

Contents lists available at [ScienceDirect](#)

Computers & Education

journal homepage: www.elsevier.com/locate/compedu

Some guidance on conducting and reporting qualitative studies



ARTICLE INFO

Article history:

Available online 9 December 2016

Keywords:

Qualitative
Quantitative
Research
Guidelines
Theoretical stance

ABSTRACT

This paper sets out to address the problem of the imbalance between the number of quantitative and qualitative articles published in highly ranked research journals, by providing guidelines for the design, implementation and reporting of qualitative research. Clarification is provided of key terms (such as quantitative and qualitative) and the interrelationships between them. The relative risks and benefits of using guidelines for qualitative research are considered, and the importance of using any such guidelines flexibly is highlighted. The proposed guidelines are based on a synthesis of existing guidelines and syntheses of guidelines from a range of fields.

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1. Introduction

The quality of research is a key concern globally. This has been reflected in exercises in a number of countries to assess research quality (e.g. The Research Excellence Framework in the UK (<http://www.ref.ac.uk/>); Excellence in Research in Australia (<http://www.arc.gov.au/era-2015>)), often using metrics that have favoured 'objectivist' approaches. This has impacted on the nature of the papers being submitted to journals, with few qualitative papers being published in top tier academic journals (Avenier & Thomas, 2015). This imbalance between papers adopting Quantitative and Qualitative approaches is reflected in *Computers & Education* (Pérez-Sanagustín et al., 2017). We are keen to redress this balance by encouraging the submission of more, high quality, qualitative research.

Research about the pedagogical use of digital technology is interdisciplinary, spanning fields specifically concerned with the design and development of digital technology systems (albeit for use in educational contexts) as well as with teaching across the full range of subject disciplines. Academics from different fields understand and value quantitative and qualitative research differently. This enhances the need for shared understandings about how to judge the quality of qualitative research, whilst recognising these multiple perspectives.

2. What do we mean by qualitative research?

There is much confusion in the literature about terminology related to research, not least in terms of the extent to which you can 'mix and match' between quantitative and qualitative research. Twining's (2010) analysis of the 'quantitative vs qualitative debate' suggests that much of the confusion relates to different 'levels' at which people are considering research. We have extended Twining's framework in Table 1.

Inevitably, Table 1 is a simplification. Thus, for example, there are more than two alternative ontological stances. However, it serves two purposes. Firstly, by clarifying the key terms being used within this paper Table 1 aims to address the problems of the same terms being used differently by different authors (Twining, 2010) and differences in meanings applied to 'the same' terminology (Santiago-Delefosse, Gavin, Bruchez, Roux, & Stephen, 2016). Secondly, by showing how key terms relate to each other, the table helps to resolve the argument about whether you can mix and match quantitative and qualitative research. Within our framing of research, you cannot mix quantitative and qualitative methodologies, because they are based on paradigmatically different theoretical stances (ontological and epistemological views). However, you can mix and match different methods, and both quantitative (i.e. numerical) and qualitative (i.e. non-numerical) data so long as you are doing so in a way that is consistent with your methodology and design (we will explore this further in the relevant sections below).

<http://dx.doi.org/10.1016/j.compedu.2016.12.002>

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Table 1
Summary of key terminology related to research (based upon Twining, 2010, p.155).

Level		Contrasting stances		
Theoretical stance	Ontology Beliefs about the nature of being or reality	There is one objective reality	There are multiple realities	
	Epistemology Belief about the nature and scope of knowledge (how we come to know the world)	You uncover the reality – there is one true explanation	Meaning is culturally defined	
Approach	Methodology Based on paradigmatically different ontological and epistemological assumptions	Quantitative Positivist, Objectivist, Empiricist, Nomothetic	Qualitative Hermeneutic Interpretivist	
	Design Emphases	Overarching strategy for collecting data, such as: Experimental Case study Quasi-experimental Action research Random Controlled Trials Ethnography		
		deductive reasoning inductive reasoning		
	Data (numerical or non-numerical)	Methods	Techniques for collecting data, such as: Survey/questionnaire; Interview/Focus group; Document analysis; Observation	
		Instruments	Specific data collection tools, such as: a specific questionnaire or interview schedule	
Analysis		How the data are processed in order to make sense of them (to answer your research questions)		

