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Using a Digital One Minute Paper in business school classes to increase participation and engagement and improve student experience

Paula Karlsson-Brown, Alison Gibb, Paul Ferri
Adam Smith Business School, The University of Glasgow

1. INTRODUCTION

This report is an output of the Chartered ABS Scholarship award granted in early 2019. The aim of the project was to investigate the use of a Digital One Minute Paper (DOMP) in large multinational business school classes to increase participation and engagement and improve student experience. As is the case with life, unexpected things happen, that may or may not change the course of events. As it were, Covid-19 had an impact on the project. With life and therefore teaching suddenly moving online, the situation presented us with an opportunity to expand the project beyond the use of the DOMP in face-to-face classes, but also to include its use in online teaching environments, with any student population and any size of class.

1.1 BACKGROUND TO THE PROJECT

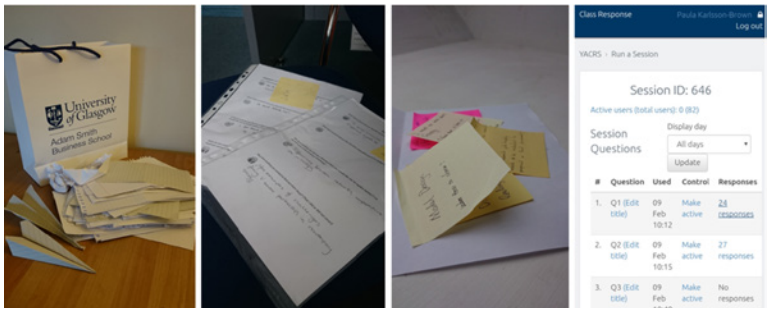
As part of a team of three teachers in the Management subject at the Adam Smith Business School at the University of Glasgow, we have been investigating the One Minute Paper (OMP, Angelo & Cross, 1993) since 2016. Following an initial period of research that highlighted some challenges when using the technique in large classes, we have been specifically interested in whether it can be made into a digital tool (a digital one minute paper, DOMP) as opposed to being used solely as a paper-based feedback technique, which it has traditionally been (Stead, 2005).

The OMP is a formative classroom assessment and feedback mechanism, concerned with asking students variations of the following three questions:

1. What was the most important thing you learned during today's class?
2. Was there something you did not understand that you would like explained more clearly?
3. Was there anything you wanted to find out more about, that was or was not covered?

Two of our team were newly appointed early career lecturers and saw the benefit of this approach, particularly for our own professional development, as we would be able to ask students for feedback during the term, rather than wait until course evaluation to find out where we could improve our teaching technique, or what our students may not have understood, allowing us to address these issues instantly – if not during the same class, certainly by the next session (Boysen, 2016; Harwood, 1996; Stead, 2005).

We experimented with different formats of the OMP during the 2016-2017 academic year (traditional notepad paper, emoji questionnaires, post it notes, and our in-house class response system). The key problem we noticed quite quickly was that when teaching large classes (over 50 students, and easily in the hundreds), collecting feedback via the traditional paper-based OMP methodology is not so easy, let alone analysing it and responding to the class in a timely manner.



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Since this initial experimentation phase, we have been working, at various stages, with the developer of our in-house class response software (YACRS), to include a digital one-minute paper application. The original YACRS software mainly allowed multiple-choice questions (MCQ) to be asked, which was not in the nature of the OMP ideology (Draper, 2003; Stead, 2005). In our view, and particularly when teaching larger class sizes, some mechanism of classroom engagement and feedback gathering via open-ended questions is important, a view supported in literature (George & Cowan, 1999; Harwood, 1996). Most tools that we have come across, such as Slido and Socrative, appear to be more focused on asking MCQs, running quizzes, and asking session participants to provide questions and then vote for the most important one to discuss. Our redesigned YACRS is effectively a classroom response system (which the functionality of Slido and Socrative allows), but with the added benefit of the DOMP methodology (rather than MCQ formats only, which are typical of traditional clicker technology, Deal, 2007).

