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Survey of Research Approaches Utilised in The Scholarship of Teaching and Learning Publications

ABSTRACT

The Scholarship of Teaching and Learning (SoTL) has been described as the fastest growing academic development movement in higher education. As this field of inquiry matures, there is a need to understand how SoTL research is conducted. The purpose of our study was to inform this debate by investigating research approaches used in SoTL publications. We analysed 223 empirical research studies published from 2012 to 2014 in three explicitly-focused SoTL journals. We classified the studies as either qualitative, quantitative, or mixed methods using an analytical framework devised from existing literature on research methods. We found that the use of the three research designs was fairly evenly distributed across the papers examined: qualitative (37.2%), quantitative (29.6%), and mixed methods (33.2%). However, there was an over-reliance on data collection from a single source in 83.9% of papers analysed, and this source was primarily students. There was some, but limited, evidence of the use of triangulation through the use of multiple data collection instruments (e.g. survey, assessment tasks, grade databases). Similarly, only one-third of publications classified as mixed methods integrated the analysis and interpretation of the qualitative and quantitative data equally within the study. We conclude that current SoTL research is characterised by methodological pluralism but could be advanced through inclusion of more diverse approaches, such as close reading, and adoption of strategies known to enhance the quality of research, for example, triangulation and visual representation.

KEYWORDS

scholarship of teaching and learning, qualitative research, quantitative research, mixed methods, research approaches

INTRODUCTION

The Scholarship of Teaching and Learning (SoTL) has been described as the fastest growing academic (termed 'faculty' in North America) development movement in higher education (Gibbs, 2013). Arising from a broader perspective on academic work, Boyer (1990) described four overlapping domains of scholarship, one being the scholarship of teaching. There has been a plethora of literature attempting to define, categorise, or simply make sense of SoTL. Potter and Kustra (2011) define SoTL as "the systematic study of teaching and learning, using established or validated criteria of scholarship, to understand how teaching (beliefs, behaviours, attitudes, and values) can maximize learning, and/or develop a more accurate understanding of learning, resulting in products that are publicly shared for

critique and use by an appropriate community." Although contested and complicated, the aim of SoTL is to enhance instructors' teaching practices and students' learning experiences.

Given the roots of SoTL in academic work, SoTL has a strong link in discipline identity (Healey, 2000). Thus, it is unsurprising that no single specific research approach can characterize all or even the majority of SoTL publications (Wilson-Doenges & Gurung, 2013). An academic's own disciplinary practice is seen to influence their SoTL practice (Huber & Morreale, 2002; Bass & Linkon, 2008; Chick, Hassel, & Haynie, 2009). The benefit of many varying disciplinary perspectives in SoTL is the potential for 'pluralism' in both methods and theories used to explore teaching in higher education (Hutchings & Huber, 2008). This resonates with the image of SoTL as a 'big tent,' inclusive of diverse approaches and perspectives (Huber & Hutchings, 2005). Debating the validity of one form of research over another across disciplines is not new for the academy and is evident within disciplines as they form and establish themselves. As SoTL grows and matures, the debate of 'what is *research* in SoTL?' seems appropriate (Poole, 2012). In outlining 'good practice principles' of SoTL, Felten (2013) acknowledges the pluralism of SoTL that can reflect a variety of disciplinary ethos. Regardless of approach, Felten (2013) argues that "good practice in SoTL requires the intentional and rigorous application of research tools that connect the question at the heart of a particular inquiry to student learning" (p. 123). Methods should be sound and appropriately aligned to the question driving the SoTL inquiry.

