Mathematics education policy enactment in England's Further Education Colleges

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England's Further Education (FE) sector is in permanent flux with policy interpretations and translations taking place at multiple levels within increasingly large and complex multi-site organizations. Devolved responsibility gives managers considerable influence in policy enactment processes which can lead to within-college tensions between vocational and mathematics teachers. This paper examines two within-college policies effecting students' mathematics learning opportunities: 1) subject choice, and 2) examination entry levels. These policies have produced inequitable opportunities for students on different vocational study programmes. Given the strategic importance of improving mathematics education, this paper explains how multiple actors and structures interact in the enactment of policy in complex FE college settings. Such understandings are needed to inform better policy design and implementation that in turn can improve mathematics education in Further Education colleges in England.

Keywords: policy enactment; mathematics; further education.

Introduction

The status of mathematics education in vocational Further Education (FE) colleges in England has fluctuated over time. Mathematics' recent high profile in government thinking makes the effective implementation of relevant policies a primary concern for both ministers and college managers. However, the uneasy tension between a traditional focus on vocational education in FE colleges, and the priority given to mathematics and English, is challenging for those developing effective college-wide strategies and policy processes. Policies for cross-college subjects such as mathematics need to be implemented effectively and consistently though, or the intended impact is unlikely to be realised. Within this paper, we explore these processes and highlight associated issues that are crucial to understanding the impact, intended or otherwise, of post-16 mathematics policy in FE.

Policy enactment happens across multiple scales, through complex networks of actors, texts and artefacts that translate policymakers' goals into local practices (Ball, Maguire, and Braun 2012; Dalby 2015). New policies are not enacted in a vacuum, but are introduced into a cacophony of policy echoes; some fading fast, others still reverberating and a few generating unpleasant feedback. Although Ball et al (2012) were primarily concerned with schools, the processes of interpretation, translation and reconstruction are also features of policy enactment in FE colleges. That said, differences in the ways such processes play out in FE compared to schools can be expected, due to contextual factors associated with institutional scale and complexity, professional cultures and the different socio-political contexts in which they operate.

The historical and local conditions of FE colleges are of particular interest given significant changes in the college-government interface over the last 25 years. Responsibility for FE has shifted repeatedly between government departments since incorporation (City and Guilds 2016) and policy enactment has accordingly been characterised by constantly changing funding mechanisms and multiple policy levers: inspections, targets, audits, performance measures and the like (Coffield et al. 2007; Fletcher, Gravatt, and Sherlock 2015). These governmental attempts to "direct, manage and shape change" (Steer et al. 2007, , p.178) have had significant impact and, in the absence of other mediating bodies, senior management teams have had to work hard to interpret policy.

Mathematics education in Further Education has long been the subject of intense debate and stakeholder concern. (For a recent example see the report by the Confederation of British Industry (2015)). Precipitated by damning reviews of adult numeracy levels (ALBSU 1987; ALBSU. 1989; Moser 1999) and compelling evidence of the relationship between poor numeracy and unemployment (Parsons and Bynner

2005), major curriculum reforms have tumbled one after another in a succession of attempts to improve post-16 students' mathematics attainment. Key Skills (Application of Number) and Adult Numeracy gave way to functional mathematics and most recently to the prioritisation of retaking GCSE Mathematics over alternative qualifications. Various levers have been used in attempts to enforce these changes but there is little evidence that these have been effective in producing the intended change (Coffield et al. 2007). As Fletcher et al. (2015) observe, such policy levers might ensure a measure of compliance with government instructions but "the outcomes for users have seldom been as planned" (Fletcher, Gravatt, and Sherlock 2015, , p.174). Recent evidence of disappointing increases in the progress of post-16 students retaking GCSE Mathematics in FE colleges (Department for Education 2016) even in the face of stringent accountability measures, suggests that the policy processes and levers are still not producing the intended outcomes.

