Where is Technology in the 'Golden Thread' of Teacher Professional Development?

Chris Shelton[0000-0002-1444-2825] and Mike Lansley[0000-0002-5903-4876]

University of Chichester, UK
c.shelton@chi.ac.uk

Abstract. Researchers and policy makers have consistently agreed that the quality of teachers is one of the most important factors in determining the quality of an educational system and that teachers need to be supported and developed through rigorous initial teacher education and continuous professional development. In the specific case of teachers' ability to make effective use of technology, it has been noted that teachers require both technological and pedagogical training and education that equips them with the knowledge, confidence and skills they need. Given this broad, international consensus about the importance of teacher education for effective technology use, this paper explores the 'golden thread' of teacher development proposed by the UK government for teachers in England. This sets out a detailed curriculum for teacher development with very little reference to educational technology. The paper considers some of the potential missed opportunities to develop teacher expertise and practice with technology.

Keywords: Teacher Education, Education Technology, Teacher Training, Professional Development

1   Introduction

The use of educational technology has become an important part of many teachers' classroom practice. This was particularly highlighted during the Covid-19 pandemic when teachers throughout the world were suddenly expected to teach online even if they had never done this before [1].

Research into technology adoption over the past 40 years has consistently identified teacher knowledge as a key driver for effective technology use. Teacher professional development is "critically important" for effective use of technology [2], it should empower teachers to use technology to match educational activities to learners' needs [3], develop skills and confidence with technology [4] and prepare teachers to use pedagogic approaches that make the best use of digital technologies [5].

However, in England, despite a very detailed set of curriculum documents that set out what teachers need to learn during their initial training, in the early stages of their career, and as they develop into specialist or leadership roles, there is little acknowledgement of technology. This is in spite of a clear governmental 'EdTech' strategy that recognises the value of educational technology and aims to develop it [6].

2   Learning to Teach with Technology

Research into the adoption of technology has highlighted that technology is used within a multifaceted environment and affected by many complex factors [7]. For example, in responding to the need to teach online during the Covid-19 pandemic, teachers displayed varying degrees of readiness reflecting both individual and institutional factors [1].

To adopt and use a particular technology effectively, teachers need to have knowledge of the technology, the skills and confidence to use it and the pedagogic expertise to ensure this is effective. However, a lack of teacher professional development has been a "perennial barrier" [8, p179] to the adoption of educational technology. While it might be thought that this would have improved over time, recent survey data from the UK indicates that:

Staff barriers, including teachers' skills, confidence and appetite for using EdTech also represented a substantial barrier. Almost nine out of ten headteachers (88%) and three-fifths of teachers (58%) cited teacher skills and confidence as a barrier to the increased uptake of EdTech. [4, p20]

While this quotation highlights the need for teachers to be confident and skilled to use technology, this alone is not sufficient. Webb and Cox [5] note that using technology for learning and teaching requires that teacher undertake "more complex pedagogical reasoning than before" (p235) and that the need for teacher professional development to support this is clear. Albion and Tondeur [3] go further and suggest that many teachers only make routine rather than transformational use of technology unless their professionalism and teacher agency are recognized and supported.

The professional development required to develop teachers' skills, pedagogy and agency needs to be available throughout a teachers' career and not just as part of their initial teacher preparation. In fact, the DfE EdTech survey [4] suggested that "teachers who have been in the profession longer would benefit from additional CPD" (p19). This ongoing development is vital if the use of technology is to have a positive impact on pupil learning. As the Education Endowment Foundation (EEF) guidance on using digital technology to improve learning makes clear, training in the use of a new technology should be planned, delivered and reinforced as part of a planned implementation process [9]. Professional development also needs to ensure that teachers are aware of new technological developments throughout their career, for example, new opportunities and risks posed by technologies and new ethical concerns (such as artificial intelligence, cybersecurity scams, etc.).

There are many different models and approaches to teacher development in the use of technology [2]. These include traditional expert-led pre-service or in-service courses, online programmes, and school-led workshops. However, it has been argued that such programmes have had limited impact on teachers' adoption of technology because they fail to address teachers' authentic contexts [10]. More recently, research has explored alternative approaches that aim to address this, for example through mentoring [10], professional learning communities [11] and teacher inquiry or design-based research [12].