However, we concluded from our initial research that this functionality (i.e., including a DOMP question format within YACRS) did not go far enough. We believed that the DOMP would also need to include an analytical component to assist us in analysing feedback received via open ended (free text input) questions from our students, as only that way would we be able to address the feedback quickly. Furthermore, we had not explored how the DOMP was perceived by our colleagues in Business Schools. The Chartered ABS scholarship has enabled us to address these elements and is what we discuss in the remainder of this report.

The following were our intended project outcomes:

1. Establish how teaching staff currently get students to participate and engage (e.g. in large, multinational classes, and in online classes).
2. Establish how teaching staff currently overcome the challenge of getting feedback from students and responding in a timely manner.
3. Determine what functionality teaching staff would like to see included in a DOMP (or a digital classroom response) tool.
4. Using software developed at The University of Glasgow the project will establish how teaching staff experience using the DOMP (e.g. is it easy to use, does it result in any clear benefits, does it help them understand their current student population?).
5. Compare and discuss the use of both traditional paper based OMP and DOMP formats whilst outlining the rationale behind using either in various circumstances.
6. Establish the demand from teaching staff for a digital tool with real-time analysis of the feedback.

2.1 COMBINING THE OMP WITH A CLASSROOM RESPONSE SYSTEM

A classroom response system can be viewed as very valuable for students, e.g. by making the class more engaging, and for teachers, in that we can assess their learning and make interventions if we believe there are issues (Deal, 2007; Katz et al., 2017; Lantz & Stawiski, 2014). However, the DOMP component is even more beneficial. By allowing students to engage anonymously, shyer, more reserved students and students that don't like to speak up in class in front of their peers are more comfortable in participating, which we have seen in many of our classes of large student populations, and especially those with a large number of international students (George & Cowan, 1999; Harwood, 1996; Stead, 2005). This is not entirely unique to the DOMP, as Deal (2007) argued that "electronic classroom response systems have been investigated (since the 1960's) as a potential bridge for the communication gap between lecturers and students" (p. 4), providing some of the same features as noted above. However, since the DOMP allows students to provide qualitative (free text) input, we should be able to get richer feedback, that will more accurately pinpoint any problematic areas within our teaching or our students' learning. It should allow us to provide an instant response to students but could also be teamed up with another well-known teaching method: peer instruction (Deal, 2007; Mazur, 2014) as a way of helping students jointly develop their understanding of concepts. In practice, we hope the DOMP will be used by teachers across HE, but especially those in social science subjects where qualitative questions/answers are more relevant than quantitative/MCQ style questions, which are more useful in science subjects.

2.2 USING TECHNOLOGY FOR LEARNING AND TEACHING

It is worth considering the concepts of digital literacy and digital natives in the context of using technology for learning and teaching. Digital literacy (the ability to understand digital tools and information) is not only concerned with having competency in various digital tools. The skills that are required will differ between lecturers and students, as "teaching with technology is inherently different from learning with it" (NMC, 2017, p.5). Digital literacy can be linked to the urban legend of younger generations being digital natives, somehow far superior in naturally navigating new technologies, a myth that has been debunked (Kirschner & van Merriënboer, 2013). Therefore, the digital competencies of students should not be assumed (Bennett & Maton, 2010).

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As technology that seems to be used by students for learning typically facilitates passive consumption of information or downloading of lecture slides (Kirschner & van Merriënboer, 2013), the use of technology in class in such a semi-structured way that the DOMP enables, means that students could develop their skills in learning with technology, as it goes beyond clicking a poll-option (e.g. Yes/No), requiring higher-level thinking. Yet, evidence suggests that switching between tasks negatively impacts performance and learning (Kirschner & van Merriënboer, 2013). Katz et al. (2017) found, in the context of using personal devices, that while students believed there were many benefits (such as the anonymity in answering, and that it was easy to use one's own device) they disliked the time that switching to a class response system deducted from 'teaching time' and that this switching may also disrupt the flow of teaching. Therefore, it is important that teachers are confident users of any such Wi-Fi enabled systems, so that there are less technical distractions, which can otherwise make its use less effective (Katz et al., 2017; Lantz & Stawiski, 2014; Morgan, 2008). Also, the use of something like the DOMP should be carefully considered, in other words, it should be investigated as to what setting or during what time in a class its use will be beneficial, and at what time it may interrupt the flow of learning.