Approaches to SoTL research have been debated for over a decade (Felten, 2013). What research approaches and methods of data collection and analysis are used in published SoTL work? Interestingly, with a few exceptions, this question has not been explored in much depth. A North American research-intensive university reviewed ten years of their institutional SoTL activity and found the predominant SoTL study design relied on qualitative approaches (Hubball, Clarke & Poole, 2010). A study analysing three years of published work in three journals explicitly focused on SoTL reported that 38% of papers employed qualitative approaches, 34% used quantitative approaches, and 28% used mixed methods (Matthews et al., 2013). However, the focus of the latter study was on students' experiences of their degree-level programs and therefore did not include a detailed analysis of methodological approaches. Prior to the 2014 International Society for the Scholarship of Teaching and Learning Conference (ISSOTL), a small group gathered to examine abstracts for talks and posters included in the conference program. They explored discipline of authors, data generated from students (e.g. perception, performance, both, neither), and level of student data (e.g. undergraduate, post-graduate) to find approximately 44% of abstracts drew on learner data (Powell, Harmon, & MacMillan, 2015).

As a subset of the researchers who conducted the Matthews, Divan, John-Thomas, Lopes, Ludwig, Martini, Motley and Tomljenovic-Berube (2013) study, we acknowledged at the time the need to further explore approaches to research in SoTL. SoTL is growing and maturing as a field of inquiry, and debates continue about what SoTL is and what constitutes SoTL research. An in-depth understanding of the types of research approaches SoTL scholars currently use, as featured in the published literature, could provide an evidential baseline to inform the debate and shape future discussions on what research in SoTL could or should look like. This study contributes such an evidential baseline, which is important for the emerging SoTL field that draws practitioners from a range of disciplinary boundaries. As SoTL continues to grow and mature, understanding how SoTL research is conducted becomes vital to engaging new SoTL practitioners.

Conceptualising SoTL research: qualitative approach

Qualitative research investigates the ways that individuals and groups encounter and understand

various experiences within natural settings (Cochrane & Oliver, 2006) and can help describe the nature and essence of what's being studied (Chick, 2013). Open-ended questions are the hallmark of qualitative SoTL research and are explored mainly through textual (but also verbal and visual) data, gathered through reflective writing, focus groups, interviews, field notes, participant observations, case studies, or document reviews (Hart, Smith, Swars, & Smith, 2009; Hubball & Clarke, 2010; Chick, 2013). Qualitative research allows for in-depth analysis of complex systems and experiences which cannot be fully captured with measurement scales and multivariate models (Plano Clark et al., 2008) and is best suited to address a research problem in which the desired variables are yet unknown (Creswell, 2012) or when a quantifiable attribute at the data collection stage is not assigned. According to Castro, Kellison, Boyd, and Kopak (2010), the strengths of this methodology include a) the capacity for generating richly detailed accounts of human experiences (emotions, beliefs, and behaviours), and b) narrative accounts that can be examined within the original context in which observations occur.

Critiques of qualitative research often include claims that it's too subjective, it can be difficult to replicate, and there is a lack of transparency regarding methods and how conclusions are drawn (Bryman, 2012; Dreher, 1994). However, these critiques may not be of qualitative research, per se, but possibly of research design, implementation, and description.

Operational definition of the qualitative approach

For the purpose of our study, we defined the qualitative approach as one that explores a central phenomenon without assigning a quantifiable attribute, permitting a broad view of the participant's experiences. Data may be quantified for data analysis purposes and presentation, post-data collection. The key principle guiding our analysis was that *data were collected in words*, not as numbers.

Conceptualising SoTL research: quantitative approach

Quantitative SoTL research can be characterized as that which seeks to confirm hypotheses, quantify variation, or predict causal relationships through the use of methods that directly gather numerical data and enable statistical analysis or some other form of quantification (e.g. percentages or descriptive statistics) (Meyers, 2008; Chick, 2013). Quantitative explorations primarily make use of closed-ended questions employing surveys, questionnaires, or structured observations (Hubball & Clarke, 2010; Chick, 2013). The strengths of quantitative research include accurate measurement, the ability to make correlations and associations, and the ability to test hypotheses. Furthermore, quantitative research allows for group comparisons and can take advantage of larger sample sizes to target a broader pool of participants (Castro et al., 2010; Creswell, 2012, p. 14).

