University of Nottingham
UK | CHINA | MALAYSIA

A professional development programme for cross-college leaders of mathematics in England's general further education colleges

Dr Diane Dalby & Professor Andrew Noyes

May 2021

Contents

1. Introduction

The Mathematics in Further Education Colleges (MiFEC) project[1] highlighted the key role played by cross-college managers of mathematics in the successful implementation of government policies for post-16 mathematics learning. These pivotal middle-leaders operate within complex organisational structures and need a particular blend of skills. They experience a unique combination of leadership, organisational, pedagogical and subject-specific challenges, all framed by national policy ambitions to improve England's quantitative skills base. The importance and distinctiveness of the role is clear but there was little evidence of bespoke professional development for these post-holders in the MiFEC research. This led to a recommendation in the MiFEC Final Report that a national programme tailored to the needs of cross-college managers of mathematics be developed.

Following the publication of the MiFEC Final Report, funding was secured from Research England to develop a new professional development programme suitable for these cross-college managers. It was informed by a literature review (Appendix 1) and evidence base of other relevant professional development (Appendices 2 and 3) which in turn led to the production of a professional competency framework for cross-college managers of mathematics (Appendix 4).

This first part of this document sets outs a proposed professional development (PD) programme for cross-college leaders of mathematics in general further education colleges in England. The programme aims to support these post-holders to develop the professional competencies within the framework. The proposed PD programme model, content and rationale are set out together with some explanatory detail to demonstrate how the activities support development of the professional competencies.

This cadre of cross-college leaders in general further education colleges numbers around 170 at any given time. Investment into this group of staff on a national scale is expected to improve the ways in which mathematics education policy is enacted in FE colleges and thereby lead to sustainable improvement in student outcomes.

2. Programme model

The proposed programme consists of several interrelated strands and activities, each designed to develop one or more of the professional competences. The programme design combines structured group sessions for all participants with an individualised suite of tasks through which personal needs can be addressed and opportunities provided for application in practice. The main components are:

- Five modules, offered as structured online sessions *(all)*
- A reflective self-assessment task *(individual, supported by external coach)*
- Coaching and professional development planning *(individual, supported by external coach)*
- A workplace project *(individual, supported by a member of their college SLT)*
- Membership of a community of practice. *(all)*

In addition, participants will be expected to share their project findings and produce a reflective account of their learning journey.

[1] The Mathematics in Further Education Colleges (MiFEC) project was funded by the Nuffield Foundation from 2017-2020 and completed by researchers at the University of Nottingham.

The national competency framework for cross-college managers of mathematics drives the programme design. It comprises five broad areas:

A. Inspiring vision, innovation and excellence

B. Professionalism, development and pedagogy

C. Robust provision

D. Effective collaboration

E. Reflective practice and resilience

Competencies A - E will be addressed as follows in the various programme strands.

The competency framework will be:	Competency
Mapped to *Reflective self-assessment task*	A,B,C,D,E
Articulated in *Coaching and professional development planning*	E
Explored in *Modules 1 – 5*	A,B,C,D,E
Expanded and built into *Membership of a community of practice*	D,E
Practiced & implemented in the *Workplace project*	A,B,C,D,E
Strengthened via *Using practice-evidence*	E
Reviewed with organisational sponsor	A,B,C, D, E

Table 1: Programme mapping to professional competency areas

2.1 The modules

Several generic FE middle-management programmes exist, and have existed (see Appendix 1-3), but none are designed specifically for the role of cross-college leadership and management of mathematics, with its distinctive challenges and opportunities. There are five core modules in the proposed PD programme.

M1: Effective cross college leadership of mathematics in FE

M2: Curriculum planning and opportunities for learner progression

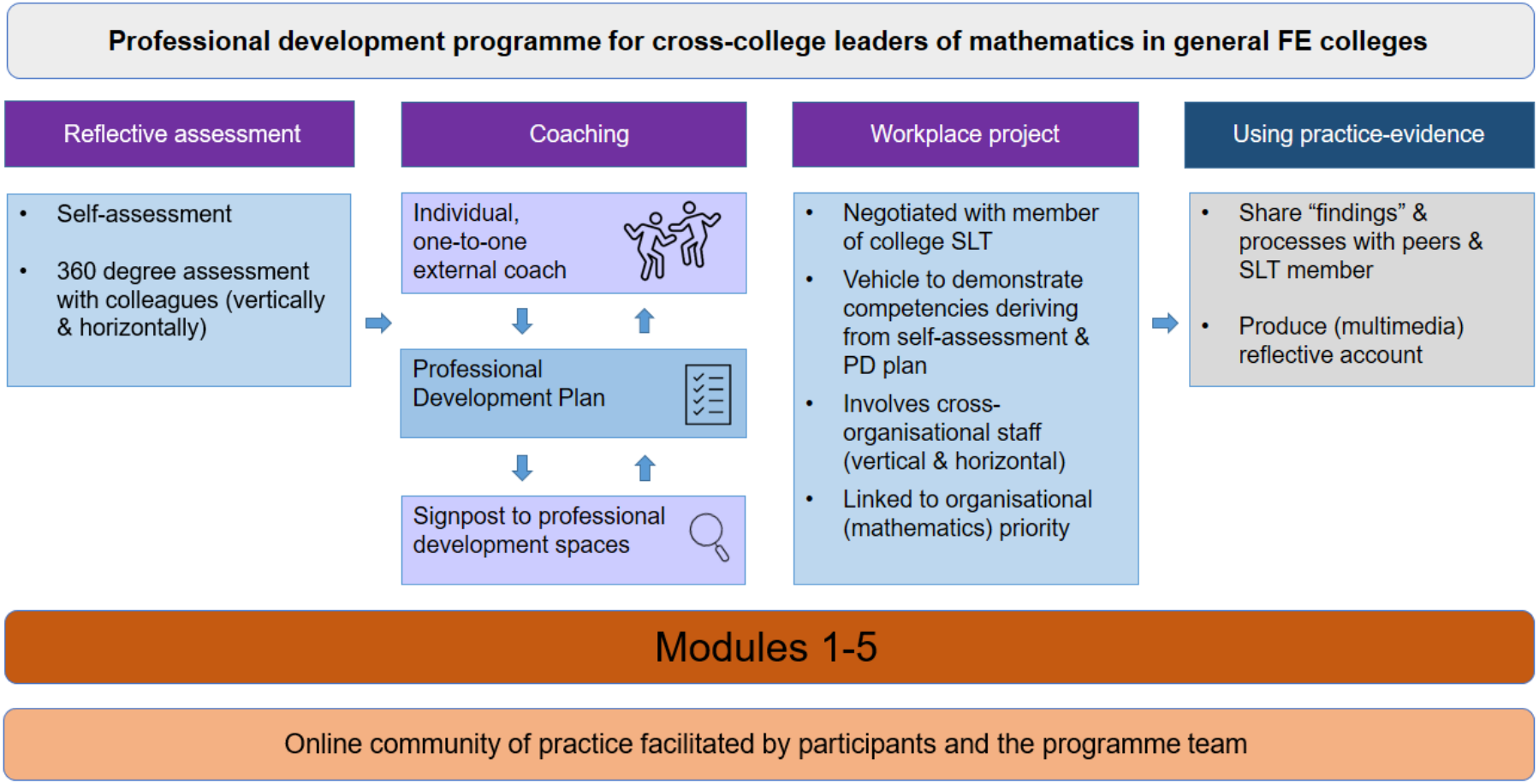
M3: High quality teaching and learning in post 16 mathematics

M4: Partnerships, collaboration and developing teams

M5: Building personal and professional success for yourself and with others

Indicative content for these modules can be found in Appendix 5.

Figure 1: The programme and its strands.



2.2 Reflective self-assessment task

The reflective assessment will enable participants to:

- self-assess against the competences outlined in the competency framework;
- obtain anonymised feedback from colleagues, vertically and horizontally;
- scope a development pathway.

Each participant will be invited to book a coaching session (1:1) with an external leadership coach to review feedback from colleagues alongside the results of their self-assessment. This will lead to further reflection and dialogue to identify differences between feedback and self-assessment, areas of strength and those where professional development may be beneficial.

There is a well-established literature highlighting the importance of reflection in professional development[2]. Furthermore, Argyris and Schön[3] argue that it is important for individuals to be aware of gaps or discrepancies in their espoused theory (how they believe they operate/behave) and their theory-in-action (how they actually operate/behave). Understanding this gap can be difficult and the provision of an external leadership coach is an important way of facilitating productive outcomes from this reflective exercise, enabling individuals to identify and take ownership of their own development goals as they articulate them.

An initial scoping activity suggests that the Advanced Practitioner Manager's Self-Assessment Tool[4] has good potential to be recontextualised for cross-college leaders of mathematics. The competencies and qualities in this self-assessment tool have been informed by the ETF's Leadership Competencies[5] but in addition they draw on the competencies, behaviours and qualities that Advanced Practitioner managers need in their role.

2.3 Coaching and professional development planning

Each participant will be supported by their external coach to draw emerging themes from their reflections into an action plan to support their professional development. The programme team will signpost and broker professional development opportunities within and outside the programme so participants can benefit from additional opportunities relevant to their plan and also contribute to the development and growth of others. In this way the programme will be tailored to the needs of individuals and extended where appropriate to ensure those needs are met.