Braun and Clarke (2006, p. 81) identify that “Any theoretical framework carries with it a number of assumptions about the nature of the data, what they represent in terms of the ‘the world’, ‘reality’, and so forth”. From a qualitative perspective [at the methodological level] “the whole of human experience is an interpretive activity mediated and sustained by signs” (Baškarada, 2014, p. 15 drawing on; Deely, 1990). This gets to the heart of the ‘mixed methods’ debate. The question is not whether you are using a mixture of numerical and non-numerical data, but how that data is being viewed. Within a qualitative methodology both numerical and non-numerical data are viewed in the same way; all data is a symbolic representation, which needs to be interpreted and thus its meaning is subjective and context dependent.

Within the remainder of this paper, in order to avoid any confusion, we will use the terms quantitative and qualitative when referring to the methodology, and will use the terms numerical and non-numerical when referring to the type of data. Approach is used to encompass the methodology, design, methods (and instruments), and analysis that a particular study uses. Where we quote other authors’ work in which these terms are used differently we will include our equivalent term (from Table 1) in square brackets for the sake of clarity.

3. Quality guidelines

Computers & Education has previously published an editorial on the reporting of quantitative studies (López, Valenzuela, Nussbaum, & Tsai, 2015). Whilst the criteria used to evaluate qualitative research are different to those used to judge the quality of quantitative research (Braun & Clarke, 2006), the conduct of qualitative research should be equally rigorous as those used to judge quantitative research. Thus, this paper attempts to set out equivalent guidelines on the reporting of qualitative research. However, this is challenging due to the diversity and “complexity of the nuances of qualitative research” (Holloway & Todres, 2003, p. 355) and because qualitative research “is divided not just in terms of substantive focus, or even according to the use of particular methods, but by divergent theoretical, methodological and value assumptions: about the nature of the phenomena being investigated and about how they can and should be researched.” (Hammersley, 2007, p. 6). This makes the development of all encompassing guidelines for qualitative research problematic.

Levitt (2015) argues that qualitative research (and specifically grounded theory) requires one to adopt what she calls an *interpretation-* rather than *procedure-driven* way of working. Whilst acknowledging the importance of interpretive judgments in both quantitative and qualitative research, Levitt argues that mathematical procedures, which are necessarily procedure-driven, assume responsibility for identifying patterns in quantitative research. In contrast, qualitative research relies on the identification of patterns “located in the subjective interpretation of data” (Levitt, 2015, p. 456), which may entail adapting the

procedures within any given approach to enable meaningful interpretation of the data. This raises questions about how to judge the quality of qualitative research and whether it is possible to have a single set of criteria that are appropriate across all qualitative approaches (Braun & Clarke, 2006; Hammersley, 2007; Reicher, 2000). Indeed, it may be that such explicit criteria would inhibit effective research (Elliott, Fischer, & Rennie, 1999; Parker, 2004; Reicher, 2000). Hammersley (2007, p. 289) argued that “explicit, concrete and exhaustive indicators” cannot sensibly be used to judge the quality of qualitative research. This was reflected in the unanimous view of 18 experts on qualitative research that guidelines should not be used rigidly to evaluate qualitative research (Hannes, Heyvaert, Slegers, Vandenbrande, & Nuland, 2015). Spencer, Ritchie, Lewis, and Dillon (2003) similarly argued against generic guidelines for qualitative research on the basis that it “should be assessed on its ‘own terms’ within premises that are central to its purpose, nature and conduct.” (Spencer et al., 2003, p. 4).

Nonetheless, the approaches used within qualitative research should be applied rigorously (Braun & Clarke, 2006). Guidelines for the evaluation of qualitative research do exist (e.g. Braun & Clarke, 2006; Elliott et al., 1999; Holloway & Todres, 2003; Kuper, Reeves, & Levinson, 2008; Parker, 2004; Seale, 1999; Silverman, 2000; Spencer et al., 2003; Tong, Sainsbury, & Craig, 2007). Indeed, in their systematic review of such ‘quality criteria guides’ in the health science field, Santiago-Delefosse et al. (2016) identified 81 discrete sets of guidelines. In recent years a growing number of guidelines have been published, often based on syntheses of existing criteria (e.g. Ajduković, 2015; Avenier & Thomas, 2015; Baškarada, 2014; Hannes et al., 2015), a substantial proportion of which are focussed on research in ‘health’ related areas (e.g. Arriaza, Nedjat-Haiem, Lee, & Martin, 2015; Levitt, 2015; O’Brien, Harris, Beckman, Reed, & Cook, 2014; Santiago-Delefosse et al., 2016). The predominance of recent guidelines from fields such as medicine reflects their more recent recognition of the potential value of qualitative approaches to complement their traditionally more quantitative methodologies.