However, if implementing something like the DOMP, it should be taken into account that students actually seem to want to have more time for discussing and analysing answers that arise from a class response system (Katz et al., 2017), and Blasco-Arcas et al. (2013) found that this can improve learning performance. Though, it may not be a direct result of using the technology, but the result of the interplay between 'clickers' and peer group practices and class discussions. Especially, students wanted this discussion to occur directly after the responses, as opposed to in the following class (Katz et al., 2017), which, Lantz and Stawiski (2014) have found to be more effective and useful.

We have taken these issues around using technology in learning and teaching into account when considering our findings and recommendations later in this report.

3. METHOD

The scholarship project funded by the Chartered ABS started in March 2019 but as noted earlier, we as a team have been working on a broader One Minute Paper project much longer than this.

The first phase of the project consisted of interviewing participants in relation to the general concept of the OMP and DOMP, without a demonstration of any software. See the appendix for all interview questions. We conducted preliminary analysis of the first phase interviews for the purpose of giving the software developer feedback with regards to what functionality teaching staff would like to see in a DOMP and inform the further development of the software.

The second phase of the project consisted of lecturers user testing the DOMP via our demo YACRS software and thereafter participating in semi-structured interviews in relation to the DOMP. Some of these were participants from the first phase, and some were new to our study. Some of our testers only taught smaller classes in the semester we were testing the software, so the ideal 'large class' scenario for testing purposes did not always materialise. However, the advent of Covid-19 presented us with an opportunity to extend our trials to include user testing in online classes. Hence, the DOMP has been tested in multiple lecture formats (small and large class size including face to face and online classes, and classes with more than one lecturer).

Care was taken to ensure that participants were diverse in terms of type of institution, subject discipline, and experience. Two of our participants are from English universities, ten are from Scottish universities. We had a mixture of modern (post-92) universities and older (including Russell Group) universities represented – with participants from a total of seven different universities. Our participants represent a variety of business school disciplines (entrepreneurship, operations management, human resource management, economics, public management and generic management). There were 4 female and 8 male participants. From here on, we will refer to our participants simply as our colleagues.

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Participant information

Participant	Discipline	Region	Institution type	Stage	Mode of testing
1M	Entrepreneurship	Scotland	Modern	1	
2M	Entrepreneurship	Scotland	Modern	1 & 2	Small face to face class
3M	Management/ Operations management	England	Modern	1	
4M	Human resource management	Scotland	Modern	1	
5M	Economics	Scotland	Russell Group	1	
6M	Entrepreneurship	England	Modern	1	
7F	Operations management	Scotland	Modern	1 & 2	Large online class with 2 lecturers – only few students attended
8F	Economics	Scotland	Russell Group	1	
9F	Management/ Operations management	Scotland	Russell Group	1 & 2	Small online class
10F	Public Management/ Economics	Scotland	Modern	1	
11M	Entrepreneurship	Scotland	Russell Group	2	Large face to face class
12M	Entrepreneurship	Scotland	Russell Group	2	Large online class – only few students attended

We have also gathered feedback at Academy of Management global Learning and Teaching conferences and the Chartered Association of Business Schools LTSE Festival, which has informed our research and has been used for developing the software further.

4.1 STUDENT PARTICIPATION, ENGAGEMENT AND FEEDBACK

Class participation and engagement via digital tools

Throughout our interviews it was widely suggested and agreed that teaching staff find it challenging to get students to participate and engage when in large classes. This is true for all large classes, not just those that are culturally diverse.

In an attempt to overcome this, teaching staff are using a number of digital tools, such as Padlet, Socrative and Slido, to encourage participation and engagement during their classes.

Our colleagues reflected on the DOMP demo software in comparison to other software and noted one clear benefit to students: accessibility, with the DOMP software they trialled, students simply need to click a link, unlike with some software where they need to download an app or create a user profile or account. Not all students want to do this, and so asking them to participate in this way may not allow for an entirely inclusive experience for students. Accessibility was brought up time and again during our interviews, with teaching staff stressing that for any tool to succeed in encouraging engagement and participation the first hurdle was ease of use for both students and staff:

- If staff are not confident in implementing a tool it will come across in class, it will take longer to use and will serve as an interruption to teaching rather than as an enhancement
- If students find the initial engagement with a tool challenging in general, they will give up and can even become distracted with other apps if using a personal device.