2.4 Work-place project

The work-place project will be situated within participants' college context. Each participant will negotiate their work-place project with, and be supported by, a member of the college senior leadership team. The project fulfils multiple purposes:

- it enables participants to apply theoretical knowledge in practice within a familiar context so they can develop and demonstrate professional competences and behaviours;

[2] See, for example, Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. Review of research in education, 24(1), 249-305; Dana, N. F., & Yendol-Hoppey, D. (2008). The reflective educator's guide to professional development: Coaching inquiry-oriented learning communities. Thousand Oaks, CA.: Corwin Press; . Dimmock, C. (2016). Conceptualising the research–practice–professional development nexus: mobilising schools as 'research-engaged' professional learning communities. Professional Development in Education, 42(1), 36-53.

[3] Argyris, A. & Schön, D. (1992). Theory in Practice: Increasing Professional Effectiveness. Jossey-Bass Publishers.

[4] How Managers Can Support and Develop Advanced Practitioners – An Organisational Approach.

[5] https://leadershiphub.etfoundation.co.uk/leadership-competency-framework

- it allows the participant to address an organisational priority for mathematics in line with their college's priorities;
- it involves working with staff from across the college, both horizontally and vertically, to develop collaborative practices.

Baars et al[6] argue that senior leaders' leadership styles are particularly important in cultivating effective middle leadership. By involving a senior leader in negotiation and support, a space is created for modelling, enacting and experiencing distributed leadership and collaborative practice. Furthermore, Dad[7] claims that the wealth of teaching and learning knowledge, expertise and experience of middle managers is often not utilized by senior leaders. The proposed approach addresses this issue and reinforces the co-dependency of senior and middle managers highlighted in the MiFEC study. The MiFEC research[8] also emphasized the value of whole college approaches in which staff work collaboratively and responsibility is shared. By situating the work-place project in the college, the participant will be able to develop and work with complex networks of effective relationships in three contexts:

- vertically with respect to senior management and curriculum leads at different levels of the organization;
- horizontally with vocational/curriculum managers who have different levels of shared responsibility and accountability depending on the college approach;
- horizontally with respect to managers of other areas of mathematics provision.

All three contexts are highlighted in the MiFEC[9] Final Report as key challenges experienced by cross-college managers (see Appendix 1). The PD programme architecture, with its interrelated strands, creates the conditions for participants to co-develop solutions appropriate for their own workplace.

2.5 Communities of practice

A key aspect of the programme is the establishment of a sustainable community of practice that can flourish beyond the professional development programme. The Covid pandemic has precipitated the upskilling and enhanced confidence of staff to use digital technologies across their teaching and leadership practice and this makes new forms of communities of practice possible. A digital hub for participants would not only provide a platform for delivery of the structured programme and support, but could also provide a shared online environment in which a community of practice can be established.

The MiFEC Final Report recommended the development of effective CPD models such as professional learning communities - built on the concept of a community of practice - as a means of developing the workforce and achieving sustainable self-improvement. There is much support in the literature for the effectiveness of such communities for ongoing professional development [10]. It is important that a shared vision and common aims[11] are first agreed amongst a group of practitioners.

[6] Baars et al, (2015/16), Firing on all cylinders: what makes an effective middle leader? LKMco
[7] Dad, F. (2016) *Further Education Policy and Context: The relationship between curriculum middle managers' leadership practice and quality improvement.* PhD thesis, University of Worcester.
[8] Dalby, D. & Noyes, A. (2021) Whole College Approach (working paper).
[9] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham
[10] Wenger, E. C. (1999). Communities of Practice: Learning, Meaning and Identity. Cambridge: Cambridge University Press; Wenger, E. C., & Snyder, W. M. (2000). Communities of practice: The organizational frontier. Harvard business review, 78(1), 139-146; Lave, J., & Wenger, E. (1991). Situated learning: Legitimate peripheral participation. Cambridge: Cambridge University Press.
[11] Bolam, R., Mc Mahon, A., Stoll, L., Thomas, S., Wallace, M., Greenwood, A., & Smith, M. (2005). Creating and sustaining effective professional learning communities. London: DfES; Hord, S. M. (2009). Professional learning communities. Journal of Staff Development,

The group then needs to develop a culture of trust, mutual support and collaboration[12] so the members can safely inquire into their professional practice[13] and share experiences.

One of the ways this can be facilitated is via an online community. This approach has been developed for the DfE-funded Advanced Practitioner Programme using the Slack platform. Early indications[14] for the Advanced Practitioner Programme suggest that being part of a community external to one's organisation enhances participants' engagement and encourages creativity, innovation, risk-taking, collaboration and a stronger sense of agency. Mycroft and Sidebottom's[15] research on constellations of praxis and the practice-evidence from ETF's #APConnect programme suggests this approach could pay dividends.

By growing a national collaborative community of cross-college leaders of mathematics, each operating in unique local conditions, the ability to develop solutions to local problems is enhanced. More importantly, the ability of cross-college leader communities to tap into one another's experiences and knowledge as the need arises is important for cross-sector learning. This includes building of alliances and the collective abilities to drive improvements at a national scale.

2.6 Using practice-evidence

Towards the end of the programme, in preparation for Module 5, participants will be tasked with reflecting, documenting and sharing their learning with their cohort and college senior leaders via face-to-face or virtual presentations. Participants will be encouraged and supported to disseminate their findings and reflections through blogs, presentations and video recordings for the wider community of cross-college leaders of mathematics. This may include presentations and reports for local, regional and national networks with the aim of developing a practice-led evidence base that can support the generation of a self-improving sector.

3. Key Concepts

The following concepts underpin the programme design:

- Professional identity;
- Practice architectures and ecologies of practice;
- Developing beliefs, skills set and behaviour;
- Acknowledging pedagogical and subject-specific mathematical challenges;
- Context matters.

3.1 Professional identity

Cross-college managers need a clear view of their role and professional learning goals.

The development of professional competency is strongly linked to perceptions of professional identity. In the case of cross-college leaders of mathematics, the MiFEC study showed variations in

30(1), 40-43; Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. Journal of educational change, 7(4), 221-258.

[12] Little, J. W. (2002). Locating learning in teachers' communities of practice: Opening up problems of analysis in records of everyday work. Teaching and Teacher Education, 18(8), 917-946.; Stoll, L., Bolam, R., McMahon, A., Wallace, M., & Thomas, S. (2006). Professional learning communities: A review of the literature. Journal of educational change, 7(4), 221-258.

[13] Hord, S. M. (2009). Professional learning communities. Journal of Staff Development, 30(1), 40-43; Dimmock, C. (2016). Conceptualising the research–practice–professional development nexus: mobilising schools as 'research-engaged' professional learning communities. Professional Development in Education, 42(1), 36-53.

[14] Donovan, C. & Forrest, 2021, #APConnect Co-evaluation (unpublished)

[15] Mycroft, L & Sidebottom, K. (2018). Constellations of Practice, in P. Bennet, & R. Smith, (Eds.). (2018). Identity and Resistance in Further Education (1st ed.). London: Routledge.

the interpretation and enactment of similar roles, with a need for better understanding of the functions such leaders and managers were expected to perform. The design of the PD programme is grounded in a professional competency framework that helps clarify the role and functions of cross-college managers.

Professional identity is developed through interaction with a professional community in a reciprocal process[16]. Initially, participants will examine their own self-identity and make comparisons to the perceptions of those they work with. This will surface inconsistencies between self-beliefs and enacted professional identity leading to further exploration with a leadership coach.

Furthermore, the development of a community of practice for those in similar cross-college positions provides a unique opportunity for this distinctive group of managers to develop a shared identity based on the competency framework.

3.2 Practice architectures and ecologies of practice

The combination of a designed, structural 'architecture' and an organic, informal learning ecology creates both a framework and an environment for change.

This proposed programme has both a designed, structural 'architecture' and an organic, informal learning ecology. These two framing metaphors are important[17] since together they create an environment for professional learning. For example, Noyes and Dalby[18] found teachers often reported that informal, unplanned sharing between peers was more valuable than formal CPD sessions but particularly benefitted when both were linked together. The planned approach allows participants to explore specific challenges of cross-college management in a practical way, whilst also undertaking a structured programme to develop theoretical understanding.

3.3 Developing beliefs, skillset & behaviour

An emphasis on development of practice helps participants to explore and develop behaviours in their own workplace environment.

The concept of practical professional development that leads to changes in practice (i.e. behaviours) is an important aspect of any professional development programme[19]. The programme design provides multiple opportunities for participants to explore, develop and demonstrate behaviours in conditions described by O'Leary et al[20] as a 'structured autonomy'. They define structured autonomy as "allowing space and flexibility for teachers to discover things themselves and work collaboratively on targeted improvements." The programme aims to provide a similar environment for cross-college managers to explore and develop as individuals.

