

The Professional Identity of Mathematics Teachers in Further Education

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Abstract

Professional identities may be viewed as narrative constructions in social situations but personal experiences and beliefs are fundamental influences in their development. Within Further Education colleges in England, mathematics teachers are typically expected to fulfil multiple roles, teaching a wide range of curricula and age groups, and this brings additional complexity to their professional identities. In this study, questionnaires and interviews with mathematics teachers in three Further Education colleges are used to examine their roles and professional identities. The findings show how teachers' personal experiences of mathematics, in formal education and the workplace, influence their beliefs and are linked to their narrative and working identities. These teachers enact complex and varied roles but develop a 'leading professional identity' that can be linked to significant critical events in the past.

Key words: professional identities, personal experiences, beliefs, workplace

Introduction

The division of upper secondary education in England at age 16 years into distinct academic and vocational pathways has led to the development of distinctly different types of curricula and assessment for post-16 students. Over the last two decades a series of different post-16 mathematics qualifications have been used to enhance the mathematical skills of vocational students, with a focus on skills for life and work, but with titles involving the terms numeracy, skills or mathematics (e.g. Key Skills, Adult Numeracy, functional mathematics). In a recent review of the mathematics workforce in Further Education (Hayward & Homer, 2015) teachers identified themselves as being either numeracy or mathematics teachers, even though the Adult Numeracy qualification is no longer being taught.

This suggests that there are at least two distinct types of professional identity amongst teachers in Further Education who might all be considered broadly as teaching some form of mathematics. Whether this distinction arises from their role, in terms of the subjects or age group that they teach, or a personal affinity influenced by other sociocultural factors, it is clear that the workforce does not have a single professional identity. Furthermore, Hayward and Homer (2015) conclude that there is insufficient reliable data, which leaves questions unanswered about the functions carried out by these teachers and their professional development needs.

The aim of this paper is to explore both the roles carried out and the professional identities constructed by a sample of mathematics and numeracy teachers from three general Further Education colleges, in order to gain a better insight into the expectations placed on them in the workplace and their professional development needs. The research will also explore the backgrounds of those teaching mathematics or numeracy in Further Education and indicate key areas to be considered in recruitment and pre-service teacher education. In view of the shortage of mathematics teachers in England, particularly in Further Education, the study provides some

valuable insight to inform the development of effective policies for future recruitment and training. The research seeks to address the following questions:

- What roles are carried out by mathematics and numeracy teachers in Further Education colleges?
- How can the professional identities of these teachers be described?
- What are the implications for the recruitment, training and professional development of mathematics teachers in Further Education?

Background

The professional identity and training of teachers generally in Further Education colleges has been a problematic issue that successive governments have sought to address in different ways (Fletcher, Lucas, Crowther, & Taubman, 2015). Historically, vocational teachers were occupational experts who shared their knowledge with trainees and professional training as a teacher has often been viewed as secondary or even unnecessary, by practitioners and managers. The introduction of national occupational standards for teachers in 1990 may have helped shape ideas regarding the definition of a professional identity for teachers in Further Education at the time but subsequent redefinitions of professional standards (2006) and eventual de-regulation (2012) may have served to confuse rather than consolidate the emerging notion of a professional educator in this sector of education. The diversity of education within Further Education colleges (e.g. vocational, academic and adult) further confuses the roles and identities of teachers who work in this area.

There is some agreement that vocational teachers in Further Education colleges fulfill a ‘dual’ identity (Peel, 2005) as both professional occupational experts and as teachers. Whether those who teach mathematics and/or numeracy in Further Education can assume the same type of dual identity is questionable. A similar ‘dual’ identity would involve being a professional expert mathematician and a teacher but entry requirements to teaching mathematics or numeracy in Further Education do not necessarily include qualifications consistent with having attained an ‘expert’ level of mathematics. Current de-regulation leaves decisions largely to individual colleges and therefore variation can be expected between Further Education institutions, even in the presence of national recommendations.

For those teaching on courses that might be broadly considered as mathematics, there is the added complication of this distinction between mathematics and numeracy. Although previously numeracy had been associated with simple numerical calculations and routine processes, as a subset of mathematics, Cockcroft (1982) refers to a wider set of skills involving applications to life and work. This suggests that numeracy is concerned with the use of mathematics rather than a simplified type of mathematics. The introduction of the Adult Numeracy Core Curriculum in 2001 led to new adult numeracy qualifications and contributed to a distinction between being a numeracy or mathematics teacher on the basis of whether the teacher’s timetable focused on teaching adults (Adult Numeracy) or younger students (Key Skills). Teachers might teach, however, across age groups and, with the replacement of Key Skills and Adult Numeracy with functional mathematics, one might expect such distinctions to disappear.