In this paper we examine varied within-college enactment of two policies related to the teaching of what were, at the time of the research, recently introduced functional mathematics qualifications. We set out to answer the following questions:

- How are mathematics education policies enacted in colleges?
- Who are the main actors, what pathways are followed and what is the impact on practice?
- How can differences between intended and enacted policies be explained?

Before exploring these questions, we briefly consider relevant literature on policy enactment within Further Education. A short historical example of policy enacted within a single Further Education college is then discussed to illustrate the difficulties and complexities of implementation.

Policy enactment within Further Education

It is not surprising that policy enactment in a large FE college is complex; one only needs to consider the sheer number of actors with power to interpret, translate or reconstruct policy. A further complication is that organisational structures for cross-college subjects such as mathematics are not straightforward. Smooth transitions from national policy to college practice are unusual but careful considerations of the contextual factors, including the historical conditions, will help to produce better understanding of the challenges and possibilities (Ball et al 2012).

Following the incorporation of colleges in 1993, the growing importance of effective financial management and strategic planning led to structural and cultural changes (Simkins and Lumby 2002; Harper 2000) with power often shifting away from vocational and academic heads of department towards new centralised business functions (Harper 2000). These functions were key to the health of the college and strongly influenced college structures but the change also produced tensions within traditional collegiate cultures (Watson and Crossley 2001). Heads of department retained some localized, limited control over curriculum but were subject to strong centralised managerial influences concerned with planning, finance and performance. Middle managers were trying to manage change effectively whilst caught between professional and managerial cultures (Shain and Gleeson 1999). Since then, further devolution has led to middle managers taking increased responsibility for finance and planning (Leader 2004; Gray, Griffin, and Nasta 2005) and thereby becoming more entangled in the tensions between the business interests of the college and students' needs.

Mathematics education policy change is complicated by the position of mathematics teachers within colleges, the diversity of programmes and structures for

curriculum management. Various mathematics courses (GCSE, A Level, Functional Mathematics, vocational modules) are taught to students across different vocational areas of the college. The staffing and management structures for mathematics may be *centralized*, *distributed* or *hybrid* (Dalby 2015) whilst heads of vocational departments retain localised control of planning and curriculum. As a result, multiple actors with different priorities and positions influence the interpretation, translation and reconstruction of mathematics education policy.

The introduction and use of policy levers is important for our analysis. Various means have been used to enforce policy (Coffield et al. 2007; Steer et al. 2007; Fletcher, Gravatt, and Sherlock 2015) but the funding mechanisms, themselves often changing, are arguably the most powerful. Together with the accountability regime of Ofsted and the performativity engendered by statistical comparison (Fletcher, Gravatt, and Sherlock 2015), these neo-liberal technologies combine to ensure the 'performance' of colleges is measured and controlled. The impact of such levers is, however, not easy to predict in a complex system. Studies show that tighter control does not guarantee commitment by teachers (Steer et al. 2007). Individuals make choices within the constraints of their localised personal power and these affect enactment (Shain and Gleeson 1999), sometimes producing alternative outcomes to those intended by college managers (Coffield et al. 2007).

This paper cannot address all the complexities of mathematics policy enactment in FE colleges. We will, however, draw on evidence from three large general FE colleges to identify key features of mathematics policy enactment, in what Spours and Hodgson (2006) term the 'policy process'. We focus on two specific examples to identify the actors, drivers and stages involved in the enactment of cross-college mathematics policies and show how they influence student outcomes. But first we turn

towards an instructive example from the not too distant past that is fading fast from institutional memory: Skills for Life.

An historical example

Consider the historical example of the government's Skills for Life Strategy (DfEE 2001). This was a comprehensive approach to addressing the deficit in adult basic skills highlighted by the Moser report (1999). Despite generous funding incentives, clear measures of attainment in the form of national tests and demanding targets, ten years of sustained effort yielded no significant improvement in adult numeracy skills (BIS 2011). Understanding such policy failure is important for government and the future education outcomes of young people.

