

The use of audio-visual lecture capture technology as a means of facilitating reflective practice

Teacher Education Advancement
Network Journal
Copyright © 2021
University of Cumbria
Vol 13(1) pages 86-99

Lewis A. Baker
University of Surrey and University of Cumbria

Abstract

A mixed-method of questionnaires and analysis of audio-visual recordings are used to contextualise one's use of lecture capture technology on a Foundation Year provision at a higher education institute. The researcher's use of lecture capture technology appears to mirror many aspects of its use amongst colleagues, including the method used and the frequency it is employed. The researcher's existing lectured captured content is analysed against common Bloom taxonomy verbs to gain quantitative insight into how questioning is used in lecture sessions. Several assumptions and preconceptions surrounding the number of questions, the cognitive difficulty, and the distribution of verbs in questions posed to students are found to be unsubstantiated. Such reflections lead to several practical changes to improve engagement and cognitive demand for students in lectures, ultimately, aiding student transitions to further levels of study. This work provides an impetus and scaffold for reflecting on one's practice using lecture capture technology and a clear case is made for the value of data contained in existing lecture captured content.

Keywords

Critical reflection; Lecture capture, Questioning; Professional development; Higher education.

Introduction and review of the literature

It is a simple and intuitive postulate that *high-quality teaching will lead to high-quality learning*, but how do we know we are providing high-quality teaching or seeing high-quality learning? Whilst there is no magic bullet to high-quality teaching, Coe et al. (2014) reviewed and synthesised the educational literature to unravel a set of themes, summarised in Figure 1. These themes find broad agreement (Cotton, 1995; MacGregor, 2007; Danielson, 2007), although within this agreeability lies an issue. These themes are broad enough to agree on themes for high-quality teaching, but it is somewhat left to the teacher to map these themes onto their everyday practice in order to *reflect* on whether or not they, themselves, are delivering high-quality teaching (Black and Wiliam, 1998). As put by Elmore (2004, p.4, quoted in MacGregor, 2007, p.5), '...it is pointless to work on [pedagogic] structures until you know specifically what kind of practice you are trying to engender'. Thus, a disparity exists between the themes which contribute to high-quality teaching, and teachers successfully reflecting on their practice against these themes. It is not unreasonable then to suggest the overarching theme which contributes towards high-quality teaching is a teacher's *ability to reflect* as a means for improvement (Danielson, 2007).

It is this dimension of high-quality teaching which seeds the motivation for this work. The ensuing text contextualises what is meant by 'reflection' and justifies it as an integral process for teachers to go through to improve their practice. Methods for effective reflection are discussed and the use of lecture capture is presented as a potentially underutilised tool that can aid a teacher's reflection, particularly, although not exclusively, within higher education. The use of questioning is used as a focal point for reflection as one dimension of high-quality teaching.

Citation

Baker, L. A. (2021) 'The use of audio-visual lecture capture technology as a means of facilitating reflective practice, *TEAN journal*, 13(1), pp. 86-99.

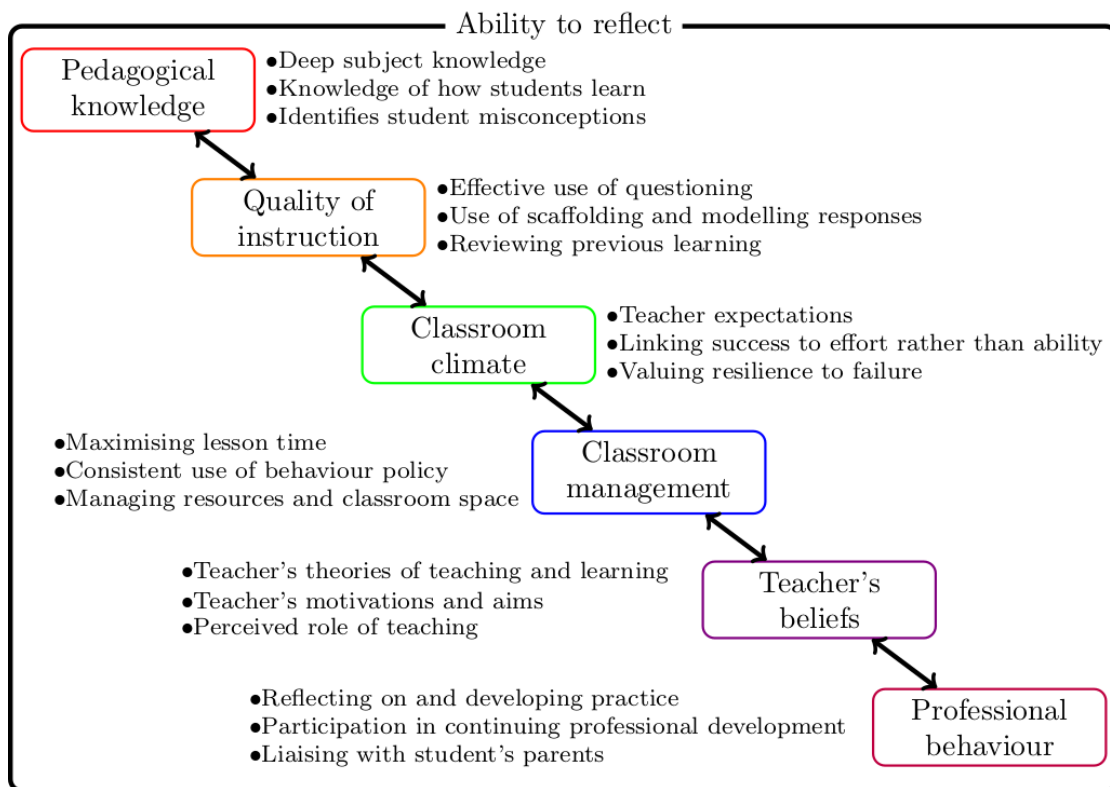


Figure 1. A summary of the common themes and characteristics linked to high-quality teaching to promote high-quality learning (Coe et al., 2014). The ability to reflect can be considered the overarching theme (Danielson, 2007).

