

ARTICLE

The Lived Experience of Professional Learning of Teachers in the North of Scotland

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Abstract

In Scotland, as elsewhere, it is widely recognised that the quality of teaching is the most important factor in children's learning, and therefore on education system outcomes. The quality of teaching can be improved through high-quality teacher professional learning. However, there is a lack of empirical research on how teachers experience professional learning.

This paper describes the experiences of professional learning of twelve physics teachers in secondary schools across the north of Scotland. Data were gathered through semi-structured interviews and by teachers completing professional learning career roadmaps and year-long reflective diary-logs. These experiences are compared with their contractual requirements and analysed against a theoretical framework based on Timperley's principles of effective of professional learning, and Kennedy's models professional learning. This aims to achieve an understanding of professional learning practices for teachers in Scotland.

The study finds that most of the teacher professional learning is transmissive rather than transformative with little evidence of enquiry as stance or collaborative enquiry-based approaches. This neither serves the macro-level desire for transformative change nor the micro-level and nano-level desire for improved instruction and is unlikely to result in improvements in pupil outcomes or system performance.

Keywords: Professional learning, professional development, education policy, education reform, school improvement

1. INTRODUCTION

Good teaching impacts on the learning of children and young people [1], and professional learning can have an impact on the effectiveness of teachers [2,3]. This is summed up well by Rauch and Coe:

"The quality of teaching is arguably the single most important thing that teachers and school leaders can focus on to make a difference in children's learning. The difference between really good teaching and less effective teaching makes more difference to learning than any other factor within school. High-quality teaching narrows the advantage gap. Crucially, it is also something that can be changed: all teachers can learn to be better." [4]

Teachers always want to do well for the pupils they teach, and education reformers and system leaders want to see improvements in education as a whole [5-7]. Kraft and Papay [8] show, for mathematics, that the impact of a teacher on their pupils' achievement increases quickly during the first few years of their career but, provided teachers work in supportive professional environments, continues to improve, albeit more slowly thereafter. This provides a strong rationale for teacher professional learning as a lever to improve valued educational outcomes. This is recognised in the contracts of teachers in Scotland and other national policy documents.

What teachers in Scotland are contractually required to do is set out in the Scottish Negotiating Committee for Teachers Handbook [9] which is agreed by teacher unions, local authority (council)

employers, and the Scottish Government. The SNCT Handbooks states that there are five in-service days per year and collegiate time during which should include “*development activity planned by the council*” which “*may form a part of the CLPL [Career-Long Professional Learning] plan and record*” of teachers (para. 9.6). Teachers also “*have a contractual requirement to complete a maximum 35 hours of Continuing Professional Development (CPD) per annum*” (para. 3.11) outside their normal working hours in schools.

The SNCT Handbook also states that teachers have to meet the professional standards of the General Teaching Council for Scotland’s (GTCS) [10,11], and to participate in the Professional Review and Development (PRD) [12] and Professional Update (PU) [13] processes designed to provide a framework for teachers to identify professional learning needs, and to reflect on and record their professional learning. Completion of the five-yearly PU process is a requirement for continued registration with the GTCS and to teach in Scotland. The GTCS and Scotland’s national education support agency, Education Scotland, have developed a National Model of Professional Learning [14,15] to support these processes and the professional learning of teachers in practice. One of the Quality Indicators in How Good Is Our School? (HGIOS) [16], Scotland’s education inspection and self-evaluation framework is ‘Leadership of learning’ which includes the themes ‘Impact of career-long professional learning’ and ‘Professional engagement and collegiate working’. The National Improvement Framework (NIF) which “*sets out the vision and priorities for Scottish education that have been agreed across the system*” [17] includes ‘teacher and practitioner professionalism’ as one of the six drivers for educational improvement further cementing the role of teacher professional learning in educational improvement. A transformative or critical conception of professionalism [18] is promoted through the liberal use of terms such as critical, enquiry and collaboration in documents such as the GTCS professional standards and the National Model of Professional Learning, and in the more general educational discourse about school and teacher empowerment, however, more managerial conceptions of professionalism are promoted by HGIOS and the NIF. As well as the contractual requirement for all teachers to undertake professional learning, this policy milieu, in theory at least, provides a fertile environment for teacher professional learning in Scotland. However, this paper now goes on to explore the research question “*how can we record teacher professional learning experiences and what does this tell us about teacher career-long professional learning in practice?*” and therefore whether this national policy environment is reflected in the practice of teachers.

2. THEORETICAL FRAMEWORK

Many have attempted to theorise teacher professional learning. The problem has been approached from different perspectives and produced models for different purposes. Some theorise the features of effective professional learning [19-22], others the purposes or modes of professional learning [23,24], and yet others theorise the process of professional learning [25-28]. Others have theorised or modelled particular modes of professional learning, such as coaching [29] or cycles of enquiry [30,31]. That there have been these different approaches illustrates the complexity of teacher professional learning and that so far, no single model or theoretical framework suffices to encapsulate all aspects of teacher professional learning.