Faced by demanding targets, some FE colleges directed students with GCSE Mathematics at grade C or above to use their GCSE grade as a proxy for the Key Skills test and quickly compile a short portfolio in order to gain the full Key Skills qualification. New learning was at best minimal and the additional teaching resource negligible, but these students' new qualifications counted towards Skills for Life targets. This approach to demanding targets produced apparent success at low cost but with little educational growth for the students concerned.

With colleges under pressure to maximize every funding opportunity, some offered incentives for adults to enrol on generously funded numeracy courses. During courses of as little as six hours in duration, students completed a diagnostic assessment followed by a national test at a level matched to their existing skills. The learning gains were small but so was the resource cost of the provision. This strategy was financially beneficial and helped colleges to meet targets but did little to meet the overarching policy goals.

These two examples suggest that those designing the policy's success criteria and funding mechanisms had insufficient understanding of the inner workings of the FE college contexts. Managers, under pressure to meet demanding targets and maximize funding, made decisions based on a wider set of important priorities; their behaviours were predictable and understandable. Although Skills for Life managers were often in influential coordinating positions in college structures at this time, their ability to generate significant funding for the college from courses with a high financial weighting tended to direct efforts away from the primary policy aim of student learning.

The Skills for Life policy anecdote illustrates how government intentions, even with the use of strong policy levers, are not always realized. The process of enactment requires closer attention to understand why this happens, in particular in the less well understood (than schools) context of Further Education. Successful policy design is dependent on sound understanding of how new interventions may interact with existing policies and the business priorities of Further Education organisations.

Research methods

This study is part of a research project into students' experiences of functional mathematics within three large FE colleges. A series of nested case studies were conducted of seventeen groups of students and their teachers across three vocational areas: construction; hair and beauty; and public services. A multiple methods approach was used with quantitative and qualitative data synthesized in these case studies. For this paper on the enactment of functional mathematics policies, the primary data sources are semi-structured interviews with managers, functional mathematics teachers and vocational teachers; college policy documents and data from student focus groups. Interviews were conducted with several functional mathematics teachers, vocational teachers and student focus groups in each college to ensure some triangulation, as well

as opportunities for within-college variations to be explored.

The analysis of this qualitative data was based on grounded theory principles, involving an iterative process of coding, constant comparison and data saturation in order to identify emerging themes (See Dalby 2015, for a more extended analysis). For the purposes of examining policy enactment, firstly some general themes were considered and then data relevant to specific policies were brought together. This resulted in several cases of policy enactment where the data available was sufficiently extensive and reliable that the policy pathway could be tracked through the organization and analysed. The following focuses on two contrasting cases that illustrate the range of policy actors and policy enactment pathways.

Results and analysis

The results and analysis are presented here in three sections. In the first two sections, the focus is on identifying the policy actors and the characteristics of the enactment processes. In the third section, two specific functional mathematics policies are considered to show how different pathways of enactment were constructed in these colleges and the contrasting effects on students' experiences of functional mathematics learning.

Actors within the policy process

The three colleges had different staffing structures for functional mathematics, with two using a *dispersed* model and one resembling a *hybrid* approach with some staff in a centralised team and some distributed across vocational departments (Dalby 2015). Despite these differences, there were similarities in the policy processes employed and in the positioning of key individuals as policy actors within the organisational structures.

Although the terminology varied between the colleges, some key policy actors within these college organisational structures could be identified:

- Senior managers;
- Cross-college manager for functional skills (a manager with responsibility for the coordination of functional skills across the college);
- Heads of faculties (managers of large vocational areas, which are sub-divided into departments);
- Heads of department (managers of vocational departments);
- Course teams (teams of vocational teachers, often with a team leader, who teach a specific vocational course)
- Lead tutors for functional skills (functional mathematics teachers with additional responsibilities as lead teachers or with a role as a 'champion' for functional skills);
- Functional mathematics teachers.

These terms are adopted in the rest of this paper when referring to staff in similar roles and positions within the three colleges, despite variations between institutions in the local terminology.