Despite concerns about the possibility of having a universal set of guidelines for evaluating the quality of qualitative research there is also broad agreement that having guidelines would have a number of benefits, including:

- reminding “researchers of what they ought to take into account in assessing their own and others’ research” (Hammersley, 2007, p. 289, p. 289)
- supporting authors in refining their research papers and proposals, encouraging editors and reviewers to think more carefully about how they evaluate papers that report qualitative research, and generally improving the transparency of qualitative research (Hannes et al., 2015)

The proviso being that meeting the criteria set out in guidelines does not guarantee the quality of qualitative research (Hannes et al., 2015) and the key is for the guidelines to be used flexibly in ways that align with the research questions and approach (Patton, 1990; Santiago-Delefosse et al., 2016), by people who have a good understanding of qualitative research (Hannes et al., 2015), as “no more than a reminder and that is always open to revision in the process of being used—indeed, which only gains meaning in particular contexts.” (Hammersley, 2007, p. 288). Used in such ways qualitative research guidelines should support researchers in providing a clear audit trail that allows evaluators to make a context sensitive judgement about the research’s quality (Hannes et al., 2015).

4. Synthesising the guidelines

The guidelines that follow are based on a synthesis of existing guidelines identified in the literature, with a particular focus on guidelines that were developed through a systematic review of the literature. They quite deliberately draw on literature from a range of fields.

Rather than starting by attempting to identify all of the existing guidelines, and then synthesising their recommendations, the approach taken was an incremental one. As individual syntheses of guidelines were identified and read, relevant guidance related to each of the ‘Levels’ identified in Table 1 were extracted. At the point where reading additional existing syntheses of guidelines was not enriching the emerging guidelines (i.e. saturation had been achieved) the review process ended and the synthesis began. This involved identifying guidance that was widely supported by the reviewed guidelines and merging that into coherent guidance for each ‘Level’. In order to avoid massive repetition of references, we selectively referenced particular studies rather than referencing all of the studies that agreed with a particular point. Where there was disagreement between sources this has been noted.

Feedback on the emerging guidelines were obtained from a range of academics within the Centre for Research in Education and Educational Technology (<http://www.open.ac.uk/creet/>), leading to their further refinement.

5. Theoretical stance (Ontology and Epistemology)

All research, whether qualitative or quantitative, is based on theory (Flynn, Sakakibara, Schroeder, Bates, & Flynn, 1990), which in turn is underpinned by an implicit or explicit epistemological position (Van de Ven, 2007). Braun and Clarke (2006) argue that this theoretical stance is often implicit rather than explicit, and typically when undefined assumes a realist [positivist] world view.

Whilst O’Brien et al. (2014) recommend that one should note guiding theory if appropriate there is strong agreement in the literature on the reporting of qualitative research that it is important that the theoretical stance underpinning the

research is made explicit (e.g. Avenier & Thomas, 2015; Baškarada, 2014; Braun & Clarke, 2006; Holloway & Todres, 2003; Santiago-Delefosse et al., 2016; Spencer et al., 2003). The theoretical stance reflects the paradigmatic nature of contrasting ontological and epistemological positions (see Table 1), which underpin the nature of the goals that can be pursued and research claims that can be made (Avenier & Thomas, 2015).

Whilst concluding that it was essential to report the theoretical framework underpinning qualitative research, Santiago-Delefosse et al. (2016) found that across different health science fields experts disagreed about the extent to which this theoretical framework needed to be explained, justified, appropriate, adequate, clear, and aligned with research goals. This raises an important question about the consistency of the underpinning theoretical stance with the overall approach, and internally between the methodology, design, method, instruments, and analysis. Santiago-Delefosse et al. (2016) conclude that it is important to align the underlying theoretical framework, the research questions and the methods/design used.

