

Examining Prospective Mathematics Teachers' Professional Identities and Their Implications for Professional Development.

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Abstract:

This paper focuses on prospective secondary school Mathematics teachers' perceptions of their professional identity. Ninety-five (95) prospective Mathematics teachers at a named university participated in the study. The data collection methods used were questionnaire and semi-structured interviews. Using the lens of two complementary theoretical frameworks by Beijaard, Verloop & Vermunt (2000) and Gee (2001), prospective secondary school Mathematics teachers' perceptions of their professional identity were analysed and discussed. It is concluded that professional identity is a filter through which teachers interpret their continuing personal professional development and learning. The paper discusses the implications for how an understanding of prospective teachers' perceptions of their identity could be used to inform and shape their professional development.

Keywords: *prospective mathematics teachers, professional identity, professional development*

Introduction

This paper focuses on prospective secondary school Mathematics teachers' perceptions of their professional identity. A 'clear self-image and ownership of an emerging professional identity' is necessary for helping prospective teachers to effectively apply the knowledge, values and skills from teacher training educational programmes into their future work place situations' (Bennet, 2013: 55). Research has also shown that the way(s) a teacher views him/herself as a professional can, to a great extent, determine how well s/he does or performs as a teacher, how long s/he may stay in the profession, how s/he feels about him/herself in the classroom and work place in general (Ingersoll, 2003: Lerseth, 2013: Mahan, 2010: Olsen, 2012). In addition, the way(s) a teacher views him/herself as a professional can, to a great extent, determine

how well s/he views him/herself in relation to others, professional purposes and the culture of teaching (Olsen, 2012).

Olsen (2012) further argues that teacher identity can be used as a pedagogical tool by teacher educators to explore ways of encouraging prospective teachers to cross examine factors, such as their experiences, that have shaped their present professional thinking. Thus, an examination and understanding of prospective teachers' professional identity can help teacher educators determine the factors that can contribute to positive educational and professional outcomes for different individual prospective teacher.

Despite there being a link between professional identity and professional development itself, there is paucity of studies with respect to professional development and teacher identity in Zambia. While there are several literatures (such as Banda, 2011; Kabeta, 2015; Kashoti, 2016; Ngumbwe, 2014) on various aspects of teacher professional development, limited number among them (such as Banda, 2011) make reference to teacher identity. Even then the focus has been on in-service teacher and not preservice or prospective teachers. This study

is confined to prospective secondary schools Mathematics teachers' identity and their professional development. It is hoped that by examining prospective Mathematics teachers' professional identities and their implications for professional development, the findings of this research, the study will contribute to narrowing the identified gap.

This paper has four sections. In the first section, the literature pertaining to some key issues pertaining to teacher identity and to teacher professional development are discussed. In the second section, the methodology used for the study is presented. The third section deals with the main issues arising from the data collected from prospective Mathematics teachers' perceptions of their identity. The findings are discussed using the lens of two complementary theoretical frameworks by Beijaard, Verloop & Vermunt (2000) and Gee (2001). The implications for how an understanding of prospective teachers' perceptions of their identity could be used to inform and shape their professional development are then discussed.

Literature review

Teacher professional identity

Teaching can be complicated in both preparation and practice (Ngang, Hashim, & Yunus, 2015) and is ‘...not merely a cognitive or technical procedure, but complex personal, social...set of embedded processes and practices that concern the whole person (Olsen, 2012:1123). Teacher identity forms a crucial part of the ‘whole person’ in teacher development and of such a holistic perspective of a teacher, teacher training and development. According to Beijaard (1995) identity can be defined as who or what someone is, the various meanings people can attach to themselves, or the meanings attributed by others. It starts with the meaning that an individual(s) hold(s) for him/herself, in their context, or as may be influenced by other people or circumstance. The views of identity or professional identity differ (Neary, 2014), but it is generally agreed that teacher professional identity is an ongoing, dynamic process and or product (Beijaard, Meijer, & Verloop et al 2004: Olsen, 2012). Professional identity is said to be a concept which describes how one perceives him/herself within his/her professional or occupational context and how this is communicated to others (Neary, 2014). It is also described as a process in which

individuals negotiate external and internal expectations as they work to make sense of themselves and their work (Beijaard et al., 2004). How is professional identity formed?

Factors contributing teacher identity formation

The factors that can contribute to the formation of teacher professional identity include the ones presented below. Interactions are important to identity formation (Igazini, 2015). A teacher’s interaction with fellow teachers, or through the mentor-mentee relationship or with pupils can negatively or positively contribute to teacher identity formation or development.