Like data gathered using qualitative approaches, quantitative research has weaknesses. Quantitative research is limited by the fact that measurements often separate information from its context (Castro et al., 2010) and its use often fails to make the distinction between people and social institutions and the "world of nature" (Bryman, 2012, p. 178). Furthermore, the use of measurements can provide a false sense of precision and accuracy, whilst the analysis of relationships between variables can create a static view of social life independent of the actual experiences of individuals (Bryman, 2012).

Operational definition of the quantitative approach

For the purpose of our study, we defined the quantitative approach as one that investigates variables that are quantifiable (counted) using methods that permit straight-forward data gathering that

is unambiguous in interpretation. The key principle for our data analysis was that *data were collected as numbers*.

Conceptualising SoTL research: mixed-method approach

A third approach to research involves a blend of qualitative and quantitative methods, and is referred to as "mixed methods" research. Mixed research methodologies benefit from the inherent strengths of qualitative research (the descriptive analysis of textual, verbal, and visual artifacts) and quantitative research (the precision in measurement and hypothesis testing) (Castro et al., 2010; Hart, Smith, Swars & Smith, 2009; Hubball et al., 2010). Quantitative and qualitative methods may be used sequentially or concurrently with the goal of bringing together differing, complementary forms of data. Thus mixed methods research can provide a better understanding of research problems than neither qualitative nor quantitative approaches alone allow (Chick, Karis, & Kernahan, 2009; McKinney, 2007; Morse, 1991) and can provide more in-depth focus on selected interests within a study (Creswell, 2012). Furthermore, when working with people, like students or academics, scholars have found advantages in combining aspects of qualitative and quantitative research, as drawing data from various perspectives can provide a richer overall picture of why and how a particular teaching strategy may influence learning (Chick, 2013).

The extent to which researchers integrate or mix the findings and inferences (partially or fully) generated by the qualitative and quantitative phases of the study and the prominence afforded to each approach (equal status or dominant status) are considered fundamental to the design of mixed method research (Greene, 2007; Leech & Onwuegbuzie, 2009). Thus, mixed methods research can require extensive time and effort in order to effectively implement both approaches and may necessitate diverse methodological training, or collaboration within a team of researchers to ensure appropriate use of each approach (Creswell, 2012).

Operational definition of mixed methods approach

For the purpose of our study, we defined the mixed method approach as one where aspects of both qualitative and quantitative research are used at any stage of the study based on the operational definition used by Hart, Smith, Swars, and Smith (2009). A key guiding principle for our analysis was that *data were collected* as numbers *and* as text. Where the data were collected as text *only*, this is qualitative, even if the authors quantify post-collection. The extent to which SoTL researchers brought together qualitative and quantitative components of their study and their relative importance was analysed subsequent to classification of a study as mixed methods.

Research question

To address our research question of what types of research approaches are commonly used by SoTL researchers, we considered specifically the following:

1. **How prevalent is quantitative research only, qualitative research only, or mixed methods research amongst empirical SoTL articles published in a collection of prominent and explicitly-focused SoTL journals from 2012 to 2014?**
2. **What data do SoTL researchers commonly gather, and when and how do they collect and analyze these data?**
3. **When mixed methods research is used, how are qualitative and quantitative approaches integrated and/or balanced within these articles?**

METHOD

The focus of this study was to explore the prevalent methodological approaches used by scholars pursuing research in SoTL. Our approach was to conduct a literature review that was grounded in awareness of the challenges and limitations associated with "defining the literature" and then reviewing that defined body of literature drawing on conceptually rich notions of methodological research approaches (Kennedy, 2007).

