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Plotting a route through SoTL: From bioscientist to pedagogic researcher

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Abstract

Despite increasing interest and engagement with SoTL the definition of, and what activities constitute, SoTL remain open to debate. This paper is aimed at life science academics whose primary role is within teaching and learning. It aims to provide support in plotting a route through SoTL to enhance professional practice, student learning, and consider promotion and reward. Given the current focus on teaching quality this paper may also be of use in a wider context.

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We explore models of SoTL, opportunities and pitfalls in SoTL, and strategies to develop an understanding of, and engagement with SoTL. In the latter part of this paper we consider colleagues' experiences with SoTL, outlining the benefits of SoTL in enhancing individual practice and the student experience, leading to the development of an audit tool to encourage educators to reflect on their SOTL practice.

Keywords: SoTL; scholarship; teaching; career development;

Introduction

The Scholarship of Teaching and Learning (Boyer, 1990) has, to a certain extent, helped to shape the teaching and learning landscape over the past three decades. In the UK with a rising number of academics being hired specifically to teach (HESA, 2018), SoTL is becoming a requirement, both in terms of improving teaching and learning practices, as well as a proxy for disciplinary research.

Boyer (1990) considered SoT (Scholarship of Teaching) to occur when teachers were "well informed and steeped in the knowledge of their field". Various models of SoTL have been proposed which bring together different aspects of SoTL and explore how these aspects are linked. By using the literature surrounding SoTL, we can use these established models to try to understand how SoTL can be developed, and how individuals can plan their own development of engagement with SoTL.

Trigwell et al's (2000) model of SoTL encompasses four dimensions, Informed, Communication, Reflection and Conception, with each dimension reflecting an aspect of engagement with SoTL; engagement with pedagogic literature and education theory, dissemination and publication of pedagogic research outputs, reflection on practice as a teacher, and how teaching and learning is viewed. Building on Trigwell et al (2000) model, the Trigwell and Shale (2004) model of scholarship takes a three-component approach, considering Knowledge, Practice and Outcomes (p. 530, Fig. 1) as the basis for the scholarship of teaching. Each of the components is composed of a number of elements (Table 1). The interaction of these three components, made public for peer

scrutiny, is the Scholarship of Teaching.

Table 1. Elements and components of SoTL, Trigwell and Shale (2004).

Knowledge	Practice	Outcomes
Knowledge of the discipline	Teaching	Student learning
Knowledge of teaching and learning	Evaluation / investigation	Documentation
Conceptions of teaching and learning	Reflection	Teacher learning
Knowledge of context	Communication	Teacher satisfaction
	Learning	

This model is a reconstitution of Trigwell et al (2000) four dimension model, and rather than express the model in levels of achievement, appears to be more holistic. While the components of Knowledge and Practice can be seen to come from Trigwell's earlier work, and the work of Glassick, Huber and Maeroff (1997), the components of Outcome are a new addition.

Antman and Olsson (2007) present a two-dimensional matrix which plots teaching practice against theoretical knowledge. The apparent simplicity of this model suggests that teaching practice improves as practitioners become more familiar with educational theory. However, in reality there can often be a lag in theoretical knowledge. This mismatch, in developing theoretical knowledge, can be used to facilitate a drawing out of experiences of practice and theory in teaching and learning.

One of the seminal pieces on scholarship, Glassick, Huber and Maeroff's (1997) requirements for scholarship can act as a guide for anyone engaging in SoTL. The steps guide practitioners through the stages of conducting a scholarly study; clear goals, adequate preparation, appropriate methods, significant results, effective communication and reflective critique. Trigwell et al's. (2000) model of scholarship owes much to this model, as one can see echoes of the informed, communication and reflection dimensions in Glassick, Huber and Maeroff's steps.

However, the activities that define SoTL may differ between settings. For the purposes of reward and recognition, the definition, at an institutional level, of SoTL may be confined to that of peer reviewed publication so that teaching-focused academics may be required to have, for example, evidence of achievement in SoTL through outputs such as publications in peer-reviewed journals, policy reports, book contributions and professional guidance on learning and teaching such as QAA (Quality Assurance Agency) reports.

