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Teacher Education review

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Acronyms

RNCS   -   Revised National Curriculum Statement

LO   -   Learning Outcome

ESL   -   English Second Language

DoE   -   Department of Education

AS   -   Assessment Standard

SF   -   Shuttleworth Foundation

NGO   -   Non-governmental Organisations

Executive Summary

This report foregrounds the landscape of teacher education both nationally and internationally. This is done with a view to providing a basis for the Shuttleworth Foundation to use in evaluating potential funding endeavours as well as enhancing existing projects that may include a teacher development component. Literature on pre-service and in-service training of teachers was reviewed and best practices were identified. The following emerged as trends in the literature that have demonstrated success:

- Revisiting teachers' experiences from their own schooling in order to access their beliefs on teaching;

- Targeting the beliefs and conceptions of teachers in professional development as a means to more sustainable development and change;

- Making use of strategies in professional development that encourage teachers to engage in reflective practices about their own teaching and learning;

- In the professional development of teachers, modelling the desired practices to them;

- Improving the content knowledge of teachers through workshops that also model the intended pedagogy they are required to practice;

- Providing programmes that offer sustainable support in professional development in order to ensure the sustainable and intended change;

- Creating platforms for the conception of communities of practices with regard to aspects of teachers' professional development;

- Encouraging and empowering teachers to make use of peer support and collaborative learning;

- Improving the ICT skills base amongst teachers.

A synthesis of guidelines for the SF funded projects included:

- A greater focus on Foundation and Intermediate Phase teacher development;

- Developing teachers more as curriculum developers to make them more critical at interpreting the curriculum, selecting, adapting and creating teaching and learning material;

- Building a professional development component into the Siyavula project to address the point above, through initiating a reflective activity within the training;

- Focusing on providing access for teachers to an open educational resource assessment database (similar to or linked with the Siyavula project) where teachers can create, adapt or select a variety of assessments for learning areas.

Past years have seen numerous intervention strategies for learners being implemented as well as a number of curriculum changes being initiated. Fourteen years down the line since the 1994 transition in our country, we are still not reaping the educational harvest our curriculum had hoped to achieve. Internationally our learners are still performing well below average in the core learning areas (numeracy and literacy) and even national systemic evaluation does not portray a promising picture. The divide between the advantaged and disadvantaged learning communities seems to also be growing, rather than diminishing, as a result of the resourced-based philosophy of Outcomes-Based Education. But the newly implemented curriculum is not likely to change soon as this would probably create even more instability in an already volatile educational context.

Perhaps it is time for the main stakeholders and agents of change within our educational system (the teachers) to be the focus of funded interventions aimed at improving learning. Our country is caught within a vicious cycle of trying to improve the status of teaching as a profession and yet grappling with a shortage of teachers. This results in students entering the profession who are either academically weak (and education is the only course to accept them) or who do not have a passion for the profession but could not get into the course of their choice. We also have a dominance of teachers within the schools who were not trained to teach during their pre-service training within the approach of the new curriculum. Newly appointed teachers entering the schools currently appear to very quickly abandon any new knowledge or strategies learnt during their training in order to conform to practices expected by them in the schools. If we are to try and break or at least indent this cycle, we need to consider including professional development of teachers as a core component of current and future interventions.

Introduction

Notwithstanding the improved qualification profile of the teaching force, most reports on South African education indicate that the majority of teachers have not yet been sufficiently equipped to meet the education needs of a growing democracy in the 21st century global environment. The President's Education Initiative research project (1999) concluded that the most critical challenge for teacher education in South Africa was the limited conceptual knowledge of many teachers. This includes poor grasp of their subjects as evidenced by a range of factual errors made in content and concepts during lessons. Many teachers' poor conceptual and content knowledge contributes to low levels of learner achievement (Department of Education [Doe], 2007, p. 4).

This quote captures the essence of the current situation of teacher education in South Africa. With teachers being the prime agents responsible for defining and delivering the curriculum at classroom level (Hargreaves, 1989), it makes sense to invest in their development in order to improve learner achievement. In doing so, it is important to acknowledge that South Africa is not alone in the situation we currently find ourselves in. Many developed and other developing countries are also dealing with similar problems in their teaching force as well as issues of teacher shortage, teacher training, professional status of teachers, etc. The aim of this report is therefore to review the global literature on teacher education with a view to:

- gaining a better understanding of the current situation in South Africa;
- reporting on best practices being suggested by other developed and developing countries;
- suggesting guidelines for funding projects related to this and;
- suggesting generic guidelines relating to teacher education and development across funded projects in various domains.

The report is broken down into two main components; the first part looks at the literature, while the second component applies the situation to the position of the Shuttleworth Foundation. The purpose of the literature review is to describe the global teacher education landscape in order to gain an understanding of best practices in the professional development of teachers. In doing so, the challenges in teacher education have also been reviewed. The review was carried out by consulting seminal works as primary references and using recurring references from these works to obtain further secondary sources. Repetitive

components mentioned in the literature were identified and grouped and sorted into major themes. These are now discussed.

Teacher education globally

Internationally schools and teachers are being challenged to advance their competence in preparing learners for a new knowledge economy. This has resulted in widespread national and international reform in education policy, practice and preparation. This transformation is affecting teacher education at both pre-service and in-service training levels. In South African policy these have been referred to as Initial Professional Education of Teachers (IPET) and Continuing Professional Teacher Development (CPTD) respectively (DoE, 2007). Trends and challenges in each of these are outlined in the sections that follow, with in-service training being fore-grounded though as a focus for the Shuttleworth Foundation.

INITIAL PROFESSIONAL EDUCATION OF TEACHERS (PRE-SERVICE)

Pre-service educational training in the **United States of America** has been scrutinized and widely criticized as too theoretical, fragmented and not holistic (Scharmann, 2007), resulting in qualifying incompetent teachers. This resulted in a disregard for the formal pre-service teacher training programmes and the development of alternative models (Darling-Hammond, 2006; Feiman-Nemser, 2001; Kent, 2005; Schwille, Dembélé & Schubert, 2007; Zeichner, 2006).

Some forms of alternative teacher training in the United States of America are based on combining the strong subject matter knowledge of academically achieving graduates and the professional experience of mentors. These graduates receive short teacher training and start their teaching careers, resembling an induction period, under guidance of a mentor. The mentor teachers are relieved of some teaching duties and are remunerated for the duties they perform as mentors (Humphrey, Wechsler and Hough, 2005). The focus of the mentoring programme should not be on the day-to-day teaching problems, but on encouraging reflection on own practice (Schwille, et al., 2007). The Charles Sturt University (CSU) in Australia developed an Accelerated Teacher Training Program (ATTP) to address the shortages in technology teachers in Australia (Green, Randall & Francis, 2004). Practical technological skills and experience in the technological industry are prerequisites for entry

into the programme. The applicants receive recognition of prior learning in their fields of expertise. Their teacher training is based on:

- A theoretical component, delivered in a mixed mode, on pedagogical content;
- Basic on-campus training in academic literacy, information literacy, teaching skills, classroom management and curriculum;
- Collaborative work with a mentor teacher at a partnership school where the mentor provides support and scaffolding (ibid.).