Firstly, *what is the role of reflection?* The meaning of *reflection* will invite numerous definitions based on the subject field in which it is being used (Kinsella, 2010). For educational practice, it is perhaps most aptly defined as ‘...a way of thinking about educational matters that involves the ability to make rational choices and to assume responsibility for those choices.’ (Ross and Bondy, 1996, p.65, quoted in Fendler, 2003, p.18). As such, reflection is both a skill and an attitude where a *reflective practitioner* considers some *evidence* to better inform their practice (Kelchtermans, 2009). The notion of ‘becoming a reflective practitioner’ for a (successful) teacher is well established throughout teacher accreditation (Amobi, 2006; Department for Education, 2019), continuing professional development (McCormack, Gore and Thomas, 2006), and is embodied within national teaching standards (Department for Education, 2011; Advance HE, 2011; Ofsted, 2019).

Why do we reflect? Reflecting is intuitive; whenever we experience something new we naturally ask ourselves, ‘What happened?’, being *retrospective*, ‘How did I feel?’, exhibiting *self-evaluation*, ‘What would I do next time?’, *reorienting* ourselves – these constructs are the very personification of ‘life-long learning’ (Finlay, 2008). Whilst reflective processes follow these foundational constructs, reflecting on our professional practice often does not come as easily, rather, it is a skill that must be continually developed for a teacher to remain a critical practitioner (Boud and Walker, 1998). When reflective practice is done effectively, it can transform a teacher’s practice as well as their perceptions of their profession (Yost, 2006; Hobbs, 2007; Gardner, 2009).

Acknowledging the necessity for teachers to reflect, we must then ask, *how do we reflect?* Everyone faces individual barriers to professional reflection. A common barrier is that emotions and feelings are often considered ‘intellectually inferior’ to subject-specific cognition which goes on to undermine the

value or 'buy-in' of reflection (Brookfield, 1994; Kelchtermans, 2009). However, engaging with emotion is a key part of the reflective process which if left unprocessed, can lead to teachers feeling fatigued, anxious and burning out (Bassot, 2015). Similarly, the context of reflection is critical to successful reflection, e.g. the 'where?', 'why?', 'how?', since they can make disclosing thoughts uncomfortable (Boud and Walker, 1998). To overcome some of these barriers, reflective frameworks have been developed to structure and guide reflection (Finlay, 2008), including the popular Kolb (Kolb, 2014), Gibbs (Gibbs, 1988), and Rolfe *et al.* (Rolfe, Freshwater and Jasper, 2001) models (or 'cycles') of reflection. Whilst this structure can help teachers develop as reflective practitioners, it is important to note critics point out that by standardising or diminishing reflection to a *one-size-fits-all*, it can make the process more superficial, reducing the effectiveness of reflection (Finlay, 2008; Coward, 2011; Thompson and Pascal, 2012; Middleton, 2017).

Being a reflective practitioner entails a process of continual and incremental improvement (Russell, 2005). Within education, the most frequent method of reflection is peer observation (Lomas and Nicholls, 2005; Hammersley-Fletcher and Orsmond, 2005). Typically, a practitioner will have colleagues observe them *in situ* and provide feedback on an element of their practice, or the practitioner themselves will observe an element of teaching in another colleague. The idea is for the practitioner to *notice* something about their practice to evoke reflection (Van Es and Sherin, 2002). In complement to or in isolation of observation, the use of reflection diaries is commonplace in education, particularly for new practitioners (Boud, 2001; Wallin and Adawi, 2018). Thoughts and feelings about a teaching session are written down by the teacher to help internalise and reflect on one's practice. Since this is removed from the teaching session being considered, it gives the teacher time and space to reflect more deeply (Boud, 2001).

Both the use of observations and reflective diaries have their limitations on how well they elicit and support effective (and authentic) reflection. The effectiveness of observations (as well as any feedback) will depend on the experience of the observer, the quality and time given to feedback, and the relationship between the observer and the observed (Hammersley-Fletcher and Orsmond, 2005). Similarly, for a teacher observing another colleague, the observation will only kindle useful reflection if the teacher is guided in what to notice. The context of observations is also important; do they contribute to some assessment or appraisal structure? Such reflections may instead be overshadowed by some passing criteria (Finlay, 2008), and thus be less authentic. In the same manner, reflective diaries will require some scaffolding on what the teacher is writing. Context again will be of importance. Who else will read the diaries? Teachers may be wary of reflecting on something they are worried about a supervisor reading (Brookfield, 1994; Boud, 2001). Again, acknowledging and engaging with emotions, as well as the context and process in which reflection is happening is key to successful reflective practice (Bassot, 2015). However, a fundamental limitation of both peer observations and reflective diaries is that reflection on one's thoughts, feelings and actions will be the residual emotion and memory of teaching sessions or situations, making any reflection inherently more indistinct or vague (Rosaen *et al.*, 2008).

In overcoming some of these limitations, as well as providing another avenue for reflection, is the emerging use of lecture capture technology (LCT). LCT involves audio and/or video devices to record a teaching session, the product of which is referred to as lecture captured content (LCC). This technology and relevant software have become widely used in education, particularly higher education. Here it has become almost ubiquitous for providing teaching resources for students beyond the confines of the lecture theatre (Ibrahim, Howarth and Stone, 2020; Baker and Spencely, 2020). It is perhaps then, unsurprising, that it is increasingly used as a tool for teacher reflection (Rich and Hannafin, 2009). This could be individual, with a teacher reflecting on their or another's practice, or with others in dialogic reflection. Indeed, a growing evidence-base has linked its use to encouraging more effective reflection through promoting self-consciousness and enhancing reception to feedback

(Smith and Sodano, 2011; Bergman, 2015; Xiao and Tobin, 2018). Perhaps most importantly, using LCT and reviewing LCC can shift the teacher focus from a memory to an accurate account of a session (Rosaen *et al.*, 2008; McCullagh, 2012; Tiarina and Rozimela, 2017). At its core, LCT not only gives additional methods for teachers to notice an aspect of their practice or classroom but also gives them the time to reflect with a true representation of the teaching session. Of course, these benefits will not be guaranteed. There are several personal and professional barriers to using LCC for reflection, as with other modes of reflection. For example, will LCC be available for others to view? Does the subject when producing the LCC know it will eventually be used for reflection? Does this reflection form part of a formal appraisal or evaluation structure? Finally, it, remains unclear how many teachers use such technology as part of their reflection and as such, taken altogether, presents the first research question of this study:

1) *How does one's use of lecture capture technology compare to current use by colleagues?*

