

# TEACHER AGENCY AND PROFESSIONAL PRACTICE: DEVELOPING AND NURTURING CREATIVITY IN MATHEMATICS TEACHER EDUCATION

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*In this paper we reflect on the current problems in teacher education as identified in recent research and policy documents, notably the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa. We then offer a critique of the problem and of the solutions proposed in policy documents, by drawing on educational theory. In particular we draw on educational philosophy regarding the vocation of teaching and a theory of professional agency, to propose an alternative set of problems with proposed solutions. We deliberate on what this alternative means for mathematics education in terms of teacher education development. We explore the complementary roles of the university education departments, the national Department of Basic Education, professional mathematics education organisations, and the ancillary role of business.*

## INTRODUCTION

The indicators of “effective” education in general, and mathematics education in particular, often revolve around technical issues that can be monitored fairly easily, for example the number of pages learners have completed in an exercise book. Another issue that appears to be easily monitored by regular systemic testing is learner proficiency in mathematics and, it seems, teacher knowledge of mathematics. For example, the first eight pages of the Mpumalanga Education Department Mathematics Strategy (Mpumalanga Department of Education, 2014) consist of systemic test results, with little explanation of what exactly was being tested. Teacher knowledge is evaluated in terms of answers to test items designed for systemic purposes, and mostly items divorced from the context of the classroom. In the same *Strategy* document learner proficiency is associated with a score on the Annual National Assessments. These tests, comprising 30 to 50 items intended to cover the entire mathematics curriculum and with each item requiring an answer in two and a half minutes, require a quickness which is not necessarily associated with thoughtful action.

Less easily measured indicators are those relating to the deeper issues of the purpose of education. What measures should be put in place to gauge the influence and contribution a mathematics teacher has had on the passion and excitement of a third year university student who spends 16 hours a day pursuing his passion, quantum mechanics? What elements of his school education have propelled this student from a desk in a poorly resourced Mpumalanga classroom, to the physics laboratories of a top South African university?

(Wylde, 2011?). Might we surmise that this mathematics teacher had vision, had agency, and saw his vocation as making a difference in the lives of his students? Such a teacher could be described as a rich and invaluable resource to his/her learners. In this paper we argue that we need mathematics teachers who are rich resources, adults with vision and agency who can inspire learners through their teaching to reach beyond current confines and prepare them to succeed in future learning.

The essential argument follows four steps. Firstly, we all agree that effective teaching of meaningful content is a prerequisite for better outcomes. Secondly, the teacher is critically important in the educational process. Even in the age of technological advances and easy access to information, teachers provide role models for learners and become mentors as they guide and accompany learners toward a successful exit from the school system. And then the fourth point is that teacher agency is hypothesized here to be closely associated with effective teaching.

With the above argument informing our lens, we investigate the problems and solutions proposed in the Integrated Strategic Planning Framework for Teacher Education and Development in South Africa (DBE, 2011).

### **The problem according to the Framework**

The problem according to the Framework comprises three main aspects: firstly the “*failure of the system* to achieve dramatic improvement in the quality of teaching and learning”, secondly, a “*fragmented and uncoordinated approach*” to teacher development, and thirdly, the *tenuous involvement of teachers*, teacher organisations and stakeholders in improving the system (DBE, p.1, authors’ emphasis).

The first problem immediately invites a further question, “What is the evidence for the failure of the system to achieve dramatic improvement in the quality of teaching and learning?” The evidence proposed in the document for this “failure” of the system is the results of systemic and international tests. “System” we think refers to the complete education organization. A straight line to cause, is drawn from the system results, based on perceived effect, back to events in the classrooms, to the preparedness of teachers, and then to the efforts of the department of education to enhance preparedness and finally back to the content and aims of the mathematics curriculum. Here we contest the validity of test scores as an evaluation of the education system. We also note here that the world has changed “dramatically” over the past 30 years. This change from an industrial world to an information-driven world has brought about a different set of criteria for proficiency in the wider world, and across the world education systems are working hard at developing answers to new educational demands. We acknowledge here that elements of systemic assessment, that is the numeracy and literacy items testing some basic knowledge, constitute part of what is needed, however the decontextualized nature of the assessment and the items, may not provide valid indicators of mathematical proficiency of either learners or teachers (Schoenfeld, 2007).