The evidence within the recent workforce report (Hayward and Homer, 2015) suggests though that teachers still retain a strong identity with either mathematics or numeracy. Considering that these teachers may have combined age groups in their classes, or mixed timetables of classes for different age groups and qualifications, the distinction is difficult to explain.

In the current situation, with new routes into teaching mathematics or numeracy in Further Education, such as the re-training of teachers of other subjects to teach mathematics, clear identities may be difficult to establish. There are also a wide range of perspectives on the meaning of identity that affect the way in which professional identity is researched. Therefore, before

exploring the roles and professional identities of a sample of teachers from three Further Education colleges, some consideration needs to be given to the theoretical view of professional identity that will be used the study.

Professional Identity

Before approaching the notion of professional identity, it seems necessary to establish a position on the meaning of the term ‘identity’ since this affects the way in which the research is conducted. Use of identity as a concept in educational research has become more prominent since the socio-cultural turn, offering a useful bridge to explain how “collective discourses shape personal worlds and how individual voices combine into the voice of a community” (Sfard & Prusak, 2005, p.15). The concept is used however across many traditions (e.g. anthropology, psychology and sociology) and the meanings attributed are not the same. As Sfard and Prusak (2005) explain, there is a need to determine an effective and theoretically sound operational definition.

There is some agreement that identities are constructed by individuals within discourse (Holland, 2001) but one of the contentious issues lies with the assumption that this is only indicative of a ‘true’ identity that resides with the individual. Whether this personal identity remains a stable trait or changes over time is a secondary problem resulting from the first assumption. From this perspective the researcher only gains a glimpse of a personal hidden identity and uses the indications from an observed or co-constructed discourse to develop their own perception of what this ‘true’ identity may be. The presence of any stable trait however is inconsistent with the socio-cultural position in which social interactions are seen as shaping identity. In this tradition the narrative is a place where identity is actually constructed and therefore it is socially situated, ever changing and created by the individual for the situation. This leads to a position where the researcher can use the narrative to construct a more reliable analysis of an identity with the understanding that this is uniquely created within the narrative, by the individual, for the situation. In an interview situation it is therefore an identity constructed for the researcher but, as such, has authenticity and credibility when defined in this way.

Professional identity might broadly be perceived as the part of identity that a person constructs in relation to their profession or occupation. Brockmann (2012) uses this notion of an occupational identity to explain how students in vocational areas adopt particular behaviours. This is consistent with the occupational aspect of the ‘dual professionalism’ of vocational teachers who are seen as occupational experts but also as professional teachers. How this connects to the professional identity of mathematics or numeracy teachers though is not clear since there is no single occupational body to which these teachers would be connected, unless they classify themselves as mathematicians. Their professional identity seems to be more closely related to their function as a professional teacher than to an occupational body.

Day, Sammons and Stobart (2007), in their study of teachers’ lives and work propose three areas of influence on identity: professional, local and personal. From this viewpoint there is a socially accepted general view of the profession to which the individual belongs, a positioning within the department or local (institutional) situation and then their personal individual life outside the workplace. For the purposes of this study this provides a useful outline framework. In each of these categories we will consider how the individual functions as part of a social community, which may or may not be an active community of practice (Lave & Wenger, 1991; Wenger, 1999).

Communities of practice would normally have a domain of operation, a shared interest and a commitment to each other that distinguishes them from simply an interest group (Wenger, 1999). Teams of mathematics or numeracy teachers may well form a community of practice within their college but also identify themselves with a wider community such as the body of mathematics teachers in Further Education. For the purposes of this research, how teachers position themselves in relation to these communities at different levels (local and national) is of particular interest.

This may include how they see themselves in relation to common perceptions of mathematics teachers in society, or how they relate themselves to the specific department in which they teach. Within a local community of practice, an individual may describe themselves as an expert with a central position, or a peripheral member such as a new teacher who is still learning their 'craft' and therefore occupies a position of legitimate peripheral participation (Lave & Wenger, 1991; Wenger, 1999). Alternatively, Wenger (1999) suggests that marginalisation may occur, when access to becoming an expert is denied. An individual may also describe their positioning in relation to several different communities of practice to which they have some sense of belonging and this may include more than one within the same workplace.