Defining the body of literature

Our body of literature for the purposes of this study included the assessment of 267 empirical research studies published from 2012 to 2014 in three SoTL journals: the *International Journal for the Scholarship of Teaching and Learning* (IJSOTL), the *International Journal of Teaching and Learning in Higher Education* (IJTLHE), and the *Journal of the Scholarship of Teaching and Learning* (JOSOTL). The journals were selected specifically for their clear affiliation with the SoTL movement. Articles for inclusion were those with an empirical focus that could clearly be identified as research-based articles. On this basis, we excluded 126 articles that lacked an empirical focus including those written as opinion pieces, book reviews, and editorials. We also excluded empirical studies that were testing surveys or other research tools as our focus was on publications specifically collecting and reporting on data from SoTL studies. As such, 44 articles were excluded. Table 1 displays the number of articles in each journal, total number of empirical studies, and number of articles included for the study within the defined time frame.

Table 1. Journal titles, total number of articles, number of empirical studies, and number of articles included in current study.

Journal Titles	Total Number of Articles	Number of Empirical Studies	Number of Articles Included for Study
International Journal of the Scholarship of Teaching and Learning	162	93	79
International Journal of Teaching and Learning in Higher Education	110	66	50
Journal of the Scholarship of Teaching and Learning	121	108	94
	393	267	223

Review team

A total of six researchers from six different higher education institutions participated in the analysis. Researchers came from a range of disciplines (e.g. biosciences, chemistry, communications, education, English) with one male researcher. The team worked at a distance with an established mode of online communication and experience in conducting literature reviews (Matthews et al., 2013).

Conducting the analysis

Four phases of testing the analysis framework were conducted that involved each researcher independently analysing the same article and entering results into an online form. Differences in interpretation were identified and discussed, and the analysis form was revised accordingly. This iterative process was essential for revealing implicit differences in how the researchers conceptualised and classified SoTL research as being qualitative, quantitative, or mixed methods.

To conduct the final analysis, researchers first worked individually to read and analyse assigned articles (approximately 75 per researcher). Each article was read and analysed by two researchers independently. Then, researchers partnered and consulted on analysis for articles. Following discussion, the two researchers came to agreement on the classification of the article. Where researchers could not agree, a third researcher was consulted. Once consensus was reached about an article, the data was entered into an online system that captured the analysis in a standardised format.

Analysis framework

The purpose of our analysis framework was to systematically capture data from each article guided by our pre-determined research questions whilst also reducing researchers' variability in the interpretation of SoTL research. Two papers were heavily drawn on to develop the analysis framework (Amundsen & Wilson, 2012; Hart et al., 2009). The Hart, Smith, Swars, and Smith literature review, in particular, guided our defining of qualitative, quantitative, and mixed method approaches. Our operational definitions to classify articles as utilising qualitative, quantitative, or mixed-methods are presented above. Our analysis framework collected demographic information about the article (e.g. journal, year, country of first author, volume, issue) and included the following prompts:

1. Article was focused in single university, multiple universities in the same country, multiple universities in different countries, other (specify).
2. Sources of data were students, academics, document analysis, other (specify).
3. Data was collected from surveys, interviews, focus groups, assessment tasks/assignment, database of grades, records of attendance, observational notes, e-learning management system, other (specify).
4. Data collection was snapshot (data collected one time), longitudinal (data captured from the same group of people at different points in time and relating to the same research question[s]), trend (data captured from different cohorts over a period of time using the same data collection instrument), pre-post (data captured before and after a particular intervention to measure the degree of change occurring as a result of that intervention), other (specify).
5. Data were analysed using descriptive statistics (numbers summarising and describing observed data; e.g., through percentage, mean, median, standard deviation), inferential statistics (inferring properties about a larger population; e.g., through tests such as p-values, T-tests, ANOVAs), thematic analysis (coding of written text into themes), grounded theory analysis (explicitly mentioned by authors in the study), other (specify).
6. Data was presented in tables, quotes, graphs, visual diagrams, case studies, themes, other (specify).
7. Approach that best describes the article was qualitative, quantitative, mixed methods, other (specify).
8. If research approach classified as mixed methods, then dominant approach was qualitative, quantitative, or equal use, other (specify).
9. If research approach was classified as mixed methods, describe how qualitative and quantitative approaches are integrated across sections of the article: not integrated, partial integration (integrated in methods, results or discussion), or full integration (integrated across methods, results and discussion with conclusions draw from both sources of data).