Despite the importance of critically evaluating one's practice, and making the findings public, SoTL is more than just that. As highlighted previously, Trigwell et al. (2000) propose that SoTL consists of four dimensions; two of those dimensions (informed and communication) deal with SoTL as research and publication, while the other two dimensions promote SoTL as the development of a philosophical viewpoint (reflection and conception). Reflection as a strategy for effective teacher development is widely supported (Kreber & Castleden, 2009; Schön, 1983) and the "reflective practitioner" is regarded as a prerequisite for scholarly teaching. Similarly, a student-centred conception of learning (Biggs, 1999) is considered a sign of a mature, reflective teacher, and is the result of reflection on practice, investigation of one's own teaching and learning context, and an underpinning of pedagogic literature. SoTL, then, could be seen to combine both research and a philosophical understanding of what it means to be a teacher.

The reality of SoTL

The models of SoTL described above assume development of the individual in terms of their engagement with literature, their practice, how they communicate, and their relationship with the subject and with students. But how does this function in reality?

Pedagogic research can present a variety of challenges, as teaching-focused academics wrestle with unfamiliar paradigms, potentially at odds with their disciplinary background, as well as a disjointed sense of identity (Oliver, Nesbit and Kelly, 2013). One particular challenge can be that of using education theory; what Hutchings (2007) calls "The Elephant in the Scholarship of Teaching and Learning Room". Those starting

out in SoTL may be unfamiliar with research styles, tools and methods, and the language used in papers and journals. Research tools may be more focussed on qualitative research, unfamiliar to many life scientists. Differences in language and in the presentation of research can leave those new to SoTL feeling out of their depth, which can be disconcerting to practitioners who have reached a recognised level within their discipline-based research (Kelly et al., 2012).

Threshold concepts have been defined as core concepts which, once understood, open up a new and previously inaccessible way of thinking, without which the learner cannot progress (Meyer & Land, 2003). Tierney (2017) explored threshold concepts within SoTL, for example engaging with pedagogic literature and theory, noting the tensions in moving from life sciences research to pedagogic research where practitioners can be less familiar with the language and research methodology of SoTL. Lawson (2013) notes some of the issues that STEM (Science, Technology, Engineering and Maths) academics may encounter when they first engage in pedagogic research and SoTL. For example, those undertaking pedagogic research can use qualitative research methods (more often used in the social sciences and psychology) in addition to the quantitative research methods they are more familiar with. STEM academics may also need to develop a new research methods skill set, for example designing questionnaires, running focus groups and analysing textual data.

SoTL, promotion and reward and recognition

With increasing numbers of staff being hired solely to teach in the UK (HESA, 2018), and not undertaking discipline-focused research, how has this impacted on reward, recognition and the promotions process in UK universities?

Many UK universities approach the teacher career path in an outwardly similar way. Often, the overall approach is to offer three promotion routes or career pathways, one teaching/scholar focussed, one discipline research focussed and one combining both teaching and discipline-based research. For the teaching/scholar pathway promotions criteria may include SoTL in a variety of ways, from keeping up-to-date with the pedagogic literature to influencing teaching policy on a university or national scale.

However, it is how these pathways are implemented and how promotions criteria are evidenced that can differ markedly between universities. Cashmore et al. (2013) discussed some of the different career paths found in UK universities, they note for example the lack of opportunity to move between the paths within some universities. Also, the criteria universities use and how they evidence these criteria vary, and within universities may vary between the different career pathways. Cashmore et al. (2013), in a series of short case studies, highlighted a number of issues those on a teaching/scholar career pathway had encountered in relation to promotions. These included; an expectation of publications in high-impact peer-reviewed journals; a lack of differentiation between criteria for pedagogical / teaching research and discipline-based research; and a lack of understanding in promotions committees of the teacher/scholar pathway.

The requirements within the teacher/scholar pathway and how success is evidenced can take a range of forms. A search of a range of universities' promotions criteria gave the following examples of evidence required on a teacher/scholar track:

- Portfolio of teaching, containing (among others) evidence that teaching draws on the latest research.
- Nominations for teaching and learning awards, both internal and external from both peers and students.
- Contributions to programme reviews and the development of new and innovative teaching including, for example, online courses.
- Feedback from students, and from peers and colleagues who have observed teaching.

These are just a few examples and demonstrate that many universities are looking beyond publications and grants when approaching the promotion of teaching focussed staff.