There does seem to be broad agreement in the literature on qualitative research that there needs to be alignment between the underlying ontological (nature of reality) and epistemological (nature of knowledge) position and the research goals/questions, methods used, results presented and conclusions drawn. Holloway and Todres (2003) recommend that reports of qualitative research should address the issue of coherence and consistency. Avenier and Thomas (2015), Baškarada (2014), Holloway and Todres (2003) and Braun and Clarke (2006) all identify the need for there to be consistency between the underpinning theory, goals of the research, methods of data collection and analysis and the claims made.

This does not mean that qualitative research cannot integrate methods such as questionnaires, nor does it preclude the use of numerical data, so long as the methods used and assumptions made about the status of the data collected align with the underpinning epistemological stance:

“in any research project, it may be possible to integrate elements developed in another epistemological framework, albeit not in an arbitrary manner (Myers & Klein, 2011), but critically and knowledgeably – i.e. by reinterpreting them according to the founding assumptions of the epistemological framework in which knowledge integration takes place.” (Avenier & Thomas, 2015, p. 91)

Thus the critical issue is to be clear about one's underpinning theoretical stance, and ensure that there is explicit alignment and consistency between your theoretical stance and your approach, as well as within the approach and thus between the methodology, design, methods, instruments and analysis.

6. Methodology

As already noted, being clear about the research paradigm/methodology is important (O'Brien et al., 2014). It should reflect the overall goals or objectives of the research, which in turn frame specific research questions, and are underpinned by particular ontological and epistemological positions (as shown in Table 1). The objectives of the research should be clearly stated and linked to the research problem or question (Santiago-Delefosse et al., 2016), which should also be explicitly stated (Holloway & Todres, 2003; O'Brien et al., 2014). Whilst agreeing that the research question should be formulated clearly, Santiago-Delefosse et al. (2016) found disagreement about the format and degree of specification that was appropriate. This might vary between open, exploratory questions (e.g. How is digital technology impacting on teachers' practices in primary classrooms) through to more tightly focussed testing of 'hypotheses' (e.g. Does using < some specific application > enhance students' learning outcomes?). In all cases there should be a logical linkage between the research question, methodology and other aspects of the approach being adopted (Santiago-Delefosse et al., 2016). The research problem should be informed by a review of relevant theory and empirical work (O'Brien et al., 2014) and the literature (Elliott et al., 1999).

Whilst there is universal agreement about the importance of research being informed by the literature, there are differences in view about the nature of that interrelationship, and hence where a review of the literature fits within the research process. A review of relevant literature should locate the study, showing how it relates to existing research (Elliott et al., 1999), identifying gaps (Darke, Shanks, & Broadbent, 1998) and helping to formulate appropriate research questions (Baškarada, 2014; Santiago-Delefosse et al., 2016). Braun and Clarke (2006) note that in studies utilising deductive reasoning the literature should come first, whilst it feeds into the process later for inductive analysis. This reflects that deductive reasoning goes from general principles to specific conclusions (e.g. All digital devices run on electricity, I have a computer, therefore it must run on electricity), whilst inductive reasoning goes from specific instances to a general conclusion (e.g. You have a laptop that has a battery, I have a tablet that has a battery, all digital devices must have a battery). Thus deductive reasoning should start with an understanding of the literature and move into analysis of the data, whilst inductive reasoning should start with the data and then test its conclusions against the literature.

A particular issue for educational technology research relates to the currency of the literature. Digital technology, which many in education refer to as Information Communication Technology (ICT), often develops rapidly and its uptake in society may change relatively quickly, and thus requires reference to up-to-date literature. However, many of the factors impacting on digital technology use in education remain remarkably constant over time. Somekh (2000) suggested that despite changes in research approaches in the field over the previous twenty years research findings had not substantially changed. Twining et al. (2006) similarly noted that many of the issues to do with the implementation of ICT in education are to do with the management of change rather than technological issues. They state that many of these change management issues have been well documented in the literature over several decades, but have remained as key factors impacting on ICT use in education. Thus, rather than excluding potentially relevant literature based on when it was published researchers should consider its

currency, acknowledging that for many aspects of educational technology research the literature often continues to be relevant for decades, whilst for other aspects it dates much more rapidly.