The second problem is identified as a “fragmented and uncoordinated” approach to teacher education development. What is the evidence for this statement? On the one hand it seems that the reasoning behind the formulation of the problem is that the roles and the responsibilities of teachers outlined in the Norms and Standards for teachers (DBE, 1998) do not serve as magnets for consolidation and coordination for teacher education. If, on the other hand it suggests that the variation between the teacher education programmes at the different universities are problematic, then we disagree. The first point of disagreement is that the purpose of university teaching is not to produce drone teachers that can be used to deliver messages from external agents. The purpose is rather to transform students to become independent thinkers and actors (Biesta, 2009) who can adapt to a changing world and teach learners to adapt. This purpose requires that teachers themselves be independent and creative thinkers. We acknowledge here that the development of teachers’ mathematical proficiency (Kilpatrick et al., 2000) is definitely the current priority of the teacher education departments in South Africa (and elsewhere); the question rests on how this proficiency is defined and attained.

The second point of disagreement, in alignment with the work of Griffiths (2013), is that however “good” the teacher education department (of the university), it is in the first five years of teaching that the teacher develops into the vocation of teaching. It is not so much the teacher’s performance in front of the class, demonstrating her own knowledge of mathematics, but her engagement with the learners in order to develop their mathematical knowledge and reasoning that is a measure of “teacher effectiveness”.<sup>1</sup> As teacher educators we do not absolve ourselves of the responsibility to reflect on our current practices. On the contrary, we question the extremely narrow focus on knowing the mathematics in the curriculum. This focus tends to exclude knowing mathematics in such a way that enables a teacher educator to involve prospective teachers with reasoning about the mathematics in the curriculum beyond the confines of current sequencing of topics. We see our responsibility as engaging with the national Department of Education concerning effective undergraduate teaching of mathematics for prospective teachers.

The third problem identified is the “tenuous involvement” of teachers, teacher organisations and stakeholders in improving the system. The question arises here concerning the categories included under “teacher organisations” and “stakeholders”. Do the teacher organisations include professional organisations such as AMESA, in addition to the obvious candidates - the teacher unions? And who are the stakeholders? Since there is no direct reference to teacher educators, we assume they are stakeholders, but their status and agency as stakeholders are not clear.

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<sup>1</sup> The term effectiveness has been critiqued by Biesta (2009a) as it is meaningless without a clear sense of purpose. For example if the performance on the system results improve (a measure of effectiveness), but the learners are sitting mesmerised in their desks hanging on to the teacher’s every work with no critical engagement, then we question the effectiveness of the education.

We would expect that the teacher educators, like teachers, be acknowledged as critical in the initiating of teachers into the vocation of teaching. By contrast, the business model<sup>2</sup>, for example the National Education Collaborative Trust (NECT) which advocates “fixing” the education system “once and for all”, pays little attention to the critical role of teachers.

Where teachers are explicitly mentioned and seen to play a role in improving “the system”, we reflect on the way teachers are portrayed in the document. The current Framework places the teachers “firmly at the centre”, and responsible for their “own development” (DBE, 2011, p. 1). This statement is somewhat contradictory, as on the one hand the teachers are being trusted to attend to their own needs and that of their learners as they see fit, and as befits the context in which they find themselves, but on the other hand teachers and their students are tested on a centralized curriculum and a one-size-fits-all test into which they had limited input. Again we reiterate that a test score does not constitute an evaluation of a complex practice like teaching.

### **The solution according to the Framework**

According to the Framework, the first outcome is to “(i)mprove the quality of teacher education and development in order to improve the quality of teachers and teaching” (DBE, 2011, p. 4). Output 1 of this outcome is to identify and address “individual and systemic developmental needs”. Three goals are identified here, the first is to “establish an institute”, the second is to “develop and deliver teacher diagnostic self-assessment”, and the third is to “develop high quality teacher resources” (DBE, 2011, p. 4).

The proposed National Institute for Curriculum and Policy Development (NICPD) is responsible for “developing and managing a system for teachers to identify their developmental needs and access quality developmental opportunities ...” (DBE, 2011, p. 5). Are we to have yet another body of highly paid officials whose purpose is to manage teachers? As regards the “teacher diagnostic self-assessment” we wonder whether a “test” of 30 questions with each question to be answered in less than 120 seconds is helpful at all to a teacher who may know the mathematics to be taught, but who struggles to engage learners in meaningful discussions for the purpose of developing mastery over the discourse (Wagner, 2007).

The value of the third goal, developing high quality resources, depends on the engagement of the teachers with the developing of external resources suitable to their context. Will these resources take the form of lesson plans, complete with worksheets for the learners? Many excellent resources are already available from the internet. Yet, the selection of the most suitable resources is the challenge for teachers, and indeed for the education department.

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<sup>2</sup> “Big business and the government have committed almost R600m to a partnership initiative which could provide a model to fix South Africa’s “fragile” education system “once and for all”, says Basic Education Minister Angie Motshekga”. Marrian and Joffe, Business Day, February 06 2014

The key question is what kind of quality resource places the teacher at the centre of system, and what kind strips her of agency and hence defers her responsibility for her learners' development.