The UK Professional Standards Framework for teaching and supporting learners in higher education (UKPSF) (2011), is described as: '*A comprehensive set of professional standards and guidelines for everyone involved in teaching and supporting learning in HE, it can be applied to personal development programmes at individual or institutional*

level to improve teaching quality'. Individuals can work towards achieving: Associate Fellow, Fellow, Senior Fellow, Principal Fellow, depending upon their role. All levels within the UKPSF include SoTL to differing levels. For example, a Fellow must demonstrate '*successful incorporation of subject and pedagogic research and / or scholarship within the above activities, as part of an integrated approach to academic practice'*. This recognition of teaching and scholarship through the fellowship scheme and the UKPSF may be used by universities to raise awareness and promote the quality of their teaching to students. Indeed, some UK universities aim to have all their teaching staff become fellows of AdvanceHE (formerly the Higher Education Academy). The UKPSF and AdvanceHE fellowships may also be used as part of the promotions process within universities.

Teaching awards, on a university, national or international level, can also provide recognition for SoTL. Two examples of UK wide teaching awards are the Royal Society of Biology HE Bioscience Teaching Award and AdvanceHE's NTF (National Teaching Fellowship) Scheme, and many universities have their own awards, where teaching staff may be nominated by colleagues or students and nominations may be used within promotions criteria.

However, the way in which universities recognise and reward teaching and learning in their promotions processes can vary substantially. Between 2009 and 2010 Cashmore et al. (2013) noted across all university mission groups (i.e. the then 1994 Group, Russell Group, Pre-1992 and Post-1992) an increase in the use of teaching and learning criteria for promotion to professorial levels. However, they also noted that interviewees in the study '*expressed the feeling that teaching-focused career tracks and positions are treated as second-class options, which are pursued by those that have failed at research*.' Interviewees noted, for example, loss of prestige, loss of funding and poorer employment prospects when they moved to a teaching track. Difficulties in undertaking research into learning and teaching were also noted, with no time to undertake research on teaching track careers, and promotion panels themselves not having an understanding of the differences between SoTL and discipline based research.

When Fanghanel et al. (2016) evaluated the use of teaching and learning in promotion criteria, (including promotion via a learning and teaching route, publication of research, and issues around citation and impact factors) they noted various potential issues. These included lower impact factors for teaching and learning focussed journals in comparison to discipline related journals, and smaller research grants associated with research into teaching and learning, both potentially impacting on promotion.

Differences between SoTL and discipline-based research can also be highlighted by processes such as the REF (Research Excellence Framework) and its precursor the RAE (Research Assessment Exercise) in the UK. Cotton, Miller and Kneale (2017) highlight some of the issues in submitting pedagogic research for the REF including questions regarding its suitability for inclusion. They also highlight another tension within SoTL, where academics may consider scholarship to be being informed by, and not necessarily to be undertaking, primary research.

The Sydney model; an example of rewarding SoTL

Rewarding SoTL can go beyond individual recognition and promotions to encompass whole departments and institutions. The University of Sydney aimed to transform SoTL within the university through a programme of institutional change which would promote, develop and reward it. Encouraging SoTL was seen as a way of both raising the status of teaching and leading to improved teaching and learning.

One aspect of this was financially rewarding departments whose staff engaged in SoTL, with the aim of improving teaching quality through increasing engagement in SoTL. This performance-based funding system, known as a Teaching Dividend, allocated six per cent of faculties' operating grant money in proportion to their relative teaching quality. Teaching quality was measured by a series of teaching performance indicators (Brew, 2007). These indicators covered a range of aspects measured through student course experience questionnaires, and measurements of student retention and progression.

There were also rewards for departments through a system called the Scholarship Index, which aimed to financially reward departments whose staff contributed to teaching quality through SoTL. The Scholarship Index covered accomplishments and

activities such as teaching qualifications, teaching awards, formal mentoring of a teaching colleague and publishing studies in SoTL in both peer and non-peer reviewed publications (Brew, 2007).

Various other initiatives also took place including strategic university-wide projects on research-led teaching, training in undertaking pedagogic research and the potential to be promoted on the basis of outstanding teaching. Although the model is no longer in operation it demonstrated how SoTL could be linked with performance and implemented and encouraged across a university.