RESULTS

A total of 267 scholarly articles from three SoTL journals were reviewed. Of these, 89.55% (n=223) were suitable for inclusion in this study based on the parameters identified in the methods section.

Demographics data

Of the papers that we analysed, 82.51% (n=184) were published with first authors from USA followed by 'other' (8.97%, n=20), Canada (3.14%, n=7), Australia (2.69%, n=6), and the UK (2.69%, n=6).

The vast majority of the articles, 89.24% (n=199), described research that was conducted at a single university; 6.28% (n=14) described cross institution SoTL within the same country; 3.59% (n=8) was cross-institutional from multiple countries; and 0.90% (n=2) was categorised as other (e.g. graduates, meta-analysis).

Prevalence of qualitative, quantitative, and mixed-methods approaches

Our analysis found 33.18% (n=74) of the papers analysed used a mixed methods approach, 29.59% (n=66) used a qualitative approach, and 37.21% (n=83) used a quantitative approach.

Gathering data, and ways of collecting and analyzing data

The most common source of data were students (88.34%, n=197), followed by academics (21.08%, n=47). 'Other' data sources included professionals and employers, researchers outside of academia, graduates, the public, and teaching assistants (tutors in Australia and UK systems). The majority of studies used a single source of data (83.86%, n=187), with the rest using two or more sources.

Data collection instruments varied across studies as shown in Table 2. The most common was surveys (71.30%; n=159). 'Other' included social network mapping, emails, website content such as comments and discussions, and teaching resources such as lesson plans. Of the 223 studies, 54.26% (n=121) used multiple data collection instruments whilst the rest used just one.

The majority of studies collected data only once as a snapshot (64.57%, n=144). A much lesser number of studies used a pre-post design (13.90%, n=31), followed by longitudinal (8.52%, n=19) and trend (7.17%, n=16) approaches to collecting data (Table 2).

Data analysis most commonly used was descriptive statistics (75.34%), followed by inferential statistics (54.71%) and thematic analysis (45.29%). The majority, 71.30%, of articles used multiple types of data analyses. Data presentation format was varied with data most frequently presented in tables or as quotes (Table 2).

Qualitative and quantitative use, and integration in mixed-methods studies

For studies classified as mixed methods research (n=74), we identified if one approach was predominantly used in these articles or whether there was a balanced use of both quantitative or qualitative approaches (following Hart et al., 2009). We found that there was fairly even distribution with a breakdown of predominantly qualitative (36.49%; n=27), predominantly quantitative (33.78%; n=25), and equal use of both quantitative and qualitative studies (29.73%; n=22).

Where studies used a mixed methods approach (n=74), we analysed the papers to identify how the authors integrated both qualitative and quantitative research. The majority of papers used only partial integration of results as evidenced by 58.12% (n=43) of mixed methods studies presenting

qualitative and quantitative results and findings separately with an integrated discussion or conclusions section. To a lesser extent, 29.73% (n=22) used full integration where SoTL scholars integrated discussion, implication, and conclusions sections that clearly drew on both qualitative and quantitative findings. Just 12.16% (n=9) of mixed methods studies had no integration, whereby authors presented qualitative and quantitative results and findings separately with no integration between the two in the discussion or conclusions sections.

Table 2. Summary statistics for all research articles (n=223) analysed by data collection instrument, data collection frequency, and data presentation style; split by research method.