While teachers are “at the centre of the system” and must take responsibility for their own learning, there is currently very little room for exercising professional agency in the mathematics classroom. Firstly, the time allocations in Curriculum and Assessment Policy Statement (CAPS) are very specifically and tightly dictated. The sequencing of concepts is firmly fixed with the expectation that in the classroom a particular order is followed. There are reports that the Grade 6 CAPS curriculum is too full. There are too many new (fragmented) concepts in one year. In personal communication a mathematics teacher with 20 years' experience noted that the separation between and sequencing of fractions, decimals and measurement in the intermediate phase was problematic. The difficulty then is for her as a teacher in a controlled system to exercise her professional judgment, or professional agency, and sequence this set of related concepts in a way that makes sense in her classroom, but also serves the interest of the system, such as readiness for systemic assessment.

## **THE TEACHER AND TEACHING**

We take the philosophical standpoint that teaching is a vocation; it is unusually worthwhile and important. Teachers in general have a “natural urge to take care of others” and “contribute to the betterment of society” (Higgins, 2013). Teachers want to “make a difference”. Many, if not most, teachers want to make a difference in the lives of their learners. They are aware of the lifelong consequences of their teaching for their learners, either good or ill. South African teachers are no different when they speak out about their aims and dreams. If they are judged to fall short as teachers, we should investigate what robs them of their professional agency.

### **Four intersecting roles of the teacher**

According to Griffiths (2013) the teacher has to coordinate at least four roles inside her classroom. The first is her role in the *dyadic relationship* between the teacher and the individual student. In this role she has to be constantly aware of individual needs for differentiation in tasks, in discussion, in support for some and to extend others. The second is her role in the (cognitive and physical) *organization of the class*, to establish an association with a common goal. In this role a teacher has to decide in the moment whether individual needs can be subsumed in the larger project of taking a class forward, or whether the class as a whole must hone in on the problem of an individual learner. The third is an *instrumental role*, to ensure that goals are met. Here we note that the practical day to day requirements of doing homework and ensuring the learners submit their assignments on time, together with the demand to keep to the timeframes of tests and examinations, are all part of what it means to be a teacher. The fourth role is coordinating the *triadic relationship between the subject matter, the teacher and the learner*.

The excitement and passion for the subject that is shared by both the learner and the teacher is an essential element of teaching – instilling a love for the subject. The extending of learners interests beyond the classroom, for example the participation in mathematics Olympiads, or organizing trips to astronomy observatories, may just spark a passion for some learners.

We propose that keeping the above four roles in balance in a class of 30 learners (or more) is a challenging task. Yet, the expectation is that undergraduate teacher education has to prepare a mathematics teacher to take up these roles from the day they enter their first classroom. The construct “teacher agency” is, we believe, the keystone to preparing teachers to deal with these many demands, and other demands which come from outside the classroom. Teacher agency, like a keystone holding in place the lateral stones to form a structurally sound arch, holds in place the myriad demands and roles.

### **The concept of agency**

The concept of agency is here defined as the dynamic competence of human beings to act independently, and to make choices (Priestley, Biesta & Robinson, 2013) in order to advance toward their goals. Two additional ideas are key to this concept: the first is that agency is not intrinsic to a person, but rather perceived as occurring interactively with the environment, and secondly that the environment in which individuals find themselves may enable or constrain agentive action (Biesta & Tedder, 2006).

Colapietro (2009) distinguishes between two models of human action, namely the *model of rational action* and that of *normatively oriented action*. Normatively oriented action<sup>3</sup> consists of ideals, standards and values provided by society which are used to evaluate one’s own and behavior and that of others (Gone, Miller, & Rappaport, (1997). When interpreted from the perspective of a teacher this action would involve following the codes set down by the department and the school. Rational action is understood as the consideration of beliefs and goals in order to determine a course of action (Goldthorpe, 1998). Here we envisage the distinction between the demands of authority and the reasoned actions judged to be in the best interests of the learner.

According to Colapietro (2009, drawing on Joas, 1996) a third category is needed, that of creative activity. This category supersedes the former categories and describes the human agency in the world. If we surmise that effective teaching and teacher agency are highly correlated, the question arises as to which components of a curriculum for initial mathematics teacher education will enable agency and therefore effective mathematics teaching.

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<sup>3</sup> “ Normative Orientation consists of those criteria (ideals, standards, values) provided by culture which are used in self-evaluation and the judgment of one’s own conduct and the conduct of others (Gone, T., Miller, P. & Rappaport, J. (1997).