In this study, a combination of the framework developed by Kennedy [24], see figure 1, and the ten principles developed by Timperley [21], see Table 1, has been used to evaluate the professional learning experiences of teachers. Kennedy identifies eight models of professional learning across a spectrum from transmissive to more transformative models which are more likely to increase the capacity for professional autonomy and teacher agency. Timperley identifies ten principles of effective learning, and it is reasonable to hypothesise that the more of these which are exhibited in professional learning activities the more impactful these will be.

Purpose of Model		Examples of models of CPD which may fit within this category
Transmissive	Increasing capacity for professional autonomy and teacher agency	Training models Deficit models Cascade models
Malleable		Award-bearing models Standards-based models Coaching/mentoring models Community of practice models
Transformative		Collaborative professional inquiry models

Figure 1. Spectrum of professional learning (continuing professional development) models [24]

Table 1. Timperley's ten principles for professional learning [21]

	Principle	Description
1	Focus on valued student outcomes	Professional learning experiences that focus on the links between teaching activities and valued student outcomes are associated with positive impacts on those outcomes.
2	Worthwhile content	The knowledge and skills developed are those that have been established as effective in achieving valued student outcomes.
3	Integration of knowledge and skills	The integration of essential teacher knowledge and skills promotes deep teacher learning and effective changes in practice.
4	Assessment for professional inquiry	Information about what students need to know and do is used to identify what teachers need to know and do.
5	Multiple opportunities to learn and apply information	To make significant changes to their practice, teachers need multiple opportunities to learn new information and understand its implications for practice. Furthermore, they need to encounter these opportunities in environments that offer both trust and challenge.
6	Approaches responsive to learning processes	The promotion of professional learning requires different approaches depending on whether or not new ideas are consistent with the assumptions that currently underpin practice.
7	Opportunities to process new learning with others	Collegial interaction that is focused on student outcomes can help teachers integrate new learning into existing practice.
8	Knowledgeable expertise	Expertise external to the group of participating teachers is necessary to challenge existing assumptions and develop the kinds of new knowledge and skills associated with positive outcomes for students
9	Active leadership	Designated educational leaders have a key role in developing expectations for improved student outcomes and organising and promoting engagement in professional learning opportunities.

10	Maintaining momentum	Sustained improvement in student outcomes requires that teachers have sound theoretical knowledge, evidence informed inquiry skills, and supportive organizational conditions.
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At the transformative end of Kennedy's spectrum is the collaborative professional enquiry model which can include several modes of professional learning all with the potential of embedding enquiry as stance [32]. This could include the use of lesson study [33,34], mentoring and coaching [29,35], practitioner enquiry [36] or professional learning communities [37,38] working through a cycle of enquiry [30,31]. Such collaborative approaches are central to Scotland's National Model of Professional Learning [14] and are likely to feature several of Timperley's principles and the mechanisms of effective professional learning identified by Sims et al. [20]. The models in Kennedy's malleable category have the potential to be transformative if enacted in a manner which promotes this. Regardless of the mode of professional learning used, or the number of Timperley's principles met, positive impact is reliant on the content of the professional learning being worthwhile and based on sound evidence.

Little showed that successful schools have high levels of collegiality with teachers collaborating through talking to each other about teaching, observing each other, and planning and evaluating their work together [39]. However, to avoid the "*sharing of ignorance*" [40], it is necessary for the status quo to be challenged which could be achieved through inputs from knowledgeable others through a variety of professional learning from relatively informal micro-events [41,42] to comprehensive formal programmes [43].

3. METHODOLOGY

The participants were physics teachers in state funded secondary schools in the north of Scotland. To ensure the participants had a reasonable minimum amount of professional learning to comment upon, only unpromoted teachers who had taught for several years or teachers in middle leadership posts (Principal Teacher) were included. Principal Teachers typically have several years of experience as teachers before being promoted. They have a small allocation of time for administration and leadership duties in addition to the statutory non-teaching time for all teachers, which means they still spend much of their school-based time teaching.

3.1 Participant Selection

An initial open call for participants on an email forum to which most Scottish physics teachers subscribe was unsuccessful. Emails were then sent directly to teachers known by the researcher to meet the criteria of the study. As the researcher was involved in providing a significant amount of professional learning for the IOP [44], to minimise possible biases, many who had most often attended IOP activities during the preceding two years were not contacted. Several who had not attended any recent IOP professional learning activities, but who were known to the researcher were approached. The researcher used professional judgement and knowledge of the Scottish physics teaching profession to approach individuals considered to be reasonably knowledgeable about the professional learning environment of physics teachers, likely to have considered views on this, and to be willing to share these. The participants in the study are therefore likely to be a 'best-case' group not fully representative of the profession but likely to be able to contribute to a deep, well-informed exploration of the professional learning environment, both within physics education, and beyond.

