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From the Scholarship of Teaching and Learning to the Scholarly Institution: A STEM Perspective

ABSTRACT

There has been a documented increase in SoTL activity, which in the United Kingdom (UK) may be a result of the heightened focus on teaching due to increased regulation and monitoring, competition, changes in the workforce structure, and quality enhancement within the sector. STEM academics specifically face challenges in engaging with SoTL as the methodologies used differ from their discipline training. Offering a STEM perspective, we provide four case studies at the institutional and national level of interventions in STEM teaching to address these challenges, namely: conducting educational research with students as partners, establishing a faculty based SoTL centre, reward and recognition of staff, and the formation of a national SoTL conference for STEM educators. We discuss the extent to which the case studies demonstrate Felten's principles of good scholarship and propose the concept of a "scholarly institution" as one which systematically nurtures and harvests SoTL research (internal and external to the institution) by establishing structures and cultures that foster evidence-informed teaching and learning practices. We conclude that to truly realise the benefits of SoTL, practitioners not only need support to undertake SoTL inquiries, but that the institutions must commit to using SoTL to inform their policies and procedures as well.

KEYWORDS

institutional support, teaching focused lecturers, reward and recognition, quality enhancement, scholarly teaching

INTRODUCTION

There has been a consistent increase in SoTL activity across the higher education (HE) sector in the last 20 years, as reflected in a steady growth in publications since 2000 (Khodabandelou et al. 2022). Plummer et al. (2023) noted a trend, since 2005, toward a greater number of authors and institutional affiliations for publications in a pharmacy education journal, suggesting increasing research complexity. It could be argued that there have always been intrinsic factors for engaging in SoTL resulting from individual motivations, but recently, there has been a noted shift in how leadership in UK institutions engage with this agenda at an institutional level. Several interconnected extrinsic factors are driving this increase in the UK, notably: regulation and monitoring, competition, the changing structure of the HE workforce, and quality enhancement (all introduced below). However, we argue that these drivers are common in other countries, and that the interventions presented in this paper to support SoTL and their impact on institutional culture and practice have relevance beyond the UK.

Regulation and monitoring

Increased commodification of HE has been a major feature in the UK over the last twenty years (Wilkinson and Wilkinson 2023). The increase in tuition fees at the majority of UK HE institutions to £9,000 in 2012 is perceived to have led to students exhibiting greater customer-like behaviour in demanding higher quality learning and good graduate outcomes (Bunce, Baird, and Jones 2017). The National Student Survey (NSS), an annual survey conducted among final-year undergraduate students across the United Kingdom, records students' perceptions of teaching quality and is highly influential in shaping the reputation of universities, informing prospective student choice, and supporting public accountability.

The Higher Education Funding Council for England (HEFCE) introduced the Teaching Excellence Framework (TEF) in 2017 to assess teaching excellence in HE establishments and how they ensure excellent graduate outcomes. The TEF ratings reflect the extent to which a HE establishment delivers an excellent experience and outcomes, as evidenced by a set of metrics such as the NSS results, as well as continuation and graduate outcomes data. The regulation and perceived commercialisation of HE has tightened over this period, as exemplified by the government's establishment of the Office for Students (OfS) in 2018 (replacing HEFCE) to ensure students were "receiving a good deal for their investment in higher education."

Although these examples of regulation and monitoring are specific to the UK, the increased commodification of higher education and focus on enhancement of teaching and learning practice have been reported elsewhere (Biggs, Tang, and Kennedy 2022; Croucher and Lacy 2022).

Competition

In a climate of static tuition fees (since 2012), increasing the recruitment and retention of students is crucial to the finances of UK universities. Marketisation has resulted in universities competing for student recruitment, resources, and market share. Initial entrants to HE aged 17–30 have increased from 279,115 (41.8% of 17–30-year-olds) in 2006/7 to 343,245 (53.4%) in 2019/20 (U.K. Department of Education 2021). League table positions based on NSS results and graduate outcome metrics are one of the major factors that influence student choice of university (A. R. Bell and Brooks 2019). This has driven institutional efforts in the UK to enhance teaching and learning practice in order to improve these metrics. In addition, the increased recruitment of students from a variety of educational backgrounds requires enhanced scaffolding and support.

The changing structure of the HE workforce

In addition to metric-driven quality agendas, the significant increase in the number of teaching-only academics employed within HE could be of major significance in the development of the SoTL in the UK. In response to a 19.5% increase in student numbers between 2018/19 and 2022/23 (HESA 2024b), academic staff increased by 10.8% (HESA 2024a) with the proportion of teaching-only academics rising from 30.6% (66,355/217,065) to 35.6% (85,620/240,420) in the same period (i.e., of the 23,355 additional academic posts 19,265 or 82.5% were on teaching only contracts).