If one is to use LCC to aid in their reflection, it is often useful to decide what the focus will be – what is it one wants to *notice* about their practice? This researcher is interested in the use of questioning within lecture sessions as a characteristic of high-quality teaching, *cf.* Figure 1. This interest comes from two standpoints. The first is that the use of questioning by teachers in schools and universities can be notably different. In further education (Framework for Higher Education Qualifications (FHEQ) Level 3), around two-thirds of questions asked by teachers in the classroom are considered low-cognitive order (Cotton, 1988; Brown and Edmondson, 1989; Hattie, 2008). In higher education (FHEQ level 4+), in a lecture session, this trend is almost reversed, where the majority of questions asked are considered high-cognitive order (Duell, 1994; Ziyaeemehr, 2016). The literature surrounding the cognitive distribution of questions used within a teaching session is somewhat sparse but identifying question verbs within cognitive domains may help establish a baseline from which to reflect upon. What constitutes a low-order or high-order cognitive question will depend somewhat on one's interpretation of cognitive taxonomies (Delcourt and McKinnon, 2011), as well as the subject context they are used in. Perhaps the most widely-used is Bloom's taxonomy and its subsequent revision (Krathwohl, 2002), which details six cognitive domains, with increasing cognitive demand (Delcourt and McKinnon, 2011): *knowledge, understand, apply, analyse, evaluate* and *create*, see Table 1. Whilst critics point out that teaching and development of curricula should not use such taxonomies as a rigid structure, it remains a suitable rubric to categorise the types of questions being used in a teaching session (Brown and Edmondson, 1989; Delcourt and McKinnon, 2011; Stanny, 2016). It is important to note that this list is not 'correct', but rather, a tool or baseline to help one notice aspects of one's questioning. Indeed, if a similar analysis were to be carried out in different subject areas, academic levels and educational contexts, one might be informed by a significantly different set of verbs.

The second research interest comes from the researcher's educational context, a Foundation Year (FY) provision in higher education (Dampier *et al.*, 2019). FYs provide a route into higher education for many students who might otherwise not have studied at university (Milburn, 2012; Sanders and Daly, 2013; Sanders, Daly and Fitzgerald, 2016). FY provisions act as a transition from where students were previously studying, typically A-level providers (FHEQ Level 3) to where they will be studying at 1st-year undergraduate level (FHEQ Level 4). As such, teachers should acknowledge the use of questioning in a way they will be familiar with, as well as preparing them for how questioning is likely used further in their studies. The researcher, therefore, wants to understand:

2) *How is one's questioning used in lectures as part of a Foundation Year provision?*

Table 1. The 105 most frequently used verbs associated with the cognitive domains of Bloom’s taxonomy is used as a rubric for analysing LCC (Stanny, 2016). Some verbs appear in multiple cognitive domains depending on the context it is used in.

Knowledge	Understand	Apply	Analyse	Evaluate	Create
cite	classify	act	analyse	appraise	arrange
define	compare	apply	appraise	argue	assemble
describe	convert	calculate	categorise	assess	combine
identify	defend	choose	classify	choose	compose
label	describe	compute	compare	compare	construct
list	discuss	construct	contrast	conclude	create
locate	distinguish	demonstrate	criticise	criticise	design
match	estimate	dramatise	diagram	critique	develop
memorise	explain	employ	differentiate	defend	devise
name	express	illustrate	discriminate	estimate	formulate
outline	extend	interpret	distinguish	evaluate	generate
recall	generalise	manipulate	divide	judge	invent
recite	identify	modify	examine	manage	modify
recognise	infer	operate	infer	prepare	organise
record	interpret	practice	outline	rearrange	plan
relate	locate	prepare	point out	reconcile	prepare
repeat	paraphrase	produce	question	set up	produce
reproduce	predict	relate	relate	synthesise	rate
select	recognise	schedule	select	revise	
state	report	show	separate	write	
restate	sketch	subdivide			
review	solve	test			
rewrite	use				
summarise					
translate					

Research design

An online questionnaire was distributed to understand how colleagues are currently using LCT and existing LCC was analysed against a rubric. Such mixed qualitative and quantitative methods allow for suitable methodological triangulation, improving the context within which conclusions may be drawn with validity (Thomas, 2009; Punch and Oancea, 2014). It represents a blending of both interpretivist and positivist philosophical paradigms (Tekin and Kotaman, 2013; Denscombe, 2014; Punch and Oancea, 2014). The former is selected for the open-end responses from colleagues’ opinions regarding LCT and LCC since it is the thoughts and reasoning of the individual that the researcher wants to understand to contextualise their practice. On the other hand, a positivist approach for examining LCC is more suitable to build up an objective evidence-base of what questions are asked in lectures from which reflection takes place.

Questionnaire. The questionnaire consisted of five questions, a mix of fixed and open-ended questions. It was distributed through email to all colleagues who work on FY provisions at the University of Surrey, and are members of a regular sharing practice meeting, totalling 24 recipients. This group was selected as it most closely resembles the environment within which the researcher teaches, making the contextualisation of any reflection more relevant. Consequently, questionnaire recipients resemble a convenience sample (Szolnoki and Hoffmann, 2013; Etikan, Musa and Alkassim, 2016). Accordingly, it must be acknowledged that since the researcher is a member of this group, the responses are vulnerable to researcher-researched relationships (Råheim *et al.*, 2016). Although the use of ‘snowball’ responses could have reduced both the effects of a convenience sample and the role

of the researcher (Emerson, 2015), it was omitted to maintain a tighter locus for the researcher's use of LCT and subsequent reflections. Therefore, questionnaire responses remain valid only in the immediate context of how LCT is used amongst colleagues on FY provisions at the same institution. Conclusions cannot be generalised further to include non-respondent colleagues or those who teach at other FHEQ levels (Baruch and Holtom, 2008; Fincham, 2008).

Analysis of lecture capture. Audio recordings of 17 lectures totalling 790 minutes of audio recorded teaching, were analysed against the rubric. The audio recordings were from one unit of assessment of a physics module taught over six weeks cumulating in a summative assessment. These audio recordings were made before the design of this research to capture the reality of one's practice, without the knowledge of an ensuing analysis. The rubric used was derived from a meta-analysis of common Bloom's taxonomy verbs, for which the most frequently used are given in Table 1 (Stanny, 2016). Each lecture was analysed against this rubric and the number of questions for each verb, either spoken or written within presented materials, was recorded.