7. Design

“Research design logically links the research questions to the research conclusions through the steps undertaken during data collection and data analysis.” (Baškarada, 2014, p. 5). Tong et al. (2007) and O'Brien et al. (2014) agree that the design (e.g. grounded theory, ethnography, discourse analysis, case study, etc.) should be made clear. The design needs to be defensible (Spencer et al., 2003), in the sense of being clearly discussed, convincingly justified as appropriate to meet the aims of the study, and consistent with the overall approach.

An important element of the discussion of the design of a study relates to ethics. This is particularly critical within qualitative research where the data are often personal and from a small number of individual participants. Whilst all researchers recognise the importance of getting ethical approval for their research, Santiago-Delefosse et al. (2016, p. 148) point out that “Qualitative research ethics are not only a question of procedures and protocols to follow for the researcher's legal protection, but also a researcher's position with regards to his/her commitment toward his/her subjects.” Where human subjects are involved researchers must gain informed consent and behave in an ethical manner (Elliott et al., 1999). This includes respecting the rights of participants, such as confidentiality and data protection (O'Brien et al., 2014), being respectful of cultural differences (Arriaza et al., 2015) and being honest and explicit about your obligations to participants in the research (Santiago-Delefosse et al., 2016). Spencer et al. (2003) specifically mention discussing with prospective participants any potential dangers of participation, how anonymity will be protected, and how research findings will be reported. Where children are involved then informed consent should be obtained from the child and their parent/guardian. This may not be straightforward, for example with very young children or with individuals who have cognitive or other disabilities, but that does not absolve the researcher of their ethical responsibilities. For more detailed guidance on ethical issues refer to one of the widely used sets of ethical guidelines for researchers such as those from the British Educational research Association (BERA, 2011).

8. Methods & instruments¹

The method(s) used must be appropriate (Elliott et al., 1999), feasible and congruent with the other aspects of the research approach (Santiago-Delefosse et al., 2016). They must be fully specified (Avenier & Thomas, 2015), and “include details on the steps and procedures to follow (including verbatim)” (Santiago-Delefosse et al., 2016, p. 149). Spencer et al. (2003) agree that the method(s) and instruments must be fully described, including detailing any limitations, noting changes made and their implications, and reproducing study documents (e.g. letters of approach, observation guides, etc.).

All data collection involves sampling, though the term sample is often replaced with terms such as cases or participants in qualitative research. This reflects the fact that qualitative research, because of its ontological and epistemological stance, does not consider the sample to be representative of the entire population and thus does not expect to be able to generalise from the study's findings (see below for more on generalisation). This tends to mean that sample sizes in qualitative studies are much smaller than is required for quantitative research.

There is general agreement that both the process of sampling (i.e. how cases/participants are selected) and the details of the sample (i.e. rich descriptions of cases/participants) must be clearly articulated (e.g. Elliott et al., 1999; O'Brien et al., 2014; Santiago-Delefosse et al., 2016). “The sample should be broad enough to capture the many facets of a phenomenon, and limitations to the sample should be clearly justified. Since the answers to questions of experience and meaning also relate to people's social affiliations (culture, religion, socioeconomic group, profession, etc.), it is also important that the researcher acknowledges these contexts in the selection of a study sample.” (Kuper, Lingard, & Levinson, 2008). Spencer et al. (2003) and Tong et al. (2007) both provided very similar lists of elements of the sampling that should be described and justified, including:

- A rationale for the selected sample
- A description of how the sample was selected (e.g. purposive, convenience, snowball, extreme cases, typical cases, etc.)
- How participants were approached and how this might have affected the sample
- Details of non-participation and gaps in coverage and their implications for the study
- The sample size and other characteristics, which should be a detailed profile of the sample

Providing an explicit description of how data were collected is a pre-requisite of quality reporting of qualitative research (Avenier & Thomas, 2015). The quality of the data collected depends upon the appropriateness of the methods used, the quality of the individual data collection instruments, such as the design of questionnaires or interview schedules (which are beyond the scope of this paper); and the process of utilising those instruments. Thus it is critical that an explicit description of

¹ For more detailed information about methods and instruments within a qualitative methodology see one of the general texts such as Cohen, Manion, and Morrison (2011) or Robson and McCartan (2015).

each of those elements is provided. Evidence should be collected from multiple sources to enable triangulation (see below) (Baškarada, 2014).