Diversity, multicultural education and social justice are prominent issues in the United States' pre-service educational landscape, which is a factor relevant to our own situation here in South Africa. The biggest challenge for novice teachers in the United States of America is to cope with diversity in inner city schools in particular (Kent, 2005; Zeichner, 2006). Some suggestions for improving the situation have been to:

- Putting stricter admission requirements for candidate teachers in place with an emphasis on the personal profile of the candidates and not merely on their academic standard (Kent, 2005);
- Extend the time student teachers spend in the field and placing students at challenging schools during the school based education period (Darling-Hammond, 2006; Kent, 2005). Humphrey, et al., (2005) are, however, in disagreement with this and claim that only the "most exceptional" (p. 41) candidates will be successful in such challenging schools;
- Develop a structured and well supported mentoring programme for both student – and novice teachers (Darling-Hammond, 2006; Humphrey, et al., 2005; Kent, 2005; Scharmann, 2007; Zeichner, 2006);
- Introduce a mandatory induction period for novice teachers (Kent, 2005);
- Involve the broader communities in which partnership schools are in order to develop the "socio-cultural consciousness and intercultural teaching competence" of student teachers (Zeichner, 2006, p. 328).

Formal pre-service teacher training programmes in the United States of America have also been criticized for lack of focus on school curriculum content and too much emphasis on

general pedagogy (Schwille, et al., 2007; Zeichner, 2006). Professional education coursework can, however, contribute to teacher effectiveness, on condition that the theoretical component is integrated with practical experience and in support thereof (Darling-Hammond, 2006; Humphrey et al., 2005). Zeichner (2006) indicates the development of reflective practices and encouraging student – and novice teachers to reflect on own practice as well as the ability to assess situations and to adjust teaching approaches accordingly as important features of successful training programmes.

Pre-service educational training in the **United Kingdom** is comparatively homogenous in England, Wales and Northern Ireland (Mc Williams, Cannon, Farrar, Tubbert, Connolly & McSorley, 2006). The curriculum for pre-service teacher education has been controlled by legislation since the creation of The Council for the Accreditation of Teacher Education (CATE). Education studies at tertiary level deteriorated as a result of the control. Mentor teachers in partnership schools in these countries do not allow student teachers much autonomy in lesson planning or in classroom management. Teachers in these countries may have consequently been "deskilled" (p. 78) (ibid.). The situation in the Republic of Ireland, however, is different. Despite less resourced schools in the Republic of Ireland, the professional development of student teachers is accelerated by allowing them full responsibility of the classes they are teaching during their school based education periods (ibid.).

The **theoretical component** in pre-service teacher education cannot be disregarded, although concern has been raised about the discrepancy between theory and practice (Darling-Hammond, 2006). Social issues, dealing with parents or with society or maintaining discipline seem to be skills that novice teachers lack (Humphrey, et al. 2005; Schwille, et al., 2007). The purpose of theory should be to shape teaching practice. To accomplish this, theory preferably includes subject matter knowledge, pedagogical content knowledge (Shulman, 1986), knowledge of the nature of the learners and how they learn and knowledge of the prescribed curriculum (Humphrey, et al. 2005; Schwille, et al., 2007). Borko (2004) describes the importance of obtaining understanding of learners' thinking processes and how to connect these ideas the learners have with concepts in the learning area. Knowledge about learners' conceptions and misconceptions should inform teaching practice. Brodie, et al. (2002) describe the theoretical component in The Further Diploma in Education (FDE) in Mathematics, Science and English Language teaching at the University of the Witwatersrand, Johannesburg, South Africa to deal with:

- Teachers' fluency in English;
- Teachers' questioning skills;
- Eliciting learners' thinking;
- Teachers' engagement with learners' thinking;
- The design of learning activities;
- Co-operative learning and group work;
- The development of own, inexpensive resources.

Thijs and Van den Berg (2002) highlight the role theory can play in illuminating the importance and relevance of proposed alternative approaches in teaching. In order for teachers to adapt their teaching practice, they need to appreciate the relevance and importance of the suggested change (ibid.).

CONTINUING PROFESSIONAL TEACHER DEVELOPMENT (IN-SERVICE)

Teacher education is regarded as a career-long process commencing with the teacher's own schooling. Following the pre-service education and the induction phase, is the continuing professional development phase. Learning in the preceding phases will impact on the learning and development in other phases (Schwille, et al., 2007). Teachers' experiences, induction phases, beliefs, curriculum materials, subject matter knowledge and pedagogical content knowledge are all factors that impact on the quality of teaching and learning. These are now further elaborated from the literature, with a discussion on identified best practices in this regard also included.

TEACHERS' OWN SCHOOLING EXPERIENCE

Teacher education can only be effective when the student teacher's or teacher's own schooling experience is recognized as the first phase in teacher learning. Teachers learn implicitly during their own schooling experiences, during their pre-service training and through their own experience in practice. These **experiences** change their views and beliefs (Glazer & Hannafin, 2006), the quality of their knowledge and impact on their practice. The school experience a teacher had as a student and learner also influences the teacher's subject matter knowledge. No teacher education programme can be successful without taking the

first phase of teacher learning, the teacher's own schooling, into consideration (Schwille, et al., 2007).

In order to enable teachers to become aware of the influence former teachers have on their professional identity, professional development programmes need to include **reflective activities** (Korthagen, 2004). By reflecting on those teachers who impacted positively or negatively on one, one comes to a comprehension of what images are directing one professionally. Teachers can subsequently manage to make conscious choices of what professional identity they wish to pursue (ibid.).

Change in teaching practice is extremely difficult when the **images** a teacher has of teaching, do not change. These images, reminiscent of the teacher's teachers, are shaped during the first phase of teacher learning and are formative in establishing a personal teaching style (ibid.). Kennedy (1999) declares unambiguously that adjustment to the calibre of teachers, to their formal academic training or to incentives will not be sufficient to achieve reform. The images teachers have of teaching need to be altered.

Loucks-Horsley, Hewson, Love and Stiles (1998, as cited in Jeanpierre, Oberhauser & Freeman, 2005) indicate several principles for effective professional development of science teachers and include at least two principles that address this issue. The desired outcomes for transformed teaching practice need to be **modelled** to teachers. Teachers need to create new images of teaching, shaped on these demonstrated models. These new images of teaching cannot be created by direct transmission, but only through experience (Jeanpierre, et al., 2005). The ideal is for teachers to become naturally inclined to these new approaches (Fullan & Miles, 1992, as cited in Jeanpierre, et al., 2005). The new approach should be integrated in their planning and their approach to teaching (Jeanpierre, et al., 2005).

To facilitate change in teaching practice, teachers should be taught both during pre-service and in-service education, in ways **similar to how they should be teaching** (Delfino & Persico, 2007; Lee, Hart, Cuevas & Enders, 2004). The paradigm, in which the teacher education is delivered, should be similar to the outcomes set for teaching practice (Brodie, Lelliott & Davis, 2002; Devereux & Amos, 2005; Hattingh & Killen, 2003; Zaslavsky & Leikin, 2004). Teacher educators do not always model the teaching approach the institution propagates. The undesirable reinforcement of the images student teachers have of teaching will be an inevitable outcome (Schwille, et al., 2007).

INDUCTION PHASE

A formal **induction period**, similar to mentoring, is recognized as an important phase of teacher education. Induction however, takes place informally irrespective of a programme. If induction is not regulated and compulsory, the effects of informal induction can have a negative effect on teaching and teachers. During induction, the teacher adapts to the culture of teaching (Schwille, et al., 2007). Induction programmes should preferably be the joint responsibility of tertiary institutions and schools (ibid.). A three-term formal induction period for beginning teachers is followed in England (Harrison, Dymoke & Pell, 2006). The roles that the mentor teachers fulfil are aimed at orientation, support and the professional development of the novice teacher. A personalized action plan for continuing professional development, a so-called career entry profile (CEP), is compiled at completion of the three-term induction phase. The CEP is based on the strengths and weaknesses of the beginning teacher. The relationship between the mentor – and beginning teacher should be one of an "open, questioning and analytical" (Harrison, et al., 2006, p. 1065) quality. There should preferably be more than one mentor teacher, as the same person being confidant and supporter as well as assessor, is undesirable (Vonk, 1993). The initial degree of control exercised by the mentor teacher should gradually be diminished to a level where the beginning teacher is self-monitoring, accepting challenges and taking risks (Harrison, et al., 2006). No developing country has a formal induction programme (Organization for Economic Co-operation and Development (OECD), 2005, as cited in Schwille, et al., 2007).