Support for SoTL

Visible encouragement and support for SoTL within a university or department can enable practitioners to both start and do more with SoTL. The Sydney model demonstrated how rewarding and supporting SoTL could encourage it across both departments and an institution (Brew, 2007). Institutional structures can provide support for SoTL, for example through the performance review process, CPD (Continuous Professional Development), and promotions structures. However, this is contingent on the recognition of teaching and learning and SoTL. Cashmore et al. (2013, p21) highlighted some of the issues around the recognition of SoTL within promotions criteria, discussing case studies where staff engaged in teaching-related research were discouraged to do so and found that the promotions process was less well defined for those on a teacher/scholar pathway. However, they also noted the improvement in recognition of teaching excellence in criteria for promotion and career advancement when compared to two previous studies (HEA and GENIE CETL, 2009, Cashmore and Ramsden, 2009).

Quality assurance processes and government policy also have the potential to support SoTL within higher education. The QAA (Quality Assurance Agency) Enhancement Themes (https://www.enhancementthemes.ac.uk/en/home) focus on particular aspects of higher education, previous enhancement theme topics have included developing and supporting the curriculum and research-teaching linkages. These enhancement themes can encourage engagement with SoTL, pedagogic research and the sharing of practice.

Within the UK the introduction of the TEF (Teaching Excellence Framework), which first reported in July 2017, while not explicitly mentioning SoTL has put a focus on teaching within UK universities.

Mårtensson, Roxå and Stensaker (2012) highlight the need for quality assurance processes to take into account academic interests and activities (i.e. learning and teaching) instead of focussing on governance and accountability. They propose that quality assurance processes have the potential to improve teaching and learning, through enabling reflection on practice in a systematic and scholarly way, if learning and teaching is the focus.

Experiences of engaging with and reflecting on SoTL

Theoretical models, such as those highlighted previously, can provide a framework for SoTL, enabling practitioners to explore how they might implement it within their own practice. For example, Glassick et al. (1997) provide a guide for SoTL in the form of a series of steps, leading practitioners through the stages of conducting a scholarly study. But how might this translate into practice? Looking at how other practitioners have implemented SoTL, and have potentially used, or been influenced by, the models of SoTL can give insight to others. For those new to SoTL it can give a starting point and encouragement, for those with more experience it can provide an opportunity to reflect on practice, continuous enhancement and objective thinking regarding the awareness of SoTL and its use in teaching and learning.

Exploring SoTL in practice

Three of the authors of this paper were involved in developing and running a series of workshops which brought together teaching staff from universities across the UK to discuss SoTL and their SoTL activities. Workshop participants considered and discussed the four models of SoTL presented in the paper, used the Antman and Olsson (2007) 2D matrix to look at their current involvement in SoTL and developed an action plan for increasing SoTL in their practice. During these workshops participants

highlighted a range of activities, practices and behaviours which supported their SoTL activities. These themes and practices have also often been raised in informal discussions between the authors and colleagues involved in SoTL.

Key Themes

Discussions at the workshops highlighted a number of key themes, consistently raised by participants as important aspects of their SoTL practice. These themes are explored in greater depth in the discussion.

- Collaboration:
    - Collaboration with colleagues across departments and institutions.
    - Working in collaboration to develop new modules or aspects of teaching, for example, practicals or resources.
    - Collaboration with students.
- Mentors:
    - Having a mentor to support aspects of teaching and learning and / or SoTL development.
    - Supporting colleagues undertaking SoTL.
    - The value of having a group of colleagues to discuss and share practice on a more informal basis.
    - How promotion to a senior role can offer opportunities to support others in their SoTL journey.
- Students:
    - Students as co-creators and collaborators.
    - Taking note of student feedback and the results of student assessment.
- Professional development:
    - Qualifications relating to SoTL and teaching and learning,
    - Promotion via a learning and teaching route
    - The performance review processes.
- Sharing / dissemination:
    - The sharing of practice via informal discussions with colleagues, presenting at conferences and publication.

    - The benefits of sharing evidence-informed practice.
- Funding:
    - The challenges in funding SoTL and learning and teaching focussed projects.
    - The benefits of obtaining funding for learning and teaching projects from institutional, national and international bodies.
- Enjoyment and Novelty:
    - Enjoying the challenge of moving from research to teaching.
    - Developing new research areas in learning and teaching.
    - Learning new skills.
    - Developing a satisfying career path.