## TEACHER EDUCATION: DESIGN AND RESPONSIBILITY

Both the design of teacher education courses and the responsibility for teacher education are currently contested terrains. From the Framework the role of university education departments is not clear. “Stakeholders” we think include the universities, business and the government, though this is not clear. Increasingly big business is being called on to “fix education” “once and for all”. In this section we discuss the design of teacher education courses, bearing in mind the keystone that we surmise holds complex demands in place, and the organisations responsible for delivering education, the universities, national departments, professional organisations and business.

We concur with Batra (2009) that teacher agency or empowerment is necessary to achieve both quality education and the associated social transformation. Batra admonishes the Indian education system for not taking seriously the professional development of the teacher since attaining independence from colonial rule in 1948. She cites the invisibility of the teacher in curriculum design and in the formulation of education policy. In some respects the two countries have undergone parallel experiences, though we acknowledge that the input of professional organisations in South Africa has played an important role in policy development and some curriculum implementations.

Batra (2009) contrasts two perspectives on the teachers role in the broader social context, the first is that of *an implementing agent* of the current economic needs and the social needs of the country. This role is somewhat aligned with the “drone model” or the NECT model whose aim is to “fix education once and for all”. An alternative perspective is that of an agent of change. In this role the teacher becomes the pivot for social transformation. Her role involves engaging directly with children, and how they are thinking. This role aligns with Griffith’s dyadic function where the teacher engages with the individual student. A second important aspect for the agent of change conceptualization is that the teacher understands the relationship between school and society and in this way can mediate the entrance into society by the learners. A third aspect involves rethinking knowledge and learning, and incorporating here the search for meaning within this growing knowledge society. Here we draw on Biesta (2009) who envisages the outcomes of education to include independent thinking and indeed an approach to society as emergent rather than fixed.

While teacher education development has many facets we aver that teacher agency, the dynamic competence of human beings, and here of teachers to respond to the needs in their environment, the classroom and school environment, is the keystone. We note here that while we consider this a competence inherent in every teacher, we acknowledge with Priestley et al., (2013), that agency is manifest in the interaction with the environment, and as such can be enabled or curtailed.

We would expect from teachers an honest appraisal of their own fears and lack of mastery, and then the realization that they have reasoning ability and resources within, and in addition have access to external resources through professional teacher organisations to increase their knowledge of particular topic areas and to build their confidence as problem solvers.

It is however, in our view, an insult to “test” teachers and principals as though a test can measure the work of the vocation, teaching. The approach to education, and particularly mathematical reasoning and problem solving requires a finer approach, where rather than to “fix” (through testing?), the appropriate verbs are to model, inspire, unfold and enable emergence.

### **The role of professional teacher organisations**

It has generally been the case that teachers have worked in isolated pockets and that an environment of competition rather than collaboration has existed in many schools. In a study on the implementation of the new Scottish curriculum, Priestley, et al., (2013) found more evidence of agency where there was a collaborative and horizontal structure rather than a hierarchical structure.

Professional mathematics teacher organizations have an important role to play in the creating an atmosphere of trust and through this trust affirm the agency, the dynamic and creative interaction with their environment, which includes interaction with the subject, mathematics. In both national and regional conferences the professional identity may be affirmed, and the worthwhile vocation of teaching elevated. The aim of professional teacher organisations such as the Association for Mathematics Education of South Africa (AMESA), together with the education departments, is to acknowledge the importance of the work of every teacher, and bring about a change from lack of confidence to a productive disposition where teachers are prepared to take on the challenges of learning and teaching, for example geometry, drawing on both internal and external resources, provided through various channels.

Professional teacher organisations are in a position to stimulate and facilitate discussion among teacher educators in order to oppose fragmentation and enhance coordination from within the community of teacher educators. In this way teacher educators can maintain agency and be proactive and adaptive to needs. Professional teacher organisations are also able to provide platforms for continued engagement between teacher educators and in-service teachers. It already does, and this should be acknowledged and supported, if necessary by some formal recognition for teachers who attend such workshops. Lastly professional organisations are able to provide a platform for teacher education to engage as a group with policy makers, government officials, textbook writers and “other role players” through planned focus group discussions of policy and research.

In conclusion, Pickering has used the metaphor the *dance of agency* (1995, p. 21), which he understood to take the form of a “dialectic of resistance and accommodation” (p. 22).



When applied to mathematics teacher education and mathematics education, this metaphor implies the movement of ideas, and a vibrant mathematical discourse within lecture halls, and within classrooms, and between teachers and students, in the interests of achieving a more creative, but at the same time a rigorous, education.

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