An emphasis on practical application runs through the modules but participants will be able to explore and develop competencies within their own college environment in the workplace project, supported by a member of their senior leadership team. The intention is that the participant is given

[16] Wenger, E. C. (1999). Communities of Practice: Learning, Meaning and Identity. Cambridge: Cambridge University Press.
[17] Kemmis S., Edwards-Groves C., Wilkinson J., Hardy I. (2012) Ecologies of Practices. In: Hager P., Lee A., Reich A. (eds) Practice, Learning and Change. Professional and Practice-based Learning, vol 8.Dordrecht: Springer. https://doi.org/10.1007/978-94-007-4774-6_3
[18] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham, p. 21.
[19] Timperley, H., Wilson, A., Barrar, H., & Fung, I. (2008). Teacher professional learning and development. Brussels: International Academy of Education.
[20] https://fetl.org.uk/wp-content/uploads/2019/05/2684-FETL-ERole-of-Leadership_AW_web.pdf, p.6.

space to work collaboratively in a real situation so they develop knowledge in practice[21], including the skills and behaviours that demonstrate professional competencies as defined in the framework.

3.4 Acknowledging pedagogical and subject-specific mathematical challenges

Subject-specific challenges such as the affective responses of students to mathematics and a lack of confidence amongst vocational staff are important.

There are several key issues for managers of mathematics concerning the student cohort and the wider context of mathematics learning within colleges. Retaking mathematics is challenging for students in FE for a number of reasons, as explained in the MiFEC findings (see also Appendix 1). For example, negative affective responses, such as anxiety and a lack of self-efficacy, are common amongst GCSE mathematics students and these can strongly impact cognitive abilities for mathematics learners [22]. In addition, vocational teachers often have low levels of mathematical confidence[23] which does not help students develop understanding of applications of mathematics in their vocational studies.

It is important that all those involved in supporting, teaching and leading mathematics are aware of the subject-specific challenges described above. The cross-college manager's role in a) supporting vocational and mathematics teachers to continuously develop their pedagogical content knowledge[24] and b) ameliorating the affective challenges experienced by re-sit students, is foregrounded in the programme modules.

3.5 Context matters

Differences between colleges mean a 'one size fits all' approach is inappropriate and local solutions need to be developed.

The MiFEC Final Report argues strongly that 'one size does not fit all' when it comes to mathematics in general FE colleges. Approaches that work in one context do not necessarily work in another due to the differences in contextual factors between colleges.

Cross-college leaders need to be able to draw on a wide range of knowledge and expertise so that decisions are well-informed and appropriate for the context, especially when planning for change. The proposed programme therefore aims to develop *communities of practice* (CoP) for cross-college managers of mathematics. These groups, who already have shared interests and a diversity of expertise and know-how, can individually and collectively 'deepen their knowledge and expertise in this area by interacting on an ongoing basis'[25]. An emphasis within this community and across the programme will be on the need to develop local solutions and change management plans suitable for a particular college rather than assume transferability across contexts.

[21] Cochran-Smith, M., & Lytle, S. L. (1999). Relationships of knowledge and practice: Teacher learning in communities. Review of research in education, 24(1), 249-305; Dana, N. F., & Yendol-Hoppey, D. (2008). The reflective educator's guide to professional development: Coaching inquiry-oriented learning communities. Thousand Oaks, CA: Corwin Press.
[22] Boaler, J. (2009). The Elephant in the Classroom: Helping Children Learn and Love Maths. London: Souvenir Press.
[23] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham.
[24] Shulman, L.S. (1986) Those Who Understand: Knowledge Growth in Teaching, Educational Researcher, 15 (2), 4-14.
[25] Wenger, McDermott and Snyder, (2002). Cultivating Communities of Practice: A Guide to Managing Knowledge, Harvard Business School Press.

4. Delivery

The programme requires a range of expertise to realise it as envisioned herein. A consortium with specialisms in leadership, mathematics, and teaching and learning within an FE context would be ideally suited to deliver it. Whichever delivery model is adopted, delivery partners will need to offer expertise in the following areas:

- Constructing, administering and collating self-assessments;
- Overseeing the deployment of leadership coaches;
- Designing granular professional development programmes, using module designers with subject expertise;
- Online programme design and delivery;
- Facilitating digital learning and developing an online community of practice;
- Leadership of module specialisms;
- Accessing a range of expertise including that of researchers, cross-college managers, other senior leaders;
- Programme administration.

This programme could be rapidly rolled out to the target audience in a relatively short window of 1-3 years. Furthermore, by adopting a mixture of delivery modes, the peer-relationships underpinning the communities of practices can be deepened for longer term impact.

5. Acknowledgements

The research informing this PD programme development was funded by the Nuffield Foundation from 2017-20. Additional knowledge transfer funding was secured from Research England from January to March 2021. We are grateful for the support from these organisations, for the consultancy services of Elizabeth Walker (Literature Review, Competency Framework and related appendices) and Joss Kang (PD programme design), for addition support from Colin Forrest and input from a small reference group of ‘critical friends’ at the Association of Colleges, Education and Training Foundation and Department for Education.

Appendix 1: Leading mathematical improvement in FE colleges - a literature review

1. Purpose

The purpose of this review is to consider relevant literature which bears upon the development of a professional competency framework for cross-college managers of mathematics. Significant among this literature is the substantial Mathematics in Further Education Colleges (MiFEC)[26] project which identified the key role which the leadership and management of mathematics plays in contributing to mathematics improvement in further education (FE) colleges. The MiFEC project comprised a substantial multi-scale research programme conducted over a three year period. The overall purpose of the research was to understand the mathematics education landscape from the national scale through college provision to classroom experience[27]. The project has provided substantial evidence, analysis and recommendations in a series of interim reports and a final report: a survey of teachers of mathematics in England's FE colleges[28]; an analysis of policy enactment in practice with respect to mathematics in England's FE colleges drawing on findings from 32 college case studies[29]; students' perspectives on mathematics in FE colleges[30]; an analysis of student progress over time[31]; and an overall drawing together of main findings together with considered recommendations[32]. The MiFEC body of work, together with other relevant sources considered in this review, has informed the development of the draft competency framework for FE cross-college managers of mathematics presented alongside this document.

2. Context

The introduction of the Condition of Funding[33] required FE students without a GCSE mathematics qualification at level 4 or above to be enrolled to retake GCSE mathematics or Functional Skills (FS) mathematics (if achieving GCSE mathematics levels 1 and 2 or below). The impact of this policy is arguable. The MiFEC project's analysis of student progress over time[34] finds that three out of four students with GCSE mathematics grade E/2 at age 16 fail to make progress over the following two years; and 2017/18 results (reported by MiFEC[35] from DfE (2019[36])) show that only 18.7% of the 16-18 year-olds resitting GCSE mathematics in 2018 achieve the required grade. The MiFEC work (e.g. the final report[37]) identifies many factors which impact on mathematics GCSE achievement rates.

3. Scope

This review will focus on the role of cross-college managers of mathematics in FE. There are few sources which have this specific focus, but there are sources which identify relevant issues. These include literatures which consider the role of the middle leader in FE and/or teachers of mathematics in FE and other educational contexts.

---

[26] Mathematics in Further Education Colleges - The University of Nottingham
[27] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham.
[28] Noyes, A., Dalby, D. & Lavis, Y. (2018) A survey of teachers of mathematics in England's Further Education Colleges – Interim Report 1, University of Nottingham.
[29] Noyes, A. & Dalby, D. (2020). Mathematics in England's Further Education Colleges: an analysis of policy enactment and practice – Interim report 2, University of Nottingham.
[30] Noyes, A. & Dalby, D. (2020). Students' Perspectives on Mathematics in Further Education Colleges – Interim report 3, University of Nottingham.
[31] Noyes, A. Dalby, D. & Smith, R. (2020). Mathematics in further education: student progress over time – Interim report 4, University of Nottingham.
[32] MiFEC Final Report, *ibid.*
[33] Education and Skills Funding Agency (2020). 16 to 19 funding: maths and English condition of funding
[34] MiFEC Interim Report 4, *ibid.*
[35] MiFEC Interim Report 2, *ibid.*
[36] Department for Education (2019). Revised A level and other 16-18 results in England, 2017/2018
[37] MiFEC Final Report, *ibid.*

4. Middle Leaders in education

The middle leader in the education context has been identified for decades as occupying a pivotal role in effective leadership and organisational performance. In the school context, middle leaders are identified by Baars et al[38] as being "responsible for the translation of school policies into practice". Cladingbowl[39] describes the leadership of teaching as having "the biggest single impact on standards". A number of sources emphasise the importance of communication in achieving this. Baars et al[40] talk about the need to "forge and maintain connections". Middle leaders are described as mediators rather than originators of school culture and policy[41] [42]. The report "Firing on all Cylinders"[43] suggests that effective middle leaders need to:

- Have a clear, ambitious vision
- Draw on careful evaluations of departmental needs and potential
- Be knowledgeable and enthusiastic about their field
- Encourage exploration and innovation
- Be strong leaders who can build a collegial culture
- Build strong teams.

In the FE college context, the Education and Training Foundation summarise findings from 30 middle leader projects which include the view that effective middle leadership needs to "Assume nothing and communicate everything"[44] .