This research received favourable ethical opinions from the University of Cumbria, and an ethical self-assessment by the researcher indicated a further review by a committee at the University of Surrey was not required (University of Surrey, 2017; University of Cumbria, 2018). Participants were provided with a Participation Information Sheet attached to an invitation email which linked to a Microsoft Forms questionnaire. The invitation email, Participation Information Sheet, and questionnaire outlined that participation was entirely voluntary, the purposes of the research, how responses would be used, stored and anonymised, and that participants had the right to withdraw (Denscombe, 2014; BERA, 2018). The invitation was re-sent to the group a week later to boost response rates (Fincham, 2008). Informed consent was sought explicitly by a single closed mandatory question on the questionnaire (Hammersley and Traianou, 2012; BERA, 2018). The LCC used in this research was produced and analysed by the researcher who lectured these teaching sessions as part of normal teaching commitments, prior to designing and conducting this research project. Finally, no other data was captured in these recordings, *e.g.*, from student discourse, where microphones are switched off.

Findings and discussion

A total of 10 responses were received, all of which completed the questionnaire in full, representing a response rate of 42%. All consented to the use of their responses for the ensuing analysis. Quantitative data is therefore not statically significant but results still provide relevant scope and context to locate one's use of LCT. All respondents indicated they taught lecture-style sessions and between them, a range of lecture audiences are taught from 25 students to more than 100 (Figure 2A). The overwhelming majority of respondents use LCT in their lecture sessions, most using a combination of both audio and video recordings (Figure 2B). Furthermore, those who use LCT report that they do so regularly, with 70% of respondents indicating they 'frequently' or 'always' use such LCT in their lecture sessions (Figure 2C).

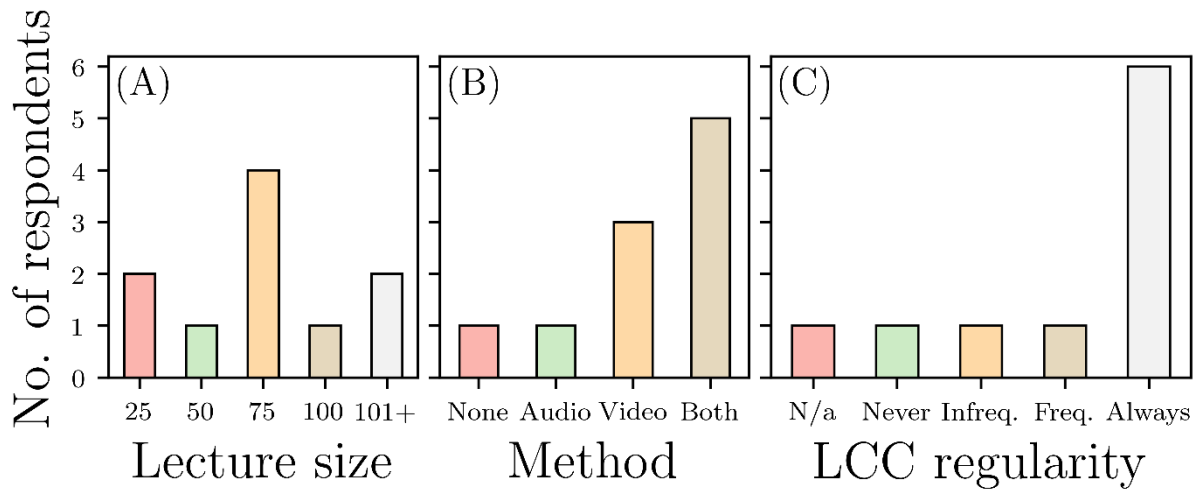


Figure 2. (A) The expected audience size in respondents’ lecture sessions. All respondents indicated they taught lecture-style sessions. (B) Most respondents indicated they use some method of LCT in their sessions, most often a combination of both audio and video recordings. (C) Of those respondents which use LCT, most indicated they use it ‘frequently’ or ‘always’. ‘Infrequently’ and ‘Frequently’ are contracted to ‘Infreq.’ and ‘Freq.’ respectively.

Analysis of the 17 lecture sessions against the rubric given in Table 1 produces a quantitative picture of how often questioning was used in lecture sessions (Figure 3A). Each recording was on average 47 ± 1.8 minutes in duration, where an average of 1.4 ± 0.4 spoken questions and 5.1 ± 1.3 written questions were asked, totalling an average of 6.5 ± 1.3 questions per lecture. All reported uncertainties are standard error of the mean. These questions utilised 20 unique verbs from the rubric, which spanned a distribution of all cognitive domains (Figure 4). The modal verb used was ‘sketch’ and ‘calculate’ for spoken and written questions respectively. Considering each cognitive domain as discrete monotonically increasing cognitive demand *i.e.*, ‘Knowledge’ = 1 and ‘Create’ = 6, the average cognitive domain for all spoken questions was 2.48 and for written questions was 2.64, representing a total weighted cognitive demand of 2.60 (*cf.* Figure 3B).

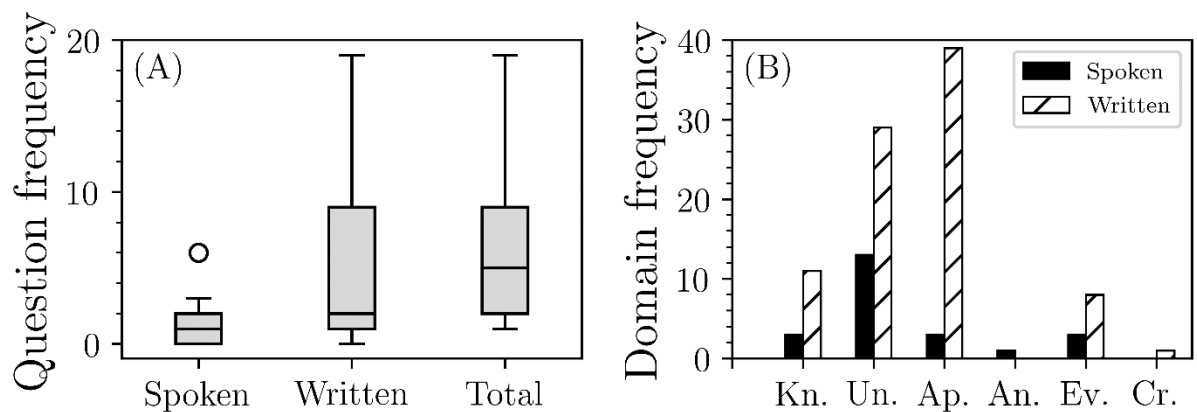


Figure 3. (A) The frequency with which spoken and written questions were asked of students in any one lecture. (B) The distribution of questions is categorised by their cognitive domains; Knowledge (Kn.), Understand (Un.), Apply (Ap.), Analyse (An.), Evaluate (Ev.), and Create (Cr.).