Professional identity can also be developed through the interpretation and reinterpretation of one’s experiences therefore suggesting that self-reflection and evaluation, which is equally an important tool for teaching and learning and which prospective teachers are expected to develop through their training, is crucial in identity formation. This is line with Beijaard et al., (2004) point that self-evaluation is key to identity formation and reformation.

Engaging in Continuing Professional Development (CPD) programmes or activities can contribute to identity development too

(Neary, 2014). Engaging in different types of professional development programmes, whether formal or informal, can contribute to teachers, pre- or in-service teacher's finding, defining or regaining or redefining of their professional identity. This could be done through allowing teachers opportunities for intellectual and social engagement and exposure to reflection on and in one's practice.

Teacher Professional development

There are several definitions of teachers' professional development in literature. Day (1999)'s definition is used here.

Professional development consists of all natural learning experiences and those conscious and planned activities which are intended to be of direct or indirect benefit to the individual, group or school and which contribute through these to the quality of education in the classroom. It is the process by which, alone and with others, teachers review, renew and extend their commitment as change agents to the moral purpose of teaching; and by which they acquire and develop critically the knowledge, skills and emotional intelligence essential to good professional thinking, planning and practice with children, young people and colleagues through each phase of their teaching lives (Day,

1999: 4).

It is argued here that Day's definition above suggests an inclusion of professional, personal and social development as dimension of teachers' professional development. This is because he not only refers to the development of knowledge and skills, but also to emotional intelligence needed throughout teachers' teaching lives in the definition of professional development (Kanchebele-Sinyangwe, unpublished). The meaning of professional development '... is located in teachers' personal and professional lives...' (Day, 1999, p. 1).

Based on Day's definition above, professional development is a long-term continuous process that lasts through a teacher's life. It is a long-term engagement in the learning process. This process begins with initial teacher training and continues through all the stages of teaching life (Villegas-Reimers, 2003). It is thus important for a teacher to be aware of who they are, where they are, for instance, in terms of their knowledge, skills, values and attitudes and the need to continue learning and improving themselves, individually or collectively, in their profession.

Theoretical framework

This study used the lens of two complementary theoretical frameworks by Beijaard, Verloop & Vermunt (2000) and Gee (2001), that reveal the relationship between teachers' professional identity and teachers' competences and teachers' professional development. On one hand, Beijaard et al. (2000)'s analysis of teachers' professional identity is linked to the critical factors linked to "what a teacher does" in his or her practice through examining teachers' expertise within the related areas of content knowledge, pedagogical decisions they would make, didactical experiences and classroom management. A teacher's professional identity can consist of a combination of the distinct aspects of expertise in the identified areas.

On the other hand, Gee (2001: 99) argues that all people have multiple identities...connected to their performances in society'. He identifies four ways to view identity as being;

- Nature identity (Identity that relates to biological factors or characteristics that are natural).
- Institution identity (Identities that focus on the positions or roles fulfilled by a person in an institution)

- Discourse identity (Individual traits, achievements, and/or attributes recognised by people)
- Affinity identity (Groups with whom one shares a common interest or experience)

To illustrate the above, someone may be tall (nature identity), a student specialising in Mathematics at a University (institution identity), a dynamic and innovative person (discourse identity) and belonging to a group of Secondary Mathematics teachers (affinity identity)

Methodology

This qualitative research involved Ninety-five (95) prospective Mathematics teachers in their last term of their third year at a named public university in Central Zambia. There is a four-year degree programme. The students had already done their school teaching experience also called school teaching practice. They were specialising in two teaching subjects-taking one as a major and the other as a minor subject. The students in this study were taking Mathematics as a major or a minor subject. In order to find out how they defined or perceived their professional identity a questionnaire and follow-up in-depth one-to-one interviews were used. This study accommodated all forms of description of their

perception of their identity including metaphorical thoughts of the participants about their identity. The key statement on the questionnaire that guided and brought out the perspectives of their professional identity which were analysed for this study was 'I am ...because...'. The same was used to guide the follow-up in-depth interviews. No restrictions were placed on the number of responses to be provided to the questions regarding their perception of their identity. Thematic content analysis method was used in the analysis of collected data.

Findings

Professional identity perceptions

Content analysis was used to extract themes, from the data obtained, which then helped shed light on the perceptions of prospective Mathematics teachers of their professional identity. Prospective Mathematics teachers' responses were grouped in three categories: Those who: seemed definite about their identity: those who said it 'depends' and: those who indicated they did not know and or did not respond to the question.