	Total		Mixed Methods		Qualitative		Quantitative	
	N	%	N	%	N	%	N	%
Data Collection Instrument								
Survey	159	71%	69	43%	27	17%	63	40%
Assessment task	75	34%	24	32%	30	40%	21	28%
Grade database	48	22%	11	23%	3	6%	34	71%
Interview	45	20%	17	38%	28	62%	0	0
Focus groups	31	14%	13	42%	16	52%	2	6%
Observational notes	26	12%	9	35%	13	50%	4	15%
Reflection	23	10%	9	39%	13	57%	1	4%
Other	16	7%	6	38%	6	38%	4	25%
Attendance records	4	2%	0	0.00	1	25%	3	75%
Online learning management	2	1%	1	0.50%	0	0	1	0.50%
Data Collection Frequency								
Multiple Approach	13	6%	6	46%	2	15%	5	39%
Trend	16	7%	6	38%	3	18%	7	44%
Longitudinal	19	9%	5	26%	9	48%	5	26%
Pre-Post	31	14%	16	52%	1	3%	14	45%
Snapshot	144	64%	41	28%	51	35.41	52	36.11
Data Presentation Style								
Table	172	77%	62	36%	31	18%	79	45%
Quotes	122	54%	62	50%	59	48%	1	1%
Graphs	50	22%	14	28%	3	6%	33	66%
Visual/Diagram	27	12%	10	37%	6	22%	11	40%
Case Study	4	1%	1	25%	3	75%	0	0%
Themes	111	49%	47	42%	60	54%	4	3%
Other	34	15%	15	44%	3	8%	16	47%

DISCUSSION

In this study, we explored the use of quantitative, qualitative, and mixed-methods research in published SoTL literature over a three-year period in three explicitly focused SoTL journals. Our aim was to inform the debate about the research approaches used in SoTL by contributing data about the extent to which quantitative, qualitative, and mixed methods are implemented by SoTL researchers and scholars.

Prevalence of qualitative, quantitative, and mixed-methods research in SoTL

We found that quantitative approaches (37.21%) were the most prevalent in the published SoTL literature we examined. Mixed methods research drawing on both qualitative and quantitative approaches was identified in 33.18% of the articles in our analysis. With 29.59% of articles categorised as qualitative, the spread across the three research approaches was relatively evenly distributed. The distribution in the current study is similar to the Matthews, Divan, John-Thomas, Lopes, Ludwig, Martini, Motley and Tomljenovic-Berube (2013) study, which was expected, as both draw on published SoTL literature, although this study uses a more recent database of articles and uses a more clearly defined operational framework for classification of papers. Considered in light of the review of ten years of SoTL activity in one university, which found qualitative approaches (71%) dominated SoTL methodological approaches (Hubball et al., 2010), the relatively even distribution of results in the current study stands out. One explanation for the difference could be that the Hubball study represents an institutional culture whilst our study, spanning several SoTL journals, more accurately reflects the work of the SoTL community.

Comparison between our SoTL results with reviews of methodological approaches from other fields of inquiry reveals stark contrasts as the prevalence of mixed method research varies considerably across disciplines. Hart, Smith, Swars and Smith (2009) reported that of the 710 research articles examined in mathematics education published over a period of 10 years, 50% used qualitative research design, 21% used quantitative, and 29% used a combination of qualitative and quantitative. Their findings clearly show that a single approach (qualitative) dominated publications in the field of mathematics education. Alise and Teddlie (2010) carried out a study to measure prevalence rates across a number of disciplines. These authors reported 24% of articles presented mixed methods research across five elite education journals, but only 6% in psychology and sociology, indicating further examples of uneven distribution of methodology across specific fields of inquiry. A striking study by van der Roest, Spaaij, and van Bottenburg (2015) demonstrated the scarcity of mixed methods research in the field of sports management, identifying only 1.7% of publications as using this approach. Whilst SoTL is having an internal debate about research study design with concerns about plurality of approaches, our results demonstrate a fairly even spread of approaches when compared to other fields of inquiry. The results of our current study support the 'big tent' claim that SoTL is inclusive of various approaches to research as espoused by Huber and Hutchings (2005).

