, collaborating on its design and committing to an ongoing reviewing process. The potential of reflective practice as a means to assist the student in bridging that gap between the universalised knowledge and the messiness of the classroom is evident in three of the four models (Barnett, Parry & Coate 2001; Korthagen, 2001; Robinson & Rousseau, 2012).

The literature consulted for this study fully acknowledges the complexity involved in the process of curriculum design. Many studies indicate that disciplinary loyalty is still the most binding concept amongst academics (Barnett 2001:436). There are warnings against a complete shift towards doing and performing rather than knowing and understanding – the danger of a model which focuses on practical experiences as if separate from the theoretical input. Korthagen (2006:1021) refers to three aspects that haunt teacher education in the 21st century: Firstly, the complaints from graduates, parents and politicians about the irrelevance of teacher preparation “for the reality of
everyday practice in schools”; secondly, the body of research presenting evidence of a reality shock, followed by a “wash-out” effect experienced by new teachers; thirdly, there are new conceptions of teaching and learning such as constructivist views, situated knowledge and recognition of the importance of experience.

To Korthagen’s list, we can probably add the lack of recognition of the role of perceptual knowledge and metacognition. Robinson and Rousseau (2012:108) refer to the need for coherence which is largely dependent on the willingness of staff to buy into a coherent vision of “what can be” rather than “what is”. They argue for a connectedness between knowing, doing, being and the ability to live in harmony with others. In addition to graduate attributes reflecting the traditional cognitive and performance domains, they advocate with Shulman (1998) the inclusion of the dispositional, motivational and reflective domains. Luckett (2001) also refers to the importance of collaboration amongst staff members. Once teacher educators acknowledge the need to look beyond the boundaries of their disciplines at possible ways of collaboration towards coherence, the framework which emerges from a shared vision may offer guidelines to a more responsive curriculum.

Moving towards a framework for the new Diploma in Grade R Teaching

Is the MRTEQ sufficiently responsive to the complexities as discussed here? I argue that this new official framework has gone a long way in encouraging applied and integrated knowledge. However, the danger is that policy compliance becomes a substitute for a collaborative process of curriculum design and is used by curriculum committees to complete templates designed for accreditation purposes, while staying in keeping with the positions, specialisations and identities of “what is”.

Faculties and schools of education could, in fact, gain a lot by using the ongoing debates around the what, the why and the how of the curriculum as the core of staff development. Russell et al (2001:46) remind us that without opportunities for dialogue amongst members of staff, “contention and division can fracture collaboration and undermine coherence”. The what, how and why of a teacher education curriculum remain work-in-progress. Its flexibility in design and implementation needs the staff as a design team to keep looking at both “what is” and “what could be”.

Yet Morgan and Roberts (2002) call the process of obtaining support from university staff who are subject specialists, “herding cats”. Russell et al (2001:46) may well hit the nail on the head when they blame the publish-or-perish environment and the selective research interests in universities for the neglected status of program development, co-ordination and teaching. Luckett (2009:451) also refers to a culture of competition amongst university staff, rather than cooperation. This phenomenon is probably driven by the university system of encouraging self-advancement through research and publication, with undergraduate teaching taking a backseat. In addition, there are also the operational issues which tend to dictate: The staffing, the timetable, disciplinary boundaries, a managerial culture which classifies categories of
knowledge – regulative rules and operational issues dictating and thereby weakening a conceptual framing that may have led to a more responsive curriculum. Seen from this perspective, the elements of coherence and collaboration are not only challenged from outside through instrumentalisation, but also by academia itself through the narrow lens of personal interest. Pleas for help from novice teachers and a lack of evidence that the financial investment in educational research renders an equal return in educational reform, are not popular topics in faculties and schools of education. Gravett (2012:4) refers to the tendency to “interest student teachers in particular theories”. She adds, “I would add that these theories are often lecturers’ ‘pet theories’ or theories emanating from their research interests”. The contest between theory with a capital T (Korthagen 2001) and practical wisdom informed by a professional, rather than a purely academic curriculum, may still prevail for a long time.

I argue that faculties and schools of education should use curriculum as their staff development agenda, encouraging staff members to debate the complexities of teacher education with each other and their colleagues, thereby developing a shared language of curriculum. This should strengthen South African teacher education and its capacity to curriculate for “new times” (Ryan & Grieshaber 2005:1), while expanding the boundaries of the existing interpretations of types of knowledge for teacher education. National policy should be seen as only one of several tools and motivations available to faculty to construct a relevant and responsive curriculum.