It is therefore key that any tool is straightforward and easy to use.

With any software tool teaching staff will have to invest a little time in advance of a class to set things up and consider for instance when the best time to introduce the tool is, thus ensuring a smooth experience for the students. It is recognised that as students become familiar with a tool the entire process becomes a lot easier. Getting over the initial hurdle of using a new software – be it staff or students – is key.

I think once they do it once, maybe they know then how it works, and I know, then it is going to be easier (9F)

Feedback from students and to students

There were varying interpretations of the meaning of feedback among our colleagues. Some equated it to module/course evaluations that take place towards the end of a course with others seeing feedback received over the duration of a course as being key to the student experience. Some considered feedback in a somewhat negative light, in that by allowing students to provide feedback teachers are giving over too much control of the teaching and learning experience to students. This was particularly true when module/course evaluations were discussed, with colleagues overwhelmingly in agreement that end of course evaluations do not facilitate an active response for the students that leave the feedback. They highlighted a number of issues with this kind of feedback including: a low response rate, that they had little control over the questions asked so were unable to focus on areas where they would like feedback, the timing of the evaluations and receiving the feedback too late to take action for the students that gave the feedback.

One participant even commented that Module Evaluation Questionnaires (MEQs) are used against teaching staff raising the question who is the evaluation really for and what benefit does it deliver?

There is a tendency to use the MEQs as a stick to beat the lecturer (6M)

More positively some colleagues were clear that receiving and providing feedback that could be actioned was an integral part of delivering a course e.g. one colleague was clear that they wanted students to know that they care about their students' experience and want courses to be useful and up to date.

One way of showing that teachers care is by fully opening yourself up to a dialogue with students about their wants, needs and experiences, and we have seen a number of tools and methods used in order to do this. Existing tools often rely on MCQ or voting responses providing quantitative feedback as a direct response to a closed question. Our research has shown that there is a need for a more qualitative approach, allowing teaching staff to pose more open questions and students to respond with free text answers. However, this alone is not sufficient as it was overwhelmingly agreed that the time to review and analyse this kind of feedback, especially with larger classes, can be significant and it is not always practical to respond to the feedback given in a timely manner. The second phase of our research allowed teachers to trial the DOMP tool which included an analytical component that instantly highlighted the key themes received within the feedback. It was felt by colleagues that this implementation of the DOMP was good at facilitating a more open dialogue and that through teaching staff having the ability to respond to feedback in real time or promptly after a class, students can clearly see that there is a genuine impact of the feedback they provide on their learning and that this directly benefits themselves, not just the next cohort to take the class.

4.2 THE DIGITAL ONE MINUTE PAPER

The software

In order to implement a DOMP we needed a host software that would allow us to test the method. One of the rationales for us choosing to use our in-house YACRS software instead of an external product was that as we were collecting data for research purposes, we felt this was more securely done by using a software that is hosted on our University servers, which is an even more pertinent consideration now given the new GDPR rules. However, for using it with external testers, we had to use a demo version on an external server, taking care to ensure that we used a provider that was located within the EU and therefore GDPR compliant.

However, GDPR compliance does not appear to be a deciding factor for our colleagues when they choose between software for use in their teaching – ultimately, we found the deciding factor is student experience.

In both phases of our research colleagues noted the time that they have to commit in reading and analysing feedback gathered via a OMP/DOMP and that it is not possible to do this during a class, and indeed it is often not practical to find the time to do this and respond meaningfully before the next class. This was discussed as part of our initial interviews and on the whole our colleagues agreed that it would be a useful addition for a digital version of the OMP to have the ability to provide a real time thematic analysis of the student input, which they could then respond to in or just after class. Currently none of our colleagues have identified a tool that includes this functionality. While the majority would welcome and use such software if it was developed, some were against this. Our more hesitant colleagues were self-confessed technophobes and/or admitted that they were more traditional in their approach and preferred to retain complete control over the teaching experience rather than opening themselves up too much to student feedback.