This re-orientation of the HE workforce has brought SoTL into sharper focus as a legitimate activity for those whose key responsibility is teaching rather than research. Some evidence suggests that the introduction of teaching-only roles has positively impacted the status of teaching (Flavell et al. 2018). Against this background of increasing emphasis on SoTL, the central challenge remains how staff, particularly those in STEM disciplines, are supported so that they can become proficient SoTL practitioners.

Quality enhancement

With this renewed emphasis on driving up learning and teaching quality, reflective practice and scholarly teaching are now viewed as essential aspects of academic practice. Potter and Kustra (2011, 3) define scholarly teaching as "teaching grounded in critical reflection using systematically and strategically gathered evidence, related and explained by well-reasoned theory and philosophical understanding, with the goal of maximizing learning through effective teaching." To support their professional development, UK university lecturers are expected to examine their own teaching practices routinely and systematically, continually improving outcomes for their students, enhancing the student experience, and drawing on evidence from SoTL. Professional frameworks and accreditation processes in HE (e.g., the UK Professional Standards Framework) emphasise the importance of these aspects for academic practice (Advance HE 2023).

The requirement to be a scholarly teacher is difficult enough with very high demands on staff, but to transition between scholarly teaching and SoTL is more challenging in this currently under-resourced sector. SoTL involves educators using their disciplinary knowledge to investigate questions about learning and teaching, usually through gathering evidence in a systematic way, submitting their findings for peer review, and making their findings public for others to build upon. SoTL differs from pedagogic research since it emerges from the practitioner's understanding of learning in the context of their own discipline, characteristically allowing educators to reconsider pedagogical theories and practices within their own context. Fundamentally, SoTL requires the researcher to also be the teacher (Trigwell and Shale 2004). SoTL practitioners therefore need a grounding in a discipline, how that discipline is taught, and the research methods required to undertake meaningful and rigorous inquiry into student learning in that context.

AIM AND APPROACH

In this paper we aim to demonstrate the benefits of SoTL and how to support SoTL in an institutional context via several case studies. Our focus is the practice of SoTL. However, we recognise that merely increasing the quality and quantity of SoTL that occurs is insufficient to enhance student learning. While ideally many practitioners would engage in SoTL inquiry, the reality is that financial constraints and current under-resourcing in higher education limit the extent to which this can occur. Therefore, enhancing student learning cannot solely rely on the engagement of a subset of academic staff in SoTL, no matter how high the quality of that work. Instead, it necessitates an institutional culture of scholarly teaching that encompasses all practitioners. It is crucial that outputs from SoTL are recognised and valued within the institution, and (most importantly) translated into more effective learning experiences for students.

A culture where scholarly teaching is considered equally important to SoTL is more likely to lead to a greater impact on teaching and learning. By intentionally developing both SoTL and scholarly teaching capacities, institutions can foster a more comprehensive and effective approach to improving student outcomes (Potter and Kustra 2011).

Characteristics of SoTL

To ensure high quality inquiry with transferable impact, SoTL should adhere to principles of good practice (Felten 2013), and be accompanied by reflection, critical reflection, and reflexivity (Cunliffe 2016, 2020). According to Felten (2013), SoTL inquiries should be:
- focused on student learning and engagement, involving question-asking, inquiry, and investigation around issues of student learning and engagement;

- grounded in context such as a cohort of students, a module, a discipline, a department, or an institution;
- designed to be rigorous and methodologically sound by building on prior research;
- conducted in partnership with students as research participants or researchers; and
- appropriately public for evaluation and uptake by peers.

These characteristics exemplify good practice in SoTL. So, what are the challenges faced by STEM educators and the wider HE community when attempting to engage with SoTL? It could be argued that these fall into the following three categories: the background of a typical STEM educator, structural support to engage with SoTL, and the culture of SoTL.

CHALLENGES TO SOTL IN STEM

Typically, STEM educators have not been exposed to social science or educational research methodology as part of their training or personal scholarship prior to embarking on an academic career. This is often a challenge in accessing the literature, designing studies, and carrying out research. Tierney (2017) identified a number of threshold concepts for life scientists moving into SoTL, mainly at the level of moving from the disciplinary to the mainstream context of education. Additionally, when academics transition into teaching-focused roles, they may struggle with the dual identity of being both a subject-specialist (i.e., a scientist, technologist, engineer, or mathematician) and an educator.

Structural support at an institutional level is highly variable (Gretton and Raine 2017). When this is lacking, academics can suffer from a lack of guidance on how to undertake SoTL. A lack of peer support can also be detrimental in terms of access to collaboration opportunities, informal review/critique of ongoing work, and a wider knowledge base of the subject area. An often reported barrier is time to dedicate to SoTL. Finally, a lack of financial support can be a barrier for academics going beyond their own institution in terms of exposing themselves to research at other institutions, gaining a wider perspective, and forming cross-institutional collaborations; Gretton and Raine (2017) reported that only 41 of the 135 teaching academics they surveyed received support to attend conferences.