The participants were selected in a purposeful manner [45] using the researcher's experience and judgement together with data from the annual census of Scottish teachers [46]. The criteria used resulted in participants which included teachers and Principal Teachers at different points in their careers, with an appropriate gender balance compared to physics teachers nationally, and from a range of schools of different locations and sizes across seven local authorities in the north of Scotland, see Table 2 for details.

Table 2. Participants (school location information from the Urban Rural 8-fold Classification [47])

Name	Role	Teaching experience	School location	Approximate school roll	Local authority
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Albert	Teacher	>20 years	Other urban area	1200	D
Andrew	Principal Teacher	<10 years	Remote rural	700	D
Ava	Teacher	>20 years	Accessible small town	850	D
Calum	Principal Teacher	>20 years	Accessible rural	450	E
Clara	Teacher	>20 years	Very remote rural	350	F
Dani	Principal Teacher	10-20 years	Remote small town	1000	D
David	Teacher	<10 years	Very remote rural	100	A
George	Teacher	10-20 years	Very remote rural	100	C
Gill	Principal Teacher	>20 years	Remote small town	400	E
John	Teacher	10-20 years	Very remote small town	1000	B
Luke	Teacher	10-20 years	Accessible small town	850	E
Neal	Principal Teacher	>20 years	Very remote rural	150	H

A hypothesised benefit of this group of participants is that the researcher being known to them, there being an existing level of trust, and the individual approach, would likely give greater ‘buy-in’ to the study. This would lead to a reduced withdrawal rate of the participants during the relatively intensive data collection process [48,49]. This research design has many elements in common with the description of case study research by Yin [50], who describes case study research as having a distinct advantage over other research methods when asking in-depth ‘how’ and ‘why’ questions about a contemporary phenomenon within its real-world context, and where boundaries between phenomenon and context may not be clear. Such case study research can be exploratory, descriptive, or explanatory in nature, and it could be argued that this study has aspects of all three. It was hoped that the data gathered from these participants, if contextualised properly, would yield useful analytical generalisations [50].

3.2. Data Collection Methods

To gather the data required, it was decided to use a combination of semi-structured interviews together with a professional learning career roadmap and diary-log with each participant. In preparation for the first semi-structured interview, participants were asked to reflect on and complete a roadmap of their professional learning journey during their careers. This roadmap was then used to provide some of the structure during the interview as well as information about the background of the participants and the professional learning they had found most worthwhile. The interview was also used as part of the preparation of the participants to complete a diary-log of their professional learning over a full year. It has been shown previously [42,51,52] that teachers often define professional learning rather narrowly,

associating professional learning with formal ‘events’ and do not recognise the informal professional learning that takes place with colleagues and ‘on-the-job’. Informal activities taking place around and during formal professional learning events, or the professional learning that occurs due to significant ‘life events’ which might seem to be unrelated to the professional activities of the individual but nevertheless have a significant shaping effect on the professional growth of the individual are also not recognised. The researcher wished to capture such information during this study and worked to ensure the participants shared a broad understanding of what constitutes professional learning.

In their diary-logs, participants were encouraged to keep a full ‘real-time’ record of their activities. Following feedback during piloting of the process, to support participants identify and record each professional learning activity they completed, fifteen modes of professional learning were provided in a drop-down menu in the spreadsheet, see Table 3.

Table 3. Professional learning modes available in the diary-logs.

Mode of professional learning	Examples of activities within this mode
informal discussion/working with departmental colleagues	discussion over coffee in staff-base or in corridor
informal discussion/working with other school colleagues	discussion during lunch in staffroom or in car park at the end of the day
informal discussion/working with others	discussion with relatives, friends, former colleagues
formal discussion/working with colleagues	departmental meeting, joint resource development
formal discussion/working with others	member of professional association committee, working as Brownie leader
in-school workshop/meeting/PLC	school organised session during a lunchtime, member of school working group, member of school-based professional/teacher learning community
in-service day activity	lecture or seminar during whole school or local authority in-service day
subject-based network meeting	twilight meeting of local physics teachers
out-of-school event/workshop	local authority organised afternoon workshop
twilight, evening or weekend workshop	IOP workshop, Pedagoog or TeachMeet event
conference	IOP Stirling Meeting, SSERC course, ASE Scotland conference, Scottish Learning Festival

private reading/research (book, journal, online, podcast etc)	background reading and research for a new curriculum topic or listening to an educational podcast
formal study for qualification	study for a MOOC, Education Scotland Teacher Leadership course, MEd, first-aid update
being coached/mentored	supported one-to-one by colleague
coaching/mentoring others	mentoring student teacher or probationer