5. Cross-organisation school coordinators

In the school context, Bartlett and Ogilvie[45] state that coordinators "see things at times from the viewpoint of the classroom teacher and at other times from the viewpoint of the school administrator". Coordinators are described by Bartlett and Ogilvie as having formal responsibilities which are exercised in largely informal ways, so that they often work through influence rather than direction, requiring a high level of interpersonal skills. Coordinators interact with people at many different levels and in many different spheres of activity. According to Blenkinsop[46], "it is the regular everyday conversations which help establish and reaffirm shared meanings both professionally and personally".

6. Cross-college middle leaders

The importance of connections and communication for a college middle leader is particularly significant for middle leaders in cross-college roles. Since before incorporation in 1992[47] cross-college roles have fluctuated in importance in college structures.

Dennison and Kelly[48] describe the work context of cross-college coordinators as involving "crossing boundaries and meeting ambiguous and conflicting demands". They identify a central paradox of the role as being that "the co-ordinator has an overall pro-active role in initiating activity while spending most of their time in a reactive mode – responding to and trying to maintain the activities

[38] Baars et al, (2015/16). Firing on all cylinders: what makes an effective middle leader? LKMco
[39] Cladingbowl, M. (2020). The key role of middle leaders – an Ofsted perspective, Teaching Leaders Quarterly, 3(13)
[40] Baars et al, *ibid*.
[41] National College for School Leadership (2003). The role and purpose of middle leaders in schools.
[42] Adey, K. (2000) Professional Development Priorities: The views of Middle Managers in Secondary Schools, Educational Management and Administration, 28(4), 419-431
[43] Baars et al, *ibid*.
[44] Education & Training Foundation (2020) Leading from the Middle – A compendium of leadership learning.
[45] Bartlett, L. & Ogilvie, D. (1980). The subject co-ordinator: the significance of the role, Australian Journal of Education, 24, 186–193.
[46] Blenkinsop, M. (1991). Curriculum co-ordination: formal and informal rules, Management in Education, 5(2), 2–3.
[47] Further and Higher Education Act (1992). https://www.legislation.gov.uk/ukpga/1992/13/contents.
[48] Dennison, W.F. & Kelly, M. (1989) The educational coordinator – perceptions of an emergent role, Educational Management and Administration, 17, 151–157.

they had initiated" (p.156). Following incorporation in 1993, Simmons[49] reported an increase in cross-college roles. These included functional specialist posts at middle management level such as human resources and marketing; and posts related to cross-college curriculum responsibilities such as GNVQ coordinator. Simmons identified a number of features which can characterise cross-college curriculum roles:

- They have as their main purpose the coordination of a key aspect of the college curriculum
- Meeting post-holder responsibilities involves working closely with and being dependent on colleagues who are other middle managers or who are line managed by other middle managers
- Coordinators have a responsibility to introduce consistency and shared approaches in contexts in which college departments sometimes wish to have a greater degree of autonomy
- As with other middle managers, cross-college managers need to mediate organisational policy; however, cross-college managers need to work in all directions, up, down and across the organisation in order to achieve effective working and improvement.

Simmons analysed managers' perceptions of their managerial roles. He found that postholders used a range of approaches to establish the credibility and authority needed to be effective in the challenging contexts in which they were working, including situations in which "non-compliance is not penalised, nor is cooperation rewarded"[50]. These included expertise in the relevant curriculum specialism (expert power); highly developed interpersonal skills and a collaborative approach (interpersonal power); developing mutually beneficial (win-win) working arrangements (bargaining power); and to some extent the authority of the role (position power). Cross-college managers described the need to draw on these different approaches to be effective in working across the college at different levels and in different contexts.

Almost by definition, cross-college roles are rooted in the need for connectedness across the organisation, so the characteristics of the role and some of the strategies it needs are understandable. Turning to the substantial body of primary research reported from the MiFEC project[51], it becomes clear that the challenges for those with a cross-college responsibility for mathematics are very much in evidence. The MiFEC final report[52] explains that the role of cross-college managers of mathematics "became more challenging following the Condition of Funding with large increases in student numbers in most colleges" (p.20). In an echo of the findings by Simmons[53] 20 years earlier, the MiFEC work also reports the challenge of maintaining a complex network of effective relationships, described as follows:

- vertically with respect to senior management and curriculum leads at different levels of the organisation, with a shared continuum of strategic/operational responsibilities;
- horizontally with vocational/curriculum managers who 'own' the students and have different levels of shared responsibility and accountability, depending on the college approach;
- horizontally with respect to managers of other areas of mathematics provision, depending on the structural arrangements in place.

[49] Simmons, J. (1999). Working in cross-college roles in further education. Journal of Vocational Education & Training, 51(4), 535-554.
[50] Cockburn, C. (1991). In the Way of Women: men's resistance to sex equality in organisations, London: Macmillan.
[51] Noyes, A. & Dalby, D. (2020). Mathematics in England's Further Education Colleges: an analysis of policy enactment and practice – Interim report 2, University of Nottingham.
[52] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham.
[53] Simmons, J. (1999). Working in cross-college roles in further education. Journal of Vocational Education & Training, 51(4), 535-554.

Research by Wolstencroft and Lloyd[54] characterises the contemporary positioning of middle managers in further education as having: "moved beyond their traditional role as the "ideological buffer between senior leaders and lecturers through which market reform is filtered in the FE workplace" to one which requires them to coordinate a multitude of tasks whilst being held accountable for the performance of their department, and further state that "these individuals hold critical roles for engaging staff in change, securing consistently good performance and generating creative and adaptable solutions all of which are essential if colleges are to meet the latest challenges within the sector."

Cross-college manager characteristics therefore need to include competencies in the area of communication in all forms, at all levels and in all directions, including interpersonal skills in a wide variety of contexts.

7. Empowering Middle Leaders

Sources which discuss middle leadership consistently emphasise the importance of a distributed leadership approach which empowers middle leaders, because of the significant contribution effective middle management can make to addressing sector challenges so as to achieve improvement. Frearson[55] suggests that leadership at this level is key to organisational transformation. Baars et al[56] cite the views of Mujis and Harris[57] that "a collaborative and collegial culture is instrumental to effective leadership"; and that "the optimal conditions for effective leadership is a context whereby there is a balance between building collective responsibility and maintaining a degree of openness and idea-sharing underpinned by trust".

In reflecting on the contribution of middle leaders in FE the 'Leading from the middle' programme[58] makes the following points:

- A lot of change initiated by middle leaders is delivered above and beyond the day job and this extra discretionary effort deserves recognition from senior leaders.
- If an organisation wants real transformation to occur, there needs to be a culture that encourages considered risk taking at middle leadership level.
- Senior leaders need to create a climate where teams and individuals can define their purpose and how their work relates and contributes to whole organisation success.
- Building confidence in middle leaders to deliver change is crucial and this often requires coaching and mentoring support.

The value of distributed leadership, then, would argue for a senior leadership style which supports and empowers middle leadership. For example, Baars et al[59] suggest that a collaborative culture and leadership style are "particularly important to cultivating effective middle leadership". Conversely, Bennett et al[60] refer to the "inhibiting effect of strongly hierarchical structures". In the schools context, the National College for School Leadership's review of Ofsted's inspection findings points out that the general 'quality of leadership at a senior level has a strong influence on the quality of leadership at middle leader level'[61].

[54] Wolstencroft, P. & Lloyd, C. (2019). Process to practice: The evolving role of the academic middle manager in English further education colleges. Management in Education, 33 (3), 118-125.
[55] Frearson, M. (2004). Leading Learning Project, Learning & Skills Research Centre.
[56] Baars et al, *ibid*
[57] Muijs, D. & Harris, A. (2007). Teacher Leadership in Action: Three Case Studies of Contrasting Schools, Educational Management Administration & Leadership, 35(1), 111-134.
[58] Education & Training Foundation (2020). Leading from the Middle – A compendium of leadership learning.
[59] Baars et al, *ibid*.
[60] Bennett, N., Woods, P., Wise, C., & Newton, W. (2007). Understandings of middle leadership in secondary schools: A review of empirical research. School Leadership and Management, 27(5), 453-470.
[61] National College for School Leadership (2004). Tackling within school variation: a leading practice seminar report.

Other literature suggests that the practices of senior leaders are important in creating the conditions for the potential of these cross-organisational role to be fully realised[62]. The agendas that frame these middle spaces however may be contested and Mhlanga[63] draws attention to the existence of groups of middle managers acting as 'principled mutineers'. Other authors challenge the notion of 'dual professional' inherent in some of the ETF standards as being too reductionist, instead highlighting that such players may be very effective boundary spanners, operating within multi professional perspectives[64]. Mhlanga's PhD thesis suggests that the notion of professional identity is also important in understanding the middle manager in mediating of the leadership/lecturer dualism within such roles.

As well as being a highly effective negotiator and communicator, the cross-college manager will need an openness to reflective practice and a degree of resilience to navigate the potential tensions and paradoxes inherent in issues of positioning and identity, both as a cross-college manager of mathematics and as a leader of pedagogy.

8. Contextual factors

The MiFEC research finds that cross-college managers are working in a wide variety of contexts. There are many factors which can have a significant impact on the nature and effectiveness of mathematics provision and on the capacity for improvement. These factors are largely outside the control of the cross-college manager.