In each of the colleges, policy enactment involves several managers with varying responsibility for mathematics. However, senior managers are usually responsible for the initial translation of government directives into internal policy statements, often in consultation with a cross-college manager for functional skills. The internal policy documents and narratives take various forms and address different elements of the same policy. Each represents a localised interpretation of, and response

to government policy, designed to ensure that the college complies with the requirements, whilst avoiding financial risk.

Although the content of internal policies varies between colleges, the subsequent pathways of policy enactment through these organisations are similar. The cross college manager for functional skills has significant input into the policy statements and the on-going narrative demonstrates a clear sense of ownership. These managers give coherent accounts of the policy process as a well-organised system but their views were not always shared by vocational and functional mathematics teachers. Analysis of the policy pathway through the organisation highlights the diminishing influence of the cross-college manager and consequent divergence of departmental practices.

We identify two different policy pathways but the most common is through vocational faculties and departments to course teams, with actors at each level making decisions on policy and practices within their area. Vocational managers have significant devolved responsibility for developing and implementing departmental policies. In all three colleges, these comply with college policy statements but there is considerable scope for vocational managers to customize according to the needs of their own vocational students which results in divergences in different areas of the college.

Distinguishing between various actors and processes in this enactment process is difficult. Interpretation and translation take place at multiple levels: senior managers, heads of faculty, heads of department and even course team leaders. Each actor brings their peculiar point and angle of view to bear, so local translations of policy get increasingly aligned to the positions and concerns of individuals rather than the fundamental issue that the policy seeks to address. Departmental versions of policies are mainly controlled by vocational managers but functional mathematics teachers still sometimes act as mediators by adapting departmental policies within the space available

to them, or in some cases using their understanding of functional mathematics to inform and influence the policy decisions made by vocational managers.

Characteristics of policy enactment

Four inter-connected themes relating to policy enactment within these colleges can be identified: 1) a context of continual change; 2) inconsistent applications of policies; 3) imbalances of understanding and responsibility; and, 4) tensions and divisions in the policy process. We explore each of these themes below.

Firstly, policies in these FE colleges are enacted in the *context of continual change*.

> We're always changing things. Nothing's settled at all really and what we try and do, we don't change wholesale. We get little areas to experiment first and see how it's working and then share that good practice or forget it if it's not, if it didn't work the way we planned. (Cross college manager, College B)

> Obviously it's been re-arranged because it didn't work too well last year, because it was new in last year and people were finding their feet and we didn't know what was what. I think next year it will be better still. (Vocational teacher, College A)

Interviewees frequently refer to policies being different from the previous year and indicate that they expect further changes. Since external policies and levers can quickly change from one year to the next in colleges, it is not surprising that internal adjustments have to be made. Yet even in the absence of external changes, managers undertake frequent reviews and make changes, sometimes taking a rather experimental approach towards developing effective practices.

Secondly, there is clear evidence of *inconsistent applications* of policies within these colleges, with variations in the resulting practices. Although senior managers provide documents and narratives for guidance, divergent policy pathways into faculties

and departments increase inconsistency. The devolution of responsibility to vocational managers affords them considerable influence over departmental policies. Variations between departments are the inevitable result of this strategic approach and are evident in all three colleges.

> So it just seems that we've got a policy but nobody follows it. Everybody makes up their own policy. (FM teacher, College B)

> It's patchy across the college. Some have taken it on board, some not, and it varies from site to site as well. (FM teacher, College C)

> I don't think that there is a college-wide approach but then I don't think that, maybe that a 'one size fits all' would happen. I don't think that can happen. (FM teacher, College A)

Although managers across these colleges state that differentiation between departments is often intentional, there is sometimes an additional, unintended lack of coherence. Opinions amongst teachers are divided on whether this diversity is appropriate or not. Some view the differences as unhelpful disorganization, or as the consequence of variation in the level of ownership taken by vocational departments. Others think the differences are appropriate for students in their department. There is substantial evidence, however, of confusion amongst staff and students regarding the actual policies and why some departments adopt different practices. Although cross-college managers give clear accounts at a macro level, most vocational teachers remain uncertain about who is actually responsible and what policy is being implemented. Students also perceive differences between departmental policies and this can produce resentment.