The need for professional development is clearly identified in the 2019 EdTech Strategy for England [6] where the Secretary of State for Education stated his belief that "technology can be an effective tool to help reduce workload, increase efficiencies, engage students and communities, and provide tools to support excellent teaching and raise student attainment" (p2). The third section of this strategy is devoted to developing digital capability and skills and states that "ensuring teachers have adequate training available is often the biggest challenge" (p16). The strategy suggests a number of actions that the government will take to address this including launching online training courses for teachers and leaders (for example: https://www.future-learn.com/courses/technology-teaching-learning) and introducing a network of EdTech demonstrator schools to share best practice and offer support to other schools. The strategy focuses on partnering with other organizations and technology companies to encourage innovation and to "reap the benefits that technology can bring" (p3).

3 England's 'Golden Thread' of Teacher Development

Responsibility for education in the UK is devolved to the four nations of England, Scotland, Wales and Northern Ireland and there are significant and longstanding differences between the four nations in terms of curriculum, examinations, methods of accountability and teacher education policy. In 2019, the Department for Education, the ministerial department of the UK government with responsibility for children's services and education in England, published a strategy for teacher recruitment and retention [13]. This strategy acknowledged that a lack of support for teachers at the start and throughout their careers can be a barrier to retaining teachers in the profession and action was needed to address this.

Therefore, alongside this strategy, the DfE launched the 'Early Career Framework'(ECF) [14] which was intended to provide a 'fully-funded, 2-year package of structured support for all early career teachers' [13, p19]. This induction support would be underpinned by a framework of content 'linked to the best available evidence' [14, p4]. This content is divided into two types: 'Learn that…' evidence statements and 'Learn how to…' practice statements. These statements are structured into five core areas: behaviour management, pedagogy, curriculum, assessment and professional behaviours but presented in eight sections mirroring the eight Teachers' Standards that English teachers are required to meet.

Shortly after the publication of the Early Career Framework for teachers in their first two years of the profession, the DfE published a new framework for Initial Teacher Training (ITT) that set out what student teachers needed to learn in order to qualify and begin employment. This ITT Core Content Framework (CCF) was designed to mirror the ECF [15, p4]. Using the same structure as the ECF, the 'Learn that…' statements of the CCF were:

"deliberately the same as the 'Learn that…' statements in the ECF because the full entitlement – across both initial teacher training and early career development – for new entrants to the profession is underpinned by the evidence of what makes great teaching" [15, p4].

The "Learn how to…" practice statements from the ECF were slightly adapted for the CCF by being sorted into two categories – those statements that student teachers would require expert support with and those that they would require practice in. But the content and focus of each statement remained identical for both student and early career teachers.

In 2021, the DfE also reformed the content of the National Professional Qualifications (NPQs) - a set of training programmes for serving teachers. Together, these reforms were intended to establish "a 'golden-thread' of high-quality evidence underpinning the support, training and development available through the entirety of a teacher's career" [16, p5]. These new qualifications were divided into specialist qualifications for classroom teachers and leadership qualifications (see Table 1).

Table 1. The 'Golden Thread' - Teacher Development System (adapted from [16]).

Who?	What?	Basis
Trainee Teacher	Initial Teacher Training (ITT)	ITT Core Content Framework (CCF)
Early Career Teacher (first 2 years)	Early Career Support	Early Career Framework (ECF)
Experienced teachers and middle leaders	Specialist Development	*Specialist NPQs* - Leading Teacher Development (NPQLTD) [17] - Leading Teaching (NPQLT) [18] - Leading Behaviour and Culture (NPQLBC) [19] - Leading Literacy (NPQLL) [20]
Senior leaders, headteachers and executive leaders	Leadership Development	*Leadership NPQs* - Senior Leadership (NPQSL) [21] - Early Years Leadership (NPQEYL) [22] - Headship (NPQH) [23] - Executive Leadership (NPQEL) [24]

As for the CCF and ECF, the NPQs are divided into 'Learn that…' and 'Learn how to…' statements. In some cases, evidence statements are used across several qualification frameworks. For example, the NPQ Leading Behaviour and Culture consists of six sections. The first 'Teaching' is just a statement that participants will have met the requirements of the ECF but the second 'School Culture' contains 7 'Learn that..' statement all of which are repeated from the ECF, which in turn are identical to the statements in the CCF. These 7 statements are then also repeated in the NPQs for Leading Teaching, Senior Leadership, Headship and Executive Leadership. These statements include such insights as:

"Teachers have the ability to affect and improve the wellbeing, motivation and behaviour of their pupils."

Thus, over their career, a teacher experiencing the 'golden thread' of teacher development might be expected to learn this statement seven times. (The 'Learn how to…'

statements for the NPQs are generally different and more advanced than those of the CCF and ECF to reflect the participants' different roles).