The data collection instruments (e.g. questionnaires, observation guides) and any devices used (e.g. video cameras, audio recorders) should be described (O'Brien et al., 2014), as should conventions for data capture such as audio recording in interviews or making field notes during observations (Spencer et al., 2003). Where software is used to support the data analysis this should be explained (Tong et al., 2007, p. 352). Copies of instruments should be provided (e.g. in an appendix or linked document). The way in which the suitability of instruments was assessed should be explained, for example how they were piloted (Tong et al., 2007).

Arriaza et al. (Arriaza et al., 2015, p. 85). Note that “in qualitative research the researcher becomes the instrument for collecting data” which means that not only do details of the data collection process need to be provided, but also information about who carried out the data collection and who else was present, and the nature of the relationships between them (Tong et al., 2007). Thus, the context within which the research is taking place matters (Spencer et al., 2003) and salient feature of the setting should be described along with an explanation of how the data collection process evolved as the study progressed (O'Brien et al., 2014). This includes the historical background and social/organisational characteristics of the research setting (Baškarada, 2014; Spencer et al., 2003).

The key is ensuring that the data are collected appropriately and that the data collection is systematic and well organised, and sufficient contextual information is provided to give readers a feel for what it was like to be there (Kuper, Lingard, et al., 2008). In order to achieve this the researcher needs to be both context-sensitive and flexible (Holloway & Todres, 2003).

A challenge in qualitative research is that one collects too much data and do not have the capacity to analyse it all adequately. Data collection should be clearly focused on addressing the research questions and should continue until the point at which further data collection no longer reveals new patterns, themes or other findings (i.e. until 'saturation' has been achieved) or new data is not enriching the thickness of descriptions. Data that isn't going to be analysed and/or doesn't contribute to addressing the research questions should not be collected.

Another danger in qualitative research is that data collection (and analysis) is superficial, for example, with researchers taking what people say in interviews at face value (Pope & Mays, 2009). Thus researchers need to be both collecting data and analysing it concurrently and iteratively (Kuper, Lingard, et al., 2008) – allowing them to interrogate what they see and hear in the moment. This iterative nature of the process should be made explicit (O'Brien et al., 2014). This is reflected in the *General Accounting Office's* (1990), observe, think, test, and revise approach to case studies.

9. Analysis

“[D]ata analysis consists of examining, categorising, tabulating, testing, or otherwise recombining evidence to draw empirically based conclusions” (Yin, 2009, p. 126). It is the process through which interpretations and inferences are made which might include the development of a theory (explanation) or model. (O'Brien et al., 2014). Clearly, the techniques used need to be appropriate (Kuper, Lingard, et al., 2008), which means there needs to be consistency between the method(s) and analysis (Braun & Clarke, 2006). In order to be able to ascertain whether or not this is the case reporting of the analysis “must be explicit and linked to the data and research question” (Santiago-Delefosse et al., 2016, p. 149). Whilst not everyone would agree with Baškarada (2014) that the data analysis process should be guided by prior theory, theoretical assumptions should be spelt out (Braun & Clarke, 2006), and the way in which data is analysed should reflect the research's underpinning theoretical stance (Avenier & Thomas, 2015).

Presentation of the data and analysis, which shows its depth, detail and richness, gives an indication of the quality of the data collection (Spencer et al., 2003). O'Brien et al. (2014) suggest that reports of data analysis should include methods of processing such as data entry, transcription, data management and security, verification of data integrity, coding, and anonymization. Thus, presentation of the data analysis should provide an explicit description of “all the operations performed in relation with the empirical material” (Avenier & Thomas, 2015, p. 98) and should allow a reader to follow each step of the analysis (Santiago-Delefosse et al., 2016) and provide what (Baškarada, 2014, p. 10) describes as “an auditable chain of evidence”. It is by making the data and its analysis visible that their credibility and trustworthiness can be verified (Santiago-Delefosse et al., 2016).