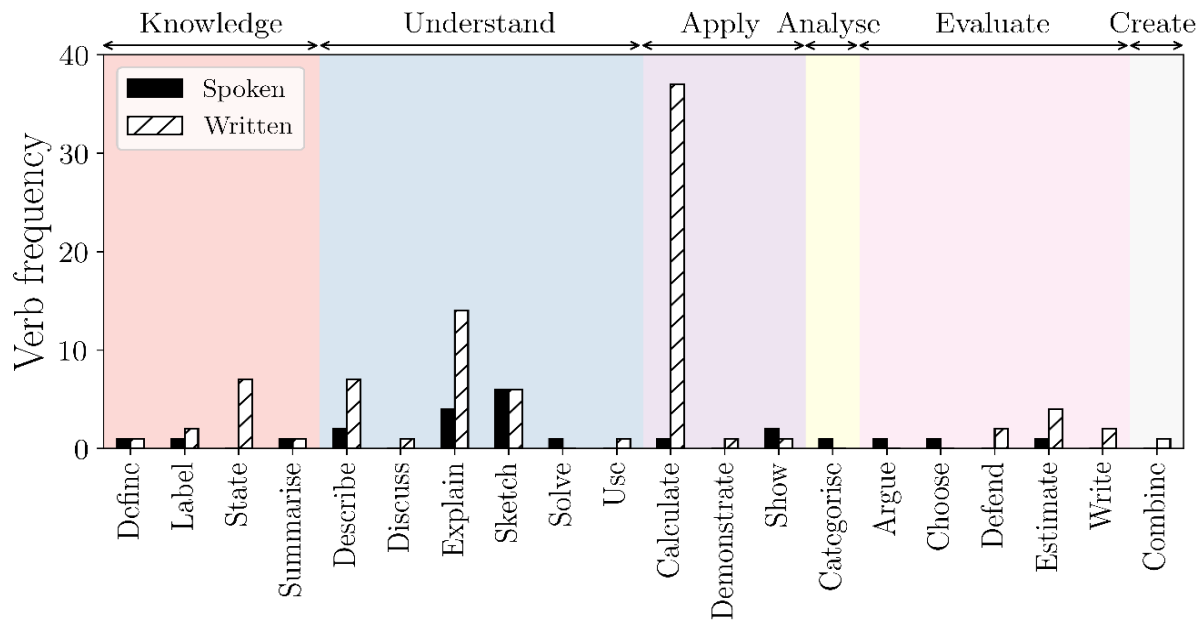


Figure 4. The frequency of the 20 unique verbs either in spoken dialogue or written on lecture notes, as observed in LCC.

The purpose of the questionnaire sent to colleagues in the FY was to help locate the researcher’s use of LCT in the wider context of the educational setting. The researcher always uses LCT in lecture sessions and would expect up to 100 students in such sessions. Thus, the context of lecture sessions is comparable to most respondents from the FYs, where 70% expect audiences of up to 75 students, or more (Figure 2A), and ‘frequently’ or ‘always’ uses LCT lecture sessions (Figure 2C). A notable difference, however, is with the methods of LCT used. The researcher only uses audio recordings (in conjunction with real-time screen capture for the lecture notes) whereas 80% of respondents either used video recordings or a combination of both audio and video recordings (Figure 2B). Whilst there is ambiguity in whether such real-time capture of lecture notes constitutes ‘video capture’, it may suggest that many practitioners also record video in such sessions, which would add another dimension on which to reflect (Tiarina and Rozimela, 2017).

Respondents were asked ‘For what reasons do you use lecture capture technology in your lectures?’. This elicited a clear student-centric rationale for its use, and an institutionally derived pressure to use it. For example, illustrative responses said they use lecture capture ‘To allow students to review the lecture for consolidation/revision purposes’ and that ‘The university expects us to do this’. Whilst the use of LCT surrounds the ‘student experience’ (Ibrahim, Howarth and Stone, 2020), it does suggest its use as a tool for reflection is not widely utilised, where only one respondent indicated using LCC to ‘...allow me to review my own teaching’. Some insight can be gleaned from responses on why some may choose not to reflect on their LCC. For example, some indicated discomfort in listening/seeing themselves in such recordings, or, how they should or should not alter behaviour when they know a recording is taking place. As one respondent said, ‘I feel a bit uncomfortable recording because then I get more stressed about making mistakes’, which resonates with findings of staff attitudes towards LCT (Bond and Grussendorf, 2013). Overall, this suggests there is an opportunity for colleagues to use LCC as a useful academic andragogical tool, for example, as illustrated in this work, critical reflection.

Considering next the results of analysing the researcher’s LCC. The most immediate observation is centred on the verbs used for questioning (Figure 4). From the 105 unique verbs in the rubric, only 20 were used across all analysed recordings. At first instance, the researcher assumed most verbs are used at one time or another during a series of lectures, after all, it is not hard to phrase a question

around a different verb. Yet, analysing the lectures, the spread of verbs being used is narrow. One reason for this is that many questions given to students in lectures were phrased as ‘what’, ‘which’, ‘how’ and ‘why’, *i.e.* without a verb. Whilst it may be reasonable to expect a student to interpret the nature of the question (e.g. dialectic discourse), one might ask, *is it always obvious to the students what they should be doing?* An illustrative example from one lecture recording highlights this: ‘What does an unloading curve look like for plastic deformation?’. A student might write prose, another might sketch a graph. Both these answers would be reasonable based on the ‘what’. One therefore asks, *what have I asked the student to do?* In many cases, a ‘what’, ‘which’, ‘how’ or ‘why’ has not explicitly asked them to do anything! This observation is useful because it highlights another unsupported assumption, *that the students know what I expect them to do*. This can be addressed by substituting an appropriate verb, for example, rephrasing the question as ‘Sketch the unloading curve for plastic deformation’. Such verb substitutions would help direct the student towards the actions one *wants* them to do, rather than the actions one *hopes* they will do, in cases where the teacher is using more didactic discourse.