The MiFEC findings[65] [66] suggest that they include the following:

- The curriculum offered by the college, including the range and level of academic and vocational qualifications
- The backgrounds, profiles and aspirations of students
- The size and geography of the college's physical presence
- The model of delivery of mathematics in terms of degree of embeddedness or otherwise, and centralisation or dispersal
- The scale and quality of the mathematics teaching resource
- The scale and quality of the broader teaching resource
- The mathematics progression strategies adopted at college level

The MiFEC reports provide helpful analyses of the advantages and disadvantages of these factors[67]. However, in terms of the implications for a professional competency framework for cross-college managers of mathematics, the MiFEC work makes a significant observation, "Although leadership and management styles vary, differences often arise from local conditions and organisational constraints that cannot be solved by a 'one size fits all' approach"[68].

This observation is substantiated by other sources. For example Higton et al[69] report the findings of primary research involving 45 FE and sixth form colleges in England and Wales which considers

[62] Dad, F. (2016) Further Education Policy and Context: The relationship between curriculum middle managers' leadership practice and quality improvement, PhD thesis, University of Worcester
[63] Mhlanga, T. (2017). The construction of professional identities in Further Education in the UK: perspectives of middle managers and academic experts in Educational Leadership and Management, PhD thesis , University of Reading.
[64] Forrest, C. (2019). Understanding dual professionalism: boundaries and opportunities (in Healthy Wealthy and Wise: Implications for Workforce Development), Learning and Work Institute.
[65] Noyes, A. & Dalby, D. (2020). Mathematics in England's Further Education Colleges: an analysis of policy enactment and practice – Interim report 2, University of Nottingham.
[66] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham
[67] MiFEC Interim Report 2, *ibid.* p.46.
[68] Noyes, A. & Dalby, D. (2020). Mathematics in England's Further Education Colleges: an analysis of policy enactment and practice – Interim report 2, University of Nottingham, p.30.
[69] Higton, J., Archer, R., Dalby, D., Robinson, S., Birkin, G., Stutz, A., & Duckworth, V. (2017). Effective practice in the delivery and teaching of English and Mathematics to 16-18 year olds, Department for Education.

effective practice in the teaching of mathematics to 16-18 year olds. This research similarly identifies the wide range of contextual factors which influence teaching and learning.

The cross-college manager, then, will clearly need an ability to ensure the effective delivery and improvement of college mathematics provision by taking account of their college's specific contexts and working within them. In order to do this the cross-college manager needs to be able to understand the driving and restraining forces in play[70], and to identify effective and realistic approaches and initiatives. This will require an ability to evaluate performance and progress in a way which takes account of context. As described by Pawson and Tilley[71] in their publication 'Realistic Evaluation', the competent cross-college manager needs to be able to identify not just 'what works?', but 'what works, for whom, in what circumstances?'

The cross-college manager will further need the ability to understand and work effectively with strategic and operational planning and implementation processes; the college curriculum offer; organisational structures and cultures; leadership, management and functional specialists, and teaching and administrative staff at all levels. To support this approach, the MiFEC final report[72] makes the following recommendation, "A mathematics self-evaluation toolkit and support package should be designed to aid college managers in reviewing their organisational strategies and developing improvement plans appropriate to their local context".

9. Whole College Approach

Given that the work of the cross-college manager is rooted in context, one dimension that emerges from the MiFEC work is the key importance of a whole college approach, which Dalby[73] describes as "a coordinated effort to improve students' mathematics skills and confidence alongside their vocational or academic studies". This view is supported by research undertaken by UCL, commissioned by the ETF[74] which highlights the strength of such approaches*:* "it is important that the whole organisation recognises that governors and senior leaders are united in being determined to implement those (whole organisational) policies".

In the FE context, the MiFEC work finds that "where regular collaboration took place, formally and informally, staff felt empowered and motivated"[75]. In addition, the MiFEC final report finds that strong leadership of mathematics can occur where cross-college managers of mathematics have effective working relationships vertically as well as horizontally in the college structure. These strong working relationships contribute to the whole college approach, which Dalby describes as essential for mathematics improvement, and in which "Leadership and management is seen as a shared responsibility across horizontal strata and vertical lines of management"[76]. The MiFEC final report states that where shared responsibility is operating well, "both mathematics and vocational staff were enthusiastic about the benefits of this collaborative approach"[77].

Dalby suggests that the particular whole college approach (WCA) needed now is driven by the Condition of Funding policy[78] and related mathematics performance measures. In some situations, the implementation of the Condition of Funding requirements at college level may tend to a culture of compliance rather than distributed leadership.

[70] Lewin, K. (1951). Field Theory in Social Science. Harper and Row, New York.
[71] Pawson, R. and Tilley, N. (1997). Realistic Evaluation. Sage Publications.
[72] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham.
[73] Dalby, D. & Noyes, A. (2021) Whole College Approach (draft paper)
[74] https://leadershiphub.etfoundation.co.uk/sites/default/files/inline-files/ioe_etf_strategicguide_final.pdf
[75] MiFEC Final Report, *ibid.* (p. 21).
[76] Dalby, D, & Noyes, A. (2021), *ibid.*
[77] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham.
[78] https://www.gov.uk/guidance/16-to-19-funding-maths-and-english-condition-of-funding

In terms of the implications for competences, the cross-college manager will need to be able to support improvement and work as effectively as possible towards promoting a whole college approach in such a way as to achieve a balance between flexibility and standardisation and accountability.

10. The mathematics context

Considering further the mathematics context, what if anything is distinctive about the nature of mathematics as a curriculum subject which may inform the competencies needed by cross-curriculum managers of mathematics? The following six characteristics may be relevant:

1. The problem-solving nature of mathematics – the mathematics syllabus comprises sets of rules, concepts and principles which are applied in problem-solving exercises. The problems are sometimes capable of being solved in a variety of ways, but up to GCSE level there is usually one (or rarely two or three) correct solutions. This means that for mathematics students success or failure is clearly visible. Mathematics professor Celia Hoyles states that "With maths, there's a right or a wrong answer and that's why people can feel so anxious – they're scared of looking foolish"[79].
2. Development of understanding in mathematics is significantly hierarchical. Successful progression to more complex mathematics (and arithmetic) will often depend on an understanding of more basic concepts. It is therefore quite possible for students to experience a sense of helplessness and be unable to find ways to regain control. According to Leat[80], "The concepts of self and self-esteem are central to a holistic view of competence because they are crucial determining factors in motivation and through motivation, disposition to action." This sense of failure could have a direct effect on the motivation of GCSE mathematics retake students, the young people who are the very target of the Condition of Funding Policy.
3. Possibly related to the above two points, studying mathematics can be accompanied by a high level of anxiety, which can inhibit cognitive processes and further impede progress. The Maths Anxiety Trust[81] draws on Tobias and Weissbrod's[82] definition of mathematics anxiety as "the panic, helplessness, paralysis and mental disorganisation which arises among some people when they are required to solve a mathematical problem." This has continued to be a problem. The Maths Anxiety Trust suggests that maths anxiety could be contributing to nearly a third of students failing to achieve a grade 4 or above in mathematics GCSE. Writing in 1993, Leat[83] suggested that, "development of competence may be inhibited by affective barriers." Sixteen years later Ashcraft and Moore[84] report that anxiety reduces the ability to process cognitively.
4. There appears to be a UK cultural norm which makes the statement "I'm useless at maths" both common and accepted. One college mathematics specialist, in response to a national call for evidence (2014), reported that "students come to us with a very fixed mindset that they are 'rubbish' at maths."
5. There is some evidence that those who have a high level of mathematics ability may not always be able to empathise with those who do not. They may also be unable to understand the nature of the difficulty which a student is experiencing with a particular mathematics

[79] Hargrave, S. (2019). 'People are scared of looking foolish': how maths anxiety is holding us back, in Guardian Newspaper, 24.6.19
[80] Leat, D. (1993). Competence, teaching, thinking and feeling, Oxford Review of Education, 9 (4), 499-510.
[81] http://mathsanxietytrust.com/
[82] Tobias, S. & Weissbrod, C. (1980). Anxiety and Mathematics: An Update, Harvard Educational Review, 50, 63-70.
[83] Leat, D. (1993), *ibid.*
[84] Ashcraft, M. & Moore, A. (2009). Mathematics Anxiety and the Affective Drop in Performance, Journal of Psychoeducational Assessment, 27(3), 197-205.

problem. This means that it can be difficult to be able to recruit mathematics staff who are both secure in their own mathematics knowledge and ability and able to understand the difficulties of those who are not. In a course for mathematics teachers addressing mathematical resilience, Johnston-Wilder et al[85] report that "Those who were more confident initially [with the maths] found it quite hard to work in an MR-building [mathematical resilience] way in the group activities – a couple of them either wanted to teach by telling or just do it quickly themselves." They also suggest that, "The problem is that teachers with maths anxiety are being asked to teach students who also have maths anxiety, without the skills or training to support their students or themselves." This view is supported by the MiFEC findings. The MiFEC final report[86] states that, "Colleges report that a lack of confidence amongst vocational teachers is the greatest barrier to effective cross-college support for mathematics." The MiFEC report includes the recommendation that, "The initial and ongoing training of vocational teachers should include better opportunities to develop personal confidence with mathematics." (Recommendation 13, p29). The MiFEC case studies found evidence that "a lack of confidence with mathematics was common among vocational teachers". There was a supportive attitude from mathematics specialists towards vocational teachers lacking confidence in mathematics. Despite this, take up of mathematics enhancement / upskilling CPD could be low, with vocational staff apparently being anxious and fearful about engaging with mathematics training and sometimes taking offence when it was offered.[87]

6. Perceptions of the relevance of mathematics can vary according to context and to the messages conveyed by staff and parents and received by students. In a 2016 study, Easey and Gleeson[88] highlight "the pivotal role of leaders and teachers….as gatekeepers, encouraging or discouraging students'….mathematics course selection." Drawing on terms described by Sealey and Noyes[89] they found that the staff focus only on professional, rather than practical or process (transferable skills/concepts) relevance of mathematics was reflected in the attitudes and choices of students with respect to mathematics. The need to encourage students to see the relevance of mathematics has been highlighted by many organisations. The MiFEC data on student perspectives on mathematics in FE colleges[90] finds that, "Students were unconvinced about the relevance of the mathematics they were learning to their lives, careers, and vocational studies."