Thirdly, devolved responsibilities for the functional mathematics curriculum, teaching and organisation produce *imbalances of understanding and responsibility*.

With respect to mathematics policy, organisational responsibility is often disconnected from curriculum expertise. Actors with overall responsibility and influence (e.g. vocational heads of department) often have weaker knowledge of mathematics curricula. Although cross-college functional skills managers have authority and curriculum expertise, they are unable to put it to greatest effect. The separation of policy and knowledge pathways leaves influential individuals such as vocational managers making decisions about mathematics policy in conditions where they have other priorities and sometimes only partial understanding. In contrast, functional mathematics teachers have limited authority in the organisational structures that affect the policy implementation process. They do however, have localised opportunities to shape decisions:

> I was hauled across three or four years ago and he (head of department) said something to the effect of 'What is this functional?' and I explained to him the philosophy behind it and he actually turned round to me and said 'Why didn't you tell me this when I first arrived at the college, when I had thrown all this Key Skills at you and told you it was a load of garbage?' This is what I wanted. This is what I want my lads to learn. (FM teacher, College A)

In this case, the functional mathematics teacher is not involved in a formal policy process but does influence the vocational head of department. Such examples show how informal opportunities can affect college policy and practice.

Finally, there is evidence of various *tensions and divisions* in the policy process due to mixed priorities. The separation of vocational and mathematics teachers in some college structures creates communication barriers but, even when functional mathematics teachers are situated in vocational departments, there are divisions and tensions.

> I generally think most people believe there's a place for maths and I think most lecturers that I've come across do believe that. Their issue's not with the subject, the topic. The issue's more about sometimes the people; very much being periphery; very much being shadows. (Vocational teacher, College C)

Some functional mathematics teachers report being well supported by their vocational departments, whilst others question vocational managers' commitment to the provision of functional mathematics and its more 'academic' focus. Some vocational teachers seem unsure about what functional mathematics teachers do and incorrectly assume that they take responsibility for functional mathematics policy decisions in the department. In contrast, functional mathematics teachers consider themselves to have little agency, since they are generally directed by the head of department and not involved in decision-making. When there are such mixed perceptions and priorities, counterproductive tensions are to be expected.

There is also evidence of tensions due to the range of policy levers and performance measures used for external or internal control. The dominance of funding is clear from teachers' comments about policy changes.

> I think it [a specific policy change] probably works out cheaper. I don't know. It will have been done for economy. Although they'll say it's so that the students will view functional skills in a different way but there are economic reasons I'm sure as well. (FM teacher, College C)

The influence of funding mechanisms and financial pressures are both deeply ingrained and clearly visible in policy considerations. Managers have to negotiate uneasy tensions between financial and learning needs or what is desirable and possible – educationally speaking.

Examples of policy enactment

There were two particular college policies that were significant in terms of their effects on student learning:

- Policies about which students should take a functional mathematics course;
- Policies about the examination entry levels for individual students.

These policies should be considered in the context of contemporaneous government policies and levers. At the time of this study, mathematics was not a compulsory subject in post-16 education. There was, however, a requirement that every student aged 16-19 years would take a course leading to a qualification in at least one of the functional skills: English, mathematics or Information Technology. The responses of the colleges to the two issues above are described briefly below to show how policies are sometimes transformed during enactment under the influence of multiple actors and drivers.

Policy 1: Which students will take functional mathematics?

In College A the internal policy requires vocational departments to select at least one functional skill for each student group but those with a GCSE grade C in the relevant subject are exempt. College B has a similar approach whereby departments select a functional skill for a group to study on the basis of relevance to the vocational competencies. For example, Engineering students take mathematics since this is considered more relevant than English or IT. Vocational managers are responsible for decisions about whether all the students in the group take the selected functional skill programme, or whether those with a GCSE grade C are exempt. For example, in Engineering, all the students in a group are expected to study functional mathematics, regardless of their prior attainment. In the process of policy enactment, a policy requiring each student to take at least one functional skill (implying some choice) is

transformed into functional mathematics becoming compulsory for all students on a particular course.