Figure 2 demonstrates how the curriculum design process can encourage collaboration amongst teacher educators, thereby promoting ownership. The process starts with the staff reflecting on their vision for their graduates (inside circle). This vision for a particular qualification needs to be framed within the vision of the faculty. At the same time the challenges (for example the diversity of prior learning and language) posed by the target group in relation to the purpose of the qualification, must be acknowledged. The discussion should ultimately result in a conceptual framework flexible enough to sustain ongoing framing and reframing against the backdrop of change.

The principles and attributes generated by the framework should next be aligned to policy requirements, as seen in the MRTEQ (DHET 2011). Since policy is an authoritative and “neutral” voice, this step in the process invites less debate, although it’s very “neutrality” may lead to conflicting interpretations. The danger here is to sacrifice some of the principles in the first stage (conceptual framework) to interpretations of the policy on the grounds of technical requirements. A case in point is the policy requirement of 60 credits at NQF level 7 for the Diploma in Grade R Teaching. This is at variance both with the entrance and the exit requirements, since the diploma is in the first instance meant to upgrade the qualifications of level 4 and 5 practitioners, allowing them to attain a maximum of 180 credits into the B.Ed. foundation phase – a qualification which usually only assigns level 7 credits to the exit level of that qualification.

Once the policy requirements and the essence of the conceptual framework has been harmonised, the collaborative curriculum design process can begin. Even at this
stage, staff should be encouraged to think in terms of different types of knowledge and its possibilities for connectedness between disciplines, rather than disciplines as silos of expertise. Throughout these first three steps, the curriculum leadership of the faculty or qualification needs to guide by constantly referring back to the design principles which emanated from the first stage of the process. Once the design is completed at macro (qualification), meso (learning areas) and micro (subject) levels, implementation and enactment can start. This last, and ongoing, phase (outside circle) should be characterised by constant review, in consultation with students and collaboratively through staff development sessions.

Figure 2. A possible process map for curriculum design in teacher education

The DHET has provided universities with a minimum requirement structure and some philosophical guidance in their policy document. Following through on the analogy of teaching as an art and the palette being the knowledge mixes, we could have an artwork painted by numbers, taking the knowledge mix grid as a literal summary of what is intended by the department. This may, in fact, allow improved
control through a matrix, and force universities in the direction of a national curriculum for teacher education.

On the other hand, faculties and schools of education could opt for an “art jamming” model – infinitely more messy due to its free form style – but conducive to growing a coherent vision in the faculty and a collaborative energy to sustain it. The prescriptive nature of the Curriculum and Assessment Policy (Department of Basic Education 2012) serves as a reminder that “harnessing” education, and more specifically early education, (Schweinhart 2005:2), may shift the attention away from the need for teachers to respond effectively to diverse student populations. A responsive teacher education curriculum needs to give the candidates the analytical tools to become active knowledge professionals. Ryan and Grieshaber quotes Popkewitz (2005:3) in saying that postmodern teacher education should involve moving away from a mastery model to active examination of how knowledge creates boundaries and possibilities – the ability to reflect critically. This can become a reality if the process depicted by the outside circle in figure 2 is interpreted as an ongoing project involving both teacher educators and students in knowledge creation.

The combination of a traditional emphasis on a developmental approach, coupled with a prescriptive curriculum, as well as prescribed materials for early childhood education, can act as a strong force against the recognition of the diverse needs of learners from multiple backgrounds. A curriculum designed to recognise the need for critical and reflective attributes in teacher education and implemented by a staff well aware of the complexities described here (figure 2), may have a better chance of steering a faculty away from a fragmented and boxed knowledge agenda. In comparison, a process orientation recognising the importance of a epistemological diversity of knowledge types and multiple lenses to observe these types of knowledge becomes an ongoing project with staff and students; the “recontextualising agents” referred to by Fraser (2006) and Luckett (2001, 2009). The glue holding together the process of designing and implementing a curriculum would be in the orientation and disposition of those involved in the process: Academic rigour characterised by multiple lenses, looking beyond the boundaries of the traditional types of knowledge for new combinations and articulations while maintaining a critical reflective stance. It is the constructive alignment with the foundations of the programme that needs to be prioritised (Russell et al 2001).

Conclusion
The metaphor from which this article took its cue is that of teaching as an art, with the colour palette being the knowledge mix. In Eisner’s book *The educational imagination* (1994:154–156) it is stated that

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\text{... because teaching can be engaged in as an art, is not to suggest that all teaching can be characterized as such. Teaching can be [... ] wooden, mechanical, mindless, and wholly unimaginative. But when it is sensitive, intelligent, and creative – those qualities that confer on it the status of an art – it}
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should [...] be regarded [...] as an example of humans exercising the highest levels of their intelligence.