For the purposes of this research, there needs to be a consideration of how this positioning within any community of practice can be obtained. Taking the approach that identity is constructed within the narrative means that teachers own descriptive accounts are essential. There is a common theme in much of the literature that suggests key events are influential in shaping identity and these will be important to capture. Black, Williams, Hernandez-Martinez, Davis, Pampaka & Wake (2010) refer to these as 'leading activities' that have a significant effect on shaping 'leading identities'. Such events are recounted by the individual in relation to a personal association with the focus of the discourse and thereby provide connections within a narrative identity that are valuable in sense-making for the researcher. The research approach will therefore be based on a sociocultural view that considers professional identity as a personal concept related to past events but constructed for the researcher in the interview situation. This may incorporate personal beliefs, values and emotions but includes what they think and do into a sense of who they are (Grootenboer & Ballantyne, 2010).

Methodology

The research aims to explore aspects of both the roles and professional identities of a sample of teachers in Further Education who are all teaching at least some functional mathematics courses, although they may also teach other classes. There are two main sources of data that inform the study.

Firstly, with respect to the roles of individuals, quantitative data from questionnaires are the primary data source. Questionnaires were used to explore teachers' roles through questions about their highest mathematics qualifications, number of years teaching, number of years in current institution and type of contract. This was completed by functional mathematics teachers (39) in three FE colleges on a voluntary basis. An overall return rate of 50% was achieved although this rate was not consistent across the colleges. The questionnaire data presents a summary of backgrounds and qualifications for a sample of mathematics teachers in these colleges but has some limitations due to the sample selection method and sample size. Its value therefore lies in indicating a possible range of roles rather than the typical role carried out by mathematics teachers in Further Education.

Secondly, semi-structured interviews were used to examine some of the roles, functions and professional identities of these teachers in more detail. A sample of twenty teachers was selected from those who had submitted a questionnaire. This sample represented the range of backgrounds, roles, ages and gender evident from the questionnaire returns but allowed the researcher to explore issues from the questionnaires in more depth. Using the theoretical position described earlier meant that capturing individual narratives in these interviews was important. The teachers were therefore asked to:

1. Briefly describe their backgrounds and explain how they came to be a functional mathematics teacher;
2. Explain their relationship with mathematics;

3. Describe their teaching role in the college, including their status and relationships with vocational teachers.

Interviews were audio-recorded, transcribed and initially coded using the framework:

- Critical personal experiences in identity formation;
- Narrative identity (personal and professional aspects, including identity as a teacher, vocational expert or mathematician);
- Working identity (identity within the functional mathematics community of practice).

Particular attention was given to identifying significant events in individual narratives, any links to aspects of professional identity and indications of positioning within communities at local and national level. Further analysis was then conducted to explore connections between personal experiences and aspects of narrative identity.

Results

The relevant results from the questionnaire (which also covered wider aspects of teaching) are first summarised in this section before examining the interview data and further analysis. There were 39 respondents in total: 22 male; 17 female. Most of these were employed on full-time contracts (28) and the majority were on permanent contracts (33) although there were some temporary staff (4) or ones on mixed contracts (2). The average (mean) length of service was 10.7 years but there was a wide range of experience amongst these teachers (1-30 years). There was a similar range in the number of years teaching at their current institution (1-30 years) but an average length of time of 7.2 years. A high proportion of teachers (21) had only ever taught in their current college.

Table 1
Table showing teachers' qualifications.

Qualification	None	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Highest mathematics qualification achieved at school	2	21	14	-	-		
Highest mathematics qualification achieved since school	8	6	3	5	13	1	2

For the purposes of this paper the actual qualifications stated by teachers have been grouped by the levels of the Qualifications and Credit Framework used in England. Level 2 corresponds to the level expected by age 16 years (GCSE level) and Level 3 to the level of academic qualification achieved at age 18 years (A level) for students who specialize in mathematics. Level 6 corresponds to an Honours degree and Level 7 to Masters level.