In College C the policy is similar but implementation results in different outcomes. Some vocational departments require student groups to take more than one functional skill whilst others decide that one will suffice and specify what that will be. For example, in the Hairdressing department all the Level 2 vocational students are required to take English and none take functional mathematics. English is, in effect, compulsory but mathematics is not available, so students with low prior attainment in mathematics have no opportunity to improve during their Level 2 course. Those who need to improve their mathematics are simply denied the opportunity, whilst others with a higher prior level of attainment find that functional mathematics is mandatory. For a government policy that is intended to support the development of students' skills in English, mathematics and Information Technology, the process of policy enactment results in an inequality of opportunity.

Policy 2: At what level will a student enter the functional mathematics examination?

Each college has a policy for the level at which a student will be entered for a functional mathematics examination. This follows a pathway directly from the functional skills cross-college manager to teachers of functional mathematics; vocational managers are not involved. The primary actors are the senior management, cross-college manager for functional mathematics and the functional mathematics teachers. In colleges A and C the policy statement developed by senior managers and the cross-college manager represents a 'safe' approach to examination entry. Students are entered at a level that teachers are confident they will achieve. They might then progress to a higher-level qualification later in the year. There is an argument that this approach supports student

motivation but more importantly, from a management viewpoint, it boosts functional mathematics success rates. There is a financial consequence though if students enter a second examination within the year and some indications that this is an uncomfortable dilemma for colleges; limiting students to one examination entry per year might deny some the opportunity to realise their full potential and access future opportunities.

There is evidence of mediation by functional mathematics teachers as they interpret the policy and make examination entries for individual students. A student might be made to wait before being entered for an examination, in the hope that they will be more likely to attain the higher level at a single sitting. In practice, the numbers taking high-level qualifications are restricted, not by the students' abilities, but by college policies that are highly influenced by financial and performance concerns.

In College B a different approach is taken, heavily framed by the anticipation of an impending Ofsted inspection. The senior management decide to adopt a policy intended to produce evidence of 'stretch and challenge'. This means that students are entered for the examination at a level above that suggested by their initial assessment. In this case, the balance between two levers, of high success rates (which are less likely under this strategy) and evidencing 'stretch and challenge' for Ofsted, swings in favour of the latter.

These examples show how the levers used to enact policy in colleges can vary in significance and influence in different situations. Policies for mathematics may be enacted through a variety of pathways within complex organisational structures with contrasting levels of control by various managers. In the first example, responsibility is devolved through a route that primarily involves vocational managers and results in wide variations in practice. In the second case, a cross-college policy is implemented

through a direct pathway to functional mathematics teachers and controlled by a centralised system with little space for mediation.

Discussion

Our data show that the enactment of mathematics education policy in these colleges follows a similar process to that described by Ball et al (2012) with actors at different levels involved in the interpretation and translation of college policy into practice. The size of these colleges and the number of actors involved adds further complexity and policy pathways therefore tend to be extended and uncertain.

Organisational structures within colleges strongly influence policy pathways but the nature of the actual policy is also important. In the first example, the pathway of functional mathematics policy is affected by the organisational location and status of functional mathematics. The policy is modified by a chain of actors including vocational staff and subject specialists. In contrast, the examination entry example did not need such wide involvement and so followed a simpler implementation path with strong control from central functions within the college. Historical changes in the responsibilities of middle managers (Leader 2004) and the increased emphasis on business functions (Harper 2000; Simkins and Lumby 2002), in particular financial sustainability in austere times, impact on the way in which policy for a cross-college subject such as functional mathematics is enacted. Functional mathematics teachers seem to be the only actors in our examples who make any serious attempt to mediate what they perceive to be the policies' negative effects on students; sometimes they succeed.