While the metaphor remains useful, the last word should probably go to John Loughran (2006:177): “A search for balance may well comprise the journey, finding harmony is no doubt the challenge”.

Reference


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Abstract
This paper comprises a brief study of the literature about the concept epistemological access, a fairly under-researched topic in South African education. It is aimed specifically at the notion of access in the early years of the primary school. Morrow’s distinction (Morrow 1992) between formal access (institutional access) and epistemological access (access to the goods distributed by the institution) is used as a conceptual framework. We argue that the meaning of the concept epistemological access, as Morrow intended it, was borne out of a particular political need that arose in higher education in the last years of the apartheid regime; the need to democratise access to higher education. The dearth of literature on the concept epistemological access and its meaning for access to basic education, especially foundation phase schooling, therefore warranted this study of the literature.

Keywords: Epistemological access, elementary school, foundation phase, human capital theory, human rights discourse, capabilities approach, social justice
Introduction

The aim of this paper is to discuss literature in order to problematise the concept of epistemological access. We work from the premise that what constitutes epistemological access still remains fairly under-researched in South Africa (Boughey 2010). In this paper we argue that epistemological access, as coined by Wally Morrow, was borne out of a particular political need that arose in higher education; the need to democratise access to higher education (Morrow 2007:11–25). Currently there appears to be no literature relating to access to basic education, especially access to foundation phase schooling. Basic education in South Africa covers the general education band (GET) over three phases: Foundation phase (grades R to 3), intermediate phase (grades 4 to 6) and senior phase (grades 7 to 9). Grade R, which is the reception year, only became compulsory and therefore part of the foundation phase in 2010 (Pendlebury 2008/9). According to Pendlebury (2008/9:25), “at the heart of basic education, is learning to read and write, to reason, to work with numbers, shapes and patterns, and to use concepts to understand the content of different learning areas”. These are therefore the goods that the institution distributes in the foundation phase.

To confirm the lack of literature on the meaning of epistemological access to basic education an advanced search was conducted on EBSCOhost, a multidisciplinary databases that is home to other databases like: Academic Search Complete (with 8 500 full text periodicals and 7 300 peer reviewed articles), African-Wide Information (with over 3.2 million citations), Education Source (with 1 700 journals), ERIC (with 1.3 million records), PsycArticles (with 153 000 articles) and SocIndex (with 2.1 million records). On conducting the search the following keywords were used: “epistemological access and foundation phase schooling” as well as “epistemological access and basic education”. This delivered no results. We then used the term “epistemological access” and got 45 hits. These 45 journal articles dealt with epistemological access as it pertained to access to higher education. We then directed our search to Google Scholar, using similar search words and came across the South African Child Guage 2008/2009, a flagship publication of the Children’s Institute that provides an annual snapshot of the status of children in South Africa. In this resource two articles stand out: one written by Shirley Pendlebury entitled Meaningful Access to basic education, and another by Jonathan Jansen, titled Reflections on meaningful access to education. In addition to this we also found an interesting journal article by Joseph Chimombo (2005), titled Issues in basic education in developing countries: An exploration of policy options for improved delivery and an unpublished thesis by Gamede (2005) with the title The biography of “access” as an expression of human rights in South African education policies. This author used Morrow’s notion of epistemological access as its conceptual framework. We also came across the work of two consortiums – CREATE (Consortium for Research on Education Access, Transitions and Equity) and EdQUAL (a research programme consortium on implementing education quality in low income countries). Although the focus in both consortiums is on research providing educational access through quality education, it could be useful when conceptualising epistemological access, especially in low performing countries like South Africa.
The literature analysis is therefore driven by the following questions:

1. What are the historical roots of the term access and how does this link to the term epistemological access?

2. Through which analytical lenses can one view the notion of epistemological access especially in relation to South African?

3. How has the term epistemological access been viewed in literature thus far?

4. How, according to literature, can epistemological access be realised in basic education, and, more specifically, in access to the foundation phase of schooling.

Structurally this paper takes on the following format: First we trace the historical roots of the term access to education as a means to understand what could be meant by epistemological access. This is followed by a discussion of literature that conceptualises the idea of epistemological access. In this section we offer a critical analysis of what constitutes epistemological access by focusing on how it has been defined in literature thus far. We then continue by entering into discussion on the conceptual frameworks through which the term could be understood. Here we focus mainly on the South African literature. Finally, we look at the meaning of epistemological access as it pertains to access to basic education, especially to foundation phase of schooling.