The wider culture of reward and recognition of SoTL within an institution can also be an impediment. The divide between the equitable valuing of research and teaching and scholarship within UK institutions is well documented (Tierney 2016). Although there are an increasing number of academics on teaching-focused contracts, the expectation to carry out SoTL and the scope of SoTL is not always clear (Fanghanel et al. 2016; Smith and Walker 2021). This also often continues to promotional opportunities, with a lack of promotional routes to senior lecturer, associate professor, reader, and professor in some institutions. Even where promotion routes exist in theory, they are often poorly defined or difficult to achieve in practice (Cashmore, Cane, and Cane 2013; Gretton and Raine 2017), and may not necessarily reward scholarship.

Potential challenges also come from the culture of SoTL itself. As documented by Canning and Masika (2022), tensions exist between SoTL practitioners and educational researchers. It is our observation that STEM educators are often not served well by outputs from educational researchers that are too theoretical to support issues encountered in day-to-day teaching delivery. There also appears to be a lack of appreciation by some educational researchers for the insight brought by SoTL practitioners. Conversely, some research that has fallen under the "SoTL umbrella" can employ a formulaic approach with a limited range of research methods, and may not be situated in the theory, which may be perceived as undermining the rigour of the field (Canning and Masika 2022). It could be

argued that excluding these studies prevents the establishment of an inclusive research community and opportunities to improve research practices.

CASE STUDIES

To reflect on the benefits of SoTL and how it is supported within and across our institutions, we adopted an explanatory case study approach (Yin 2018). The four cases draw on related publications and previously unpublished data, as well as our observations and reflections on practices at our institutions. The first case discusses a university-wide scheme to engage students and staff as educational researchers in order to improve the student experience at Kingston University. The second case examines the part a SoTL centre plays in supporting practitioners undertaking SoTL projects within the STEM faculty at The Open University. The role of reward and recognition is considered within the third case study exploring academic promotion at Leicester University. The final case shifts focus from an institutional context to the national context, exploring the support provided through a cross-institutional initiative to build a STEM SoTL community through establishing and sustaining a national conference.

Case 1: Educational research with student partners

Kingston University's Student Academic Development Research Associate Scheme (SADRAS) aims to facilitate staff and student research in order to improve the student experience, with an emphasis on addressing the experience of under-represented student groups. The HEA's Students as Partners Change Programme supported the development of the scheme (Curran and Honan 2013). The main aims of the scheme were to: gain students' perspectives on improving the student experience, enhance staff-student collaboration and relationships, and develop students' research skills. However, it soon became clear that the scheme played a key role in enhancing many academics' SoTL practice as well.

Structure and operation of SADRAS

Staff are encouraged to submit project proposals for research that addresses the university's strategic priorities, such as retention and progression, student wellbeing, attainment, employability and future skills, and access to Higher Education. The projects also need to benefit at least one group of under-represented students (e.g., disabled, black, minority ethnic, mature, lower socio-economic groups, LGBTQ+, those with mental health issues)and to identify potential student partners. In part, this scheme is one way in which Kingston University addresses BME awarding gaps (McDuff et al. 2018). Each project funds a maximum of 100 hours of paid student work (paid at the London working wage rate). There is also a small project fund available to bid for in order to enable students to present their research at HE teaching and learning conferences.

The annual call for proposals goes out via the university staff and student intranet. A steering group made up of representatives across the university review project proposals, providing feedback aimed at helping the applicants improve the research approach, as many are new to pedagogic research. Table 1 summarises the outcomes between 2014/15 and 2021/2. This highlights that projects often have several staff partners, commonly one of them being more experienced in pedagogic research and able to help develop this capability in other staff members.

Table 1. Details of SADRAS project teams

Year	Number of applications	Number of projects funded	Number of staff partners (average per project)	Number of student partners (average per project)
2014/15	26	19	29 (1.5)	60 (3.2)
2015/16	32	23	51 (2.2)	83 (3.6)
2016/17	41	24	41 (1.7)	60 (2.5)
2017/18	38	19	40 (2.1)	52 (2.7)
2018/19	22	15	36 (2.4)	43 (2.9)
2019/20	18	12	35 (2.9)	35 (2.9)
2020/21	21	14	23 (1.6)	46 (3.3)
2021/22	18	14	23 (1.6)	54 (3.9)

Once project teams are formed, they are encouraged to attend an induction session that shares best practices and tips on working with students as partners. Project teams are required to submit an interim report, a poster (to be presented at the university's festival of learning), and a final report. Teams are also encouraged to disseminate their results within the faculty and at national teaching and learning conferences. Examples of SADRAS publications include (Calabrese et al. 2022; Mulrooney and Kelly 2021; Page, Forster-Wilkins, and Bonetzky 2021; Swann et al. 2021; Williams and Benjamin 2022).