TEACHERS' BELIEFS AND CHANGE

Luft (2001) describes the results of The Inquiry-Based Demonstration Classroom (IBDC) in-service programme in the United States of America. Certain teachers are **resistant to change**. They may change their practices, but not their beliefs about teaching. This is in agreement with the findings of Elmore (2002, as cited in Schwille, et al., 2007) that transformation of teaching practice may (or may not) transform teachers' beliefs. Lee, et al. (2004), however, report findings that differ from those previously stated. In their study, teachers' espoused beliefs about inquiry-based science teaching changed without impacting significantly on their classroom practice. Previous careers in science may enforce the resistance teachers have towards a change in beliefs about teaching. Well experienced teachers may be more resistant to change (Jeanpierre, et al., 2005). Cultural beliefs can hamper transformation when authority is a dominant attribute of the particular culture

(Hardman, Abd-Kadr & Smith, 2008). Professional development programme design should accommodate the various belief systems the participants may have of teaching and learning (Luft, 2001). Teachers in professional development programmes should be encouraged to reflect on and investigate their own **beliefs** about teaching and learning (ibid.).

CURRICULUM MATERIALS

A fundamental component of school-based professional development programmes is exhibitory curriculum materials (Gouws & Dicker, 2006; Harvey, 1999; Thijs & Van den Berg, 2002). Clarke (1997) is confident in maintaining that professional growth is strongly supported by curriculum materials. This conclusion was one of the prominent findings in the study reported by Lee, et al. (2004). Those teachers, that did actually portray a change in teaching practice, recognized the availability of instructional materials as support for their transformation. These instructional materials were explicit in the description of how to conduct scientific inquiry in the classroom and how to accommodate learners from various cultural and language groups. The materials offered scaffolding to teachers for developing their teaching practice from a teacher-centred to a learner-centred approach. Strategies for implementing teaching units were provided in the materials too (ibid.). Thijs and Van den Berg (2002) are confirming this approach when stating that curriculum materials need to contain and portray envisaged changes in practice.

SUBJECT MATTER KNOWLEDGE

An important issue in continuing professional development is the balance between in-depth understanding of the curriculum content and more advanced subject matter content (Ball, 2003; Schwille, et al., 2007). No authoritative conclusions can be drawn from research (Floden & Meniketti, 2005, as cited in Schwille, et al., 2007). Although a one-year in-service distance education mathematics course for teachers in South Africa, referred to later in this document, (Stols, Olivier & Grayson, 2007) did not focus on the curriculum content the teachers taught in their classes, their content matter knowledge as well as their pedagogical content knowledge improved. The focus of the course, however, was on improving their problem-solving -, mathematical thinking - and reflective skills. Everwijn, Bomers and Knubben (1993) based the development of a new curriculum for the Business School at the Nijenrode University in the Netherlands on the assumption that the promotion of problem-solving skills would enable students to transform theoretical knowledge into informed

practice. Ball (2003) argues that an increase in the quantity of teachers' mathematical knowledge per se would not necessarily improve mathematical learning. Teachers should learn mathematics in ways that enhance their mathematical teaching skills. Teaching mathematics effectively involves more than the ability to do mathematics (ibid.).

PEDAGOGICAL CONTENT KNOWLEDGE

Improving teachers' pedagogical content knowledge (Shulman, 1986) seems to be a more preferable practice than improving their general pedagogy (Schwille, et al., 2007). In France, the emphasis during the induction of novice teachers is on the subject didactics of mathematics and on pedagogical content knowledge (Shulman, 1986), given the exceptionally strong subject matter knowledge of French teachers (Britton, Paine, Pimm & Raizen, 2003, as cited in Schwille, et al., 2007). A conclusion from the one-year in-service distance education mathematics course for teachers in South Africa (Stols, et al., 2007) may be that pedagogical content knowledge improves when meta-cognitive skills are developed through problem-solving. The preceding conclusion is in agreement with the curriculum goals formulated by Everwijn, et al. (1993). First and foremost the students should have excellent and profound subject specific or content knowledge. The development of general skills, identified as (pp. 429, 450):

- *Communication skills;*
- *Analytical and information-management skills;*
- *Problem-solving skills;*
- *Decision-making skills and valuing;*
- *Social interaction and leadership skills*

supports and enhances the acquisition of content knowledge. Thirdly students need to develop meta-cognitive skills, encompassing reflective skills.

BEST PRACTICES IDENTIFIED

Best practices in teacher education, conducive to substantial change in teaching practice, are described by the following principles:

- The school setting is transformed to a powerful social system and interaction between teachers, even that of informal discussion, is utilized in contributing to continuing professional development (Glazer & Hannafin, 2006; Putnam & Borko, 2000);

- Participating teachers need to understand and appreciate the underlying principle(s) behind the reform. Appropriate theory is incorporated in the programme to accomplish this (Harvey, 1999; Thijs & Van den Berg, 2002);
- New approaches to teaching need to be modelled to teachers in order to facilitate their understanding thereof (Britton, et al., 2003, as cited in Schwille, et al., 2007; Glazer & Hannafin, 2006; Loucks-Horsley, Hewson, Love & Stiles, 1998, as cited in Jeanpierre, 2005; Thijs & Van den Berg, 2002). In addition to practices being modelled, teachers should experience the new approach to teaching as learners and receive guidance in applying these in their own classrooms (Hattingh & Killen, 2003);
- Teacher education is based on the participation of colleagues in peer-assessment of teaching practice through critical evaluation and in facilitating collegial discussion (Edmonds, 2007; Glazer & Hannafin, 2006; Putnam & Borko, 2000; Thijs & Van den Berg, 2002);
- The developmental innovation depends on the skills of the participants while those skills are developed and improved during the particular innovation (Putnam & Borko, 2000);
- Innovations in teaching practice are implemented co-operatively by teachers in the context of the classroom (Schwille, et al., 2007; Thijs & Van den Berg, 2002);
- Support through feedback is provided by a mentor or consultant and support material (ibid.).

Even as early as the 1980's, Sparks and Loucks-Horsley (1990, § 2) described best practices in professional development as the following:

- *Programmes conducted in school settings and linked to school-wide efforts;*
- *Teachers participating as helpers to each other and as planners, with administrators, of in-service activities;*
- *Emphasis on self-instruction with differentiated training opportunities;*
- *Teachers in active roles, choosing goals and activities for themselves;*
- *Emphasis on demonstration, supervised trials, and feedback;*
- *Training that is concrete and ongoing over time; and*
- *Ongoing assistance and support available upon request.*

During the Eisenhower programme in which professional development in the United States of America was evaluated, Porter, Birman, Garet, Desimone and Yoon (2004, as cited in Schwille, et al., 2007), distinguished between **core and – structural features** of such programmes. The core features comprised a focus on improving subject matter knowledge as content, active involvement of teachers in learning processes through conducting classroom observations and being observed by colleagues and consistency between the goals of the programme, the official curriculum outcomes and assessment standards and teacher experiences as communicated by them to the programme developers. The structural features comprised prolonged engagement of teachers in programmes, programme activities developed to facilitate change in teaching practice and mentor – and peer supported participation in activities. Team related participation in programme activities, with team members in close proximity of one another, e.g. district-based teams are an extension of the collegial dimension of best practices in professional development.