Cross-college managers of mathematics need to have a depth of knowledge and understanding of these distinctive characteristics of mathematics, which should be reflected in any competency framework developed in relation to this post.

In terms of implications for mathematics teaching, Hoyles[91] identifies the need for mathematics teachers to be great communicators, able to show empathy, have the ability to convey the value of mathematics, and have belief in the ability of students to make progress. The Centres for Excellence in Mathematics (CfEM) programme (2020)[92] suggests that mathematics teachers need

[85] Johnston-Wilder, S et al. (2016). Developing teaching for mathematical resilience in further education , 9th International Conference of Education, Research and Innovation (Published in ICERI2016 Proceedings, pp 3019-3028)
[86] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham, p. 29.
[87] Noyes, A. & Dalby, D. (2020). Mathematics in England's Further Education Colleges: an analysis of policy enactment and practice – Interim report 2, University of Nottingham.
[88] Easey, M. & Gleeson, J. (2016). The Relevance of Mathematics: Leaders and Teachers as Gatekeeper, Australian Catholic University.
[89] Sealey, P. & Noyes, A. (2010). On the relevance of the mathematics curriculum to young people. The Curriculum Journal, 21(3), 239-253.
[90] Noyes, A. & Dalby, D. (2020). Students' Perspectives on Mathematics in Further Education Colleges – Interim report 3, University of Nottingham.
[91] Hargrave, S. (2019) 'People are scared of looking foolish': how maths anxiety is holding us back, The Guardian, 24.6.19
[92] Centres for Excellence in Mathematics

to support students in such a way as to address contextualisation, motivation and engagement, use of technology, and mastery. Cross-college managers of mathematics will need to take account of these factors in leading for mathematics improvement.

11. Cross-college managers of mathematics: activities

Turning to the more operational level of detail, a variety of sources can shed light on the components of the cross-college manager role. These include research papers and reports, and job descriptions and related documents.

MiFEC research[93] indicates that General FE colleges often have a particular post-holder who is key in the cross-college strategy and management of mathematics provision across the college. The MiFEC final report describes these post-holders as, "critical to the effectiveness of mathematics provision". They may hold positions ranging from senior leader to curriculum leader, but the roles could largely be described as broadly middle management positions. In general terms, a review of current job descriptions and related documents suggests that the activities of these post-holders can be summarised as follows

1. Strategy: Contributing to the development of the college vision and strategy for improvement with respect to mathematics, taking account of the Condition of Funding requirement.
2. Mathematics innovation: Leading development and innovation, acting as an ambassador and champion for mathematics.
3. Collaboration: Working collaboratively to engage curriculum managers and teams in mathematics including embedding mathematics in other provision and sharing best practice in mathematics teaching across the college.
4. Curriculum: Planning and delivery of mathematics curriculum provision, including contributing to timetabling, organising examinations and internal verification.
5. Students: Contributing to the management and oversight of student support, attendance, assessment, tracking, advice and guidance.
6. Leading quality assurance and quality improvement including: gathering and interpreting data; self-assessment and evaluation; and evidence-based quality improvement plans.
7. Resources: Leading the development and sharing of mathematics resources, including schemes of work and technology enhanced learning.
8. Staff: Leading and managing staffing of mathematics provision, including recruitment, management and support of high performing teams.
9. Professional development: Leading the planning and delivery of professional development, including: CPD to teach embedded mathematics; leading the development of mathematics skills for teaching staff across curriculum areas; modelling excellence in mathematics teaching and learning; leading mentoring and coaching of mathematics and other teaching staff; supporting mathematics advanced practitioners.
10. Networking: Networking and working collaboratively with other colleges including contributing to the work of Centres for Excellence in Mathematics.
11. Reflective practice: Working as a reflective practitioner, reflecting on own practice, evaluating impact of initiatives, maintaining professional updating.

Consideration of these activities and the competencies which support them can inform the development of a competency framework.

[93] Noyes, A. & Dalby, D. (2020). Mathematics in Further Education Colleges: Final Report, University of Nottingham, p. 21.

12. Standards and competencies

In the FE context, existing competencies, standards and other roles provide insights into competencies required by middle leaders including those responsible for mathematics provision.

Examples include the Education and Training Foundation's, Leadership Competency Framework,[94] Middle Management Programme,[95] Professional Standards, Advanced Teacher Skills (ATS)[96], and Advanced Practitioner (APs)[97] documents.

The leadership competency framework sets a context for characterising excellence and developing the capability of leaders and managers within the FE sector to improve the quality of sector leadership. It comprises six domains underpinned by positive indicators and development indicators in the areas of vision, culture and values, high performing teams, networking, collaboration and self-management/development. The ETF Middle Leaders' programme includes sections on curriculum intent and provision, curriculum planning, quality strategies, quality improvement, and vocational relevance of mathematics. Competencies are implied, but there is no explicit competency framework accompanying this programme.

The Professional Standards have been contextualised by the ETF for more experienced teachers and include the expectation that they should "demonstrate a high level of teaching and leadership skills and show initiative in improving teaching and learning within a wide range of settings".

ATS is intended as "the badge of advanced professionalism and mastery in further education and training" and holders are expected, amongst other attributes, to be able to "influence internal and external stakeholders and effect change in curriculum and improve organisational quality and development". Likewise, AP roles are seen as providing "support to meet strategic objectives set by the Department for Education (DfE), Ofsted, senior management or Heads of Department". Some of the resources produced by the ETF to support AP development focus on the development of 'high performing teams[98]' including the need for "linking individual, collaborative and organisation learning".

An overview of the ETF standards and competencies with potential relevance for the development of a competency framework for cross-college managers of mathematics in FE is provided in Appendix 2. Examples of resources relevant to the development of mathematics specific middle management skills is provided in Appendix 3.

In developing a relevant competency framework, Human Resources professionals may also have a useful perspective. From this perspective, Corbett (2020[99]) highlights four areas that are important in developing FE middle managers. They are, in order of priority: an ability to lead and foster team working relationships; a focus and drive to ensure learners/students are successful; resilience and an ability to respond to change; a good understanding and commitment to the further education sector.

13. Conclusions

Taking account of all of the above, the following points can be made:

1. The context in which the cross-college manager of mathematics is working makes a significant impact on the nature and potential effectiveness of the post-holder's work.

[94] https://leadershiphub.etfoundation.co.uk/sites/default/files/ETF18009_ETF_Leadership_Competency_FW_12PP_WEB_AW.pdf
[95] https://www.et-foundation.co.uk/news/etf-launches-new-middle-managers-programme-leading-middle/
[96] ETF Advanced Teacher Status
[97] IES (2017) Understanding the role of advanced practitioners In English further education.
[98] See, for example, Facilitating professional Development and high-performance through situated learning.
[99] Corbett, S. (2020). Establishing professional expectations in further education middle management: The human resource manager's perspective. Educational Management Administration & Leadership, 1–17.

Contexts vary hugely both within and across FE colleges, for example with respect to scale, staffing structures, mathematics curriculum policy, college curriculum offer, physical college configuration, student profile, dispersed or centralised provision, embedded and/or separate provision. Cross-college managers of mathematics therefore need the adaptability to be able to work effectively towards improvement in their own college context.

2. The implementation of Condition of Funding requirements at college level may sometimes tend towards a culture of top-down compliance rather than distributed leadership. The ability of cross-college managers of mathematics to achieve maximum impact in contributing to mathematics improvement will be enhanced by effective senior leadership support and constrained by an overly top down approach.
3. The cross-college manager of mathematics will need to be able to support improvement and work as effectively as possible towards promoting a whole college approach in such a way as to manage the possible tension by achieving a balance between flexibility on the one hand, and standardisation and accountability on the other.
4. The work of cross-college managers involves 'crossing boundaries and meeting ambiguous and conflicting demands',[100] which makes the importance of connection and communications particularly significant.
5. The cross-college manager of mathematics role needs to combine strategic, operational and developmental characteristics, taking account of the activities of current post-holders.
6. Cross-college managers of mathematics need to have a depth of knowledge and understanding of the distinctive characteristics of mathematics.
7. The review did not find any current examples of an explicit competency framework for middle managers in departmental or cross-college roles. However there are leadership competencies and teaching standards, as well as role descriptors for leadership and advanced practitioner roles, which can inform the development of a bespoke competency framework.
8. Given the variable nature of FE mathematics provision, any competency framework needs to encompass both current reality and the potential and aspiration for improvement in the effectiveness of the cross-college manager of mathematics role in delivering mathematics improvement.