There is a wide variation in the highest mathematical attainment of these teachers at school and in qualifications taken since school. The data suggest that the majority of teachers did not specialise in mathematics in school (23) and that almost half (17) do not hold a mathematics qualification above Level 3. The qualifications achieved after leaving school range from GCSE mathematics to Masters level qualifications in STEM subjects (with substantial mathematical content). There is also evidence from the actual qualifications stated that the disciplinary backgrounds of teachers vary widely across mathematics, science and the social sciences. All of

these teachers did however have a formal teaching qualification but these varied between post-graduate, degree level and lower level qualifications.

Table 2

Table showing other subjects taught by functional mathematics teachers.

Vocational	Functional skills (English or IT)	GCSE Maths	A level Maths	Other Maths	Numeracy	Key Skills
8	18	2	2	2	1	4

There was wide variation in the backgrounds of these teachers but also in the other subjects that they taught. Almost half the teachers also taught another functional skill (either English, ICT or both) and more taught on vocational programmes than on GCSE and A level courses. Of the 39 teachers, only five were exclusively teaching mathematics/numeracy subjects (i.e. GCSE Mathematics, A-level Mathematics, Key Skills Application of Number, Functional Skills Mathematics or other mathematics such as specialist modules for Engineering students). Although teachers were given a free choice of subjects only one stated that they taught numeracy. This suggests that the sample is not directly comparable to the wider survey conducted by Hayward and Homer (2015) but does indicate the range of variation in mathematics or numeracy teachers' backgrounds and roles within even a small group of colleges.

For the twenty teachers who were interviewed, there was further evidence of very varied backgrounds and also routes into teaching mathematics. By using the framework described earlier and then more detailed analysis with further coding, some key themes emerged. These will be illustrated by summaries of the basic analysis for two teachers with contrasting narratives, to show the type of data extracted from these interviews.

Example 1: Lynne

Critical personal experiences:

- Had a career in retail management, so believes she understands how mathematics is used in the workplace;
- Loved mathematics at school but did not do well with A level mathematics, so does not see herself as a mathematician.

Narrative identity:

- States that she is not a 'maths guru' i.e. high level mathematician;
- States she is not a 'geek';
- Believes she relates well to students;
- Sees herself as a functional expert rather than a mathematician, i.e. views herself an expert in using mathematics and making it relevant.

Working identity:

- Has a lead role as a functional expert in the team;
- Acts as a guide to others;
- Sees herself as distinct from mathematicians within the team;
- Believes she needs to build connections to the vocational teachers to enhance the relevance of the functional mathematics she teaches.

Example 2: Ian

Critical personal experiences:

- Recognised as having dyslexia at school, so has leaned towards mathematics and science;
- Both parents were teachers but insisted he should work before teaching so he would better understand people who were less mathematical;
- Had early involvement with functional mathematics qualifications externally, so understands the philosophy behind the qualification.

Narrative identity:

- Sees himself as a mathematician (high level);
- Believes functional mathematics is consistent with his identity since it emphasises mathematical thinking rather than fluency with routine processes;
- Believes he is not successful with lower level mathematics students.

Working identity:

- Teaches across different levels of mathematics, including higher mathematics;
- Has a role as a lead practitioner for functional mathematics due to his external involvement;
- Teacher educator so trains other teachers within the college.

Within these two examples there are indications of the main themes that emerged from the full set of interviews. As suggested by Sfar and Prusak (2005) the critical experiences highlighted by teachers in their accounts of how they came to be a functional mathematics teacher were strongly linked to their narrative identities and positioning within their working situations. The coherence between these critical personal experiences, narrative identities and working identities suggests aspects of a ‘leading professional identity’ similar to the concept of a ‘leading identity’ used by (Black et al., 2010). Although there is coherence, the data still suggests such professional identities are multi-faceted and highly variable across this sample of teachers.

The interviews also provided data on the entry routes of teachers to their positions as functional mathematics teachers in Further Education colleges. These were diverse, with a common theme of mathematics teaching in Further Education being a career change after other employment. This was often not planned in advance but followed from casual conversations and encounters with friends or acquaintances who suggested this as a suitable path. Some teachers were trainers or assessors before entering teaching, or had started as part-time temporary staff before progressing to more substantial contracts. Only one of the twenty teachers interviewed had left formal education with the intention of becoming a mathematics teacher as their first choice of career.

For some of these teachers, the decision to focus on mathematics as their main subject was a personal choice based on a love of the subject or ability, but for others it was a pragmatic choice based on the assumption that there would be job security as a result of a continuing national need for more mathematics teachers. The following section of summary data from the questionnaire indicates the extent to which teachers liked mathematics and believed it to be useful.