Examples of comments from students who seemed to be sure of their identity include the following:

I am a student teacher at KWANU University...I mean a focussed student teacher of Mathematics at KWANU University...because I am training to teach Mathematics...P12

...hardworking student teacher... because I am being trained to be a teacher...and my lecturers speak of being a hard working teacher... P15

...perfect teacher...because that is my vision...I don't want to be like my secondary school Mathematics teacher who didn't seem to know much about being a Mathematics teacher... P 16

... a master... because I am mastering the mathematics to teach and how to teach it well and hopefully better than my secondary school teacher of Mathematics... P 25

...trainer with a whip(assessment)...because learners need to be trained into learning mathematics and other things... P 41

...the one who knows a lot of Mathematics and then shares ...because there are some Mathematics teachers out there who know very little about Mathematics so I am learning the of Mathematics which needs to be shared...P 50

...Doctor of mathematics patients at secondary school...because I will be teaching

Mathematics patients and I have to treat them well... P 55

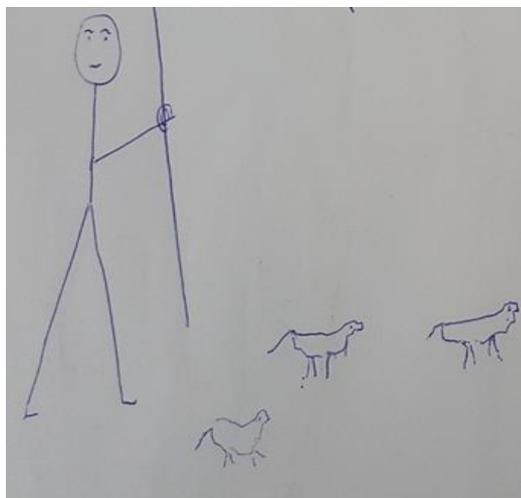
I am a coach...because I will be a life coach including on matters beyond Mathematics which means I will have to be a step or steps ahead of my pupils almost always ... P 66

I am an instructor and facilitator...because that is what teachers of Mathematics do-they instruct learners and guide them to learn Mathematical concepts and principles...P62

Some of the students presented their perception of their professional identity using metaphors. Examples of such metaphors are below.



I am because that is what is there for teachers of Mathematics ...need to grow into having a heart for many... P82



I am because teaching can be a lonely life (unless you predetermine to interact with other shepherds) ...too focussed on one activity (looking after your animals). A teacher can learn things from the animals and be a better shepherd for them... P9



I am because teachers have multiple tasks...I need to learn to do many things in a single encounter with learners e.g. handle different learners in their different situations, teach, manage class and learner behaviour... P79

Prospective Mathematics teachers' responses show that their perception of their professional identity is related to who a (Mathematics) teacher is or should be and or what a (Mathematics) teacher knows/does or should know/do. This is consistent with both Gee's (2001) and Beijaard et al., (2000) theoretical framework and analysis of teacher professional identity as presented above. Who a teacher is appears to be very closely linked to what a teacher does or knows.

Factors contributing to shaping identity

Further analysis of the collected data also revealed that prospective Mathematics teachers' perception of their identity was also tied to the factor(s) they thought contributed to the development or shaping of their professional identity. These factors have been grouped under the subthemes: Higher institution of learning, school teaching practice (STP) environment, experiences, background, knowledge and 'self' and recognition. Some examples of teachers' comments are presented below.

Higher institution of learning

Some study participants indicated that their learning institution contributed to shaping their identity. For instance, one study participant's comment was: *I am an excellent teacher*

in the making because my university's motto is teaching for excellence...P81. Another had this to say: *I am a confident, smart and creative up-coming teacher...that is what my lecturers here at the university have told and taught me...P66.* *I am beautiful, intelligent and my university is making me even more intelligent and smart because it's helping me to develop competencies needed for a Mathematics teacher to teach... P91.*

The above suggests that there is a connection between teacher educators, teacher training institution and identity development. The development of a teacher's identity is a central process in becoming a teacher (Friesen & Besley, 2013) starting from initial teacher training.

School Teaching Practice (STP) environment

Examples of comments from the study participants with respect to the contribution of STP environment and experience to professional identity formation include: *I am hoping not to be like some lazy Mathematics teachers...because I saw it in my mentor during STP who were hardworking, organised, dedicated...P15* and...*a teacher-parent...because that is what I saw in most teachers I interacted with during teaching practice... P21.* Another had this to say: *I am hoping to be a more rational, flexible and*

accommodating teacher of Mathematics...because I don't want to be like my STP mentor who was the exact opposite...P5

The above suggests that prospective teachers' interaction with fellow teachers, or through the mentor-mentee relationship or with pupils can negatively or positively contribute to teacher identity formation or development. In general, it is argued that there is a link between STP and the shaping of prospective teachers' professional identity (thesis).