14. Competency framework

In developing a competency framework to support improvement, it is worth considering Messick's[101] point that "competence is about potential. Performance describes the current performance capability, but competence is what a person can do under ideal circumstances".

In order to achieve this, the development of competence needs to be rooted in a reflective practitioner approach: "intelligent reflective thinking is an increasingly important necessity"[102]

A competency framework for cross-college managers of mathematics needs therefore to reflect both the current strategic and operational responsibilities and requirements of the post-holder, and the competencies of the future. The framework needs to reflect and characterise current realities and future aspirations. The draft competency framework presented alongside this document aims to achieve this combination.

[100] Dennison, W. & Kelly, M. (1989). The educational co-ordinator – perceptions of an emergent role, Educational Management and Administration, 17, 151–157.
[101] Messick, S. (1984). The psychology of educational measurement, Journal of Educational Measurement, 21, 215–238.
[102] Leat, D. *ibid.*

Appendix 2: ETF: relevant standards and competencies

ETF Professional Standards.	Advanced Teacher Status (ATS)	Understanding The Role Of Advanced Practitioners In English Further Education	Leadership Competency Framework
Clustered under three themes (selected examples potentially related to mathematics leadership) 1: PROFESSIONAL VALUES & ATTRIBUTES • Build positive and collaborative relationships with colleagues and learners. 2: PROFESSIONAL KNOWLEDGE & UNDERSTANDING • Maintain and update knowledge of your subject and/or vocational area. 3: PROFESSIONAL SKILLS • Address the mathematics and English needs of learners and work creatively to overcome individual barriers to learning. • Contribute to organisational development and quality improvement through collaboration with others. • *Differentiated example*. demonstrate a high level of teaching and leadership skills and show initiative in improving teaching and learning within a wide range of settings	'the badge of advanced professionalism and mastery in further education and training'. *Confers Chartered Teacher Status* (applicable to schools too) • Continuing self-improvement and development of pedagogical practice and subject specialism. • Commitment to the development of others through coaching and mentoring activity with colleagues. • Ability to influence internal and external stakeholders and effect change in curriculum, and improve organisational quality and development. And • Demonstrates effective practice in teaching and learning to the highest standard. • Shares their high level pedagogical/subject expertise through networking, coaching or mentoring. • Has high level technical or academic subject knowledge and professional experience. • Can support colleagues to improve learner and learning experiences. • Can critically evaluate their practice with colleagues or peers and assess its impact.	Describes the Functions of APs as: • Voluntary one-to-one support for the wider teaching workforce. • Leading and facilitating group CPD programmes and sessions. • Mandatory coaching and mentoring for staff experiencing challenges in their practice. • Inductions of new staff. • Support to meet strategic objectives set by the Department for Education (DfE), Ofsted, senior management or Heads of Department. This programme is underpinned by a suite of resources includes the guide: Facilitating Professional Development And High-Performance Through Situated Learning Chapter 2 focusses on: • Team-based performance and quality improvement • Linking individual, collaborative and organisation learning And refers to these four elements that could link to competencies: **1.** Employee decision-making through empowered teams, made up of multi-skilled and emotionally intelligent individuals who are as skilled interpersonally as they are in their subject or vocational area.	Framework has 6 domains underpinned by positive indicators and development indicators: A. Creating and Leading a Clear Vision B. Creating the Right Culture and Values C. Building High Performing Teams D. Networking Effectively at Local and National Level E. Working Collaboratively F. Self-management and Development Leading From The Middle Programme Includes sections on: • curriculum intent and provision • curriculum planning • quality strategies • quality improvement • vocational relevance of mathematics suggests that these areas could inform competencies How Managers Can Support and Develop Advanced Practitioners – An Organisational Approach Approaches to support individuals and teams, frameworks for 'supervising' and coaching APs, supporting their development and

	• Can contribute strategically to the developing curriculum and organisational development. • Typically holds roles such as senior teacher, trainer or assessor, curriculum manager or coordinator, aspiring senior manager, senior instructor supporting apprenticeships.	**2.** Support for employee performance through continuous learning often assisted by a mentor or coach. **3.** Rewards for performance including 'generous and public recognition' or individual and group-based performance pay. **4.** Open and immediate sharing of information and knowledge to: support (1), above; contribute to the management of the work process; support the free flow of feedback to those responsible for organisational strategy to ensure operational and strategic coherence. CASE STUDY: HEART OF WORCESTERSHIRE COLLEGE: skills and attributes of AQPs. '*The role of an Advanced Quality Practitioner requires a broad skills-set that goes beyond simply being a good teacher. This involves a combination of high-performing teaching skills and personal qualities. AQPs must have the ability and confidence to effectively coach and mentor others and have excellent interpersonal skills so that they are able to build relationships with colleagues and act as role models. Advanced Quality Practitioners must also be highly organised in order to juggle the many aspects of the role'*	empowering them to take the lead on driving improvements in teaching and learning. (implications for middle leaders of mathematics)

Appendix 3: Post 16 examples of mathematics-specific resources for middle managers

ETF (2015) Five Case Studies the delivery of GCSE English and Maths to the 16-19 cohort	Case study p 56 The importance of the English and mathematics curriculum manager: how to create change at middle management level Role involves: • Operational management of the curriculum, teaching, curriculum planning, budgets and working collaboratively on planning at a strategic level; and, • Direct line management of staff, recruitment and development and quality improvement
ETF A Strategic Guide for the delivery of GCSE English and Maths to the 16-19 cohort	Curriculum Management and Course Delivery (p.7). Each heading has further sub divisions. • Curriculum management: provision review, awarding organisation choice etc., examinations, liaison with employers • Delivery: departmental organisation, timetabling, effective teaching approaches • Staffing: capacity, CPD, action research,
DfE (2018) Teaching, leadership and governance in Further Education	Chapter 5 includes insights into the characteristics of middle managers in FE. English and mathematics context is explored p 36 onwards. does not focus on curriculum leadership specifically but provides these insights from Ofsted for good (English and) mathematics provision that presumably a head of mathematics needs to foster: • Teachers successfully integrate aspects of both English and mathematics into their course teaching. Students are aware of how these subjects are important in their vocational area. • Academic and vocational teachers work well and collaboratively with specialist English and mathematics teachers to improve learners' skills and vocabulary. • Teachers have high expectations of the quality of students' written work in all subjects and correct errors in spelling, punctuation and grammar
STEM Centre (2018)	New and aspiring leaders of mathematics CPD (schools) Themes: • Creating a vision for the department; Understanding personality types and high performing teams; Strategies for building links; • Developing outstanding teaching and learning; Problem Solving; Reasoning; Effective Communication; Source of resources • Running Effective Meetings; Systems to support learning; Monitoring, Evaluation and Observation; Gap task and Action planning • How to lead change; Effective Assessment and Feedback; Adapting existing resources to meet the demands of the new curriculum; Working with STEM Ambassadors • Coaching; Budgeting, resources and funding; Recruitment and retention; Using manipulatives to enhance understanding • Literacy in mathematics; Assertive Skills; Unpicking the GCSE examinations; Action planning and next steps

	Heads of Science (post 16) CPD covers • vision for science teaching • outstanding teaching and learning • supporting colleagues • difficult conversations • enriching the curriculum • running effective meetings • coaching • leading change • different styles of leadership • assessment for learning
STEM Centre Blogs	Leaders of mathematics: taking the next steps to develop your department | STEM Leading from the front: confessions of a head of mathematics
DfE (2018) Effective practice in the delivery and teaching of English and mathematics to 16 to 18 year olds	Section on Leadership and Management p 10/11 implies certain competencies e.g. • understanding of policy changes • strategic planning • curriculum development • mathematics policy development • advocacy of mathematics to other curriculum managers • understanding of relevant training and qualifications for mathematics teachers • understanding of departmental structures: centralised v dispersed. • Timetabling considerations.
MEI's Leaders of Maths in Further Education and Work-based Learning CPD (2020)	Course aims linked to competencies • articulate your personal vision of excellent mathematics teaching, learning and assessment • construct an ambitious and coherent curriculum journey for all students, based upon a clear leadership vision • manage a team in effective planning, resourcing and assessing that leads to students achieving their potential whilst preventing unnecessary burdens on staff • employ effective leadership strategies to secure improvement in teaching, learning and assessment • embed the principles of the course in practice, through structured interim tasks

Appendix 4: Competency framework

DRAFT COMPETENCY FRAMEWORK FOR CROSS-COLLEGE MANAGERS OF MATHEMATICS		
A. Inspiring vision, innovation and excellence	Developing and securing engagement in a clear and innovative vision of mathematics provision	**A1.** Strategy: Contributing to the development of the college vision and strategy for improvement with respect to mathematics, taking account of the Condition of Funding requirement. **A2.** Vision: Developing and securing engagement in a strong and inspiring vision of excellence in mathematics teaching informed by robust self-assessment and reflection. **A3.** Curriculum intent: Designing comprehensive mathematics curricula and assessment and delivery methods that support learners' ambitions and progression in mathematics and other sectors. **A4.** Mathematics innovation: Leading development and mathematics innovation, acting as an ambassador and champion for mathematics. **A5.** Landscape: Understanding the changing external landscape, policy developments, DfE requirements including Condition of Funding requirements and expectations.
B. Professionalism, development and pedagogy	Creating and supporting inspiring professional development and sharing of effective practice for improvement of teaching and learning	**B1.** Professional development: Leading the planning and ensuring delivery of inspiring and engaging mathematics focused professional development for mathematics specialist staff. **B2.** Professional development: Through securing effective and engaging CPD, enabling colleagues across all relevant curriculum areas to: (a) maintain and enhance their own knowledge of mathematics; (b) realise maximum student improvement through the effective teaching of embedded mathematics. **B3.** Student focus: Modelling excellence in mathematics teaching and learning which supports growth in self efficacy and confidence for learners, and overcomes barriers to learning mathematics. **B4.** Advanced practice: Facilitating mentoring and coaching of mathematics and other teaching staff; credibility and authenticity as an advanced practitioner, effectively supporting mathematics advanced practitioners **B5.** Culture: Fostering cultures that support high performing teams and empowered colleagues.