Jeanpierre, et al. (2005) describe a professional development programme aimed at facilitating science teachers to incorporate inquiry-based and learner-centred research projects into their teaching practice. The programme was designed to adhere to the requirements of The National Science Education Standards of 1996 in the United States of America. The professional development programme was conducted full-time over a two-week period with follow-up evaluations over a two-year period. A community of practice was created between science teachers, secondary school learners and professional scientists. The success of the programme was ascribed to:

- Intensification of the teachers' levels of science content knowledge and scientific understanding;
- Development of teachers' knowledge of the processes of inquiry-based teaching and the confidence of the teachers in using these processes;
- Creating opportunities for teachers to experience and practise these new approaches to teaching and learning;
- Development of teachers' abilities to facilitate co-operative learning and their management skills;
- Assessing the teachers' demonstration of competence in inquiry-based science teaching.

A professional development programme aimed at the growth of teachers in Israel, was based upon a **constructivist** view of teaching and learning (Zaslavsky & Leikin, 2004). A **community** of practice, incorporating **reflection** on the experiences of both teachers and teacher educators, was established over an extended period of time and regular contact sessions. The teachers and teacher educators were actively involved in a continuous process of learning. The learning and growth took place through personal experience, prolonged engagement in the community of practice and reflective discussions (ibid.). These programme characteristics were incorporated in an In-Service Education and Training (INSET) programme of the University of the Witwatersrand in South Africa, called Programme for Leader Educators in Senior Phase Mathematics Education (PLESME) (Graven, 2007).

Research in China and Japan reported best practices in continuing **professional development** as those based on the **collaboration** of colleagues or peers. Peer support does not only exist for continuing professional development, but for the induction phase of teacher education too. Co-operative groups of experienced teachers take responsibility for the induction of novice teachers (Schwille, et al., 2007). A heterogeneous group of colleagues may enhance the positive outcomes of collaboration (Delfino & Persico, 2007). Continuing professional development in general can benefit by such practices. A **culture, conducive to collaboration**, one of openness, of acceptance of critique without defence, should be engendered among teachers (Hertzog, 2000; Schwille, et al., 2007).

Training, resulting in transformation of practices, involves **teacher participation** and **follow-up** sessions (Graven, 2007; Schwille, et al., 2007). The importance of follow-up is emphasised by Luft (2001), in particular in reference to the accomplishment of transformation in teacher beliefs through change in teaching practice. Follow-up sessions play an important part in various other professional development projects (Jeanpierre, et al., 2005; Schwille, et al., 2007; Thijs & Van den Berg, 2002). Professional development preferably takes place continually over an extended period of time. The Israeli project (Zaslavksy & Leikin, 2004) is an example of prolonged engagement on a regular basis. The teacher involvement lasted for four consecutive years, with contact on a weekly basis. Transformation of teaching practice may subsequently result in a **change in the views and beliefs** teachers have of teaching and learning (Elmore, 2002, as cited in Schwille, et al., 2007).

Engendering **reflective practices** is frequently indicated in the literature as a prominent best practice in teacher education (Edmonds, 2007; Korthagen, 2004; Schwille, et al., 2007; Zeichner, 2006). Induction of novice teachers in Switzerland follows a holistic approach, based on co-operation between colleagues and with opportunities for reflective practice (Britton, Paine, Pimm & Raizen, 2003, as cited in Schwille, et al, 2007). Professional development programmes should not merely instruct teachers how to reflect, but should guide teachers on what to focus on. Reflections on own practice is best done in collegial mode. Reflection on a concrete experience should focus on (Korthagen, 2004, pp. 87, 88):

- *The environment one encounters, i.e. everything outside oneself;*
- *Behaviour, less effective and other possibly more effective behaviours;*
- *Competencies;*
- *Beliefs;*
- *Professional identity, one's own professional role;*
- *Mission, what is the calling that has led one to become a teacher?*

South Africa and other developing countries

In developing countries in particular, teacher education cannot be isolated from the **factors impacting on the numbers and the quality** of the teacher corps. Brodie, Lelliott and Davis (2002) mention the inhibiting factor of medium of instruction in a South African context. The majority of teachers are not teaching in a first language and rural teachers often only use the medium of instruction in the classroom context. In addition to language barriers on the teachers' part, Harvey (1999) points to the impact of low levels of learners' language competence. Transformation of teaching practice to a learner-centred approach cannot be realized when lack of language ability inhibits learner participation.

The **HIV/AIDS pandemic** needs to be addressed (Schwille, et al., 2007). HIV/AIDS is the cause of high mortality among teachers in developing countries in Africa and indicates unacceptable high levels of teacher absenteeism (Moon, 2007).

In an expanding global economy, offering a multiple of career choices, very few, if any, academic achievers choose teaching as a career (Schwille, et al., 2007). The teaching profession is offering lower comparable salaries; the relative **status of the profession** has deteriorated and the working conditions in developing countries are poor (Moon, 2007;

Schwille, et al., 2007). Teaching as a career choice is often a last resort (Schwille, et al., 2007). The fiscal component in the teaching profession needs serious reconsideration if the quality and the quantity of the teaching corps are of future importance (ibid.).

As mentioned in the preceding paragraphs, the majority of candidates for future teachers, in developing countries in particular, are not ideal as teachers. Teacher education needs to address these **academic and personal shortcomings** (Schwille, et al., 2007). In developing countries in particular, the low quality of subject matter knowledge of candidate teachers is the outcome of poor secondary school education (ibid.). Academic shortcomings are, however, not limited to developing countries. Lee, Hart, Cuevas and Enders (2004) describe the need to develop a professional development programme by the University of Miami in the United States of America in order to broaden and deepen the science content knowledge of elementary school teachers. Brodie, et al. (2002) state the importance of developing in-service programmes with these shortcomings as focus.

Best practices

Research projects, in which human development, values and dispositions were taken into account, were identified in the literature. Stols, Olivier and Grayson (2007) describe a one-year in-service distance education mathematics course of the University of South Africa (UNISA) for teachers in South Africa. Important projected outcomes intended for the course was improving teachers' **attitudes** towards mathematics and engendering a "mathematical attitude of mind" (p. 33). The mere improvement of teachers' mathematical content knowledge and teaching teachers how to transmit mathematical content to learners are destined to fail in transforming teaching practice. The "strengthening of teachers' mathematical identity" (p. 3) was a prominent outcome of the In-Service Education and Training (INSET) programme of the University of the Witwatersrand in South Africa, called Programme for Leader Educators in Senior Phase Mathematics Education (PLESME) (Graven, 2007). Zaslavsky and Leikin (2004) describe two of the outcomes of an Israeli professional growth programme as "a reflective state of mind and a collaborative disposition" (p. 30). Thijs and Van den Berg (2002) describe the development of leadership and management skills of Heads of Department of mathematics and science at the partnership schools in the University of Botswana In-Service Education and Training Programme for Science and Mathematics Teachers (UB-INSET).

One-time workshops, characterised by lectures, are not part of the best practice repertoire (Borko, 2004; Glazer & Hannafin, 2006; Schwille, et al., 2007). These workshops do not usually result in a substantial change or improvement in teaching practice, especially when presenters attempt to convince teachers to transform their practices by urging them to do so (Leu, 2004). Graven (2007) gives an interesting slant to this view in reporting how workshops, characterised by lectures and non-participation, can impact negatively on the professional identity of teachers. Participation implies the acknowledgement and confirmation of teacher professional identity (Wenger, 1998, as cited in Graven, 2007). Programmes that do follow a workshop approach can have a significant impact on teaching practice provided that the teachers are actively involved, there are a number of consecutive workshops and the workshops have an iterative nature. Ahmed, Flisher, Mathews, Jansen, Mukoma and Schaalma (2006) report such a training programme in the Western Cape in South Africa, aimed at empowering teachers to teach HIV/AIDS prevention in the life orientation learning area. Two consecutive week-ends were spent on improving teachers' content knowledge and developing teachers' facilitative skills. Subsequent workshops or "refresher training" (p. 625) served as opportunities for report-back and sharing and discussion of experiences (ibid.).