4   Technology in the Golden Thread

In the DfE EdTech survey, 42% of teachers who responded "indicated that more information on what good technology use looks like in the early careers framework would help" [4, p108]. But that survey does not address the question of how much information about technology is currently included in the ECF and what more should be added. Similar questions should be asked about the other ITT and NPQ frameworks.

To address this question, each of the frameworks that make up the 'golden thread' from CCF to NPQ were analysed by the authors. During the analysis, three specific research questions were considered:

1. Does this framework make any explicit mention of technology?
2. Does this framework make any implicit reference to technology?
3. Are there any additional opportunities to refer to technology evident within this framework?

ITT Core Content Framework (CCF)
The CCF contains no explicit mention of technology in the content statements either in terms of the use of technology to support learning or the use of technology to support teachers' professional responsibilities (e.g. planning, assessment, etc).

There is one reference to the use of technology (video clips) to support teacher learning and development in the introduction to the framework where the phrase (frequently used in the CCF statements) "Observing how expert colleagues … and deconstructing this approach" is defined as:

*"Working with expert colleagues – using the best available evidence – to critique a particular approach – whether using in-class observation, modelling or **analysis of video** – to understand what might make it successful or unsuccessful"* [15, p5]

It could also be argued that some statements of the CCF do have an implicit reference to technology in that it might be expected that teachers would need to use technology to achieve them. For example, statements about the use of data for assessment including recording data (p24) or "looking at patterns of performance over a number of assessments" (p23) might imply the use of digital assessment records although it is not clear that a novice teacher would recognize this.

It should also be noted that the CCF is explicitly intended as a minimum requirement: "The ITT Core Content Framework does not set out the full ITT curriculum for trainee teachers" (p4) and "It will be crucial for providers to ensure trainees have adequately covered any foundational knowledge and skill that is pre-requisite for the content defined in this framework." (p4). It could be argued that understanding of technology should be considered part of this 'foundational knowledge and skill' although none of this foundational material is defined or signposted.

Given that the CCF sets out a minimum requirement, there are many possible opportunities to extend the content of the CCF with reference to technology. For example, *'Seeking opportunities to engage parents and carers in the education of their children'* could be exemplified with reference to digital communication systems.

Early Career Framework (ECF)
As the content and focus of the ECF is identical to the CCF, with variation only in the degree of independence expected by the practice statements, there is no explicit mention of technology in the framework.

Similar to the CCF, there are a few statements within the ECF that might be considered to imply the use of technology. For example, there is reference to freely available training materials which will be shared online.

However, there are also some places where technology could usefully have been explicitly mentioned. For example, new teachers are expected to learn how to provide high-quality feedback including by sharing model work with pupils and highlighting key details (ECF 6.17 [14]). This might be achieved through using visualisers or other technologies for sharing pupil work.

Specialist National Professional Qualifications (NPQs)
The four Specialist NPQs (Leading Teacher Development; Leading Teaching; Leading Behaviour and Culture; and Leading Literacy) each contain identical content on 'Implementation' and 'Professional Development' (although this is structured differently and extended in the NPQLTD). Throughout these four frameworks, there is only one explicit reference to technology – this comes in the shared 'Professional Development' content where there is a single reference to teacher learning through viewing and discussing videos of teaching.

These shared sections also contain some statements that might be considered to imply the use of technology. These are references to using evidence (which will probably be most freely available online), interpreting data (which will most likely be collected and stored electronically); networking or sharing knowledge amongst staff (which may be through digital media) and making reasonable adjustments for staff with disabilities (which may include using assistive technologies).

There is, however, no mention of online approaches to professional development (e.g. those proposed by the EdTech Strategy) which may have been usefully discussed and evaluated and might be considered essential content for the NPQLTD. There are also multiple opportunities to include specialist uses of technology in these frameworks, for example, communication with parents or understanding cyber-bullying (NPQLBC); understanding digital texts or using digital tools when writing or editing (NPQLL); or using technology to support effective planning, teaching and assessment (NPQLT).

Leadership National Professional Qualifications (NPQs)
The four Leadership NPQs (Senior Leadership; Early Years Leadership; Headship; Executive Leadership) cover similar (and in many cases identical) content but with increasing scope and complexity to reflect the differing roles. These frameworks all contain an explicit reference to technology under resource management, for example:

Learn how to… manage resources… by: Developing and implementing a technology infrastructure that is good value for money, supports school operations and teaching, and is safe and secure. (*NPQH* [23, p28]).

However, there are no references in any framework that will support participants to be able to know what uses of technology might support teaching to enable this statement to be achieved.

There is also an explicit mention of engagement with social media as a public advocate within three of these frameworks.