Experience

The prospective Mathematics teachers' (past) experiences were also identified as a factor contributing to professional identity development. Some prospective teachers mentioned experience in general. For instance:

I am going to be many things all linked to being a teacher who will make a positive difference in learning Mathematics...because you know experience has taught me a lot...I don't want to be like some bad Mathematics teachers I know...P4

Others were able to qualify the kind of experience. For instance:

I am a product of a very good Mathematics teacher...it has been because of my good experience as a learner of Mathematics at

secondary school that I want to do my best to help my future pupils learn...P33

The above illustrates that experience, whether bad or good, teaches a lot and shapes one's thinking and belief system about teaching Mathematics, teaching and life in general.

Background

Some prospective Mathematics teacher's responses pointed to their background with respect to their learning of Mathematics as being a factor affecting their identity. Some of their comments include:

I am a captain-a strict captain of the Mathematics learning ship ... because that is the way I grew up learning Mathematics 'with a whip'-whips forced me to learn Mathematics...I will take the whip of tests-whips can be in many forms like assessment or tests. I can ask about other ways from others ...P2

I am a Mathematics learning motivator...because my teacher and some of my lecturers here (at University) was/are like that-motivating and fun to learn Mathematics from... P10

The above could be an indication that prospective Mathematics teachers have an idea from their Mathematics learning background of what attributes or characteristics make a

good teacher of Mathematics. It also goes to show that whether a teacher of Mathematics is said to be 'good' or 'bad' learners may find themselves connected to him/her in a positive or negative sense and their identity influenced by them.

Knowledge

The other factor which affects a pre-service teacher identity development is the knowledge they possess. One study participant stated: *I am a professional Teacher-I have said this because of the knowledge I have about Mathematics, about teaching Mathematics, about teaching, about education...P3.*

Another one stated:

I am a teacher and a learner...a teacher because I have knowledge that teachers of Mathematics should have to teach...I am a learner, because I have to continue learning, like through the CPDs, to build on the knowledge I have...P62

The above also shows that it is not only a teacher's content knowledge that plays a significant role in determining a teacher's effectiveness (Beijaard et al., 2000) and shaping their identity, but broad teacher knowledge in general such as presented by Shulman (1987) and others.

'Self' and recognition

'Self', in the context of own mindset, and recognition are other factors that pre-service teachers identified as contributing to identity development. Excerpts to this effect include: *I am making a very good teacher in myself...because of what I know about myself... P29.* Another had this to say: *I am well known by almost every one- my parents, friends, church mates-to be good in almost everything I do...because of this I will try hard, no matter what, and do whatever I can to keep the high standard...P90.* Yet another stated:

I am a student teacher who wants to make a big name for myself as a teacher...because it feels good to be recognised as having done something worthwhile... the way other secondary school teachers I know have been recognised...I can get some tips from them here and there ...P17

The findings presented above appear to show that there are differences and variations on what each of the prospective Mathematics teacher perceived to be factor(s) for shaping their identity. Based on the findings of the study, the factors contributing to shaping identity may not be a single factor, but a combination of factors. These factors could

relate to a single or combination of areas of expertise as identified by Beijaard et al (2000) and or be viewed in relation to their nature, institution, discourse or affinity as all ways of viewing identity as described by Gee (2001). In addition, the findings indicate that prospective Mathematics can have multiple identities such as **P15**, **P62** and **P79**. This is consistent with Gee (2001: 99)'s argument that people have multiple identities...connected to their performances in society'. It has to be mentioned here that despite there being several factors contributing to shaping prospective teachers' professional identity one thing remains common to all study participants-that is they are all at a teacher training institution. Teacher educators and training institutions have a significant role to play in shaping prospective teachers' professional identity. Teacher training provides a basis for defining, developing or refining individual or collective prospective teachers' identity. It is also a platform on which continuing professional development can be erected (Bubb & Earley, 2007; Day, 1999). It can contribute toward the development of acceptable conceptualisation of professional personal professional development and habits and the attitudes that can serve as the basis for Professional Development throughout a teacher's life (Kanchebele-Sinyangwe, 2017). This is needed in order to help teachers develop a

positive attitude toward continually developing themselves as professional right from initial training time.