There was no evidence of other modes not captured by the comprehensive list. Participants were also asked to enter the duration of each activity and the location where it occurred. For each activity the participants were asked to rate it using a four-point Likert scale, from 1 – not at all useful to 4 – very useful, plus a brief justification of the score. However, as described by Guskey [23], such evaluations can be superficial and provide information only on the initial reaction of participants to the professional learning. They do not provide any indication of impact, whether that be changes in classroom practices impacting on the learning of pupils or longer-term professional growth of the individual. In an attempt to establish if a professional learning activity did have a worthwhile impact, the participants were asked to revisit each entry in the diary-log after a period of a few weeks and again after the end of the year, to reflect on the impact of each professional learning activity on their needs and practices, and to record appropriate comments. Whilst this did not gather data on pupil outcomes, this process was designed to collect data on the longer-term impact of the professional learning on teacher practices. This is also consistent with the reflection promoted by the GTCS professional standards [11]. The diary-logs allowed some quantifiable data to be gathered on the frequency and duration of professional learning undertaken. See Table 4 for a sample diary-log entry.

Table 4. Sample diary-log entry with immediate, intermediate, and final entries.

Field	Value
Date of PL	11/03/2021
Duration of PL / mins	60
Mode of PL	twilight, evening or weekend workshop
Location of PL	online webinar / event
Title / topic of PL	IOP Scotland CLPL: Evidence-based Teaching - Cognitive Load Theory: Session 2
Immediate assessment of usefulness / impact of PL	3 - reasonably useful
Immediate comment on usefulness / impact of PL	Quite busy on the day, glad to be able to also watch back on YouTube

Date of intermediate reflection on impact	30/08/2021
Intermediate comment on impact / professional growth due to PL	Helped improved my work in a lot of lessons in setting up problems for students.
Date of end of year reflection	05/05/2022
Final assessment of usefulness / impact on practice / professional growth due to PL	3 - reasonably useful
Final comment on usefulness / impact on practice / professional growth due to PL	Still useful additional knowledge

On completion of the diary-log, a second interview was conducted to help determine the accuracy and completeness of the diary-logs and to explore activities that either the participant or the researcher considered significant. Both initial and follow-up interviews were conducted and recorded on Zoom. This had the benefit of ensuring a more consistent approach than may have been possible if they had been conducted in-person in participants' workplaces. It also facilitated automatic transcription and was more efficient and sustainable than had the researcher travelled around the north of Scotland conducting interviews.

3.3. Data Analysis

All interviews were video recorded and transcribed. Using a grounded, inductive approach [53], recurring themes were highlighted and coded in NVivo. Some of the initial themes were a priori themes as they were related to specific questions in the semi-structured interview schedule, which themselves were informed by the researcher's previous research and experience and by the literature. Other themes also emerged from the data. A reflexive constant comparison method was used to develop the themes on subsequent readings of the transcripts and uncoded sections of transcripts checked for potentially missed themes. The information in each theme was then collated and summarised. The themes were iteratively refined as they became more visible which gradually built up a narrative describing the professional learning experiences of the participants [54].

The diary-logs were analysed to determine the extent and frequency of professional learning undertaken by the participants. Simple quantitative analysis of activities was conducted, including analysing separately activities completed during the teachers' Working Time Agreement, such as during collegiate time, as opposed to during the 35 hours of personal professional learning. In a similar manner to the analyses of the interviews, a grounded, inductive approach was used to identify recurring themes which were then highlighted and iteratively collated and summarised to determine findings. This included identifying the professional learning participants considered to be of most value and greatest benefit to improving their practice and professional growth. It also included identifying professional learning which had been less beneficial and how these activities might be improved, and the barriers which prevented or frustrated them from reaching their professional learning aspirations. The follow-up interviews allowed for interesting or ambiguous issues raised in the earlier parts of the data gathering and analysis to be clarified with participants.

The data gathered from the roadmaps, diary-logs and interviews were analysed against Timperley's principles and Kennedy's framework. These were used to determine the likely overall quality of the professional learning experiences of the participants, whether there was evidence of enquiry as stance, and how transformative these experiences were likely to have been. This process was designed to gain a deep understanding of the professional learning environment of the participants.

4. THE FINDINGS: THE PROFESSIONAL LEARNING EXPERIENCES OF TEACHERS

The data indicated participants were meeting contractual expectations regarding participation in professional learning with almost 300 professional learning activities reported on in total with participants undertaking an average of 50 hours of professional learning per year. Several main themes emerged from the data. These are summarised in Table 5.