Continuing professional development needs to adhere to five requirements in order to facilitate change in teaching practice (Thompson & Zeuli, 1999, as cited in Schwille, et al., 2007).

- Teachers should have new experiences with teaching and learning, in conflict with existing views and beliefs these teachers may have. Zaslavsky and Leikin (2004) are in resonance with this requirement in reporting that their participants' learning differed from their own previous learning;
- Subsequent to these conflicting experiences, the teachers should go through lengthy reflective processes, supported by discussions;
- Confrontation of existing views and beliefs should take place in the realistic context of their own teaching practice and – setting;
- Teachers need to develop sufficient practical experience in the new educational paradigm. Brodie, et al. (2002) support this statement by stating that, in order for teachers to acquire new models for teaching, the teachers should experience those practices as learners;

- Teachers should receive sustained support in realizing the new educational paradigm in practice.

The one-year in-service UNISA distance education mathematics course for teachers in South Africa (Stols, et al., 2007) was based on the above-mentioned requirements for transformation (Thompson & Zeuli, 1999, as cited in Schwille, et al., 2007).

- Teachers had the opportunity to experience new approaches to the teaching and learning of mathematics, in conflict to their own schooling experiences and their own pedagogical approaches;
- Reflective practices were encouraged and developed among teachers;
- Coherence was established between the realistic context of the curriculum taught in the classroom and the programme material. The programme material was based on current curriculum demands;
- Teachers were exposed to challenging, non-routine problems over an extended period of one year. The approach of confronting mathematics teachers with open-ended, non-routine tasks was also applied in the Israeli "Tomorrow 98" project (Zaslavsky & Leikin, 2004);
- Support was provided through feedback and during contact sessions.

A United States Agency for International Development (USAID) funded Basic Education System Overhaul (BESO) project in Ethiopia was based on the principle of **teams of teachers from school clusters**, taking responsibility for their own professional development with the support of course materials (EQUIP, 2002, as cited in Schwille, et al., 2007). From experience through their involvement in teacher professional development in East Africa and South Asia, the Aga Khan Foundation (AFK) recommends a **whole school approach** to teacher education, as opposed to individual development (Anderson, 2002, as cited in Schwille, et al., 2007). Moon (2007) highlights the negative implications of "out-of-school" (p. 356) based programmes targeting individuals as being costly, focusing on only a small minority benefiting from these and the intensification of pressure on the reduced teaching staff who is excluded. Whole school programmes, involving peers and colleagues, are not only cost effective, but adhere to the important condition of education in context. The emphasis of teacher education should shift to a whole school approach that benefits all

teachers (ibid.).   In line with this whole school approach, Thijs and Van den Berg (2002) describe the departmental approach of developing the leadership and management skills of Heads of Department of mathematics and science at the partnership schools of the UB-INSET programme.   Brodie, et al. (2002) mention the importance of managerial support in regard to the whole school approach.   Glazer and Hannafin (2006) subscribe to Brodie et al.'s point of view of the importance of managerial support in school based professional development.   Blumenfeld, et al. (2000), however, point to a negative implication of the whole school approach.   The inclusion of teachers, who are resistant and critical towards transformation, would be unavoidable.   This can compromise the creation of a collegial community.

Best practices for the professional development of teachers are described in the Organization for Economic Co-operation and Development (OECD) report (2005, as cited in Schwille, et al., 2007) as school based, focussing on subject matter content and relevant pedagogical practices and providing **sustainable support** and formative feedback.   Transformation of teaching practices and introduction of alternatives are achieved by modelling such practices to teachers who observe and experience these intended new approaches to teaching.   These practices correspond to those listed by Jeanpierre, et al. (2005).   Sustainable support of teachers in the UB-INSET programme was provided through programme course materials, exhibitory curriculum materials and school visits by university-based project staff (Thijs & Van den Berg, 2002).

Thijs and Van den Berg (2002) describe an in-service programme, aimed at implementing a learner-centred approach to teaching in secondary school mathematics and science classrooms in Botswana.   The programme was based on the Coaching to Support Science and Mathematics Teachers (COAST) study and part of the University of Botswana In-Service Education and Training Programme for Science and Mathematics Teachers (UB-INSET). **Peer coaching** was applied as a supportive mechanism in transforming teaching practice to learner-centred.   Peer coaching entails reflection on own practice in collaboration with peers. The properties of peer coaching are (Joyce & Showers, 1982; Thijs & Van den Berg, 2002):

- Peer coaching is not evaluative in nature, but a form of formative assessment through analysis of classroom practice;
- Peer coaching has a cyclic nature of observation and feedback;
- Peer coaching has the improvement of classroom practice as outcome.

The conditions of peer coaching are:

- Participants should be trained in the peer coaching strategies of classroom observations and discourse;

- Peer coaching projects are dependent on managerial support. School organization needs to be restructured to allow for peer collaboration (Brodie, et al., 2002; Delfino & Persico, 2007; Glazer & Hannafin, 2006; Thijs & Van den Berg, 2002);

- Peer coaching per se would not result in transformation of practice. The possibility of lack of focus exists. Participants should appreciate the relevance and importance of the intended reform in teaching practice in order to fully benefit from peer coaching.

An aspect of peer collaboration, indicated in the literature as a best practice in continuing professional development, is the practice of **classroom observations** of teachers (Edmonds, 2007; Glazer & Hannafin, 2006; Schwille, et al., 2007; Thijs & Van den Berg, 2002). To utilize these classroom observations to their fullest advantage, they are conducted in combination with formative assessment, feed-back and discussion (ibid.). Britton, et al. (2003, as cited in Schwille, et al., 2007) describe induction practices in Shanghai where novice teachers observe mentors modelling teaching practices, novice teachers are observed and evaluated by mentors and peers, novices and mentors discuss classroom observations publicly and novices discuss and motivate learning task designs and pedagogical choices. A high premise is placed on the **collaboration and the community of colleagues**. The advantages of modelling teaching practice to peers are not one-dimensional. Peers not only observe effective teaching approaches, but can learn from the thinking strategies applied to design these (Glazer & Hannafin, 2006). Ertmer (2005) points to the advantage of increased confidence among teachers as a motivational outcome of modelling or "vicarious experiences" (p. 33).

The community of practice, created among colleagues (Darling-Hammond, 2006; Edmonds, 2007; Zaslavsky & Leikin, 2004), participates in **discussion aimed at consensus**. Colleagues are able to motivate critique in formative peer assessment with examples from the colleague's practice. Colleagues are able to describe each other's practice elaborately. Alternative practices are suggested (Feiman-Nemser, 2001; Thijs & Van den Berg, 2002). Graven (2007) suggests the use of video recordings of learning periods to facilitate reflection during post-lesson debriefing and during collegial discussions. Blumenfeld, Fishman, Krajcik,

Marx and Soloway (2000) suggest the use of video recordings on a much larger scale. Video recordings of learning periods conducted in the envisaged, desirable paradigm, available on-line, can be instrumental in the professional development of teachers. **Discourse** among teachers at a school and across schools within close proximity, is another factor, as identified by Leach and Moon (2002) and the TESSA project, contributing positively to reaching the outcomes of teacher education. Moon (2007) describes continuing professional development of teachers as a "social process" (p. 368). The interaction between the members of the community of practice, with different levels of teaching experience, enhances their professional development (Zaslavsky & Leikin, 2004).