After colleagues tested the DOMP with the analysis tool it became apparent that deeper analytical functionality than our demo software already provides did not appear to be needed, certainly not for use in every class. This is likely due to the fact that colleagues tested it in small classes and online classes, so the challenges of quickly reviewing and responding to DOMP feedback identified in large classes was not evident. Therefore, if somebody develops a fully designed thematic analysis component as part of a software that allows the DOMP to be administered, this can be considered a bonus. What we currently have in the demo software delivers, at the minimum, the traditional OMP features, in a digital setting enabling instant analysis of the feedback received, allowing a real-time response.

The DOMP output with our demo YACRS software enables the following:

All student responses are collated in a list format

- Keywords from student responses will appear also in a word cloud format (which can be shown instantly to students) – filler words (the, and, an, on etc) are excluded. The larger the size of word, the more responses it is included in
- The teacher can select a word from the word cloud, and combine it with another word, giving the teacher a reduced word cloud (including only the responses with the selected words)
- The selected words are colour coded in the list of full responses below the word cloud, e.g. green for 'Theme' and yellow for 'Theory'. This way staff can quickly pinpoint what the context is about, i.e. it is a quick way of making some kind of sense of the issues that students are facing – any clear issues that seem to come out this way could be dealt with immediately in class
- Deeper analysis and interpretation can be done after the class if the teacher wishes to do this – for this the teacher can download the full set of student responses (this is the equivalent of having the traditional OMP responses on paper, except the teacher does not need to try to decipher students' handwriting, and the responses can be more easily scanned through as the teacher could e.g. search for keywords in the dataset).

We touched on the importance of accessibility earlier in this report, but our research has highlighted that any software used for the DOMP needs to go further than just being easy to access for students and staff to engage. Especially with the thematic analysis functionality, it would need to be user friendly, easy to use and reliable. Colleagues that tested the DOMP in their teaching stressed this throughout their interviews: no matter how effective and beneficial they perceive the DOMP method to be in their teaching, they would be reluctant to implement it if the user interface was clunky and challenging to use. Therefore, any host software of a DOMP would need to provide a visually appealing interface that worked well across multiple devices e.g. desktop, tablet, phone, and platforms e.g. Android and Apple. It would also need to have clear instructions that enabled the user to quickly and easily set the tool up. Throughout the interviews colleagues commented on some of the functionality that they considered would be important when using a DOMP. To aid the user experience for the students they felt that having the question visible to students on their screens while answering was essential and many suggested that using a share screen or QR code for students to access the response windows as a strength as this would significantly speed up access to the DOMP for students. From this it is clear that students' experience of using any digital teaching tool is just as important as the teachers.

The DOMP as a pedagogical tool

As we have discussed, most of our colleagues would welcome a digital version of the one minute paper that could receive text based feedback and that could be used in real time during their teaching.

To me it's a really useful tool. I'm a fan of getting feedback. The more we know about our approach and our teaching and the content, the better. So I was quite pleased to get a hold of this one (11M)

The DOMP would be particularly useful for enhancing student communication, feedback and openness – mainly when students are struggling or worried, for example in relation to their assignments. Given the new online learning environment we have all – staff and students – been forced into, there may be many more unanticipated issues and concerns that students have. Use of a teaching tool like the DOMP can be especially helpful for spotting those student concerns early on and stopping them from becoming major issues. The fact that the DOMP is anonymous makes a significant difference in the kinds of responses students provide, in other words, students should not feel worried about voicing any concerns, which they may be too reluctant to raise in more open situations e.g. in a Virtual Learning Environment (VLE) discussion forum.

Our colleagues who tested the software found that even in classes with very vocal students, the use of the DOMP still gave lecturers information that they were unaware of. In synchronous online classes, even when students can talk, they tend to use the chat function rather than talk. Therefore, the element of anonymity makes the use of the DOMP potentially more successful in achieving student participation and engagement. Our colleagues noted that it tends to be the same students who always interact, and this was the same for both face-to-face classes and online teaching, the DOMP could also allow those less confident to engage.