Table 5. Themes which emerged from the data

Theme	Summary
Collaboration with colleagues	Valued highly by participants but opportunities often subverted by accountability agendas and poor leadership
Mentoring and coaching	Valued by participants but occurred rarely beyond the early career stage or was associated with the development of leadership skills
In-service day and collegiate time	Used mainly for meetings and administrative tasks and rarely for professional learning to improve the instructional core in classrooms
Subject-specific professional learning	Most desired by teachers but hardly provided by employers resulting in teachers meeting their needs in an ad hoc manner from a range of sources
Whole-school professional learning programmes	Often imposed on participants from above but only perceived to be effective by participants if focussed on improving the instructional core in classrooms
Professional Review and Development (PRD) and School Improvement Planning (SIP)	For most participants the PRD process for individuals was not well aligned with the whole-school SIP process
Barriers to professional learning	Lack of time, excessive workload and lack of availability of cover teachers

Each of these themes are now described in more detail before these findings are analysed against the theoretical framework.

4.1. Collaboration with Colleagues

Consistent with previous research [55], participants valued time to work with colleagues and with other teachers of their subject in neighbouring schools. All participants reported characteristics of working in communities of practice [56] through a mixture of activities from informal discussions with colleagues at break times through to more formal events such as departmental meetings and local authority subject network meetings. However, many reported that too much of the agendas of meetings were dictated by leaders and too much time used for administration and accountability issues rather than on improving instruction and professional learning. The potential for these opportunities to be transformative was being squandered. Where they occurred, local authority network meetings suffered from inconsistent attendance of individuals and attendance being restricted to only one teacher per school. These individuals were then afforded limited time to cascade information back to colleagues within their schools. Participants also had concerns about the capacity of the meso-level to support network meetings and other subject-specific professional learning. Where such activities occurred this was due to the leadership of a small number of committed physics teachers doing what was needed to ensure the activities were as effective as possible, essentially on a voluntary basis.

Where formal observations were occurring, this was generally driven by accountability and done

by line-managers rather than being peer observation aimed at collaboratively improving instruction. For most, observations only occurred as part of the mentoring of probationer teachers.

4.2. Mentoring and Coaching

All participants were positive about the mentoring they had received early in their careers during their initial teacher education (ITE) and probationary periods. Most participants had not had the opportunity for mentoring or coaching since, but the two who had, were positive about their experiences. However, neither of them had received this in respect of improving their normal day-to-day teaching. One had received mentoring for a subject in which they were not qualified but had to teach due to staffing difficulties in their school, and the other had received coaching to support their development as a middle leader.

Several of the participants had mentored student teachers and probationers, and all who had done so saw this as a positive professional learning experience for themselves as it caused them to reflect on their own teaching practice. However, this occurred rarely for many of the teachers in schools a significant distance from the universities offering ITE.

4.3. In-service Days and Collegiate Time

The main contractual time which allows for collaboration are collegiate time and in-service days. This time has the potential for teachers to collaborate formally with colleagues within and between schools and for knowledgeable others to visit schools and work with significant numbers of teachers. However, participants reported that they considered this time was being used poorly and mainly for meetings and administrative tasks, often driven by a centralised accountability agenda resulting in little professional learning which was meaningful to them. Transmissive approaches dominated with opportunities for more transformative working missed. Teachers also identified a lack of time for subject-specific professional learning focused on improving pedagogy in their classroom context, consistent with Education Scotland's data on the needs of teachers [57-59] where teachers in all phases have prioritised their desire for professional learning on developing curriculum-making, skills progression, and pedagogy in their subject(s).

4.4. Subject-Specific Professional Learning

Participants consistently desired more subject-specific professional learning. Subject-specific professional learning was available to participants in a variety of forms with local authority subject networks, conferences, twilight workshops, and more private activities such as listening to podcasts, studying MOOCs, and reading books and blogs all mentioned. The professional learning activities provided by the Institute of Physics (IOP), the professional body and learned society for physics in the UK and Ireland [44], and SSERC, the national support agency for the STEM subjects [60], was consistently rated more highly than alternatives mentioned. This perhaps reflects that participants saw it as impacting more effectively on their professional practices; changes being relatively easily transferred into their own working context.

Opportunities to network with other subject-specialist colleagues out of school, and not necessarily during meetings with prescribed agendas, were valued by participants, particularly those in small schools, where there are few opportunities to meet with other similar subject-specialists during normal day-to-day work. The Sputnik email forum for teachers of physics in Scotland and online professional learning activities were seen as important in providing more equitable access to subject-specific discussions for all, although synchronous online twilight or evening events often clashed with other commitments such as caring responsibilities. This emphasises the importance of maximising the opportunities for professional learning during the contracted working time of teachers.

4.5. Whole-school Professional Learning Programmes

Prior to, and during, this study, several of the schools in which participants worked had introduced whole-school professional learning programmes, often with support from external providers. These frequently used much of the available collegiate time and in-service days. The impact of these on the participants varied greatly, and this appeared to depend on how well teachers had been involved in the decision-making regarding the introduction of these programmes and how involved they were in their

delivery. Teachers more involved in the decision-making process or who had received additional professional learning designed to support them cascade this to others or to facilitate activities with others were significantly more positive about these programmes than those who had not been so involved. It may have been that those chosen for such leadership roles were those initially more positively disposed to the programmes, more motivated to ensure successful enactment, or this positivity may have been due to the more extensive professional learning experience. The different views reported also provides evidence of the ineffectiveness of cascade methods for the majority.