Evaluation of impact
Most of the evaluation of SADRAS has focused on the impact on the students. An evaluation of partners' pedagogic research experience in the first year of operation indicated that only one out of 23 staff partner respondents indicated they had extensive experience in pedagogic research, and 17 indicated they had limited or very limited experience (see Figure 1). An evaluation by Jackson and Ooms (2014) reported that staff partners agreed that their educational research skills had improved and their appreciation of educational research had grown. Huet, van der Sluis, and May (2016) reported that the projects stimulated strong staff/student collaboration and commitment, and strengthened the motivation and enthusiasm of students for engaging in university life. Furthermore, staff reflected that the research has promoted change and helped develop students' research competencies.

Two staff members subsequently published a reflection on their management of SADRAS projects (J. Bell et al. 2019). Both cases discussed their first experience of managing pedagogic research projects. Although already accustomed to juggling multiple commitments, the staff members highlighted time management and the practicalities of managing the partnership as key learning points. They noted that they overestimated what was possible over the lifetime of the projects and appreciated the opportunity to work with 12 engaged students.

Faculty promotion of SADRAS
The science, engineering, and computing faculty encouraged STEM academics to engage with SADRAS to support the development of their SoTL practices. As a result, academics from the faculty have led over 50% (92/179) of the projects funded and ran since the inception of the scheme in 2012/3 until 2021/2. In total, 75 different STEM academics have been partners in pedagogic research projects during this period. Several academics led multiple projects over the years, and the scheme has been a great support for their pedagogic research and SoTL.

Figure 1. Staff and student partners' experience of conducting educational research
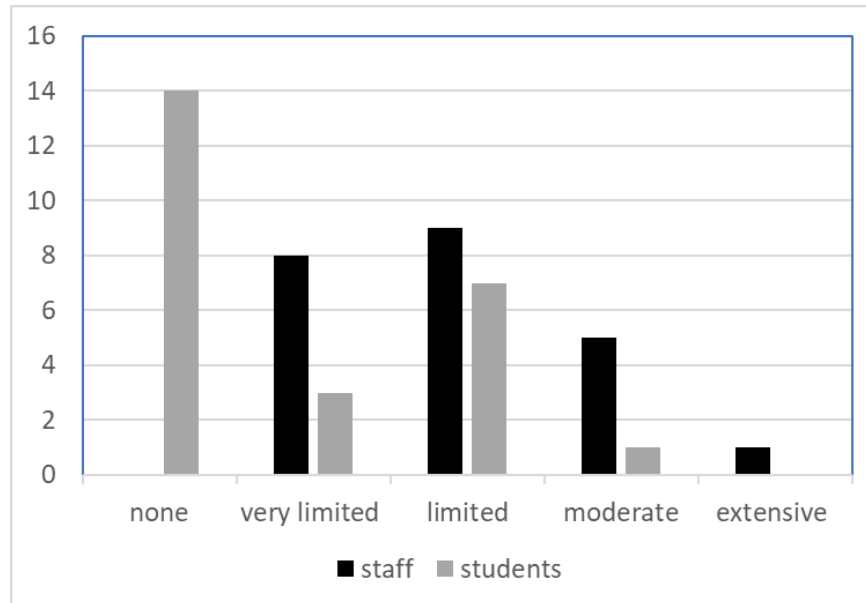
Case 2: A Faculty SoTL Centre

This explanatory case study focuses on eSTEeM, The Open University (OU) STEM faculty's scholarship and innovation centre, as an example of a SoTL centre. The case draws on a collection of primary data from the reflective written commentaries from project teams, which the centre gathered over the last 11 years as part of the final project reporting process, and participant observations from two of the authors who were previous directors of the centre.

Institutional support structures

The support structures for SoTL at any given institution are shaped by their context, history, and culture. To look at some common practices, we drew a convenience sample by running a Google search on the phrase "sotl centre"—the first two pages of results identified 18 sites, which were hosted by 17 distinct universities (seven from Canada, five from the USA, four from the UK, and one from the Netherlands). Of these, five were institutional centres for SoTL (specifically), 11 were hosted within institutional centres for teaching and learning, and one was hosted within a college of education. 13 out of 17 centres, including all those hosted within centres for teaching and learning supported academic's professional development (APD) through reflective practice, scholarship studies, and/or pedagogic research. Of the five institutional centres for SoTL, two focused on APD, two focused on pedagogical research, and one on SoTL research. The centre hosted in a College of Education focused on SoTL research. All the centres had a common goal: to benefit student learning.