Other related findings

As earlier indicated, some of the prospective Mathematics teachers indicated '*...it depends...*' in their response to the statement and or discussion on their professional identity. During the follow-up interviews some of them were able to state that their response depended on: 'who was asking/or who wanted to know' or; 'the situation in which they were; 'where/when they are being asked' or 'why they were being asked'. This could be explained by the point that professional identity and professional identity formation keeps changing depending on several factors among them social and personal factors. It can be argued that this is in line with Beijaard et al (2004) and Neary (2014)'s argument that professional identity is not static, but fluid and is influenced by how we see ourselves and or how we perceive others see us.

It has been mentioned above that some prospective mathematics teachers mentioned that they did not know or were not sure about their identity by giving comments such as: '*...you just never know with teaching...*'; 'I

am not very sure...'; '...I don't know...'; '...I may give a wrong answer...; Others simply left the statement uncompleted and or did not respond to the question during the interviews. On one hand, this could be justified by arguments such as by Bennison (2014) that teacher professional identity can be said to be complex. It can be complex to define or understand. On the other hand, it may be argued that the prospective Mathematics teachers in question may simply not have seriously taken time to reflect on the aspect of their professional identity. The argument that professional identity is influenced by how we see ourselves and how we perceive others see us (Beijaard et al, 2004; Neary, 2014) could underscore the importance of encouraging self-reflection among prospective teachers. Teacher education and training can help prospective teachers to identify their own ways of knowing themselves (Gee, 2000) and how they can grow in their profession. (Prospective)teachers may need to be initiated into taking stock of their knowledge levels and skills and to an extent take responsibility for their own professional development and growth. Cattley (2007) and Vavrus (2009) suggest that the involvement of preservice teachers in activities such as reflecting on their writing and collaborative reflection can inform preservice teachers' professional identity. Therefore, pre-service teachers may need to

engage more in similar self-reflective activity that could (re)activate in them the need to (re)construct or be more aware of their professional identity.

Conclusion and implications

This paper focused on examining prospective secondary school Mathematics teachers' perceptions of their professional identity. The complementary theoretical frameworks by Gee, 2000-2001 and Beijaard et al., 2000 helped to analyse and explain the nature of their identity.

One of the key findings is that Prospective Mathematics teachers' perception of their professional identity is related to who a (Mathematics) teacher is or should be and or what a (Mathematics) teacher knows/does or should know/do. Who a teacher is very closely linked to what a teacher does and their competencies. It is concluded that professional identity is a filter through which teachers interpret their continuing personal professional development and learning which maybe in line with different areas of needs, competences and expertise such as linked to mathematical content knowledge, Mathematics pedagogical content, teaching in general or classroom management or social interaction among other areas. The

implication of this for professional development is that prospective teachers may need to be initiated into critically reflecting on who they are and hope to be in the profession. They may need to be prodded toward making more conscious, more intentional, and more research-based adjustments of their teacher professional identities (Olsen, 2012). In addition, prospective teachers may need to be initiated into critically taking stock of their knowledge and skills levels and into taking responsibility for their own PD during their initial teacher training. Teacher educators may also have to consider exposing prospective teachers to multiple and multidisciplinary nature of professional development initiatives that exist and which could meet their identified professional development and learning needs.

The other key finding is that there are differences and variations on what each of the prospective Mathematics teacher perceived to be factor(s) for shaping their identity. These factors included: Higher institution of learning, school teaching practice (STP) environment, experiences, background, knowledge and ‘self’ and recognition. Based on these findings, it is concluded that there are several factors that can shape professional identity. In some cases, it may not be a single factor, but a combination of factors shaping need to be verified by future research.

teachers’ professional identities. An ‘...*understanding of student teachers’ views on learning and teaching and themselves as teachers is of vital importance for teacher educators as it is the foundation for meaning-making and decision-making*’ (Bullough, 1995: 21). Teacher educators and teacher training structure and system may need to build on students’ emerging professional identities from the beginning of their educational journey as trainee teachers as this would provide opportunities to explore the complexity of the practice and provide systematic support for their professional development (Izadinia, 2015).

Based on the above presented points, it is argued that initial teacher training can provide a basis for defining, developing or refining individual or collective prospective teachers’ identity. It is also a platform for the development of acceptable conceptualisation of professional identity, personal professional development and the habits, values and attitudes that can serve as the basis for professional development. However, the extent to which this is or can be achieved may depend upon the systematic programmes and support structures put in place in teacher training institutions for this purpose and may

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