A distinctive feature of this FE context is the cross-college manager with responsibility for functional mathematics policy and curriculum. Although this role has the potential to strengthen coordination across the college, there is evidence that the

devolution of policy responsibility, from cross-college manager to vocational staff, results in some inconsistency of provision and student outcomes. The role, responsibilities and relative power of these managers within the organisation is critical and needs to be better understood.

Fullan (2001) stresses the importance of both relationships and knowledge sharing in change management and FE colleges' policy pathways display weaknesses in this regard. Limited connections between cross-college managers and vocational departments lead to greater reliance on intermediary managers, or on well-controlled systems. In our two policy examples, neither of these strategies led to entirely consistent or appropriate outcomes. In a similar way to the Skills for Life example discussed earlier, our study identifies unintended consequences, not just of management responses to government directives but of multi-level policy enactment pathways within colleges. Within these policy trajectories, decision-making by individual actors plays a vital part in shaping the effect of policy but our study suggests that knowledge is not necessarily coupled with authority in this process. Neither can we assume that any localized knowledge that is utilised within this chain of policy enactment is securely based on robust evidence.

Although there is more than one enactment pathway for functional mathematics policies, the devolution of responsibility through vocational faculties and departments is the most common. Policy interpretation and translation happens multiple times at different levels within these pathways, which increases the variation between departmental practices. The number of actors and decisions made increases the likelihood of ineffective policies being developed and implemented. Heads of vocational departments and other managers in vocational areas often have a high level of influence and responsibility for functional mathematics policies but do not always

have the knowledge and understanding of the mathematics curriculum to make well-informed decisions. With mixed priorities and insufficient understandings there are more opportunities for the production of localised policies and practices that are counter to the policy intention.

Our analysis highlights contrasting views on whether diversity in departmental policies for functional mathematics is desirable. The justification given by some staff focuses on the opportunity for departmental managers to apply the policy guidelines in ways best suit the needs of their students. This assumes that these managers understand the needs of their students, that they will act in the students' interests and that they grasp the wider intentions of the policy. We cannot say from our data whether the first of these assumptions is reasonable but we know that in a performance culture where budgets are tight, the use of financial and performance-related levers exerts considerable pressure. Various levers, in combination with the environment in which they are used, influence decisions made by managers at different levels and have a strong bearing on whether the outcomes of policies are aligned to appropriate educational values. This study suggests that the instruments used to drive policy are crucial to policy 'success' but supports the claims made by others that they are likely to have unexpected effects as well as those intended (Coffield et al. 2007; Fletcher, Gravatt, and Sherlock 2015).

In particular, we see the strength of financial measures as policy levers in both historical and current situations but little evidence that these are well understood. Financial incentives in the form of generous funding for Skills for Life encouraged enrolments on mathematics courses but proved ineffective in achieving measurable evidence of learning. With the current *condition of funding*, the threat of substantial financial penalty rather than incentive encourages a comparable nominal engagement

with mathematics without producing the intended student learning gains. To avoid a repetition of this recurring theme of unintended consequences, it seems important to understand and learn from the mistakes of the past before recreating similar situations, in which the traits of previous policy 'failure' are already evident.

Our examples of policy enactment span a period of almost 10 years and take place under different governments with distinctive policy agendas. Despite contrasting approaches to education and changing policies, the importance of mathematics within vocational education has increased but the effect on students' mathematical attainment remains negligible. Although more post-16 students are studying mathematics in England, many fail to make any significant learning gains (Department for Education 2016) and the impact is reminiscent of the outcomes of the government's Skills for Life Strategy, which attempted and failed to improve levels of adult numeracy. A closer examination of the reasons for mathematics policy 'failure' in Further Education seems to be an obvious step towards a deeper understanding of the processes involved, the obstacles to be overcome and the likely routes to successful policy implementation in the future. Our examples provide a starting point but further examination of the pathways of mathematics policies in Further Education colleges is necessary to gain the depth of understanding that might ensure future success.