The analysis of the participants' diary-logs, supported by data from interviews, highlighted two distinct subgroups within the twelve participants. For four participants, most of their professional learning was undertaken during their working time agreement and/or on activities closely related to their school improvement plans, whereas for the others the majority of their professional learning was not related to their school improvement plan and conducted in their 'own time' as part of the 35 hours per year of personal professional learning time. This was despite the two groups reporting that on average they undertook almost identical amounts of professional learning per year. The distinctive feature between the two groups was that the four participants had available to them coherent programmes of professional learning focussed on improving pedagogy. These took different forms: mentoring for one; a strong whole-school programme well planned and led by school colleagues for another, and the other two were actively involved in the leadership of a programme of professional learning within their schools which benefited from the input of significant external expertise and funding.

These programmes aligned well with the teachers' priorities for improving their pedagogical practices and resulted in a level of buy-in and participation not observed elsewhere. The other participants did not find the professional learning provision from their school or local authorities to have sufficient focus on classroom pedagogy or their subject and as a result looked elsewhere for such professional learning resulting in them participating in a wide but ad hoc range of professional learning which they counted towards their 35 hours per year requirement, some doing considerably more than this nominal amount. In this regard some of the participants showed significant agency, although frequently stating they considered themselves to be disempowered regarding their school improvement planning process and the decision-making about their school's professional learning provision which they generally considered to be too generic and to not meet their needs. This raises questions about the decision-making processes used by individuals and in schools regarding professional learning.

4.6. Professional Learning Decision-Making

4.6.1. Professional Review and Development and School Improvement Planning

The Professional Review and Development (PRD) process is a national policy designed to support the professional learning of teachers in Scotland [12]. To remain registered as a teacher in Scotland it is mandatory to undertake an annual PRD and five-yearly Professional Update (PU), however, PRD was not occurring for all participants, and most did not consider it to be a worthwhile experience. This is consistent with the findings of the GTCS's evaluation of the first five years of PU [61].

All the participants reported a disconnect between the PRD process and the process for agreeing the School Improvement Plan (SIP). All but one of the participants did not consider they had had an opportunity to engage fully in drawing up their SIP, either because they had not been asked or not been given adequate time to do so. It was very clear that the national processes designed to allow teachers to identify, plan and evaluate their professional learning experiences were not working well in practice. This may in part explain the significant disconnect between the professional learning experiences available within schools and local authorities and the wishes and priorities of the participants.

The participants were also not aware of or using national policy guidance, including the GTCS Professional Standards [10,11], the National Model of Professional Learning [14], or National Improvement Framework [17] to guide and shape their professional learning. In an overly crowded policy landscape [62,63], it appears that time-poor teachers rely on their line managers to interpret and disseminate relevant policy information to them which can emphasise managerial conceptions of professionalism rather than transformative ones.

4.6.2. Barriers to Professional Learning

The barriers to participation in professional learning reported by the participants were consistent

with those reported in the literature with time, workload, conflict with caring and other responsibilities, and lack of availability of cover teachers all featuring prominently [64-67]. There was some evidence of teachers, particularly those in remote areas, self-censoring when asking to attend events in major population centres which require significant travel time and/or overnight accommodation. In previous research [68], it was reported that a lack of time for collaborative professional learning was a major issue for Scottish teachers, likely exacerbated by the high teacher-pupil contact hours in Scotland compared to other countries [65]. However, the decision-making and culture in many schools, does not appear to support the use of the time already available on in-service days and during collegiate time for subject-specific professional learning or for collaborative enquiry-based professional learning with this time instead often used for performative tasks driven by the accountability culture that is widespread in Scottish education [69].

4.7. Summary of Findings

Overall, the findings from the exploration and analysis of teachers' professional learning journeys paint a picture of teachers being engaged in an ad hoc mix of predominantly transmissive professional learning activities. Teachers can, and do, exercise autonomy and agency over how and when they engage with personal professional learning such as private reading, webinars, and podcasts and outside their working time agreement. All participants were confident of being able to satisfy the contractual expectation of completing 35 hours of personal professional learning per year. Participants also reported that much of this type of professional learning met a need, and certainly if this were not the case, they would be unlikely to give up their 'spare time' to participate in it. However, the formal professional learning opportunities in local authorities and schools are mostly failing to embrace more transformative modes of professional learning or to maximise the opportunities afforded by shared collaborative time, and most participants state it does not match with their needs or priorities, including improving instruction.