I think it could be two ways. You know, the ones that are responding are quite engaged. They're engaged with technology and quite like to do stuff just for the reason of being asked to do it. It might have the opportunity to capture some of the other ones that don't want to be speaking up or they're a bit nervous of speaking in front of other people, so it's kind of catching both (7F)

The DOMP is more useful if it is used in a planned rather than ad-hoc way. Our colleagues who tested it indicated that they would in the future use the DOMP in a more structured way than simply turning up one week with the DOMP, and instead think more carefully from a pedagogical perspective about what they want to get out of using it. This is where the preparation of students is key to success – without their buy-in it won't bring any real benefits. The benefits of the DOMP need to be 'sold' to students so that they do not feel as if valuable contact/teaching time is spent on something that is of no use to them, in other words, 'class time being wasted just for collecting feedback' from their point of view. One way in which this perception of students can be avoided is to introduce the DOMP from the start of a course, as a core element of how the course is run, with clear explanation of how and why it will be used, paying special attention to what the students will gain out of engaging in DOMP exercises.

A key finding – and this concerned any software used as part of teaching – was that the DOMP should be used as a seamless part of teaching rather than a stand-alone tool for collecting feedback. For example, it can be used to build bridges between content to interlink classes. It can easily be used in support of a flipped classroom style of teaching, as well as using it between lectures to inform tutorial or group discussions.

One of our colleagues suggested that they would use it more regularly in a course, but when doing so, use it for different purposes at different times. For example, used early on in a course, it would be used for gaining more general feedback; used midway through a course it would be used for checking the understanding of core concepts; and used towards the end of the course, it would be implemented for the purpose of focusing on the understanding around the assignment.

The timing and regularity of use of a DOMP within a course was widely discussed during our interviews. When thinking about regular use of the DOMP, none of our colleagues considered weekly use to be especially beneficial, but rather using it more at regular intervals/key stages throughout an entire course. The timing of using the DOMP during a class was also a topic for discussion and our research shows that, unlike the traditional OMP, due to the quickness of analysing the feedback received, the DOMP could be carried out at any time, allowing the teacher to choose the optimum moment e.g. if a class is group work or discussion based the teacher can ensure that there is no disruption to flow or if transitioning from one topic to another the DOMP can be used in the middle of a session to check in on understanding before moving to the next topic or theme.

A secondary use of the DOMP is that it can be used to co-create the curriculum. As the curriculum can be made much more responsive with the use of the DOMP, it could enable a truly co-created learning journey where students engage in their teaching and learning experience as true partners together with the lecture staff. This would align with calls elsewhere for involving 'students as partners' (Bovill, 2017; Cook-Sather et al., 2018; Healey et al., 2014; Matthews, 2017; Mercer-Mapstone et al., 2017). This was an insight brought by many of our entrepreneurship lecturers who were teaching smaller classes, where the course content is often very dependent on the body of students, i.e., the course content is, to some extent, designed ad-hoc, taking into account the interests of the current student cohort. It was participants using DOMP in such learning environments who found it to be an especially useful pedagogical tool. Therefore, a DOMP is helpful in that it can enable a more flexible and responsive approach to designing and delivering teaching content.

I think they [students] see it as really valuable because we're trying to get their input into what's working and what's not working, and some of the things ... there's always some things that you can tweak based on the feedback that you get. Obviously, some of it you can't change. I think that's very valuable in that students can obviously see you responding to their feedback closing that loop (12M)

I can see how I could tweak the literature content, workshop content, based on even from this small sample, based on like some of the words that they've used or things that they would want to focus more on (2M)