The difficulties of developing effective policy processes for functional mathematics and the unintended consequences highlighted in this paper suggest that this is a neglected aspect of policy implementation of relevance to mathematics and other cross-college 'core' subjects. Overlooking the complexity of the internal processes and the possible effects on student learning in the implementation of current post-16 policy for subjects such as mathematics is an approach which seems destined for failure.

Conclusions

There is evidence from this study that the complexities of functional mathematics policy enactment in FE colleges are largely due to organizational size and the college structures through which policy responsibility is devolved. Organisational structures for the management of cross-college subjects vary between colleges but in both *dispersed* and *centralised* systems the policy pathways are often not straightforward due to the number of actors involved at different levels. Attempts to implement practices designed to meet learners' needs can get de-railed by the mixed priorities of actors facing competing pressures from funding and performativity cultures. Tensions between the business interests of the college and student needs are only too apparent, sometimes leading to decisions that may not represent the best strategies for student progress with mathematics. Consequently, the aims of policies are sometimes not realised.

Policies are layered on top of one another in complex ways and sometimes with unpredictable interferences and outcomes. Multiple external demands and strong policy levers need to be negotiated by college managers to demonstrate compliance whilst maximising business effectiveness (i.e. finance and performance). At the same time, internal changes are designed to improve practice, albeit within a pervasive culture of performativity and accountability.

Understanding these policy processes is critical to the successful design and implementation of policy in future, and to the realization of Smith's recent call for commitment to a maths-for-all-to-18 (Smith, 2017) within a decade. The four themes that emerged from the analysis are key to such understanding: a context of continual change; inconsistent applications of policies; imbalances of understanding and responsibility; tensions and divisions in the policy process.

Colleges are often unsure of how best to develop and implement effective change in such unstable and unpredictable times, with frequent and multiple changes of policies and levers. Attempts to improve mathematics pathways and practices remain largely experimental within these changing conditions and there seems to be little understanding of how to sustain cumulative, effective implementation strategies. Inconsistent applications of college policies result from, and reproduce, contrasting views on the need for diversity between departments. This highlights the uncertainties around what constitutes effective policy and practice. Direction is needed on these issues but there is insufficient evidence-based advice available to colleges.

Furthermore, the effects of imbalances of understanding and knowledge, coupled with the tensions and divisions present, indicate that policy processes for cross-college subjects such as mathematics within colleges are difficult for managers to develop and control. Structural and cultural factors affect policy enactment even when systems appear well organised and policy processes cannot be easily separated from the historical traditions and values of socially situated practices. In particular, we see evidence of tensions between a vocational approach to education and cross-college subject teaching that affect decisions made within policy pathways.

Policy levers, such as financial incentives or penalties, have a significant impact on the implementation of policy in Further Education colleges. Such measures influence management decisions and drive policy enactment towards outcomes that often differ from those intended. There is much to learn about the effects of policy levers from historical examples but these lessons also need to be re-applied within the current landscape of increasing austerity to understand the possible severity of their effects on the relevant current policies.

In this complex and messy process, we also identify decisions by the main policy actors are being vital to the implementation of appropriate changes in practice. Key decision-makers within protracted chains of policy enactment in colleges may, however, lack the necessary understanding of mathematics policy to take effective actions. This finding highlights a need for individuals to be better supported by clear evidence-based guidance and the need for additional research to provide a more secure foundation.

The findings from this study show that a better understanding of the characteristics of policy enactment in Further Education colleges, particularly with respect to cross-college subjects such as mathematics, is essential to effective policy-making. In view of the current high profile of post-16 mathematics in policy discourses but the on-going failure to produce results (Department for Education 2016), this is an apt time for further research into these complex processes. Whilst exploring these cases and specific examples, some key features of policy enactment and possible problems that may result in policy 'failure' have been highlighted, but the need for further research in the context of FE is clear. The reasons for previous mathematics policy 'failures' and the processes that have led to unintended consequences warrant further critical examination to inform a more robust design of policies and levers that can achieve their stated objectives and, in this particular case, can raise the quality of mathematics learning in young people.

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