There is general agreement that the data analysis needs to be systematic (e.g. Kuper, Lingard, et al., 2008). However, Santiago-Delefosse et al. (2016) flag differences across disciplines in expectations about what a good account of data analysis looks like, for example, with some fields being more concerned with the analysis being insightful whilst others focus on threats to validity and reliability. That is not to say that the credibility of the research doesn't matter in some fields, but in some instances it might be argued that research that might be judged to be relatively weak in terms of rigour is still valuable because of the insights it provides.

For those working within a qualitative methodology the notions of reliability and validity are problematic because they conflict with relativist ontological and epistemological positions. As Avenier and Thomas (2015, p. 89) note, “the validity of research results can only be justified in reference to a certain vision of what is knowledge, i.e. in reference to an epistemological framework”. Thus, qualitative researchers often replace reliability and validity with terms such as truthfulness, credibility, and trustworthiness (Avenier & Thomas, 2015; Holloway & Todres, 2003).

Whilst being transparent and explicit about the data analysis process is critical in order to enable the credibility and trustworthiness of the research to be established (Arriaza et al., 2015), it is not sufficient. The researcher's assumptions and

decisions also need to be made clear (O'Brien et al., 2014), including how interpretations of data have been checked and inferences drawn (Avenier & Thomas, 2015). From a qualitative standpoint data collection and analysis is inevitably subjective. In order to enhance the credibility of the research it is important to explicitly take the researcher's influence on the data collection and analysis into account through being reflexive (Arriaza et al., 2015; Baškarada, 2014; Kuper, Lingard, et al., 2008). Thus, the active role of the researcher in making judgements about what is of interest needs to be made clear (Braun & Clarke, 2006). Whilst Santiago-Delefosse et al. (2016) noted differing views about what this involves, Hannes et al. (2015) were clear that reflexivity needs to go beyond simply discussing the researchers impact on the research procedure or highlighting potential conflicts of interest. It should include discussion of any researcher values, biases, assumptions, relevant interests or other characteristics that might influence the research (O'Brien et al., 2014; Spencer et al., 2003; Tong et al., 2007); what Elliott et al. (1999, p. 221) refer to as “owning one's perspective”.

Credibility and trustworthiness can also be enhanced through analytic processes such as:

- Data triangulation – using data from different participants or in different settings or at different times (Santiago-Delefosse et al., 2016)
- Method triangulation - using multiple methods to collect data (Kuper, Lingard, et al., 2008; O'Brien et al., 2014; Santiago-Delefosse et al., 2016)
- Participant checking - giving participants the opportunity to comment on transcripts and emerging findings (Elliott et al., 1999; O'Brien et al., 2014; Santiago-Delefosse et al., 2016; Tong et al., 2007)
- Investigator triangulation – having two or more researchers involved in the data collection and/or analysis (Elliott et al., 1999)
- Theoretical triangulation – interpreting the data using two or more theoretical frameworks (Elliott et al., 1999)

Overall the credibility of qualitative research depends upon “the logical consistency that exists between the theoretical reference, research question, collection techniques and data analysis. This logic must be as explicit as possible, and must present the verification methods used such as the triangulation of data and analyses, the search for negative cases and the feedback given to participants.” (Santiago-Delefosse et al., 2016, p. 149).

There are a number of common problems with analysis within qualitative studies. The first is lack of analysis. This may involve showing the data, which may include paraphrasing it, rather than interpreting it (Avenier & Thomas, 2015). Data analysis should involve moving from descriptive information to patterns and abstractions (Baškarada, 2014). It should be explanatory (Pope & Mays, 2009), using extracts from the data to elucidate how the researcher has made sense of it (Braun & Clarke, 2006). Pope and Mays (2009) note one danger of using qualitative data analysis software is that it looks systematic, but the researcher still needs to interpret the data.

The second common problem is a lack of criticality within the analysis. As already noted this includes taking what people say at face value (Pope & Mays, 2009). A convincing analysis explicitly seeks out and tests rival explanations (Baškarada, 2014) and counter examples (Spencer et al., 2003), whilst still being internally consistent and coherent, and with a clear match between the analysis and data (Braun & Clarke, 2006).