Such a convenience sample is arguably biassed (e.g., towards larger centres with SoTL in their title), but nonetheless their websites demonstrated a range of institutional support structures and practices. Nearly all directly funded or supported applications for institutional funding for SoTL projects or individual fellowships (16/17); organised events such as seminars, workshops, or conferences (16/17); or provided training, resources, or mentoring support (16/17). Postgraduate qualifications or support for professional accreditation were available from over a third of the centres

(6/17, five with a focus on professional development and one focused on SoTL research). Over a third of the centres (6/17; three focused on APD, two on pedagogical research, and one on SoTL research) highlighted SoTL publications affiliated with the centre.

In discussing the OU context and the eSTEeM centre, specifically, we consider how these forms of institutional support (i.e., funding, events, training, accreditation, and publications) manifest within the context, history, and culture of our institution.

SoTL in a distance learning context

The Open University (OU) has two factors that distinguish it within its national context: it is a distance learning university and an open entry institution. These features enable OU to operate at scale with students spread throughout the UK and support a wide range of students who wish to participate in higher education. The university currently has 208,308 students, 71% of whom work during their studies (The Open University 2023). Course materials are developed in multi-disciplinary module teams that include academics, educational technologists, and media specialists. Associate lectures for each module provide academic support to OU students, and specific teams within student support services provide insight on course choice, careers advice, and studying support.

The separation between the production and presentation of module materials enables the university to operate flexibly and at scale. However, the scale and distributed structure of the organisation can also make it more challenging to make changes and attribute cause and effect compared to face-to-face teaching universities. Therefore, student feedback is embedded within our quality assurance processes to ensure every module is reviewed after each presentation and revised as needed. Crucially, each module team has the autonomy and agency to make changes to the module they are responsible for. However, this can also make it challenging to manage consistency across the organisation. Therefore, SoTL is a particularly relevant approach to ensure evidence-based practices are developed and shared across the organisation.

A faculty based SoTL Centre

From 2005 to 2010, the Open University hosted four government-funded centres for excellence in teaching and learning. These established a significant and extended SoTL community of practice within the university and more specifically within the STEM disciplines, as three of the four centres focussed on STEM. As the period of enhanced funding ended, the OU Centre for STEM Pedagogy established eSTEeM to sustain this activity and maintain the university's position at the forefront of distance education.

Over the past 14 years, eSTEeM has built a significant body of work and experience amongst colleagues through the initiation and support of projects which focus on SoTL. Small grants and the provision of a comprehensive support package supports project proposers as they develop and address research questions around student learning within their practice. As a result of this inclusive approach, the STEM faculty has established a diverse and thriving community of scholars that drive innovation through critical inquiry and evidence-based practice.

One project leader completing a project in 2022, concluded that eSTEeM is "a great way to ensure that changes are underpinned by evidence. It allows us to explore new ways of doing things, collect the evidence, and then disseminate across the university and beyond." The support a scholarship centre offers SoTL practitioners is an essential ingredient for success, as one project leader in 2020 summarised, "I very much appreciate the eSTEeM framework and all of the support that the team offer." This support includes training to develop new skills and approaches, a feature one project leader in 2021 described as follows, "I am now a confident NVivo user for analysis of

quantitative and qualitative answers and literature, and I have worked on other eSTEeM projects as team leader . . . and trained others in the use of NVivo."

eSTEeM takes an inclusive approach ensuring as many distinct categories of staff as possible can participate in SoTL. The OU's method of open supported learning involves multidisciplinary teamwork in order to produce module resources and support students, and the input of this diverse community of lecturers, educational developers, multimedia designers, and student-support staff brings significant advantage and impact. Indeed, the feeling of community engendered through SoTL within a large faculty is commonly expressed; one project leader completing a project recently remarked, "the mentoring and networking opportunities have been invaluable in developing my profile and skills."

To deliver high quality SoTL that meets Felten's principles of good practice (2013), most eSTEeM scholars require support and professional development. Transitioning from the positivistic research methods of most STEM disciplines to SoTL, where the research questions and methods are more clearly aligned to the social sciences, is challenging. The role of eSTEeM in delivering academic professional development and project mentoring supports this transition. Lead times are, however, extensive; suggestions that it takes 10 years to become a fully functioning SoTL practitioner (Kelly, Nesbit, and Oliver 2012) are well founded with several eSTEeM scholars reporting that only by their third or fourth project did they feel fully confident in their identity as a SoTL practitioner. However, the benefits to practitioners of SoTL supported via eSTEeM are myriad. One project leader, on a teaching only contract, commented:

> It (SoTL) has given me a route back into research that I had long since abandoned as part of my academic career. Having not really engaged with my subject research since my PhD studies, I had largely abandoned the idea of having a research profile but doing this project has opened new avenues to me and given me confidence as a researcher with ideas to contribute to the academic community and scholarly discourse.