However, given the claims of several prominent SoTL scholars (Bass & Linkon, 2008), the description of SoTL research design should extend beyond those characterised as qualitative, quantitative, or mixed methods. For instance, alternative approaches are common in the humanities, such as close reading, which is a literary criticism technique involving the in-depth interpretation and analysis of written texts (Bass & Linkon, 2008; Chick et al., 2009a). However, our results from 223 empirical SoTL articles did not find one instance of close reading, or other approaches that fell beyond the boundaries of qualitative or quantitative approaches. A reason for this could be that scholarship that employs discipline-specific research methods may be more readily found in disciplinary journals—in the

case of close reading methods, journals in the arts and humanities. By our operational definitions, any encountered articles utilising close reading would have been categorised as qualitative. Our findings therefore imply that SoTL has the scope to expand into new and alternative realms of research. New SoTL journals are explicitly inviting SoTL scholars to submit work that draws on diverse and under-utilised methodological approaches. For example, *Teaching & Learning Inquiry: The ISSOTL Journal* was established in 2013 and states in its Mission that, "its pages will showcase the breadth of the interdisciplinary field of SoTL in its explicit methodological pluralism, its call for traditional and new genres, and its international authorship from across career stages." (Teaching & Learning Inquiry: The ISSOTL Journal, 2013, Mission section, para. 1). As new SoTL journals emerge with a broader remit, it is plausible that future analysis of SoTL journals will yield results different than the current study.

Gathering data, and ways of collecting and analyzing data

Although approaches to SoTL research were found to be relatively evenly distributed across qualitative, quantitative, and mixed methods, in-depth examination of sources of data, data collection, and data analysis revealed disproportionate distribution. The vast majority of SoTL publications that we analysed gathered data from students (88.34%). Inquiry into student learning is the first of Felten's (2013) five good practices for SoTL. Thus, the high percentage of data sourced from students is perhaps unsurprising as SoTL's ultimate aim is to enhance student learning. However, the results from an analysis of abstracts submitted to the 2014 ISSOTL conference found less than 50% of the presentations or posters sourced data from learners (Powell et al., 2015). Of course, both studies involved gatekeepers in the form of peer-reviewers who decide what gets published, either in the journals selected for this study or the conference studied by Powell, et al. Differences in SoTL presented at a conference and published in international journals would expectedly vary. Nonetheless, further exploration of sources of data in SoTL would benefit the field. Given that we found 83.86% of SoTL publications in this study employed a single source of data, future research should examine the use of triangulation in SoTL studies given the consensus that triangulation improves research practices, particularly studies of learning and teaching that are messy and complex (Mathison, 1988). Triangulation could be through data gathered from multiple sources (learners but also other sources such as academics, employers or graduates) as appropriate.

A range of data collection instruments was identified, although surveys were clearly a preferred tool that were used across qualitative, quantitative, and mixed methods studies. Powell, Harmon, and MacMillan (2015) highlighted the use of surveys in SoTL as an established means of collecting perception data. Although surveys were the dominant data collection mode found in the current study, a range of other instruments were identified (e.g. grades, reflective tasks, usage data from social media or online learning management systems) with just over 50% of the articles using at least two data collection instruments. This suggests that whilst SoTL scholars draw on a single source of data (mainly students), many are collecting relevant data in different ways. Our analysis also showed that studies typically drew on multiple ways of analysing (e.g. descriptive statistics, thematic analysis) and presenting data (e.g. tables, text, figures). Thus, some triangulation is evident. The range of data collection methods indicates variation that resonates with the pluralism of research approaches expected of such a broad field as SoTL (Huber & Hutchings, 2005).