Similarly, it was noted that several verbs frequently used within lectures, such as ‘prove’, ‘justify’, ‘confirm’ and ‘derive’, are absent from the rubric in Table 1. These verbs are commonplace within the physical sciences and as such, might warrant an augmented rubric to fully capture the scope of questioning being used if one wants to further contextualise their teaching.

Another observation noted by the researcher, which challenged one’s supposition, was the number of questions asked in lectures. At 6.5 ± 1.3 questions per session (Figure 3A), it simply felt lower than expected. Furthermore, the number of questions asked displayed a large variation between lecture sessions, ranging from a minimum of 1 question asked to 19 questions asked. To some extent, this is explained by ‘missing’ rubric verbs or questions asked without the use of a verb, however, another explanation becomes apparent when reviewing audio recordings. Many ‘questions’ were simply not asked at all, for example, in worked examples and rhetorical dialogue. Whilst there is nothing inherently wrong with this; worked examples and rhetoric are important teaching devices, it does mean that the students were not directed to attempt these questions. Rather, there is a risk that one *thinks* a student is answering these ‘questions’ in their head, but instead they are passively parsing the question. With subtle changes to the order of lectured content, one can create more opportunities to ask explicit questions ensuring the learning is more active.

Turning attention to the distribution of questions asked several interesting facets of one’s teaching are uncovered. As shown in Figure 3A, written questions are more often posed to students than spoken questions. Whilst there are different pedagogical and classroom environmental reasons for using different modes of questioning, there is a clear difference in the cognitive domain between spoken and written questions (*cf.* Figures 3B and 4). Normalising the domain frequency by the total number of spoken and written questions, and mapping domains to a discrete monotonically increasing scale, the average cognitive domain for all spoken questions was 2.48 and for written questions, 2.64, supporting this observation. This suggests there are some missed opportunities for higher cognitive questions, particularly spoken questions, which would likely elicit higher-quality student discourse. Additionally, it suggests that the cognitive demand is on average, on the lower end of the taxonomy. As suggested in the research literature, typically two-thirds of questions posed to students can be considered lower cognitive order in secondary education, whereas in higher education, the reverse is more likely (Cotton, 1988; Brown and Edmondson, 1989; Duell, 1994; Hattie, 2008; Ziyaemehr, 2016). Evaluating cognitive domains with this ratio suggest schools might expect an average domain of 3.0 and undergraduates might expect an average domain of 4.0 if one assumes a uniform distribution of questions across all domains. Thus, even with this coarse analysis, it would likely be appropriate to increase the number of more cognitively demanding questions to ensure students are appropriately exposed to verbs they will likely face at FHEQ Level 4.

The distribution of verbs also yields useful insight. For spoken questions, the modal verb is 'sketch' appearing 4 times, and for written questions 'calculate' appeared 37 times (Figure 4). This can make a domain appear well sampled, *e.g.* Figure 3B shows a peak in the 'apply' domain, however, this is almost entirely due to the one modal verb. Instead, this suggests that the variation of verbs used *within* a domain could be improved. For example, many instances of the use of 'calculate' could be substituted with 'choose', 'compute' or 'show', to expose students to more verbs whilst preserving the cognitive demand of the question.

Whilst the scope and context of using LCC to facilitate one's reflective practice have been made clear, there are several areas for which further work would be fruitful. Extending this analysis to video recordings could provide another dimension to analyse one's practice. Analysis using a subject-specific rubric could further the context of one's teaching and, importantly, help determine the effect the rubric itself has on this type of analysis. Collaborating with colleagues at different FHEQ levels to design a rubric to share amongst colleagues might enhance transition for students between further levels of studies. However, care must be taken not to establish a rigid, one-size-fits-all structure or integrate it into any formal appraisal process, doing so will undoubtedly degrade the quality of reflection. Finally, it would be useful to understand colleagues' experiences using LCC for reflective practice, which would help to recognise the barriers to using LCC as a tool for reflection within this educational context.

Conclusions and implications

The purpose of this work was to provide scope and context to how lecture capture can be used to reflect on one's use of questioning in lecture sessions on a Foundation Year provision. Colleagues' opinions provide useful insight into how and why they choose to use lecture capture in their teaching. Overwhelmingly, colleagues report a student-centric rationale for its use and regularly employ both audio and video recordings as part of their teaching, though most do not use it for reflection, thus, this work may serve as a stimulus. By analysing the use of questioning against a predetermined rubric of common Bloom taxonomy verbs, comparative statistics can be constructed from a series of lecture recordings. From this, the researcher found that multiple assumptions about one's practice were unfounded. A narrow range of verbs in questions was used suggesting an ideal opportunity to diversify. Furthermore, the absence of verbs from a predetermined rubric highlights that care should be taken in using rubrics since verb distributions will vary significantly between subjects and educational contexts. Finally, it was found the distribution of verbs within each cognitive domain was narrow, and modal verbs were disproportionately used, presenting a clear scope to expose students to a wider range of similarly demanding, but unfamiliar questions.

Thus, a case is made for using lecture capture content as a tool for reflecting on one's practice beyond those used more commonly in education. The data contained within a series of lecture captured content (which often have already been recorded for student experience reasons) can provide multiple avenues to notice something about one's practice, providing the seed for self-reflection or support with colleagues – here, questioning is used as an example. This tool appears to be underutilised for the process of reflection and as such, this work scaffolds lecture capture technology for use as a vehicle for reflective practice.

Acknowledgements

The author would like to thank Jeremy Woodhouse and Ian Todd (University of Cumbria), and Patricia Warner (University of Surrey) for critical reading of the manuscript.