Table 3
A table to show teachers' responses to mathematics.

Statement	Strongly disagree	Disagree	Neither	Agree	Strongly agree
Maths is a subject I liked at primary school	2	2	9	10	15
Maths is a subject I liked at secondary school	3	6	2	10	17
Maths is a subject I like today	1	0	3	10	24
The maths I learned at school has been useful in my personal life	3	2	6	11	15

There is evidence that most of these teachers now liked mathematics and believed it had been useful. This is not unexpected, since these teachers have chosen to be mathematics teachers but, despite positive feelings and beliefs from the majority, there are some mathematics teachers who are less convinced. Notably, early experiences of mathematics were not all positive and changes have taken place over time. Many of these teachers were actually teaching several subjects and there were indications in their interviews that decisions about what subjects appeared on their timetable were often made by managers. The subjects they taught, therefore, did not always match the specialist training, skills or preferences of the individual.

Implications and conclusions

The wide variety of subject combinations and levels of mathematics taught by this fairly small sample of teachers in just three Further Education colleges suggests that roles in the sector are very varied. This demands a flexibility and adaptability to different social situations, in addition to wide subject knowledge. Current provision for initial teacher education and professional development, which tends to focus on subject knowledge and general pedagogy, seems unlikely to adequately address the needs of teachers to adapt to such complex, multiple roles.

Multiple entry routes into teaching and the lack of compulsory pre-service training make it difficult to establish a recognised professional identity or status for mathematics teachers in Further Education. The public and political view in England seems to be that mathematics teachers in Further Education are an ill-defined and possibly inferior subset of mathematics teachers, since they only teach low-attaining and less academic students. This study suggests a need for a better definition of professional identity for these teachers in Further Education, particularly in terms of the multiple roles carried out and the skills expected. The tensions of 'dual professionalism' experienced by vocational teachers (Peel, 2005) were less evident for these teachers, who often identified themselves more strongly with being a Further Education teacher than with being a mathematician. Within their narratives, the teachers in the study generally provided coherent individual accounts of who they were (Grootenboer & Ballantyne, 2010) but there was no strong shared sense of professional identity, even for teachers within the same

college. In their individual narratives, they often constructed a ‘leading professional identity’ that was connected to critical experiences in the past but there was little evidence of a collective discourse (Sfard & Prusak, 2005) or of individual voices combining into the voice of a community.

The absence of strong positive professional identities at local and national level is a concern. An effective community of practice is dependent on having a shared vision and commitment (Wenger, 1999). It seems unlikely that existing local communities of mathematics teachers in Further Education will move forward in their professional practice without a clear shared understanding of their professional identity, since this determines what sort of ‘expert’ they are trying to become.

Entry routes for new teachers of mathematics in Further Education are difficult to categorise from the study due to the wide variation evidenced. A current shortage of mathematics teachers, particularly in Further Education may make it an attractive second career with some job security, despite the lack of parity with schools regarding pay and conditions in England. The difficulty lies in where to focus when recruiting new teachers into the profession when the existing workforce is so diverse and their professional identities are difficult to define. In the absence of strong positive national or local identities the sector seems likely to continue to struggle with the development of an effective recruitment strategy.

Strategies to recruit new mathematics teachers to work in Further Education have recently focused on high-achieving graduates in mathematics or science, due to perceptions that sound subject knowledge is essential. Although subject knowledge is undoubtedly important, it is worth noting that the teachers in this study often positioned themselves primarily as teachers in Further Education, relating to the Further Education community more strongly than to being a mathematics teacher. Furthermore, there was more frequent identification with being a functional mathematics teacher (who understood how mathematics was used in life and work) than with being a mathematician. This suggests the need to consider the suitability of new recruits for teaching contrasting curricula, as well as the context in which they are expected to work and the roles they need to fulfil.

This small-scale study indicates some important areas for consideration in the professional identities of mathematics teachers in Further Education in England but also highlights the need for a larger scale study of roles and identities. The findings suggest that mathematics teachers in Further Education need to be prepared to work flexibly, teach more than one subject, teach across levels and adapt their teaching to different curricula and age groups. This requires personal qualities and skills that go beyond subject knowledge and basic pedagogy. A wider and more detailed study of the roles and professional identities of mathematics teachers in Further Education is clearly needed to better inform strategies for the recruitment of teachers, their initial training and professional development, but this study provides some foundations from which further research could be developed.

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