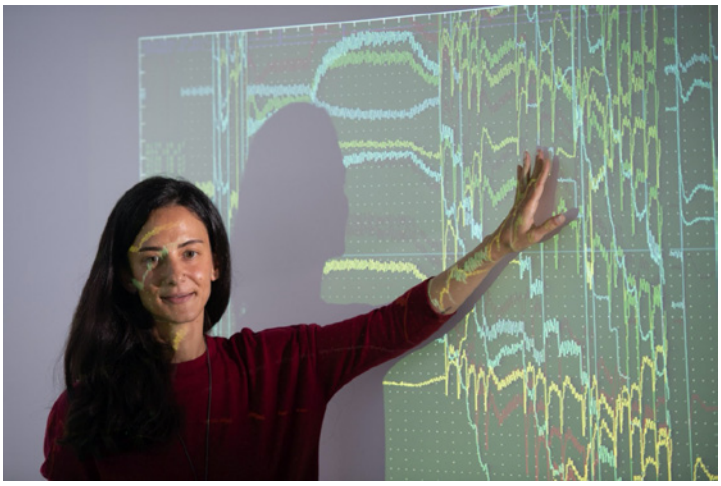
The teacher benefits

Our colleagues who felt positively about the DOMP considered it a valuable tool for any teaching professional, regardless of their level of experience. For example, some of our more experienced colleagues were even more enthusiastic about the benefits of the DOMP, than the inexperienced colleagues. However, as with students, buy-in was needed for getting the most out of the DOMP from a teacher point of view.

In comparison to survey tools or course evaluations, the DOMP was perceived as much more engaging, with students able to contribute to the direction of a teaching session (class or course). While the DOMP was compared to course evaluations and it was found to be more responsive to current cohorts of students, the DOMP was also seen as beneficial for future cohorts much like course evaluations are focused on improving courses for the future. DOMP responses help teachers see what students are not understanding this year and can be used to inform next year's content and delivery as well.

Other, more specific, teacher benefits included the use of the DOMP for professional development purposes. This was considered especially important for new teachers who might only get feedback through course evaluations at the end of courses. One benefit picked up by more experienced colleagues was that the DOMP could be used to pre-empt any issues. Essentially, by using the DOMP, teachers can to some extent protect themselves from student complaints that might arise at the end of a course or later (often after unsatisfactory grades on course assignments). If you have asked students questions around their understanding and given them ample opportunity for anonymous feedback, and they have not raised any issues during the course, it will be harder for them to justify raising them at a later stage.

A drawback of the DOMP is that there is some time commitment involved, that teachers do not necessarily notice as part of other feedback mechanisms such as course evaluations which are often standardised and administered centrally rather than by the teacher. The time commitment of the DOMP includes: deciding on questions, setting up the 'questionnaire' via the software, administering the questions in or outside of teaching time, looking over the data and the time it takes to mentally process the information, deciding on the relevancy of the data, and finally the tweaking of your teaching material or style in response to the student feedback. On the other hand, one could argue that these are simply elements of good academic practice that should form part of our normal teaching activities, and the DOMP just helps us achieve good practice.



Comparison to the OMP

While both the OMP and DOMP were considered useful, and many of our colleagues would use both now that they were aware of the tool, the digital version was perceived as more beneficial.

It's just more difficult to analyse it [OMP]. It's going to be more time consuming. You do get a higher response rate though because you're asking them all to do it there and then rather than using a device, but I think we're all kind of moving to digital (7F)

The issue associated with the time it takes to analyse data is an issue of the OMP that we have only partially been able to deal with in the demo software, with the word cloud picking up keywords. However, what the DOMP does is it removes the time it takes to process the data (i.e. not needing to go through and potentially transfer paper-based answers onto one document), and in that way enabling a quicker response time to students.

With small classes, the word cloud, or the other analytical component i.e. the combination of keywords, was not considered necessary as a teacher can just glance at the responses. However, the DOMP makes this part easier as all responses can be displayed on one page, compared to numerous sheets of paper. From this point of view, the DOMP was considered much more manageable in a large class than the OMP. Furthermore, the visual display of student responses can be used to activate discussion, therefore helping to improve engagement and participation.

It's just extra bits of paper to lose, honestly, like I can hardly keep hold of my class register and things like that (2M)

One colleague said that he would not use the paper based OMP simply because it would involve more paper to lose. The DOMP allows easier storage of student responses. It also removes any issues around not understanding students' handwriting. This colleague suggested that he would rather just ask for verbal feedback in small classes. The efficiency of the DOMP is a key benefit.