Analysis of data collection revealed another noteworthy trend. Of the 223 articles included in the study, 64.57% relied on one-off, or snapshot, collection of data. Matthews, Divan, John-Thomas, Lopes, Ludwig, Martini, Motley and Tomljenovic-Berube (2013) found that the 71% of 154 SoTL publications in their literature review were focused on single units of study (or modules). Given the

short time-frame of a single unit of study in many SoTL papers, the reliance on one-off data collection is perhaps unsurprising. However, capturing data over a period of time, either from the same participants or by comparing cohorts over multiple years, affords greater triangulation. There is clearly significant potential for SoTL studies to expand to gathering data over multiple points in time and in doing so strengthen the conclusions of their work.

Qualitative and quantitative use and integration in mixed-methods studies

Greene (2007) identifies three components as critical to the design of mixed methods research: the extent to which the qualitative and quantitative approaches are integrated, the relative prominence given to each approach, and the timing of data collection. Similarly, Leech and Onwuegbuzie (2009) describe mixed method research designs as comprising of three fundamental components: the level of mixing between the qualitative and quantitative parts (either partial or full), time orientation (qualitative and quantitative data collected concurrently or sequentially), and the emphasis afforded to the two approaches (equal status or dominant status).

We found that approximately one-third of the papers categorised in our study as mixed methods used an equal-status design in which the same relative importance was given to the qualitative and quantitative approaches. In another third, the quantitative strand dominated, and in the final third, the qualitative strand dominated. Thus a fairly even distribution is evident within mixed methods studies classified in the SoTL articles analysed for this review. This supports the Huber and Hutchings (2005) 'big tent' approach of inclusive SoTL approaches, at least within the types of mixed methods SoTL studies in this review.

However, mixed methods researchers argue that the hallmark of a mixed methods study is equal integration between qualitative and quantitative approaches (Johnson, Onwuegbuzie & Turner, 2007). In practice, many researchers report difficulty in "bringing together the analysis and interpretation of the qualitative and quantitative data and [in] writing a narrative that links the analyses and interpretations together" (Bryman, 2007). An expanding number of publications are now advancing practical strategies or frameworks to facilitate better integration (Bazeley, 2012; Castro et al., 2010; Heyvaert, Maes & Onghena, 2011; O'Cathain, Murphy & Nicholl, 2010). Ivankova, Creswell, and Stick (2006) propose using a visual representation of the research process, illustrating where, when, how, and why data sets are connected and mixed, to aid clarification of integration. Further exploration of mixed methods in SoTL would benefit the field, including SoTL-specific frameworks for employing mixed methods approaches.

CONCLUSION

By examining three-years of publications from three international, SoTL-focused journals, our paper offers insight into the types of SoTL research currently being used in the published literature and establishes evidence that will inform the ongoing debate about research design and shape future discussions in the field. However, our results should be considered in light of several limitations. First, choices used to define the body of literature under review inevitably introduced bias. By explicitly describing our rationale, article selection, and analysis procedures, we sought to provide readers with essential information about the objectives, scope, and criteria we used to facilitate our understanding and interpretation of the study's results. Second, operationalising the varying approaches to complex research SoTL scholars employ, ones that are contested in the literature (e.g. qualitative, quantitative, mixed methods), into concrete definitions is inherently limiting. Again, we sought to address this by explicitly describing our definitions and analysis framework. Third, we deliberately avoided analysis of theoretical orientations found in our literature review and when discussing research approaches. We

acknowledge that all types of research maintain theoretical assumptions and orientations, regardless of whether or not they are explicitly stated. For pragmatic reasons (space in the article and time limitations of the authors) and research reasons (little known from which to build this study), we elected to focus on the current practical implementation of SoTL researchers. Future investigators would do well to further explore the theoretical elements of SoTL studies.

Overall, this review of published SoTL literature reveals instances of methodological pluralism expected of the broad field that is SoTL, supporting the 'big tent' view of the field, particularly when compared to methodological reviews from other disciplines. The findings also demonstrate that SoTL can advance through the inclusion of methodological pluralism (e.g., use of close reading) and adoption of strategies known to enhance the quality of research (e.g., triangulation and visual representation).

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