The slow process of adoption and the development of new skills and experiences necessitates both long term commitment to academic professional development and a considered approach to academic workload management, ensuring that participation in SoTL is legitimised through workload systems and collectively recognised as a valuable and worthwhile activity. The legitimisation of SoTL arises largely from two distinct directions: first via broad recognition of the beneficial impact on student learning and the transfer of learning from projects to other areas in the curriculum; and second by the inclusion of SoTL outcomes, outputs, and impact in teaching track promotion profiles.

SoTL Centre impact—opportunities, challenges, and reach

eSTEeM also influenced the formation of a university-wide scholarship plan in 2018 that resulted in sibling centres being set up in the three other faculties. The processes, support structures, and resources developed by eSTEeM were then shared through an online scholarship toolkit, which helped establish a cross-institutional community of practice among the scholarship centre directors and managers. The process of reflecting on and documenting the support provided through eSTEeM also helped the eSTEeM centre manager and directors review and question their own practices. As the four centres developed, it has been enlightening to see how common values and interests are enacted differently in each faculty in response to distinct disciplinary cultures.

One of the challenges of the faculty-based approach has been the transfer of learning across discipline and faculty boundaries. Building a strong sense of community and peer support within each

faculty has, inadvertently, reinforced faculty boundaries, which have been further reified through the faculty funding structure. To counter the negative implications of discipline and faculty silos, a university-wide repository for scholarship reports was established to facilitate access to and use of scholarship across the university. In the last four years, the Scholarship Steering Group (comprising the four centre directors and managers) have run calls for pan-university scholarship projects which undertake SoTL inquiries across the faculties.

The provision of training and funding to enable project teams to disseminate their research externally is a further characteristic of SoTL that counteracts an inward focus and has brought further scrutiny and credibility to the work of SoTL practitioners. In our experience, the importance of external verification cannot be understated, as it validates the research and reinforces the identity of SoTL researchers.

Case 3: Reward and recognition

Researchers have documented the growth in teaching-focused roles both nationally and internationally, and these roles are attributed to the expansion of the HE sector and the rise of managerialist policies (Smith and Walker 2021, 2022). As noted in the introduction, data from the Higher Education Statistics Agency (2024a) shows a 5.0% increase in the proportion of teaching-only staff between 2018/19 (30.6%) and 2022/23 (35.6%). Career pathways and the status of teaching-focused staff have lagged behind, with opportunities for advancement hindered by ambiguous and inconsistent conceptual frameworks regarding the role of scholarship in career progression, structural inequalities relating to available development support, and an absence of role models (Smith and Walker 2022).

Several STEM academics at the University of Leicester have considered the issues around rewarding and recognising teaching. Initial work by Cashmore, Cane, and Cane (2013) for the Higher Education Academy noted cultures in which teaching is perhaps undervalued in relation to research as well as an absence of robust criteria to measure excellence in teaching. Subsequent research examining the benchmarking of academic promotion criteria internationally concluded that routes for promotion in relation to teaching and learning are increasingly evident across a range of institutions, but their acceptance and implementation appear lacking (Wills et al. 2013). The impact of these barriers was explored by Gretton and Raine (2017) who surveyed UK teaching-focused staff, uncovering an enthusiastic workforce who felt undervalued by the system.

So, how has this research impacted practice at the university? Two initiatives stand out in addressing these areas: the university's Distinguished Teaching Fellow scheme to recognise excellent teaching, and changes to the Promotion Framework to reward outstanding staff in teaching-focused roles.

Distinguished teaching fellow awards

The university initiated its Distinguished Teaching Fellow scheme over fifteen years ago. It is open to all teaching staff and recognises outstanding and inspiring contributions to teaching and learning, curriculum innovation and development, and the overall student experience. Awards can be made for particular and recent achievement or for sustained long-term contributions centred on, but not restricted to, innovation and leadership. Each year between six and ten fellows are awarded the prize, which is conferred at degree ceremonies reflecting the prestige of this award. Initially, recipients received £3,000 to fund a teaching project, although this has now ceased.

A key benefit to the awardees is induction into the university's teaching academy. The award application draws heavily on the structure used by Advance HE in their National Teaching Fellowship

Scheme, supporting recipients to progress to these national accolades in due course. Another benefit of these awards is that they function as "badges of esteem" where evidence for this can be lacking, and these accolades provide a mark of teaching quality to support promotion or application to senior roles.