**Tracing the historical roots**

In the literature that we have studied we found that the meaning of the concept access to education is not as clear-cut as it at first would seem. For some authors it is defined in terms of physical access, or in terms of entry (enrolment) into schools (Gamede, 2005; Chandani, Balan, Smith & Donahue, 2007; Alexander, 2008). For others, it is more than mere physical access, since it is reflected in educational outcomes or in what Samoff (2001:25) calls “expanded access” (post-enrolment experiences). Policies like the constitution of South Africa, which borrows from international instruments such as the Universal Declaration of Human Rights (1948), the World Declaration of Education for All (1990) and the Dakar Declaration on Education for All (2000), view access to education as a basic human right. Gamede (2005:4) argues that the complex nature of the meaning of “access to education” lies in how people think and talk about education as a human right and how the representation or non-representation of different voices in education policies, including the Constitution, advances or hinders the realisation of open access to education as a basic human right.

The complexity of the meaning of access to education therefore necessitates an exploration of the historical roots of the concept. Following is a chronological account of the use of the term.

Historically, the term, access to education can be traced back to the early 19th century in Europe and the Americas, and earlier also during the reformation movement, when “compulsory mass schooling became part of the legal framework
in the nation-state building process” (Chandani et al 2007:10). In the 1940s, with the formulation of the United Nations Declaration of Human Rights, the right to free basic education became part of the policy framework of most developing countries, especially those that were receiving support from international agencies. The period between the 1950s and 1960s was dominated by the education-for-development discourse, when international agencies prioritised the notion of education as a means to economic growth. Chandani et al (2007:10) argue that this period resulted not only in the growth of public schooling, but that it also led to an increase in the enrolment rates to public schools throughout the developing world. They further point to the fact that the debt crisis in the 1980s, which marked a decrease in international aid, forced most developing countries to find alternative ways to finance their education systems (2007:10). The 1990s, with the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and other international organisations’ launch of the Education for All (EFA) movement, once again placed education at the top of the developmental agenda. Up to and including this period, the preoccupation of the international community was on gaining universal access to basic education for all children; the emphasis being on enrolment and physical access. The commitment to ensuring universal access to primary education is also contained in the United Nations’ Millennium Development Goals (MDG), which aims to ensure that children everywhere will be able to complete a full course of primary schooling by 2015. According to Alexander (2008:6), this statement contained in the MDG was “immensely ambitious yet conceptually minimalist”. We argue that it failed to consider the multiple contextual factors encountered by developing countries that could hinder the achievement of these goals. As mentioned before, the preoccupation of the Western world was on ensuring physical access to schooling, and very little attention was given to educational outcomes and ensuring expanded access (post-enrolment) in terms of what happens to keeping the learner in school and ensuring quality education. In 2000 the Dakar World Conference reaffirmed its commitment to achieving the MDG by ensuring universal access to education by 2015. Govinda and Bandyopadhyay (2011:1) however argued that

the Dakar Declaration put quantitative progress and quality of education in two separate baskets by creating a separate goal on quality distinct from universal schooling provision.

This dovetails with what Alexander (2008:1) said when he noted that setting up infrastructures for universalising basic education is one thing; universalising genuine belief in a pattern of basic education which is well conceived in its own terms, regardless of what follows it, is quite another. According to Govinda and Bandyopadhyay (2011:1) “only one whole report (for the year 2005) of the Global Monitoring Report (GMR) was devoted to the quality”. They further note that the focus of the report remained at the “generic and philosophical” level, focusing on what quality means, but not on how it could be operationalised (Govinda and Bandyopadhyay 2011:1). What appears missing from the report is a focus on classroom and school-based processes or, as confirmed by Alexander (2008:vii), “pedagogy is often the missing ingredient in EFA discussions.
on quality”. For the purpose of this paper, borrowing from Gamede (2005:4), access to education is understood to mean “both the means of entry, which is the first step, and post-enrolment access that is reflected in the outcomes” of schooling, since this definition would encapsulate both physical access and access to quality education. In the next section we provide an overview of the possible frameworks that could be used to analyse the term epistemological access.

The human capital approach to education in South Africa

In this section we explore frameworks such as human capital theory, human rights discourse and the alternative discourses of social justice theory and the capabilities approach. The aim of this section is not to go into a deep critical analysis of the conceptual frameworks, but to draw on literature that could provide explanations of the main focus of each framework. We then look at how and when these frameworks dominated within the South African educational policy-making arena. Our main purpose for holding this discussion is to suggest that it is the dominating framework driving a country’s education policies that ultimately determines how epistemological access is viewed.