Discussion

The themes emerging from, and discussed at the authors' workshop series, highlight a variety of ways in which academics have engaged with SoTL and support their, and their colleagues', engagement with SoTL. One of the most invaluable aspects of engaging with SoTL, highlighted by many workshop participants, was the opportunity to share and discuss teaching practice, both within and outside of their department. The four models of SoTL presented in this paper all highlight communication as an important aspect of SoTL, enabling sharing of ideas and exchange of practice.

Discussion with colleagues from different disciplines and with those more familiar with the research methodologies used in SoTL could mitigate some of the issues highlighted previously with moving from a life sciences research background into teaching and learning research. With time limitations and being new to the concept and practices of SoTL, sharing and discussing practice with colleagues who are further along the route to SoTL provides a starting point to those new to it. This may instil the confidence to introduce a new (to them or their department) "proven" teaching practice or technique which could later be adapted and further disseminated.

Within discussion and sharing of practice we could also include the publication of research and practice. The Trigwell and Shale (2004) model of SoTL has three

components – Knowledge, Practice and Outcomes – and the interaction of these three components, made public for peer scrutiny, is what they consider to be the scholarship of teaching. Trigwell et al. (2000) also highlight the dissemination and publication of pedagogic research outputs. When thinking about the publication of research and practice it is perhaps important for practitioners to consider avenues other than peer-reviewed papers in journals. A practitioner just starting out in SoTL may not feel confident in authoring a research paper for peer-review, even if they have published discipline-based research. A small, effective change in teaching practice, while not providing enough scope for a paper, could reach a wide audience presented as a poster, article in a faculty or university newsletter, a case study or a blog post. Practitioners should also consider making resources generated as a result of a new or changed practice, for example, assessment criteria or a lab handbook, available. Having a description of the teaching practice and its' implementation, teaching resources generated, how it was received and any changes in, for example, student engagement and attainment as a result, could provide others with the resources and evidence they need to introduce this new practice. Glassick et al. (1997) highlight the variety of outcomes from SoTL, from spoken advice to magazine articles and note that the outcome is not always a peer-reviewed article or book. Trigwell et al's (2000) model of scholarship also highlights this variety of outcomes, with the focus being on communicating information and results to others.

As a practitioner, keeping up-to-date with the learning and teaching literature is an important aspect of SoTL. Glassick et al. (1997) consider adequate preparation – which includes an understanding of existing scholarship in the field – to be an essential part of the design and undertaking of scholarly research. Trigwell and Shale's (2004) model of SoTL contains three components, one of which is knowledge, including knowledge of teaching/ learning. This knowledge of the literature, as well as enabling the development of new practice can also support the dissemination of SoTL, through referring to the literature when, for example, giving a presentation and pointing other practitioners towards relevant papers when discussing and sharing practice.

Not all dissemination of practice is written and, as discussed above the discussion and sharing of practice was highlighted as valuable. Conferences, seminars, internal and external to departments and institutions provide other, more formal, opportunities to

share, disseminate and publish research. This aspect of SoTL is highlighted in, for example, the UKPSF and promotions criteria for many institutions (Fanghanel et al., 2016). However, finding the time and the funding to attend teaching and learning conferences can be problematic. So where might those new to SoTL find opportunities, and potentially funding, to discuss and share practice? Many universities run a programme of teaching and learning events and conferences and, if funding and time are restricted and don't enable attendance at external events, these can provide opportunities to share practise with colleagues from different departments. They also have the potential to enable the formation of networks of practice sharing. Practice sharing networks can be invaluable, giving members opportunities to exchange practice, ideas and resources with colleagues from different departments and institutions. McKenzie et al. (2010) describe the formation of a cross-departmental learning community of teaching focussed staff who are required to engage in SoTL. The community enabled discussion and sharing of ideas and impacted positively on its members' approaches and attitudes towards SoTL.

Looking further afield, national conferences and events from organisations such as AdvanceHE, ISSOTL (International Society for the Scholarship of Teaching and Learning) and learned societies such as the Royal Society of Biology and the Society for Experimental Biology could give opportunities for practice sharing and network forming. Hubbard et al. (2015) highlight the opportunities learned societies could provide in terms of supporting cross-institutional support for teaching focussed academics, which could enable practice sharing and collaborations.