In agreement with the accepted best practices mentioned in the preceding paragraphs, Borko (2004) emphasises best practices in teacher education as the creation and maintenance of a **community of practice** and facilitating discussion related to critical evaluation of each other's teaching practice. An effective professional development programme in the United States of America, Supporting the Transition from Arithmetic to Algebraic Reasoning (STAAR), is reported to spend a considerable amount of time on initially establishing a community of practice and on engendering a culture conducive to the functioning of such a community. Borko (2004) reports on several American projects in which records of classroom practice, e.g. assignments, video recordings and learners' scripts are utilized to create an environment for peer coaching (Thijs & Van den Berg, 2002). The teaching context is authentically captured by using these records (Borko, 2004). In the Cognitively Guided Instruction (CGI) programme in the United States of America collaborative groups of teachers used similar problems in their mathematics classrooms, examined and discussed the learning outcomes and co-operatively designed pedagogical interventions based on their mutual understanding of learners' thinking processes and problem solving strategies (ibid.). The final workshop of the programme developed by the University of Miami, as reported by Lee, et al. (2004), was based on the principle of teaching similar units, followed up by report-back and collegial sharing and discussion of classroom experiences.

The effectiveness of teacher education programmes is higher when these programmes are **school based** and integrated with the teachers' experiences and contexts. The desirable **context** for continuing professional development is the school and the classroom. **Active involvement** of teachers in their continuing professional development is recognized as a best practice (Borko, 2004). The training programmes should be directly related to teaching practice (Darling-Hammond, 2006; Scharmann, 2007; Schwille, et al., 2007). Active

professional learning through school-based activities, true to the cultural context, is one of the factors identified by Leach and Moon (2002) and The Teacher Education in Sub-Saharan Africa (TESSA) project as contributing positively to the achievement of intended outcomes in professional development programmes. The cultural context needs to be taken into consideration when applying so-called best practices in teacher education as these cultural components can impact negatively on the effectiveness of generally accepted best practices like collegial collaboration or peer coaching (Saito, Tsukui & Tanaka, 2008).

Dembélé and Miaro II (2003) reported on a professional development project in Guinea based on the following principles as interpreted by Schwille, et al. (2007, p. 115):

- *The programme focused on direct improvement of teaching in context;*
- *The programme was based on the felt needs of teachers;*
- *The programme required extensive and continuing collaboration among teachers;*
- *The programme attempted to improve a sequence of lessons at a particular grade level on specific topics in basic subject matters;*
- *The programme provided for practice, feedback and formative evaluation;*
- *Observation of and feedback from observation by other teachers played a key role;*
- *The programme attempted to maintain a constant focus on student learning and the analysis of student work;*
- *Teams were expected to write up the results to share with other teachers;*
- *The programme was a type of action research, requiring problem identification, student assessment, experimentation and evaluation of outcomes; and*
- *The programme provided access to external expertise.*

Employees of the Guinean Department of Education were trained as mentors. The continuing professional development of the teachers was supported by sustained contact through school visits and regular formative evaluation. Researchers predict such an ambitious model to probably be **unsuited** for a teacher corps with **low levels of training** (Johnson, Monk & Hodges, 2000) and recommend a differentiated model of teacher education, starting at the lowest level of transmission and progressing to sophisticated action research type models of active learning. The introduction of such a model should be a gradual process that is intensely facilitated (Schwille, et al., 2007). The Primary Science Programme (PSP) in South Africa, as described by Harvey (1999), was also characterised by

a gradual transformation from focussing on transmitting content to eventually enabling teachers to select an appropriate teaching approach from their personal repertoire they had built through the professional development programme. The UB-INSET programme (Thijs & Van den Berg, 2002) took the local hurdles to learner-centred teaching into consideration. The new approach was introduced gradually by initially merely encouraging the teachers to introduce activities into their teaching.

Distance education, enhanced and complimented by regular contact sessions, has been proven to be a cost-effective form of teacher education (Schwille, et al., 2007). Such a programme for professional development, tailored to be representative of the nation, was developed in Namibia. The programme entailed an action research or practice based approach with contact sessions and distant education components. The distance education component was represented in study guides containing the content of the programme modules and the submission of written assignments. Feedback on assignments and tutor assistance with the study material were provided during contact sessions that took place in the school holidays (Zeichner & Dahlstrom, 1999, as cited in Schwille, et al., 2007). Moon (2007) is in agreement with the notion of exploring distance education in developing countries. The positive outcomes of a one-year UNISA distance education mathematics course for teachers in South Africa (Stols, et al., 2007) confirm the above-mentioned statements.

Devereux and Amos (2005) are reporting about a successful **co-operative project** with a **distance education** component in the Eastern Province of South Africa. **Employees** of the provincial Department of Education were trained as tutors or mentors and were involved in the project, initiated by the University of Fort Hare. Activities were designed to be carried out by the teachers in their classrooms. The design of these activities was based on the same educational paradigm as that of the desired outcome for teaching. Formative and continuous assessment and feedback were prominent features of the programme (Moon, 2007).

Various role players can be involved co-operatively in teacher education, each feeding particular expertise or resources into the professional development programmes. An example of such a venture is The Teacher Education in Sub-Saharan Africa (TESSA) provision of web – and text-based curriculum materials as resources for continuing professional development (Moon, 2007). The Association for Mathematics Education of South Africa (AMESA) was involved as a role player in the PLESME-project (Graven, 2007).

Membership of such a professional body and exposure to the larger community of practice through conferences and literature impacted positively on the development of a mathematical identity (ibid.).

The Malawi Integrated In-Service Teacher Education Programme (MIITEP) (Lewin & Stuart, 2003) is an example of a **collaborative project** between various role players, namely university based mentors and school colleagues. The project is based on the apprenticeship model, applied in a developing country. The success of such an apprenticeship model does not however, only depend on peer collaboration, but is unfortunately negatively influenced by a lack of resources (ibid.). Moon (2000, as cited in Moon, 2007) is calling for the increased and prolonged involvement of tertiary institutions in the continuing professional development of teachers.

Peer support and the creation of a community of colleagues are not readily accomplished in the rural areas of developing countries (Moon, 2007). **Information and communication technologies** (ICT) are avenues that should be explored in Africa. These technologies can be applied in the enhancement of continuing professional development. The Open University of Sudan combines the development of regional study centres and information and communication technology to ensure the personal contact highly prioritized in teacher education.   Projects like Mindset and SchoolNet are examples of information and communication technologies applied in the South African context to facilitate teacher education. Taking advantage of information and communication technologies, in combination with other conditions for effective teacher development and transformation like curriculum focus on teaching skills and pedagogical approaches and programmes based on the daily teaching activities in the context of the classroom, is indicated as a measure in successful reform (ibid.).   TESSA identified eight points from previous studies by Leach and Moon (2002) that will positively impact on the success of teacher training. Three of these points are related to information and communication technologies (Moon, 2007, p. 367).

- *Vision and sustained commitment on the part of government, educational leaders and policy-makers, to professional development, including ensuring effective technological infrastructures than can support ICT components;*
- *Access to high quality multimedia resources that utilize ICT, use teachers' own language(s) and which integrate exemplars that reflect local culture, education and practices;*

- *Provision of carefully planned, well-managed online environments, allowing for the collaborative development of professional knowledge.*

Finally programme evaluation of teacher education in-service programmes needs to be in place to ensure **quality control**. Programme evaluation is complemented and informed by follow up and assessment of teachers (Schwille, et al., 2007). Leach and Moon (2002) suggest that teacher feedback and external evaluation should visibly inform quality assurance processes in teacher education and that these should be thoroughly and strictly applied.