The conceptualisation of education from a human capital approach was first pioneered by economists Gary Becker (1993) and Theodore Schultz (1963). Human capital theory considers education as an investment, with the economic productive ability of the human being as most important. The skills and knowledge acquired through education serve as a precursor, as the more skilful and knowledgeable a person is, the higher their wage earning. This becomes very important, especially for people living in poverty, where acquiring decent education (with the necessary skills and knowledge) can be “the difference between starving and surviving, and between merely surviving and having a decent life” (Robeyns 2006:72). The drive for human capital concerned economic productivity and valued education, skills and knowledge only if they served purposes of economic enhancement. The dominance of the human capital approach before the 1940s was based on the notion that education is fundamental to overall economic development and personal economic satisfaction.

Unlike human capital theory that sees human beings as productive beings, the rights discourse views humans as beings with ethical and political concerns. The human rights discourse, underpinned by the Universal Declaration of Human Rights which was adopted by the United Nations in 1948, ensured that all children have a legal right to basic decent education (Robeyns 2006). The mobilisation of every child to be in schools largely implied that governments needed to play a central role and ensure that the resources needed to offer quality education are there (UNICEF 2003:8). This commitment was reaffirmed with the adoption of the EFA movement in 1990. Chimombo (2005:130) challenges the EFA movement’s intentions by stating “whose Education for All and Education for All for what?”, noting that although it is desirable for every child to have basic schooling, in most developing countries this is not always possible. As previously mentioned, basic schooling failed to recognise physical access
and access to quality education as being on the same side of the coin; instead it was being viewed as separate things (Alexander 2008). The rights-based theory was often blamed for being merely rhetoric especially in developing countries where external issues such as poverty and illiteracy could hinder the goals of this discourse.

Two alternative emerging approaches to educational policy that have not as yet received adequate exposure in literature on education are the capabilities approach and social justice approach. A critique and a call to move beyond the human capital and human rights approach and shift the focus to a conceptual model of capabilities approach was offered by Sen (1992, 1999). Explaining capabilities, a person has to comprise

the ability to be well nourished, to avoid escapable morbidity or mortality, to read, write and communicate, to take part in life of the community, to appear in public without shame (Sen 1990:126).

Sen’s (1999:19) concept of an “agency freedom” is central to the capability approach and key in addressing education. Sen uses a concept of agency freedom by which he means

someone who acts and bring about change, and whose achievements are to be judged in terms of her own values and objectives, whether or not we assess them in terms of some external criteria as well.

Robeyns (2006:78) gives an understanding of education as a capability by qualifying that the capability approach is a broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society.

In the capability approach education is important for both intrinsic and instrumental reasons (Dréze & Sen, 2002; Unterhalter, 2003). The focus on the importance of education as an intrinsic value in life means that attention is being paid to what people are able to do. The instrumental value of education relates to the goods that provide instrumental value (Pressman & Summerfield 2000:95). If education is understood as a capability in itself, it is then imperative to ask of the contribution of education and education policy in human capabilities (Walker 2006:170). From a capability perspective compulsory education for eligible children is then needed, with a qualifier that the education provided is of high quality and is aimed at shaping a full human being (Nussbaum 2003:320).

For Tikly and Barrett (2011), the social justice framework draws on capability theory and can be used as a basis for supporting and extending the rights-based approach. They base their conclusions on the work of Fraser (2008:16) who notes that

overcoming injustice means dismantling institutionalized obstacles that prevent some people from participating on a par with others as full partners in social interaction.

In an African context these “institutionalised obstacles” are multifaceted and often differ from one context to the next. The social justice approach has three dimensions, namely “redistribution”, “recognition” and “participation” (Fraser 2008:16). Taken
from Tikly and Barrett (2009:5), redistribution relates to the distribution of wealth or access to resources, recognition means to identify and then acknowledge the claims of historically marginalised groups in the African context, and participation or participatory justice is “the rights of individuals and groups to have their voices heard in debates about social justice and injustice, and actively participate in decision making” (Tikly & Barrett 2009:5).

To understand the human capital approach in the South African context, one has to trace the policies that were in place during the apartheid regime. Although marginalised to only a certain people, the policies of pre-1994 South Africa had a human capital tone which was veiled by the apartheid ideology and agenda. According to Tikly (2011:4) the human capital approach served as the main discourse and framework of choice during the apartheid era. He argues that it was often overshadowed by other dominating ideologies of apartheid. Due to the national and international pressure before and after apartheid’s demise, coupled with the human rights discourse which was instrumental at the time, the human capital approach was slowly being replaced by the human rights discourse with local and international scholars and organisations championing South Africa’s democratic cause.