A third common problem that undermines the credibility of the analysis is failure to provide sufficient examples from the data (Braun & Clarke, 2006), so that you fail to convey its depth and complexity (i.e. richness) (Spencer et al., 2003). High quality analysis involves providing the right balance between data extracts (e.g. quotes from the data) and analytic narrative (i.e. text explaining and justifying how the data are being interpreted), in order to tell “a convincing and well-organised story” (Braun & Clarke, 2006, p. 96). Elliott et al. (1999) agree that a good analysis provides a coherent data-based narrative, but highlights the importance of preserving the nuances in the data. Thus, there needs to be a clear link between the data, analysis and conclusions (Avenier & Thomas, 2015; Baškarada, 2014; Spencer et al., 2003), which enables readers to evaluate alternative interpretations (Elliott et al., 1999).

Spencer et al. (2003) and Santiago-Delefosse et al. (2016) refer to generalisation, and the need to identify the extent to which findings can be generalised to wider populations. However, from an ontological and epistemological standpoint the notion of generalisability, in the sense of straightforward transfer of findings across contexts, is problematic for qualitative research. There are two ways in which the findings from qualitative research may be applied across contexts. Firstly, if the research setting is similar to another setting, the findings may resonate (Kuper, Lingard, et al., 2008); they may help to highlight, illustrate or suggest explanations for phenomena in the other setting. Secondly, qualitative research can extend its relevance beyond the particular study through the development of theory (Avenier & Thomas, 2015). The onus is on qualitative researchers to be explicit about the epistemological status and the wider relevance of their findings (Holloway & Todres, 2003). The researchers should explain how their research outcomes relate to the literature (Baškarada, 2014; O'Brien et al., 2014) and should be clear about what knowledge claims they are making (Elliott et al., 1999; Spencer et al., 2003) and the limitations of their research (Elliott et al., 1999; O'Brien et al., 2014).

10. Summary

As noted in the introduction, there is an imbalance between the number of quantitative and qualitative studies published in high quality journals (Avenier & Thomas, 2015), and specifically in Computers & Education (Pérez-Sanagustín et al., 2017).

Table 2
Summary of the CAE guidance on qualitative research.

		Level	CAE Guidance
Theoretical stance		Ontology (the nature of reality)	The critical issue is to be clear about one's underpinning theoretical stance, and ensure that there is explicit alignment and consistency within the approach and thus between the methodology, design, methods, instruments, data and analysis.
		Epistemology (how we come to know the world)	
Approach (must be internally consistent and informed by your research question(s))		Methodology	Must align with the underpinning ontological and epistemological assumptions, which should be stated. The goals of the research should be clear. The research should be informed by relevant literature, which is still current (which may include very old papers)
		Design	Must align with methodology. Should be clearly articulated and justified. Should address ethical considerations.
	Data (numerical or non-numerical)	Methods Instruments	Must align with methodology and design. Should be appropriate, feasible and fully specified, including describing and justifying: who carried out the research, the context of the research; the cases/participants; how data were collected (including details of any instruments used); how the data collection process evolved.
		Analysis	Must align with methodology, design, methods and data. The techniques for processing data and drawing inferences should be fully described and justified. The depth and breadth of the data should be made clear. Should be reflexive. Should go beyond description. Should be critical (e.g. considering alternative interpretations and seeking out counter examples). Should make clear how findings relate to existing literature. Should make clear its limitations and broader relevance.

Notwithstanding concerns about the extent to which one set of criteria can adequately cover the range of different qualitative methodologies, providing guidance for conducting and reporting qualitative research is likely to help address this imbalance. The key is that the guidance is used flexibly and is not viewed as a rigid list of criteria (Santiago-Delefosse et al., 2016). Table 2 provides a summary of the key guidance for qualitative research.

It is important to acknowledge that a major challenge for qualitative researchers is how to adequately address all of these requirements within the constraints of journal word limits (Hannes et al., 2015). As O'Brien et al. (2014) note, qualitative researchers are expected to provide much more detail and justification of each aspect of their approach than quantitative researchers. This is mitigated to some extent by journals, such as Computers & Education, being flexible about word length and encouraging researchers to publish supplementary materials (e.g. research instruments, data sets and/or extracts, and other relevant information) online, with links from the article itself.

Ultimately the value of any research should be evaluated in terms of "its ability to provide meaningful and useful answers to the questions that motivated the research in the first place." (Elliott et al., 1999, p. 216).

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Available online 9 December 2016