The literature around the success of award schemes in improving teaching is mixed. Gunn and Fisk (2014) suggest that structures are one of four dimensions for developing the architecture of a teaching excellence taxonomy, including national and institutional teaching excellence awards. A study by Warnes (2021) noted the most significant impact on recipients of university and national teaching awards was "affirmation"—an acknowledgment of their excellent work, giving them "permission" to continue. This work indicated that students were often unaware of such teaching awards, even though many managers used successful teaching fellowship awards in marketing initiatives to improve the profile of the university in a competitive student-recruitment market.

Promotion framework revisions

In 2014, the university introduced a revised promotion framework, which brought teaching fellows at lecturer level into the academic job family and allowed progression through a teaching route. Since then, the university has reviewed and refined promotion criteria, with the latest review in 2021 considering the content of the academic career map to ensure alignment with the university's strategic themes and values for each career pathway. The latest promotion criteria recognise the following areas of activity for those seeking promotion through a teaching route: high quality teaching practice, curriculum development, leadership and impact, teaching accreditation, student experience and esteem, and professional standing (including SoTL).

How do these areas compare with those at other universities? A review by Wills et al. (2013) argued that any consideration of teaching in HE should include the following five activities: professional learning, student engagement, curriculum development, research and scholarship, and leadership and collaboration. The current Leicester criteria align closely with these, but with additional emphasis on student experience (in addition to engagement) and with less emphasis on research and scholarship, which now sits within a wider set of activities under esteem and professional standing. The Leicester framework also explicitly requires a teaching accreditation at SFHEA or equivalent for promotion to associate professor or professor. Over the last three years, the proportion of academic staff promoted through the teaching route has increased (see Table 2), and at the last round of promotions (2020/21), 30% of promotions to chair were via the teaching route.

Table 2. Promotion total for year 2018/19–2020/21

Total successful applications for promotion by position	2018/19	2019/20	2020/21
Professor	12	17	27
Associate professor	18	30	39
Teaching-focused professor	2	1	8
Teaching-focused associate professor	8	8	9

Case 4: A national SoTL conference

Sharing educational practice and its evaluation with other educators is an important aspect of SoTL. A starting point for some of the authors was a learning and teaching conference focused on their academic discipline, for example, a chemistry higher education teaching and learning conference. One way to increase the impact and reach of SoTL work is via broader subject-based conferences. Such conferences offer the advantages of widening the breadth of impact of scholars'

own work and the opportunity to learn about practices and work from different disciplines that could be translated to their own. Another key aspect of such events is they offer a forum for discussing research plans and preliminary results.

The cessation of the UK Higher Education Academy's (HEA) STEM annual conference in 2015 prompted the authors to play a role in establishing a new science technology engineering and mathematics wide learning and teaching conference. The first "Horizons in STEM Higher Education: Making Connections, Innovating and Sharing Pedagogy" conference ran at the University of Leicester in 2016. Since then, the conference has been held annually at different UK universities. The rotation of the venue helps attract new contributors as a local venue removes a barrier for some attendees (i.e., travel and accommodation costs). A key feature of the conference is that the registration fees are kept low. Since 2016, the conference has attracted contributions from over seventy universities, enabling presenters to broaden the impact and reach of their SoTL work.

The spirit of this conference series is one of community, collaboration, and collegiality and has particularly welcomed contributions from STEM educators at the early stage of their SoTL practice, providing an inclusive and supportive space for delegates to disseminate their research and practice. The conference series has facilitated new collaborations and innovations, as commented on recently by a Kingston University lecturer: "I met [name] from Sheffield at the Horizons conference. We had a long chat, resulting in a joint study on disability and belonging across two different institutions, which we then presented at the next Horizons conference."

Another key staff development feature of the conference series has been the opportunity to write up presentations as an article in the *New Directions in the Teaching of Natural Sciences* online journal (previously, New Directions in the Teaching of the Physical Sciences). The journal publishes short reports of innovations or developments in teaching that may be based on conference presentations and peer-reviewed research articles on pedagogy focused on evidence-based developments in teaching and learning. Guidance and encouragement on writing and submitting to the journal are given during a plenary session at the conference.

DISCUSSION

The changing nature of HE has re-shaped teaching and learning within the UK over the last decade, and we have provided local and national examples of initiatives that have arisen within this context. Our case studies illustrate approaches to developing SoTL practitioners within three UK universities and a wider UK HE network. Within these examples, we acknowledge the STEM specific contexts and the benefits of practitioners' analytical approach drawn from these disciplines. Nonetheless, there is also a need for upskilling in social science research methodology for STEM practitioners to confidently transition to SoTL researchers (Webb and Welsh 2021). When done effectively, this approach empowers STEM practitioners to become impactful SoTL researchers. We present some reflections below to further support SoTL in the STEM disciplines within current HE circumstances.