4.8. Analysis Against the Theoretical Framework

On comparing the experiences of the participants with Kennedy's framework, a clear conclusion is there was little evidence of collaborative professional enquiry models of professional learning. There was also limited evidence of the four models in Kennedy's middle malleable category, but where there was, the enactment of these all tended toward transmissive rather than transformative implementation. It is very unlikely that truly transformative professional learning was being experienced and as a result there is limited capacity for developing professional autonomy and teacher agency.

Almost all the activities described by participants fell within one of Kennedy's three transmissive models: training, deficit, and cascade. Often these were directed, compulsory school events which did not match the needs of participants. There were situations where participants had identified a deficit or training need and attended a one-off event or undertaken some private reading or online study to address this with these micro-level professional learning events potentially leading to significant professional growth.

The most scathing comments by participants related to the cascade model of professional learning where a single member of staff from a school attends an event and then reports back to other colleagues not allowed to attend the event. Participants were frustrated that little time was then built into busy school schedules to facilitate further dissemination. This was considered part of a wider problem where insufficient time is provided for follow-up activities, opportunities to properly embed changes into practice, and to evaluate impact of any change.

Little of the professional learning experienced by participants exhibited more than a few of Timperley's ten principles for effective learning, particularly those related to professional enquiry and sustainability, the principles she states most likely to lead to both good or sustained professional growth of the individuals involved and more holistic system improvement. There was a lack of systematic professional learning focused on valued pupil outcomes, content participants saw as worthwhile, or multiple opportunities to process learning with others or embed learning in practice. There was also a lack of professional learning leadership capacity in the meso-level, such as in local authorities, and it was widely seen as having decreased in recent years. In addition, time, support or professional learning for those leading professional learning activities was lacking which resulted in the opportunities afforded by

collegiate time being used poorly. Against this background, the participants were asked what their ideal professional learning journey would look like, and this is discussed next.

4.9. Ideal Professional Learning

The ideal professional learning provision described by participants can be summed up by the concise answer given by one of the participants.

- *“Good relationships with school colleagues and mechanisms in place to allow activities such as learning visits and peer observation.*
- *Regular meetings and good networking with other subject colleagues in the local authority or schools nearby to discuss teaching and learning of the subject.*
- *Opportunity to attend at least one national or international conference per year giving the opportunity to meet with people from different backgrounds and with different experiences.*
- *Encouragement and financial support to undertake additional qualifications such as masters courses.*
- *The maintenance of an online professional learning offer, beyond the COVID-19 pandemic, allowing teachers to dip into professional learning at times convenient to them.”*

This is very similar to the range of provision described by Cobb et al. [43] following their extensive study into how to improve mathematics teaching.

- Professional learning:
 - Conferences and stimulus events giving access to knowledgeable others,
 - Instructional coaching by subject pedagogical experts,
 - In-school collaborative time facilitated by subject pedagogical experts,
 - Teacher networks to facilitate between school collaboration.
- Instructional materials and assessments developed by groups of curriculum and pedagogical experts.
- Supplementary supports for currently struggling students.

The provision of such professional learning would have a much greater focus on pedagogy and improving the instructional core in classrooms than most of the professional learning currently experienced by participants. This combination of activities is also likely to exhibit many of Timperley's principles and to have a range of activities including some at the transformative end of Kennedy's spectrum. This would likely result in more transformative outcomes for all concerned compared to the current provision and to more likely embed enquiry as stance in teachers' practice.

5. ETHICAL CONSIDERATIONS

The study was approved by the Strathclyde Institute of Education Ethics Committee and followed ethics guidelines [70]. All participants were anonymised along with any colleague, school or other relevant organisation mentioned. Participants were sent transcripts for checking and approval; all did so without change.

To test the roadmap and initial interview process a pilot was conducted with a teacher who was well known to the researcher and who was expected to provide accurate feedback. This interview was conducted in the way future interviews were planned but with an added element of then asking the interviewee to provide feedback on the process used, the semi-structured interview schedule and other documentation. The interviewee was asked whether he considered what was being proposed was reasonable for a teacher to complete. In addition, the pilot interview provided logistical information, such as the probable duration of the interview, which could then be used to better inform potential interviewees of the likely demands of participation in the study. The recording of the pilot interview and initial analysis were reviewed by the researcher's supervisors to ensure the process was conducted appropriately and potential biases minimised. Review of the pilot by the researcher and supervisors led to some additional guidance on the roadmap activity being provided and some additional structure to some of the questions

in the interview schedule and to the diary-log, but it showed that the approach was sound.

This study was undertaken in a community with which the researcher is very active, to which he has good access, and in which he has significant credibility due to proactive participation and contribution for many years. This means there is an ‘insider’ element to the study which brings several advantages. The researcher brought a great deal of knowledge and understanding of the Scottish education system, physics education more specifically, and professional learning in physics and science. This gave him a good understanding of the context of the teacher participants and the ability to understand readily, and interpret effectively, the data provided by participants. However, being an insider comes with potential disadvantages such as introducing an element of bias, subjectivity and potential vested interests where care must be taken to ensure objectivity, consistency and rigour in the conduct of the research [71]. The researcher attempted to recognise any potential unconscious bias and to minimise the impact of this [72]. This was aided by the researcher also being an ‘outsider’ to the local authority school system having been employed by an independent third-sector body for many years and the study being conducted under the auspices of a university. This helped minimise power relationships during data collection and, despite frequent checks, at no time did participants exhibit or report any signs of discomfort with the process.