References

- Advance HE (2011) 'The UK Professional Standards Framework for teaching and supporting learning in higher education', Advance HE, Available at: <https://www.advance-he.ac.uk/guidance/teaching-and-learning/ukpsf> (Accessed 08 December 2020).
- Amobi, F. A. (2006) 'Beyond the call: Preserving reflection in the preparation of "highly qualified" teachers', *Teacher Education Quarterly*, 33(2), pp. 23-35.
- Baker, L. A. and Spencely, C. (2020) 'Blending Microsoft Teams with Existing Teaching Environments to Increase Access, Inclusivity and Engagement', *Journal of the Foundation Year Network*, 3, pp. 3-20.
- Baruch, Y. and Holtom, B. C. (2008) 'Survey response rate levels and trends in organizational research', *Human Relations*, 61(8), pp. 1139-1160.
- Bassot, B. (2015) *The reflective practice guide: An interdisciplinary approach to critical reflection*. Routledge.
- BERA (2018) 'Ethical guidelines for educational research', Available: British Educational Research Association, London, Available at: <https://www.bera.ac.uk/publication/ethical-guidelines-for-educational-research-2018> (Accessed 08 December 2020).
- Bergman, D. (2015) 'Comparing the effects of classroom audio-recording and video-recording on preservice teachers' reflection of practice', *The Teacher Educator*, 50(2), pp. 127-144.
- Black, P. and Wiliam, D. (1998) 'Inside the black box: raising standards through classroom assessment', *The Phi Delta Kappan*, 80(2), pp. 139-148.
- Bond, S. and Grussendorf, S. (2013) 'Staff attitudes to lecture capture', *The London School of Economics and Political Science*, LSE Research Online, Available at: <http://eprints.lse.ac.uk/54870/> (Accessed 08 December 2020).
- Boud, D. (2001) 'Using journal writing to enhance reflective practice', *New Directions for Adult and Continuing Education*, 2001(90), pp. 9-18.
- Boud, D. and Walker, D. (1998) 'Promoting reflection in professional courses: The challenge of context', *Studies in Higher Education*, 23(2), pp. 191-206.
- Brookfield, S. (1994) 'Tales from the dark side: A phenomenography of adult critical reflection', *International Journal of Lifelong Education*, 13(3), pp. 203-216.
- Brown, G. and Edmondson, R. (1989) 'Asking questions', in Wragg, E.C. (ed.) *Classroom Teaching Skills: The Research Findings of the Teacher Education Project*: Routledge, pp. 97-120.
- Cotton, K. (1988) 'Classroom questioning', *School improvement research series*, 5, pp. 1-22.
- Cotton, K. (1995) 'Effective schooling practices: A research synthesis 1995 Update', Northwest Regional Educational Laboratory, Available at: <https://educationnorthwest.org/sites/default/files/resources/effective-schooling-practices-508.pdf> (Accessed 08 December 2020).
- Coward, M. (2011) 'Does the use of reflective models restrict critical thinking and therefore learning in nurse education? What have we done?', *Nurse Education Today*, 31(8), pp. 883-886.
- Dampier, G., Baker, L. A., Spencely, C., Edwards, N. J., White, E. and Taylor, A. M. (2019) 'Avoiding the Deficit Model and Defining Student Success: Perspectives from a New Foundation Year Context', *Journal of the Foundation Year Network*, 2, pp. 41-52.
- Danielson, C. (2007) *Enhancing professional practice a framework for teaching*. 2nd edn. Virginia: Association for Supervision and Curriculum Development.
- Delcourt, M. A. and McKinnon, J. (2011) 'Tools for inquiry: Improving questioning in the classroom', *Learning Landscapes*, 4(2), pp. 145-159.
- Denscombe, M. (2014) *The good research guide: for small-scale social research projects*. 5th edn. Maidenhead, England: Open University Press.
- Department for Education (2011) 'Teachers' standards', Department for Education, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/665520/Teachers__Standards.pdf (Accessed 08 December 2020).

- Department for Education (2019) 'ITT Core Content Framework', Department for Education, Available at: www.gov.uk/government/publications/initial-teacher-training-itt-core-content-framework (Accessed 08 December 2020).
- Duell, O. K. (1994) 'Extended wait time and university student achievement', *American Educational Research Journal*, 31(2), pp. 397-414.
- Elmore, R. F. (2004) *School reform from the inside out: Policy, practice, and performance*. Cambridge: Harvard Education Press.
- Emerson, R. W. (2015) 'Convenience sampling, random sampling, and snowball sampling: How does sampling affect the validity of research?', *Journal of Visual Impairment & Blindness*, 109(2), pp. 164-168.
- Etikan, I., Musa, S. A. and Alkassim, R. S. (2016) 'Comparison of convenience sampling and purposive sampling', *American Journal of Theoretical and Applied Statistics*, 5(1), pp. 1-4.
- Fendler, L. (2003) 'Teacher reflection in a hall of mirrors: Historical Influences and Political Reverberations', *Educational Researcher*, 32(3), pp. 16-25.
- Fincham, J. E. (2008) 'Response rates and responsiveness for surveys, standards, and the Journal', *American Journal of Pharmaceutical Education*, 72(2), pp. 1-3.
- Finlay, L. (2008) 'Reflecting on 'reflective practice'', *Practice-based Professional Learning Paper*, 52, The Open University, Available at: <http://oro.open.ac.uk/68945/> (Accessed 08 December 2020).
- Gardner, F. (2009) 'Affirming values: using critical reflection to explore meaning and professional practice', *Reflective Practice*, 10(2), pp. 179-190.
- Gibbs, G. (1988) *Learning by doing: A guide to teaching and learning methods*. Oxford Polytechnic: Oxford: Further Education Unit.
- Hammersley, M. and Traianou, A. (2012) 'Ethics and educational research', British Educational Research Association, Available at: <https://www.bera.ac.uk/publication/ethics-and-educational-research> (Accessed 08 December 2020).
- Hammersley-Fletcher, L. and Orsmond, P. (2005) 'Reflecting on reflective practices within peer observation', *Studies in Higher Education*, 30(2), pp. 213-224.
- Hattie, J. (2008) *Visible learning: a synthesis of over 800 meta-analyses relating to achievement*. Educational Psychology Abingdon: Routledge.
- Hobbs, V. (2007) 'Faking it or hating it: can reflective practice be forced?', *Reflective Practice*, 8(3), pp. 405-417.
- Ibrahim, Y., Howarth, A. and Stone, I. (2020) 'Lecture capture policies: A survey of British universities', *Postdigital Science and Education*. DOI: 10.1007/s42438-020-00102-x (Accessed 08 December 2020).
- Kelchtermans, G. (2009) 'Who I am in how I teach is the message: self-understanding, vulnerability and reflection', *Teachers and Teaching*, 15(2), pp. 257-272.
- Kinsella, E. A. (2010) 'Professional knowledge and the epistemology of reflective practice', *Nursing Philosophy*, 11(1), pp. 3-14.
- Kolb, D. A. (2014) *Experiential learning: Experience as the source of learning and development*. 2nd edn. New Jersey: Pearson Education, Inc.
- Krathwohl, D. R. (2002) 'A revision of Bloom's taxonomy: An overview', *Theory into Practice*, 41(4), pp. 212-218.
- Lomas, L. and Nicholls, G. (2005) 'Enhancing teaching quality through peer review of teaching', *Quality in Higher Education*, 11(2), pp. 137-149.
- MacGregor, R. R. (2007) 'The essential practices of high quality teaching and learning', The Center for Educational Effectiveness, Inc, Available at: www.effectiveness.org (Accessed 08 December 2020).
- McCormack, A., Gore, J. and Thomas, K. (2006) 'Early career teacher professional learning', *Asia-Pacific Journal of Teacher Education*, 34(1), pp. 95-113.