Addressing the principles of good scholarship

Our case studies focus on supporting and championing staff to conduct inquiry into student learning within their own practice and context. Institutional structures at Kingston University and The Open University provide funding and practical support for project-based initiatives which legitimise scholarly inquiry as a worthwhile and meaningful activity for teachers. In both universities, vibrant scholarship communities provide essential SoTL training and development, coupled with events for networking and dissemination. These support structures provide opportunities for academics to

acquire new skills in unfamiliar research methodologies and locate new academic networks, ensuring high quality outputs which are rigorous and methodically sound.

The approaches adopted demonstrate Felten's principles of good scholarship (2013). At Kingston University, The Open University and the Horizons in STEM network working with students as co-researchers is a key part of SoTL activity. The SADRAS scheme (Kingston) specifically enables the employment of students in this capacity. Institutional events in our three institutions and the national conference (Horizons in STEM) provide incremental opportunities for novice and experienced SoTL practitioners to disseminate their work to a supportive audience, gathering experience and developing their SoTL practice in a supportive context. Similarly, practitioners are encouraged and supported to disseminate SoTL findings through attendance at internal, external, and national conferences, and in print, fulfilling Felten's "appropriately public" remit.

In all the case studies, the importance of appropriate reward and recognition of scholarly activity is a key motivator for staff to become involved in SoTL and deliver high quality outputs. Generally, academics who are teaching-focussed have been undervalued, with their careers attracting less prestige than their colleagues with more traditional career profiles. All our case studies demonstrate opportunities for scholars to receive prizes, fellowships, and badges of esteem for excellence in SoTL, affirming the importance of SoTL as a legitimate academic activity. Our case studies illustrate how SoTL activity may provide evidence for promotion and advanced HE fellowships (provided such routes are clear and supported).

Driving quality enhancement through scholarly teaching

All our case studies exemplify institutional commitment to enabling practitioners to undertake SoTL research, and we believe this work can inform academic leaders who are serious about improving teaching and learning. However, to change these practices, investment in research needs to be matched by an institutional commitment to support scholarly teaching. We envisage the "scholarly institution" as one which systematically nurtures and harvests SoTL research (internal and external to the institution) by establishing institutional structures and cultures that foster evidence-informed teaching and learning practices. Implementing SoTL findings is crucial to ensure long-term impact on HE practice, which requires going beyond the limited duration of an individual SoTL project and fostering an environment where the outcomes of SoTL are effectively and systematically integrated into teaching and learning.

We propose that many of the institutional structures that support SoTL can also be applied more broadly to scholarly teaching. These include support for professional development through training and mentoring; recognition and reward through awards and promotion frameworks; and opportunities to disseminate and adopt effective practices (within and across disciplines and institutions) through funding and practical support. Reflecting on our four case studies for supporting SoTL practitioners (i.e., student partnership, faculty support, reward and recognition, and a learning and teaching conference), they are also relevant and beneficial to supporting scholarly teaching. However, for SoTL to have a transformative impact on teaching, we may need to further develop our institutional cultures so that they support a more symbiotic relationship between scholarly teaching and SoTL. If SoTL is not viewed as having the impact it should, perhaps we need to redress the balance in order to ensure scholarly teaching is sufficiently resourced and connected to SoTL so that practice informs undertaken research, and consequently, the research findings are more likely to inform practice.

CONCLUSION

HE educators have witnessed increasing focus on the monetary value of a university education and associated monitoring. Therefore, we need to take a scholarly approach to evaluate our practices and ensure we provide the optimal education in our individual institutions. The increase in the number of teaching-focused academics within the UK presents further opportunities for the development and promotion of SoTL as a mechanism for improving student outcomes. Despite the documented challenges for STEM educators engaging with SoTL, institutions are increasingly supporting SoTL practices and recognising the contributions of their SoTL practitioners and scholarly teachers.

We envisage a "scholarly institution" as one that: skills educators to meaningfully engage with SoTL and encourages collaboration; normalises cross-institutional partnerships for research, dissemination, and implementation; and recognises that career progression for teaching academics requires adopting scholarship-informed practices and processes. So, how do we move from supporting SoTL to becoming a scholarly institution? The major challenge now is to establish effective institutional pathways and mechanisms that maximise the impact of SoTL research and allow for evidence-informed decision making, where SoTL informs decisions at every level from individual practice through to policy and strategy. As Webb and Tierney (2020) note, there is a need for "institutional cultures that predispose, enable, and reinforce educational leaders and teaching-focused faculty to actively engage in SoTL" (620). Without addressing this issue, we cannot realise the benefits of having an engaged workforce with the potential for significant amounts of SoTL activity.

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