C. Robust provision	Leading the effective organisation, delivery, improvement and resourcing of cross-college mathematics provision, including GCSE and Functional Skills provision	**C1.** Curriculum: Planning and delivery of mathematics curriculum provision, including contributing to timetabling, organising examinations, internal verification, and meeting AO requirements and Ofsted requirements. **C2.** Students: Contributing to the management and oversight of student support, attendance, assessment, tracking, advice and guidance. **C3.** Quality: Leading quality assurance and quality improvement including: gathering and interpreting data; self-assessment and evaluation; drawing on and effectively interpreting performance data for other provision to take an informed approach; and developing and implementing evidence-based quality improvement plans. **C4.** Resources: Leading the development and sharing of mathematics resources, including schemes of work and technology enhanced learning, skilfully deploying resources. **C5.** Staff: Leading and managing staffing of mathematics provision, including recruitment, management and supporting the wellbeing of high performing teams.
D. Effective collaboration	Collaborating effectively within the college and networking externally for mathematics improvement	**D1.** Collaboration: Working collaboratively to engage and inspire curriculum managers and teams in mathematics improvement including embedding mathematics in other provision and sharing best practice in mathematics teaching across the college, including for T levels and apprenticeships. **D2.** Networking: Networking and working collaboratively with other colleges and FE partners including contributing to the work of Centres for Excellence in Maths and promoting mathematics improvement.
E. Reflective practice and resilience	Evaluating, reflecting and ongoing learning from practice of self and teams	**E1.** Practice: Working as a reflective practitioner; fostering a culture of effective and research-informed reviewing of team and departmental practice; evidence based evaluating of the impact of initiatives and implementing resulting learning. **E2.** Self: Effective self management; maintaining efficient and effective working practices; reflecting on and learning from own practice; maintaining research-informed professional updating; maintaining resilience.

Appendix 5: Module content

Module 1: What does it mean to be an effective cross-college leader of mathematics in FE?

This module would address the following indicative content.

- Develop an understanding of policy developments and drivers and their relevance for the design and delivery of mathematics. This includes the implications of the technical reforms, apprenticeships and other employer-led provision.
- Develop an overview of college funding including the implications of the condition of funding requirement.
- Examine how the condition of funding requirements can lead to different leadership cultures and subsequent outcomes.
- Identify the resources needed to support cross organisational mathematics including how timetabling can be used strategically.
- Understand the use of management information, including attendance, retention, achievement data, and its impact on funding and performance.
- Identify and co-construct strategies to address the unique challenges inherent in leading cross-college mathematics:
    - Develop expert, interpersonal, bargaining and position[103] power to navigate inter-dependency on other middle managers and staff one does not necessarily line manage.
    - Recognise and actualise the opportunities afforded by cross-college working for practitioner-led activities such as action research and/or professional learning communities by creating the conditions for staff to experience trust and feel their views are valued (especially vocational and technical staff).
    - Champion, vocalise and articulate subject-specific mathematics and pedagogical challenges and strategies to support learner and staff agency
- Advocate and encourage (practitioner) research into under-researched FE mathematics topics;
    - mathematics teaching and learning addressing specific contexts, constrains and affective issues;
    - ongoing professional development for FE mathematics teachers,
    - effective strategies for out-of-class mathematics learning
    - ‘embedding’ or developing of mathematics in vocational learning
- Develop ways of working that enable all actors to contribute their perspectives, in a meaningful and efficient manner, using coaching approaches such as the Thinking Environment
- Recognise and value your unique position to feed into future policy and design of post-16 mathematics pathways from a close to practice and close to leadership perspective.

[103] Simmons, J. (1999). Working in cross-college roles in further education. Journal of Vocational Education & Training, 51(4), 535-554.

Module 2: Curriculum planning, and opportunities for learner progression

This module is designed to address the following content.

- Understand the advantages and disadvantages of different organisational models to support mathematics.
- Build approaches and behaviours to ensure staff actively develop the mathematics curriculum and its delivery model.
- Examine the implications of the Gatsby benchmarks[104] for curriculum planning and tracking learner progress.
- Understand the expectations of awarding organisations on the timing of delivery and deployment of resources.
- Understand the key features of curricula that allow learners to progress successfully in mathematics and wider contexts.
- Explore ways of working effectively with vocational and technical practitioners and support staff so mathematics is seen as a shared responsibility.
- Actively ensure mathematics is explicitly built into the curriculum, including developing relationships between vocational, technical and mathematics practitioners and making explicit links between study programmes, T-levels, mathematics curricula and lessons.
- Understand the importance of inclusive approaches to the delivery of mathematics including supporting self-efficacy, the importance of literacy skills and resilience.
- Regularly collect learners' and staff' views and experiences of mathematics teaching and learning across the curricula, and triangulate with other data sources, to inform evidence-informed improvements.
- Recognize the value and practices of implementing changes in an evolutionary, sustainable manner for the longer term.

Module 3: High quality teaching and learning in post 16 mathematics

This module is designed to address the following content.

- Understand the implications of the Ofsted Education Inspection Framework: intent, implementation, impact for middle leaders of mathematics and for classroom teachers.
- Develop an awareness of a wide range of contemporary developments in the teaching, learning and assessment of mathematics.
- Develop an awareness of evidence-informed approaches including the findings of action and practitioner research.
- Understand how digital technologies can support high quality teaching and learning of mathematics.
- Develop approaches to facilitate the sharing of effective practice within the organisation.
- Understand how recruitment initiatives for post-16 mathematics teachers and vocational teachers can support workforce planning and career development that appreciate individuals' different situations; changing careers, curriculum or context.
- Identify and support different professional development needs for mathematics teachers depending on their starting points, including mathematics-specific CPD and CPD relevant to

[104] https://www.gatsby.org.uk/education/focus-areas/good-career-guidance

the affective challenges experienced by the majority of the GCSE resit cohort.

- Drive the implementation of a cross-college strategy to upskill vocational and technical practitioners so they can confidently and enthusiastically develop naturally occurring mathematics in their vocational and technical subjects.
- Work collaboratively to investigate, develop and evaluate:
    - out-of-class support and independent learning for mathematics students
    - rich pedagogical toolkits for teaching and learning in mathematics classrooms
    - approaches to embedding/ developing mathematics by vocational teachers

Module 4: Partnerships, collaboration and developing high performing teams

This module is designed to address the following content.

- Develop and articulate your vision of excellent mathemaitcs teaching, learning and assessment across the organisation.
- Understand the importance of organisational self-assessment and how your impact and that of your team members can be articulated.
- Explore how advanced practitioner type-roles can be used to underpin the implementation of the vision.
- Practice coaching and mentoring approaches in supporting high performance.
- Develop strategies to work and communicate with internal and external partners.
- Identify the key influencers in delivering your vision for mathematics across the organisation.
- Explore the importance of expansive formal and informal professional development activities and resources to meet organisational and individual needs.
- Work collaboratively with stakeholders to develop and implement a strategy to upskill vocational/technical practitioners so they confidently develop naturally occurring mathematics in their vocational/technical subjects.

Module 5: Building personal and professional success for yourself and with others

This module is designed to address the following content.

- Celebrate achievements to date.
- Reflect on strengths and areas for further development.
- Reflect on feedback from peers and sponsors on the work-place project.
- Review distance travelled and prioritise the strengths and areas for development with timescales and potential costings, if relevant, going forward.
- Identify what types of resources and support most benefited and going forward will likely to be needed for yourself, colleagues, and your organisations.
- Reflect on the impacts of the specific resources, networks, and communities of practice that have been most helpful in providing support and helping you drive quality improvements, and plan way forward.
- Critically reflect on your participation in the mathematics cross-college Communities of Practice and how this has impacted on your identity as a cross-college leader of mathematics in FE.
- Work out how you will continue creating alliances to drive evidence and practice-informed quality improvements in a wider community of peers.