- McCullagh, J. F. (2012) 'How can video supported reflection enhance teachers' professional development?', *Cultural Studies of Science Education*, 7(1), pp. 137-152.
- Middleton, R. (2017) 'Critical reflection: the struggle of a practice developer', *International Practice Development Journal*, 7(1), pp. 1-6.
- Milburn, A. (2012) 'University challenge: how higher education can advance social mobility', Cabinet Office, Available at: <https://www.gov.uk/government/organisations/cabinet-office> (Accessed 08 December 2020).
- Ofsted (2019) 'The education inspection framework', Ofsted, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/801429/Education_inspection_framework.pdf (Accessed 08 December 2020).
- Punch, K. F. and Oancea, A. (2014) *Introduction to research methods in education*. 2nd edn. London: SAGE Publications Ltd.
- Rich, P. J. and Hannafin, M. (2009) 'Video annotation tools: Technologies to scaffold, structure, and transform teacher reflection', *Journal of Teacher Education*, 60(1), pp. 52-67.
- Rolfe, G., Freshwater, D. and Jasper, M. (2001) *Critical reflection in nursing and the helping professions: a user's guide*. Basingstoke: Palgrave Macmillan.
- Rosaen, C. L., Lundeberg, M., Cooper, M., Fritzen, A. and Terpstra, M. (2008) 'Noticing noticing: How does investigation of video records change how teachers reflect on their experiences?', *Journal of Teacher Education*, 59(4), pp. 347-360.
- Ross, D. and Bondy, E. (1996) 'The continuing reform of a university teacher education program: A case study', *Currents of reform in preservice teacher education*. New York: Teachers College Press, pp. 62-79.
- Russell, T. (2005) 'Can reflective practice be taught?', *Reflective practice*, 6(2), pp. 199-204.
- Råheim, M., Magnussen, L. H., Sekse, R. J. T., Lunde, Å., Jacobsen, T. and Blystad, A. (2016) 'Researcher–researched relationship in qualitative research: Shifts in positions and researcher vulnerability', *International Journal of Qualitative Studies on Health and Well-being*, 11(1), pp. 30996.
- Sanders, L. and Daly, A. (2013) 'Building a successful foundation?: The role of Foundation Year courses in preparing students for their degree', *Widening Participation and Lifelong Learning*, 14(1), pp. 42-56.
- Sanders, L. D., Daly, A. P. and Fitzgerald, K. (2016) 'Predicting retention, understanding attrition: A prospective study of foundation year students', *Widening Participation and Lifelong Learning*, 18(2), pp. 50-83.
- Smith, C. M. and Sodano, T. M. (2011) 'Integrating lecture capture as a teaching strategy to improve student presentation skills through self-assessment', *Active Learning in Higher Education*, 12(3), pp. 151-162.
- Stanny, C. J. (2016) 'Reevaluating Bloom's Taxonomy: What measurable verbs can and cannot say about student learning', *Education Sciences*, 6(4), pp. 37.
- Szolnoki, G. and Hoffmann, D. (2013) 'Online, face-to-face and telephone surveys - Comparing different sampling methods in wine consumer research', *Wine Economics and Policy*, 2(2), pp. 57-66.
- Tekin, A. K. and Kotaman, H. (2013) 'The epistemological perspectives on action research', *Journal of Educational and Social Research*, 3(1), pp. 81-91.
- Thomas, G. (2009) *How to do your research project: A guide for students in education and applied social sciences*. 1st edn. London: SAGE Publications Ltd.
- Thompson, N. and Pascal, J. (2012) 'Developing critically reflective practice', *Reflective Practice*, 13(2), pp. 311-325.
- Tiarina, Y. and Rozimela, Y. 'Reflection on action: The use of reflective journal plus video recording'. *Fifth International Seminar on English Language and Teaching (ISELT 2017)*: Atlantis Press, pp. 228-234.

- University of Cumbria (2018) 'Research ethics policy', University of Cumbria, Available at: <https://www.cumbria.ac.uk/media/university-of-cumbria-website/content-assets/public/researchoffice/documents/EthicsPolicy.pdf> (Accessed 08 December 2020).
- University of Surrey (2017) 'Ethics policy', University of Surrey, Available at: <https://www.surrey.ac.uk/sites/default/files/ethics-policy.pdf> (Accessed 08 December 2020).
- Van Es, E. A. and Sherin, M. G. (2002) 'Learning to notice: Scaffolding new teachers' interpretations of classroom interactions', *Journal of Technology and Teacher Education*, 10(4), pp. 571-596.
- Wallin, P. and Adawi, T. (2018) 'The reflective diary as a method for the formative assessment of self-regulated learning', *European Journal of Engineering Education*, 43(4), pp. 507-521.
- Xiao, B. and Tobin, J. (2018) 'The use of video as a tool for reflection with preservice teachers', *Journal of Early Childhood Teacher Education*, 39(4), pp. 328-345.
- Yost, D. S. (2006) 'Reflection and self-efficacy: Enhancing the retention of qualified teachers from a teacher education perspective', *Teacher Education Quarterly*, 33(4), pp. 59-76.
- Ziyaeemehr, A. (2016) 'Use of questioning techniques and the cognitive thinking processes involved in student-lecturer interactions', *International Journal of Humanities and Cultural Studies*, 3(1), pp. 1427-1442.