Similar to the specialist NPQs, there are references to communication with parents and carers and to the use of data or systems that might be considered to imply an understanding of the role of technology in education. There are also references to networks and communications with external organisations that are likely to involve digital communication tools. And there are opportunities across the leadership NPQs to incorporate discussion and evaluation of uses of technology in teaching, inclusion, professional development and collaborative working practices.

Summary

In summary, the only specific technology explicitly referred to in any of the frameworks for professional development is video and this is in the context of teachers developing their practice through watching videos rather than any use of the technology with pupils.

There are also statements that imply or possibly assume the use of technology, for example, for recording and analysing data, and in the case of the leadership NPQs there is an explicit reference to school leaders' use of social media. However, these are focused on teachers' professional use of technology rather than developing teacher expertise in the use of technology for learning and teaching. The frameworks set out no expectations that teachers need to learn how to use technology effectively with pupils.

In comparing the professional development frameworks with the aims of the UK EdTech strategy, there is one direct link – school leaders are expected to learn how to manage an efficient and effective technology infrastructure. However, the broader focus of the strategy on supporting teaching and raising pupil attainment are not addressed.

5   Conclusions

The system of teacher development created by the DfE represents a major investment in supporting teacher learning. It is envisioned that teachers will move through the different stages of their career using each framework and qualification to deepen their knowledge and effectiveness from student teacher to becoming an executive leader of a chain of schools.

Such frameworks send a clear message to teachers about what is considered to be important to the government and the aspects of professional practice that they consider to be "evidence-based" and worthy of dissemination throughout the profession. The omission of educational technology is therefore notable because the official DfE

position, as stated in the 2019 EdTech Strategy, is that digital technology is very important. It is difficult to explain why, if teachers need "greater skills and confidence to use technology effectively" [6, p7], the frameworks that set out what teachers should learn in their initial training [15] and first two years of teaching [14] make no mention of this.

Similarly, if the EdTech strategy identifies specific potential opportunities for making better use of technology (to help reduce workload, increase efficiencies, engage students and communities, support excellent teaching and raise student attainment), it is unclear why these are not all reflected in the frameworks for teacher specialist and leadership development. A single statement about ensuring value for money of technology is unlikely to fully reflect the knowledge and skills leaders need to develop. In particular, if the government is supporting the development of online courses for teachers, it would seem appropriate for those taking a qualification on Leading Teacher Development to develop some understanding of how to use and evaluate online professional development.

Each of the frameworks contains a sentence noting that they have all been independently reviewed by the Education Endowment Foundation (EEF) to ensure that they draw on the "best available evidence and that this evidence has been interpreted with fidelity" (e.g. NPQLBC, [19, p7]). However, the EEF have published several reports about digital technology (e.g. [9]) so it is unclear why the EEF's independent review missed or decided not to acknowledge these.

However, it is acknowledged that the content of each of these frameworks must "be kept under review as the evidence base evolves. As in any profession, the evidence base is not static and research insights develop and progress." (NPQLL [20, p 8]). As is clear from the previous section, there are lots of opportunities to integrate technology into the English 'golden thread' of professional development and a good starting point might be to look at potential synergies between the aspirations of the EdTech strategy and the 'golden thread' of professional development. There may also be potential opportunities to learn from professional development practices in other countries and the existing evidence for professional development for technology.

In order to inform future developments of England's 'golden thread', further research is needed to investigate the lived experiences of teachers using technology in the classroom and to explore the forms of professional development that are sustainable and transformative.

References

1. Howard, S., Tondeur, J., Siddiq, F. and Scherer, R. "Ready, set, go! Profiling teachers' readiness for online teaching in secondary education." *Technology, Pedagogy and Education* 30:1 (2021). DOI: 10.1080/1475939X.2020.1839543
2. McDougall, A. "Models and practices in teacher education programs for teaching with and about IT." In Voogt, J. and Knezek, G. (eds) *International handbook of information technology in primary and secondary education*, pp. 461-474. Springer, Boston, MA, (2008). DOI: 10.1007/978-0-387-73315-9

3. Albion, P. and Tondeur, J. "Information and communication technology and education: meaningful change through teacher agency." In Voogt, J., Knezek, G., Christensen, R. and Lai, K (eds). *Second Handbook of Information Technology in Primary and Secondary Education.* Springer: Switzerland (2018). DOI: 10.1007/978-3-319-53803-7_25-2

4. Department for Education (DfE). Education Technology (EdTech) Survey 2020-21 Research report. DfE, London (2021). Available at: https://www.gov.uk/government/publications/education-technology-edtech-survey-2020-to-2021. Accessed 2022/2/25