The majority of world governments, leading donor agencies and non-governmental organisations (NGOs) responded to the EFA call by providing funding, formulating policies and implementing initiatives that were aimed at improving the provision of basic education. Sub-Saharan Africa was faced with a big challenge and a desperate situation, and governments had to act promptly to ensure that the goals of EFA were met. According to Novicki (1998:1), more than half of the region’s children were not in school, and adult literacy levels stood below the 40% mark. South Africa was excluded from attending the Jomtien conference because of the apartheid policies of the time. After the country gained democracy in 1994, the country has participated in all EFA processes and has embraced the EFA principles and goals (DOE 2002). South Africa’s education policy focused on the right of access to education during the transition period to democracy (DOE 1995). Section 29 of the country’s 1993 constitution states that everyone has the right to basic education and that the state should take reasonable measures to make education accessible (Republic of South Africa 1993). EFA released statistics for South Africa for the 1998/1999 period in their 2000 assessment report. Some of the alarming highlights in the assessment include a reported net enrolment of 87% (this indicated that the country was yet to fulfil universal access to education). Grade repetition rates were very high, especially for grade 1, and 67% of the population aged above 15 years was functionally illiterate at the time (UNESCO 2000:12). According to Motala, Dieltiens and Sayed (2009), the issue of universal education in South Africa is hindered by infrastructural backlogs depriving learners of equal opportunities to quality education. They further state that expanded access has little import unless it includes regular attendance, enables progression through grades at appropriate ages, and provides meaningful learning, achievement and completion … access must be more than just a place in a school for every child; it must be meaningful access (2009:251).
Even though the statistical results are contrasting, they do show a South Africa which is near to achieving the EFA and MDG. However, physical access has not translated to meaningful access and learners are yet to reach the required level of achievement and competency (DOE, 2005; Motala et al, 2009). Therefore, there is need to ensure that the learners are provided with quality basic education to ensure they pass in good time (UNESCO 2008:3).

In addressing the access conundrum in education, Motala et al (2009:260–261) suggests that

the key South African access issue is not simply physical access (although there are significant marginalised groups who do not have access to schooling), but what learners have access to ...

It is clear from the discussion that epistemological access, access to knowledge that could lead to successful schooling outcomes, still escapes the majority of South African learners. The question remains, if South Africa is on its way to achieving universal access to basic education in terms of physical access, how can we ensure that all learners in schools have epistemological access? In other words, what would epistemological access to basic education mean in reality? Before we address this question, a critical analysis of the term epistemological access is warranted.

Epistemological access: Towards a critical analysis

This section offers a critical analysis of the concept epistemological access in order to establish how we can define the concept within the boundaries of this paper. As mentioned already, the term was first coined by Morrow (2009: iv), a South African scholar who played a notable role in educational reform. The term appears to have been constructed while Morrow grappled with real concerns pertaining to higher education policy making and practice. The philosophy of epistemological access, for Morrow, is bounded by the past and present context in South African education. He captured most of his concerns in his book Bounds of democracy, which consist of nine essays that provide insightful reflections on higher education, more specifically his views on new ways to conduct academic practice in future (Morrow 1994:40). He first used the term in an article published 1992 with the title Teaching large classes in higher education, in which he describes the two dimensions of access to higher education; the first being institutional access (formal access) and the other being access to the knowledge that institution distributes (epistemological access), offering a clear distinction between formal access and epistemological access. To the contrary, Gamede (2005:53) warns that Morrow’s concept of epistemological access is somewhat limiting, since it falls out of the human rights framework as it disregards issues of equity such as not only increasing access of learners from disadvantaged backgrounds, but also providing support in order to increase their chances of success.

Gamede further argues that Morrow’s formulation of this concept “rules out the existence of a hidden curriculum that favours some and excludes others” (2005:58).
Robertson and Hill (2001:95) agree that marginalisation of certain forms of knowledge can compromise access to knowledge. Morrow (2009:78), however, asserts that epistemological access is not a product that could be bought or sold, given to someone or stolen; nor is it some kind of natural growth, such as the growth of plants or bodies. Epistemological access cannot be supplied or “delivered” or “done” to the learner; nor can it be “automatically” transmitted to those who pay their fees, or even to those who collect the handouts and attend classes regularly. The reason for this is that epistemological access is learning how to be a successful participant in an academic practice.

It appears that both Gamede (2005) and Robertson and Hill (2001), in their critique of Morrow’s idea of epistemological access, are alluding to the political and social dimension of access to education and taking into consideration the type of learner which is referred to. Morrow (2009:78) does acknowledge that learners come from different backgrounds and that having certain things can facilitate one’s epistemological access, but it still does not guarantee it. Morrow (2009:78) simply states that “in the same way in which no one else can do my running for me, no one else can do my learning for me”. Both Morrow’s ideas and the limitations which Gamede (epistemological access for whom and for what?) raised has implications for how this paper constitutes the provision of epistemological access. It also has further implications for the type of analytical framework (discussed later) that we will use to inform the way epistemological access will be constituted within the realms of this paper.