Position paper for Shuttleworth Foundation

In the literature review above trends, challenges and best practices in teacher education globally as well as in South Africa were reviewed. The aim of this was to present a landscape to the Shuttleworth Foundation from the literature in order to deduce some generic guidelines relating to teacher education. These will hopefully be applicable and useful for the organisation in the selection and execution of projects being funded. In order to write the position paper, we have drawn on the literature as well as our knowledge and available information on the Shuttleworth Foundation from the website.

Introduction

> *If we are to lift Africa from her current circumstances, we will need a generation of learners that are gifted with curiosity about the world in which they live, and the tools to understand and shape the world. (Shuttleworth, 2008,http://www.shuttleworthfoundation.org/home)*

The generation of learners that this quote refers to are in the hands of our current generation of teachers. Effecting change at learner level, as also described in your evolutionary development process of the "theory of change" document in Figure 1, will most like be optimally achieved through first ensuring change at the teacher level. Teachers are the change agents that will have the biggest impact on your "Remove barriers to innovation" and "Accelerate promising ideas" points. Teachers are also valuable sources in providing open source material and encouraging the promotion thereof amongst the learners. They are most likely to use, promote and support open learning though if they firstly know how to use it confidently, and secondly can see the value in it for their own purposes of teaching and learning. The Shuttleworth Foundation (SF) is in a wonderful position to empower teachers in this through the projects being funded.
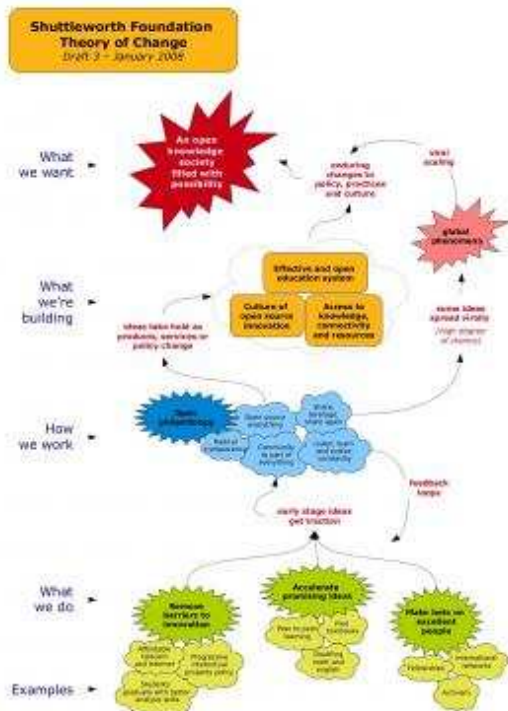
Figure 1: *Theory of Change (http://www.shuttleworthfoundation.org/home) January 2008 version*

From the literature a number of aspects that positively affect in-service training of teachers can be identified. These include: giving teachers new experiences, using reflection to improve teachers' practices, supporting teachers through extended periods to implement the changes in their classrooms, creating communities of practice as a mechanism to support teachers, encouraging peer interaction and support within these communities and using distance education as a means to reach large numbers of teachers. These are now discussed with regard to the Shuttleworth Foundation.

Open Educational Resources

Open educational resources are a useful tool that can be used to provide **new experiences of learning** to teachers. For example, best practices of teachers facilitating learning in their classrooms could be recorded and made available as open educational resources for other

teachers to view. This addresses a shortfall we have in South Africa where teachers are being expected to implement our new curriculum using the philosophy of Outcomes-Based Education, with few of them ever having experienced the format or delivery of such a lesson. Open educational resources could also become a vehicle through which teachers could share, view and experience how teachers in other countries are conducting teaching and learning in their classrooms. Just looking at the amount of teaching clips available on "You tube" sparked ideas on a site for teachers where clips are categorised into, for example, subjects, grades, approaches to teaching, handling difficult learners etc. The nature of teaching makes it difficult for teachers not to become fairly isolated within their own classrooms or schools. A website dedicated to providing teachers with new experiences in teaching could be a means to breaking down this isolation and encouraging a **broader community of practice**.

Pre-service training of teachers could also benefit from such a site. Teachers in training could be shown short video clips of interactions between teachers and learners and asked how they would respond in a similar situation. This would enable our pre-service students to have access to situations on how to handle, for example, learner errors, learner questions, discipline and subject content, without the threatening situation of encountering these in a live classroom full of learners for the first time. Students could therefore be exposed to a range of situations and scenarios from within the classroom while conducting their training on campus. Such an approach to training students would also enrich the theory that is presented to them during their training. This theory is often presented to students without a context that requires the practical application thereof, thereby rendering the theory futile in the moment. A site with teaching and learning clips could allow lecturers at universities to select contexts that create a need and use for the theory they are presenting to the students.

Open educational resources and open source software programmes could also be used as a training tool in **distance education**, where interactive teaching and learning opportunities can be exchanged with a computer where face-to-face facilitation is not available. Distance education has to deal with the limitation of offering limited new experiences to its recipients in that they are mostly exposed to a plethora of reading material and required to produce assignments based on what they have read. In teacher training, this does little to change and challenge the experience of the individual in terms of their own learning as a model of teaching. Providing an open source window for teachers (including material, ideas, video clips and exchanges) could help address this limitation of distance education.

South Africa needs to consider training willing teachers and/or schools in producing and utilising open source material as discussed above. In such training, the teachers would be exposed to a new learning experience that they could further be encouraged to **model** in their classrooms. These training sessions could also be used to empower our teachers as **curriculum developers and designers**, something that has not been fore-grounded enough in the pre-service training in the past. Grossman and Thompson (2008) argue that new teachers also need opportunities to analyse and critique curriculum materials. This in turn enhances the **content knowledge** of teachers which is another crucial component of their practice. The Siyavula project is an example of an opportunity for advancing in this regard.

With the rollout shortly of a computer for every school, this type of training can become a reality. Perhaps the SF could consider funding the design of such a **prototype module** that could be formatively developed and evaluated in partnership with a university. Once developed, the module could be used by different institutions in training their pre-service teachers in material development, specifically for an open source purpose. The whole concept of open source and collaborative materials creates urgency in training teachers to also be **competent curriculum material developers**. Being a competent developer requires a high level of engagement with and understanding of the subject matter one is working with. This therefore again becomes a non-threatening tool that can be used to improve the content knowledge of our teachers - a deficit fore-grounded in the opening quote of this report.

Communication and Analytical Skills

Identified by the SF as two vital skills for learners in our country, these skills need to be imparted to our learners from teachers are both competent in these domains and ones who design and present lessons that also challenge and grow their learners. As mentioned in the report on the analysis of analytical and communication skills in our new curriculum, there is usually a vast discrepancy between the intended, implemented and attained curriculum (see for example, Hargreaves, 1989; Fullan & Pomfret, 1977; Fullan, 2001).

The intended curriculum is the written document (for example our RNCS) that outlines the standards, outcomes and ideals the curriculum intends to accomplish in each learner. The implemented curriculum refers to the process that occurs when the intended curriculum is interpreted and implemented by teachers and other stakeholders in the schools. The intended curriculum is open to interpretation by material and curriculum developers, teachers,

subject advisers and those in education responsible for drawing up the national assessments such as the Senior Certificate examinations. The curriculum therefore often gets implemented through the use of different philosophies from the one that was used to draw up the intended curriculum. The attained curriculum is basically described as what the learners eventually learn as demonstrated through achievement assessments.