Funding was highlighted by the workshop participants as invaluable in the development of learning and teaching projects and in supporting SoTL. Funding for SoTL projects can also support dissemination and the sharing of evidence-based practice. Finding sources of funding for teaching and learning projects and research can be challenging and funding for SoTL and pedagogic research projects can potentially impact upon promotions. Promotions criteria may involve an aspect of successful funding applications, but funding for learning and teaching focussed projects can compare unfavourably with funding for discipline-based research within the life sciences (Fanghanel et al. 2016). For example, with fewer funding opportunities, funding for

smaller projects and smaller funding amounts, it may be considered less prestigious by promotions boards.

Professional development was a recurring theme among workshop participants. Participants and colleagues have highlighted courses and formal qualifications which have supported them in their SoTL journey, for example, the PGCHE (Postgraduate Certificate in Higher Education), PGCAP (Postgraduate Certificate of Academic Practice) and Masters courses in particular aspects of education. Mathany et al. (2017) found practitioners felt more aware of the discipline and better able to conduct SoTL based research after formal training and mentoring. Many institutions offer CPD courses in aspects of teaching and learning and courses exploring aspects of research unfamiliar to life scientists could give a boost to SoTL. These SoTL skills can also be passed on to others, through, for example, formal and informal mentoring.

Mentoring can provide support for SoTL. Mentors, both through a formal programme set up by a university or an external body, or an informal route, can provide opportunities for discussion with someone who has been on a similar path. Peer mentoring has been found to support teaching and learning in higher education. Andrews and Clark (2011) found peer mentoring enabled students to make the most of the academic opportunities available to them, one of the most valuable roles of peer mentors was supporting their mentees in ‘learning how to learn’. Mathany et al (2017) found practitioners felt better able to undertake SoTL based research following a formal mentoring programme. Peer mentoring, pairing those new to SoTL with more experienced practitioners, could support SoTL across a department or university. When staff experienced in SoTL are promoted to senior levels it can provide an opportunity to champion SoTL (Mathany et al., 2017) through, for example, processes such as the inclusion of SoTL in promotions criteria and mentoring.

Students and student involvement with SoTL were a recurring theme among practitioners. Students were collaborative partners, working to develop new teaching and learning resources, student feedback was used to support the development of new modules and highlight issues with current modules. Students were also the beneficiaries of SoTL where new modules and courses were developed to support their knowledge and skills development,

The involvement of students in research itself should also be considered. The case is often made for student involvement in disciplinary based research, enabling learning through, and about, research and enquiry (Healy and Jenkins, 2009). Why not involve students in SoTL and pedagogic research? This can enable student skills development. – making students a key part of a learning and teaching research project or development (Brew, 2003).

The novelty of SoTL was also highlighted by practitioners at the workshops, the exploration of a new research area, the development of new skills from working in a new area. Novelty for the students was also discussed, teaching something that had been taught for a number of years in a novel way. Often tied in with novelty was enjoyment, practitioners discussed the pleasure or enjoyment they gained in teaching and learning and / or SoTL.

Developing SoTL

Having considered the models of SoTL, themes arising from discussions at the workshop events and from informal discussions with colleagues, we have developed an audit tool for teaching practitioners to support the introduction or development of SoTL in their practice.

An audit tool is intended to be developmental, not based on point scoring but to encourage thought and reflection on how practice might realistically be changed and, following on from this, an action plan for incorporating SoTL can be developed. The audit tool at the end of this paper (appendix 1) brings together various aspects of SoTL covered in the paper, both from the models of SoTL outlined previously and from the SoTL workshop series to encourage individuals to reflect on their SoTL practice.

Conclusions

The themes presented in this paper, and the models of SoTL highlighted, showcase a range of activities and practices which could support practitioners in their SoTL journey.

The key themes included; sharing and discussing practice inside and outside of a home department with others involved or interested in SoTL and proactively searching for funding for learning and teaching projects. Professional development was also discussed as was the importance of becoming familiar with, and utilising, current pedagogic literature from a variety of sources. The benefits of SoTL for teaching staff and students are wide ranging and engaging in SoTL can lead to improvements in student learning, development of new teaching practice and career reward and recognition. All these elements are key to ensuring continuous improvement of learning and teaching in higher education.

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