Although Morrow eloquently describes the meaning of epistemological access, it is not clear how it could be realised in reality or what measures will be used to judge whether epistemological access has been obtained. In other words, how does one gain access to the processes of knowledge construction? From the discussions above it is clear that the term epistemological access was mainly used as Morrow intended, as one dimension to understanding access to higher education. Morrow does however suggest that new ways of thinking about teaching are needed if we are to meet the challenges of enabling all learners to gain epistemological access (Morrow 2007:11–25). He goes further to posit that what is needed is a realist focus Lotz-Sisitka (2009:11) argues that the meaning of realist focus is not explicit in Morrow’s work. She notes that one should move away from technical solutions to embrace an open-ended notion of epistemological access; to enhance reflexivity, agency and responsiveness to risk and vulnerability given that such conditions characterise the contemporary context in which children learn...

the extent to which the teaching and learning in a university meet the changing needs of employers by producing graduates that are innovative, skilful and competitive (Moll 2004:4).

Cultural or institutional responsiveness to the curriculum “entails accommodating diversity of socio-cultural realities of students, by developing a wider variety of instructional strategies and learning pathways” (Moll 2004:4). Disciplinary responsiveness of the curriculum entails a curriculum that is responsive to the nature of its underlying knowledge discipline by ensuring a close coupling between the way in which knowledge is produced and the way students are educated and trained in the discipline area (Moll 2004:7).

Learning responsiveness of the curriculum entails teaching and assessing students in ways that are accessible to them. This includes making available what is valued about the underlying discipline, how it is assessed, and which evaluative criteria are of significance, but also adjusting the teaching to rhythms, and tensions and emotions of learning. Slonimsky and Shalem (2006:37) focus on the latter two ways of being curriculum responsive. Both Lotz-Sisitka (2009) and Slonimsky and Shalem (2006) expanded on Morrow’s notion of epistemological access by shifting the focus away from external peripheral factors impacting on schooling to the internal processes of schooling.

In brief, it appears that Morrow’s conception of how to gain epistemological access differs from the ways in which others have used it. For Lotz-Sisitka (2009) and Slonimsky and Shalem (2006) epistemological access appears to be the work of the institution’s academic activities, whereas Morrow felt strongly about the individual student’s role, noting that these are aspects that could facilitate, but not guarantee one’s epistemological access. He does however propose that systematic learning is a necessary way forward, when he suggest “that teaching is the practice of organising systematic learning”, noting that the practice of teaching is the practice that centres around the design of learning programmes that foster the gradual development of competences that cannot be learnt in an instant (Morrow 2007:15).

What the above discussion affords us are the debates around what constitutes epistemological access. We now turn to a discussion on what epistemological access to basic education could mean.

**Epistemological access to basic education: What this could mean in reality**

Drawing from the literature presented throughout this paper, this section attempts to unpack the notion of “epistemological access for whom and for what purpose?”. Pendlebury (2008/2009), Jansen (2008/2009), Gamede (2005), Chimombo (2005) and Motala (2001) provide us with some understanding of how epistemological access can
be realised in basic education, thus shifting our focus away from higher education. For Pendlebury

access is meaningful only when schools ensure epistemological access, and support children’s systematic learning of basic skills, knowledge, values and practices, and do so in a manner that respects children’s dignity and background (Pendlebury 2008/2009:24–25).

She further states that epistemological access and systematic learning imply that learning must be structured so that children develop coherent ways of understanding and engaging with different learning areas. Teaching for meaningful access is about carefully designed learning programmes and materials that enable children to gradually develop competencies that cannot be learned in an instant, and that go beyond the informal learning that goes on daily at home (Pendlebury 2008/2009:24–25). Here the meaning of epistemological access dovetails with meaningful access and systematic learning, which extends beyond mere physical access and includes ways to ensure quality teaching and learning. Jansen (2008/2009:8) warns that in South Africa, especially in the early years of schooling, “access does not result in success for more than 50% of children”. It appears from Jansen’s reflections that for access or epistemological access to lead to success in schooling, one should reflect on the following: Access for whom (equity), access for how long (retention), access to what (curriculum) and access for what success (achievement)? In addition, for Gamede (2005), epistemological access at classroom level should be expanded to include the political and social dimensions such as

who provides knowledge, what kind of knowledge is made accessible, what kind of knowledge is valued, who is being taught and what is the time allocation to the topic and the language of learning and teaching as well as various teaching styles employed ... (Gamede 2005:4).