The aim during the study was to keep the process as simple as possible for the participants and to ensure that they felt encouraged and supported when participating in the study. Participants, as reported elsewhere [52,68], commented that taking part in the study was itself a worthwhile professional learning experience and gave them an incentive to reflect on their practice in a way they rarely been able to do in the past. The willingness of participants to contribute suggests that abuse of power or coercion to participate in the study was not an issue.

6. LIMITATIONS

Participants were a relatively small number of experienced secondary physics teachers from the north of Scotland which limits the generalisability of findings to other contexts, although the professional learning leadership and support structures are broadly similar for secondary teachers of other subjects, and for other areas of Scotland, which ought to allow for some transfer of the findings and conclusions. Data was not gathered from early career teachers as they have separate induction arrangements, and the purpose of this study was to investigate the professional learning of the majority of teachers who are beyond the beginning stage of their career as this is under-researched in comparison. The data gathered represents only a snapshot in time; one disrupted by the COVID-19 pandemic. Participants were asked to respond more generally and historically and not just in terms of professional learning behaviours driven by the social distancing and online working demanded by the recent COVID-19 pandemic. The researcher could be considered an ‘insider’ in the community being researched resulting in potential biases and vested interests both in his analysis of data and in the way in which participants responded to his questions. However, the researcher was aware of these issues from the outset and acted to minimise potential problems. Any disadvantage of the researcher being an ‘insider’ is also likely to have been offset by him being better able to interpret some of the more nuanced and subtle statements made by participants which might not have been transparent to an ‘outsider’.

7. CONCLUSIONS

The findings of this study show that despite the promising policy milieu at national level within Scottish education there is a significant policy-practice gap. Professional learning provided by the ‘system’ through schools, local authorities and the national agency, Education Scotland, is often aimed at developing leadership, rather than having a focus on improving instruction in classrooms. Professional learning on improving instruction is the main priority of classroom teachers, but they generally must source this outside their workplace, despite employers having a contractual responsibility to provide professional learning for their teachers [9]. The discrepancy between the priorities of teachers and school and other meso-level leaders has been reported elsewhere [3]. The policy-practice gap would likely be diminished if teachers had a greater voice in policymaking including school improvement planning processes. If school and system leaders prioritised inclusive collaborative planning this would also likely

result in a greater prioritisation of subject-specific professional learning focused on improving instruction and thereby improve pupil outcomes. A commitment by employers to an increased provision of subject-specific professional learning has also been shown to increase teacher motivation and result in more enquiry-based professional learning [73,74]. The implementation of enquiry-based approaches to professional learning would likely encourage transformative rather than managerial conceptions of professionalism and facilitate improved teacher agency and empower teachers giving them a greater voice in the policymaking process [75,76].

When discussing the ‘optimal mix’ of professional learning, Guskey stated: “There is no ‘one right answer’ or ‘one best way.’ Rather, there are a multitude of ways, all adapted to the complex and dynamic characteristics of specific contexts.” [77]. To maximise impact, it is important that professional learning includes effective mechanisms and practices [20,78]. There is a need to increase and improve professional learning for classroom teachers which is focused on improving instruction.

Fullan made this statement over thirty years ago:

“Nothing has promised so much and has been so frustratingly wasteful as the thousands of workshops and conferences that led to no significant change in practice when teachers returned to their classrooms.” [79]

This appears to apply just as well today. The Scottish education system needs to work together to address this problem. The findings of this study suggest that this will require a shift in culture with a reconceptualization of professional learning away from something that is mostly transmissive and provider-led towards one which is more practitioner-led with an increase in collaborative enquiry-based approaches and better recognition of the value of informal professional learning activities as described by Evans.

“If the professional learning and development field is to advance meaningfully, we need to re-order that agenda, placing informal and implicit processes in a much higher position than they have hitherto occupied.” [42]

The findings of this study are consistent with this statement by Evans, and by the conclusions of Coe and Kime [80], and suggests a redistribution of power within the Scottish education system will be needed if this is to occur. There is therefore scope for further research to establish whether the findings of this study apply in other contexts, such as for teachers in Scottish primary schools. It would also be informative to gather data from different actors within the same school, and its associated support community, to explore and compare the perspectives towards teacher professional learning of those at different levels within the education system.

Ethics: The research was approved by the University of Strathclyde Institute of Education Ethics Committee.

Participant consent: All participants gave informed consent.

Data availability statement: Data from this study is not available.

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