This implementation process stresses the need for teachers who are competent at effectively using their own communication and analytical skills while incorporating the teaching thereof. Communication skills are often taught as dedicated modules in pre-service training in South Africa. To our knowledge, however, analytical skills are not currently explicitly addressed. The **"Critical Thinking Group" project** of the SF appears to be addressing this analytical skills deficit. Something that could perhaps be considered in order to enhance this project is the use of on-line discussions. Ryan and Scott (2008) used on-line discussions in developing informed and critical literacy teachers at the pre-service level. In their study as well as studies conducted by others (Hsu, 2004; Sorin, 2004) the use of case studies for on-line discussions emphasised active, cooperative learning and higher-order thinking. This links back to points mentioned in the previous section on how open source materials could be used to provide a forum for such case studies.

The **"Digital Hero Book Project"** of the SF could perhaps be adapted or extended to include a component of in-service training that is emerging as an important way to develop teachers. This is the skill of reflection. There seems to be consensus that reflection is mainly concerned with finding solutions to real problems (Adler, 1991; Calderhead, 1989 as cited in Hatton & Smith, 1995). But it also includes thinking about and discussing one's own actions, and in the case of teachers, one's own practice. Paige, Chartres & Kenyon (2008) report on research where teacher stories were gathered through interviews and classroom observations as a means to exposing quality educational practices in the Eastern Cape as teachers participated in a teacher education programme. Perhaps a project where teachers are encouraged to create self-illustrated "story books" about their practices could be developed. While serving as an affective platform to deal with issues of demoralisation, frustration, change and increasing demands in the profession of teaching, such a forum could also encourage a broader community of sharing, best practices and learning experiences for pre-service teachers.

Another project mentioned on the website is the **"Plus Time" project**. It is suggested that by allocating more time to teaching assistance may have positive benefits. The core of this relates back to the quality of the teaching and the teaching assistance though. More teaching (or assistance) does not necessarily imply more learning if the quality of the teaching remains poor. Improving the analytical and communication skills of teachers and encouraging them to reflect on the effectiveness of their own practice remains a pivotal issue in the South African education system being able to deliver quality life-long learners. Perhaps higher quality teaching, making more use of problem-based learning, within the allocated school day would alleviate the need for additional tuition outside of the regular school timetable. This project appears to provide an ideal forum to intensify the subject matter, analytical and communication skills and pedagogical content knowledge of teachers and monitor the effects thereof on the learner achievement.

Suggested synopsis of guidelines for projects

While it is indeed the responsibility of the Department of Education to be training and upgrading teachers, the reality is that this is not being as effectively done as is necessary for improving the quality of our teaching and learning as well as meeting the changes in our society. The DoE has also focussed much of its effort on the Further Education and Training Phase in order to improve Senior Certificate Examination results. In our opinion though, this has been to the detriment of our core phases of educational development, namely the Foundation Phase and the Intermediate Phase. While Non-governmental Organisations (NGO's) have been involved in training teachers in this regard, the projects are often short-term and lack sustainability or transferability. A suggested guideline therefore for the SF relating to teacher training is to **focus more on projects within the Foundation and Intermediate Phases**.

Teachers are currently expected to function as masters of several roles including as curriculum interpreters, developers and assessors. These are not roles that teachers were necessarily equipped for during their training. Many teachers in our schools were trained in a period where the syllabus was strictly dictated and textbooks were drawn up in accordance with the syllabus and used to teach from. Teachers were not required to do much interpretation of the syllabus or to develop their own material. However, with the introduction of the new curriculum (which is often vague and non-specific), teachers have been forced to

make decisions about what the curriculum is demanding and also to often draw up material where there has been a lack of resources, especially in newer learning areas such as Economic and Management Sciences. Owing to the rush to implement the new curriculum, quality control on the textbooks and resources being developed and made available to schools has not been optimum. Teachers are often left not knowing which books or material are best to use. Many schools have turned to developing their own material and no quality control has necessarily been done on such ventures. Teachers would therefore benefit from **additional training in the role of curriculum developers**.

This is an area that is very much in line with work that the Siyavula project is undertaking. Although the **Siyavula project** is mainly aiming to motivate the formation of community of practices relating to the use and adaptation of Open Source material, teachers need to be able to know certain core principles on curriculum interpretation and development in order to benefit from this resource and community of practice. It is therefore our recommendation that the Siyavula project also include a **component of professional development** in their workshops with teachers. These could, for example take the form of reflections (in line with best practices above), where teachers are given material to evaluate and to reflect on according to a set of guidelines in curriculum development. They could also reflect on the process of trying out or adapting material to trial in the classroom situation. The project could also consider video taping some of the lessons being trialled in actual classrooms and make clips of these also available on the website for other teachers to access. This would all feed into sustainability of a community of practice that not only seeks to improve their quality of teaching and learning through the use of open source materials, but also a community who are more critical and informed about the materials they are using and adapting.

The role of assessors for teachers was also mentioned above. With the new assessment policy being implemented over the last few years, teachers are expected to be moving away from tests and examinations and also incorporating more authentic and performance-based assessment. This type of assessment requires teachers to think "outside of the box" and create various assessments that not only test the knowledge and procedural knowledge of the learners, but also evaluate various skills and cognitive abilities in more realistic contexts. Many of our teachers in schools were not trained to fulfil this role. Over and above the heavy workload and demands of the new curriculum, the large classes and the large amount of administration, teachers struggle to develop and find time to mark this ongoing assessment. The United Kingdom have partly relieved this problem by developing a range of assessment

materials for their teachers and making computer generated assessments an option. Using this, teachers can use databases to generate a range of assessments and also to input the results. The computer programme then diagnostically generates a report for the teacher on content or skills that may have to be redone in class or what sections individual learners may be struggling with. The SF could therefore consider funding projects (similar to the Siyavula project) that aim at **developing an open educational resource type assessment database available to teachers, where teachers can also be professional developed through being empowered to evaluate, adapt and design their own assessment tasks**, both for and from the database. Alternatively this could become another component of the already intended community of practice that Siyavula is aiming at conceiving.

Conclusion

This report has endeavoured to portray the literature landscape on teacher education both globally and in South Africa. This has been done with a view to providing the Shuttleworth Foundation with a background and possible guidelines and suggestions in funding their projects. The literature review covered important components and challenges within the teacher education domain and presented illustrations of best practices. The following five requirements summarise guidelines that continuing professional development needs to adhere to in order to **facilitate change** in teaching practice (Thompson & Zeuli, 1999, as cited in Schwille, et al., 2007).

- Teachers should have new experiences with teaching and learning, in conflict with existing views and beliefs these teachers may have. Zaslavsky and Leikin (2004) are in resonance with this requirement in reporting that their participants' learning differed from their own previous learning;
- Subsequent to these conflicting experiences, the teachers should go through lengthy reflective processes, supported by discussions;
- Confrontation of existing views and beliefs should take place in the realistic context of their own teaching practice and – setting;
- Teachers need to develop sufficient practical experience in the new educational paradigm. Brodie, et al. (2002) support this statement by stating that, in order for

teachers to acquire new models for teaching, the teachers should experience those practices as learners;

- Teachers should receive sustained support in realizing the new educational paradigm in practice.

The literature review was followed by a position paper for the Shuttleworth Foundation, directly linking literature to the scope of their work. Suggestions were made from the literature to hopefully enhance and suggest new ideas for projects that will contribute to the quality of education in South Africa. Improved and sustainable learner achievement in our country will need to be underpinned by a radical improvement in the quality of our teachers, within whose hands rest the implementation of a curriculum built on ideals set to produce critical, reflective life-long learners.

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