5. Webb, M. and Cox, M. "A review of pedagogy related to information and communications technology." *Technology, Pedagogy and Education,* 13(3), 235-286. (2004). DOI: 10.1080/14759390400200183

6. Department for Education (DfE). Realising the potential of technology in education: A strategy for education providers and the technology industry. DfE, London (2019). Available at: https://www.gov.uk/government/publications/realising-the-potential-of-technology-in-education. Accessed 2022/2/25

7. Davis, N. *Digital technologies and change in education: The arena framework*. Routledge, New York 2017. DOI:10.4324/9781315638201

8. Watson, G. "Models of information technology teacher professional development that engage with teachers' hearts and minds." *Journal of Information Technology for Teacher Education* 10:1-2 (2001). DOI: 10.1080/14759390100200110

9. Stringer, E., Lewin, C., Coleman, R. *Using Digital Technology to Improve Learning: Guidance Report.* EEF: London (2019)

10. Baran, E. "Professional Development for Online and Mobile Learning: Promoting Teachers' Pedagogical Inquiry". In Voogt, J., Knezek, G., Christensen, R. and Lai, K (eds). *Second Handbook of Information Technology in Primary and Secondary Education.* Springer: Switzerland (2018). DOI: 10.1007/978-3-319-71054-9

11. Prestridge, S. and Main, K. "Teachers as Drivers of Their Professional Learning Through Design Teams, Communities, and Networks". In Voogt, J., Knezek, G., Christensen, R. and Lai, K (eds) *Second Handbook of Information Technology in Primary and Secondary Education.* Springer: Switzerland (2018). DOI: 10.1007/978-3-319-71054-9

12. McKenny, S. and Roblin, N. "Connecting Research and Practice: Teacher Inquiry and Design-Based Research". In Voogt, J., Knezek, G., Christensen, R. and Lai, K (eds). *Second Handbook of Information Technology in Primary and Secondary Education.* Springer: Switzerland (2018). DOI: 10.1007/978-3-319-71054-9

13. Department for Education (DfE). Teacher Recruitment and Retention Strategy. DfE, London (2019). Available at: https://www.gov.uk/government/publications/teacher-recruitment-and-retention-strategy. Accessed 2022/2/25

14. Department for Education (DfE). Early Career Framework. DfE, London (2019). Available at: https://www.gov.uk/government/publications/early-career-framework. Accessed 2022/2/25

15. Department for Education (DfE). Initial teacher training (ITT) Core Content Framework. DfE, London (2019). Available at: https://www.gov.uk/government/publications/initial-teacher-training-itt-core-content-framework. Accessed 2022/2/25

16. Department for Education (DfE). Delivering World-Class Teacher Development. DfE, London (2021). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/991390/Delivering_World-Class_Teacher_Development.pdf. Accessed 2022/2/25

17. Department for Education (DfE). National Professional Qualification (NPQ): Leading Teacher Development Framework. DfE, London (2020). Available at:

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925511/NPQ_Leading_Teacher_Development.pdf. Accessed 2022/2/25

18. Department for Education (DfE). National Professional Qualification (NPQ): Leading Teaching Framework. DfE, London (2020). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925513/NPQ_Leading_Teaching.pdf. Accessed 2022/2/25

19. Department for Education (DfE). National Professional Qualification (NPQ): Leading Behaviour and Culture Framework. DfE, London (2020). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925508/NPQ_Leading_Behaviour_and_Culture.pdf. Accessed 2022/2/25

20. Department for Education (DfE). National Professional Qualification (NPQ): Leading Literacy Framework. DfE, London (2021). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1025652/NPQ_Leading_Literacy_Framework.pdf. Accessed 2022/2/25

21. Department for Education (DfE). National Professional Qualification (NPQ): Senior Leadership Framework. DfE, London (2020). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925512/NPQ_Senior_Leadership.pdf. Accessed 2022/2/25

22. Department for Education (DfE). National Professional Qualification (NPQ): Early Years Leadership Framework. DfE, London (2021). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1024896/National_Professional_Qualification_for_Early_Years_Leadership.pdf. Accessed 2022/2/25

23. Department for Education (DfE). National Professional Qualification (NPQ): Headship Framework. DfE, London (2020). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925507/NPQ_Headship.pdf. Accessed 2022/2/25

24. Department for Education (DfE). National Professional Qualification (NPQ): Executive Leadership Framework. DfE, London (2020). Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/925506/NPQ_Executive_Leadership.pdf. Accessed 2022/2/25