Chimombo (2005) offers thoughts on the manifold challenges and dilemmas facing developing countries like South Africa in providing quality basic education. Here he discusses opportunity cost of schooling, equity and gender issues, cultural and religious attitudes, efficiency and quality, relevance of education and financial issues as reasons for the challenges in achieving EFA in developing countries (Chimombo 2005:131–144). From his findings he concludes that

all evidence is pointing to the fact that education should be inclusive, responding to the diverse needs and circumstances of learners and giving appropriate weight to the abilities, skills and knowledge they bring to the teaching learning process (2005:147).

There appears to be two key debates developing out of the literature presented in this paper relating to how learners could gain access to school knowledge (the goods distributed by the school), especially the more than 50% of South African learners who do not have meaningful, epistemological access to early schooling. On the one hand there are those who are strictly in favour of separating horizontal knowledge (everyday knowledge) and vertical knowledge (school knowledge) (see Bernstein, 1990; Moore & Muller, 1999), and on the other there are those who believe in bringing the two together in the teaching and learning process (Lingard & Mills, 2007; Hattam
Marrying school knowledge and children’s everyday worlds appears to be one way of allowing all children, especially previously marginalised children, to gain epistemological access to early schooling. This idea of marrying the two knowledge discourses emanates from the work done in Australia and dovetails with the notion of productive pedagogies (Lingard & Mills 2007:233), and the RPiN (Redesigning Pedagogies in the North) project (Hattam & Zipin 2009:297–301). They aimed at designing a curriculum and pedagogy which engages students in meaningfully relevant learning that at the same time enables academic successes. The RPiN project used the “funds of knowledge” approach developed by Moll, Amanti, Neff and Gonzalez (1993:132) among Hispanic communities in the USA, to capitalise on the students’ household and other community resources in the classroom (Fataar 2012:12). Fataar (2012), argues that drawing on the funds of knowledge approach is not enough; he suggests a further “pedagogical modality”; the necessity of scaffolding from life-world knowledge engagement (everyday knowledge) to explicit and practical learning of the cultural codes (school knowledge) needed for success in mainstream school work (Fataar 2012:12).

In this way, according to Fataar, one could establish a pedagogical relationship between these two knowledge discourses, one which respects the importance of the vertical knowledge of school knowledge and would provide a useful bridge between the life-world context of disadvantaged students and the knowledge codes that inform school knowledge (Fataar 2012:4). It is interesting to note that both the funds of knowledge approach of Moll et al (1993:132) and the pedagogical modality offered by Fataar (2012) are based on the social justice approach to education. Henning (2012:185) warns that a country cannot claim social justice in education if teachers do not know their subjects, and if they do not know how the children and youth that they teach learn these subjects.

In South Africa teachers are often accused of not having sufficient content knowledge, and this has implications for adopting a social justice approach to education.

In closing, in this paper we attempted to conceptualise the term epistemological access, especially in terms of foundation phase schooling. After perusing the literature we came to understand that epistemological access goes far beyond mere physical access. It appears to refer to what happens after children are enrolled in school, shifting the focus from institutional access to meaningful or expanded access. What is certain from the literature is a cry for more research into pedagogical sites, where teachers and learners interact for the purpose of teaching and learning. In other words, a move away from placing too much emphasis on redistribution (Fraser 1996:3–6), to concentrating on what Alexander (2008:43) calls the “missing ingredient” to quality education, which is pedagogy. This, we argue, would mean less research
philosophising about what is needed to ensure that all learners achieve success in schools and more research into how this could be made possible.

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According to Smith (2013:32), “conceptual change” in mathematics is a process and needs “scaffolding” in the classroom. Khumalo (2013:66) agrees, adding that this involves “a teacher who works systematically in each and every lesson, assessing the learners individually”.

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Example
Piagetian notions of constructivism in early childhood conceptual development of arithmetic have been abandoned by developmental psychologists and neuroscientists. In this regard Stanislas Dehaene says:

  We now know that this aspect of Piaget's constructivism was wrong. Obviously young children have much to learn about arithmetic and obviously their conceptual understanding of numbers deepens with age and education – but they are not devoid of genuine mental representations of numbers, even at birth ... Unfortunately the tests that Piaget favoured do not enable children to show what they are really capable of (2011:33).
In-text referencing

• Many mathematics teachers are mostly underqualified to teach (Adler & Davis 2006:277).
• According to Gallistel (2012), the neurons that fire when number is contemplated are in the same area of the brain as neurons that fire when space and time are thought of.
• In the introduction to the book titled Reading in the Brain, Dehaene (2009:1) explains the new and “true science of reading” with examples from psychology and neuroscience in the last 20 years.

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