There also appeared to be less interest among students in using the paper OMP, as they felt the OMP more clearly cut into the teaching time. The length of a class may be a contributing factor to this, where a 1-hour class was seen as particularly unsuitable for the use of the OMP – the DOMP can of course be administered after a class to be completed by students at any time, therefore not cutting into teaching time. Perhaps it is more challenging to integrate the OMP into teaching activities compared to the DOMP. The DOMP in online teaching is easiest to integrate into activities.

In this digital environment that we all have found ourselves in, the OMP is currently redundant in paper form.

Colleagues indicated that the DOMP was not really a "one minute" exercise, but "many", as there was the time involved in administering and explaining it and getting students on to the correct web link. Of course, this is something that can be overcome with more regular use, as students no longer need the preparatory elements at later points of using it. This was in comparison to the traditional OMP which meant that students could simply rip out a piece of paper from their notebook and hand this in when leaving the classroom. However, how many students still carry paper and pen with them? It is not an infrequent experience when students have asked to borrow a pen for any paper based activity we may have given them in class. If they need to start borrowing equipment it soon becomes an arduous and time-consuming task that they simply choose to ignore. Another part of this is when asking students to return a paper based OMP in a large class, e.g. 100 students – the logistics of this is not actually that easy when everyone is trying to rush to their next classes, including the teacher, often with another cohort of students and their teacher already attempting to enter the classroom. Therefore, even the OMP is not really a one minute exercise, as administering it can often be quite chaotic, as we have experienced ourselves.

In this digital environment that we all have found ourselves in, the OMP is currently redundant in paper form with the DOMP as the only option at this point in time.

The DOMP in online teaching

Coronavirus created some significant challenges for us in terms of testing the software and completing our interviews. However, it also created a situation that benefited us. We had hoped to speak to people who normally teach in online settings – Covid-19 forced this upon everyone. Even when there is a return to face to face, in person teaching, it is expected that some of the changes in practice that have been forced due to the current situation will remain and that many more teachers could find themselves choosing to engage in online activities to support a new way of teaching rather than the more traditional, didactic delivery that has often been preferred. It is therefore opportune to have information on how DOMP works in online classes when looking forward to the new normal.

Teaching online comes with many challenges, and we do not propose that the DOMP fixes them all, but we do believe that the DOMP can be used to alleviate some of the issues that may be encountered.

Our colleagues indicated that it is very important to be able to see the expressions of their students. In online teaching – even where the option for sharing their video exists, students rarely choose to do so – all visual cues have largely been removed, making it more difficult for the teacher to 'see' whether students are comprehending the teaching content. Unless we see our students, this lack of visibility is difficult to overcome. We can ask students about their understanding, e.g. in Zoom sessions, or on virtual learning environment forums, but how likely is it that you get an answer at all, let alone an honest answer? Our colleagues found that even in online classes when students were able to talk, they chose instead to use the chat function. Positively, our colleagues noted that students actually participated in discussion via the chat function more than they would have normally participated in classroom-based discussions.

Based on our research, we suggest that use of the DOMP could result in a more successful learning and teaching relationship in an online environment, rather than teachers relying on potentially limited verbal feedback or visual cues. Consequently, the DOMP can be used to direct our teaching practice, e.g., if we find from student responses that we need to go over something in more detail. Our colleagues indicated that students were still responding to the DOMP questions, at the end of Zoom classes, when students were already free to go. This serves the same purpose as when students queue up to ask the teachers questions at the end of a lecture in a classroom. In both instances, students probably rarely have the full attention of their teachers, who may already be running late from their next class. The use of the DOMP is beneficial in this regard, as the teacher can simply open up a DOMP question and administer it to the class, leaving it open while getting on with other tasks. The teacher can come back to deal with the DOMP responses when it is suitable for them.

I think if you were using it online and you didn't use it live online, I think it would still work because I essentially built it into the slides and then students are obviously then looking at that offline, they can just click on that (12M)

Therefore, the DOMP can help connect students to teaching staff, which is especially important in remote teaching, where students may easily feel that there is a huge chasm between themselves and their teacher. In an online teaching scenario, we need to be extra vigilant about enabling a feeling of connectedness among our students.

In online teaching, the wording of DOMP questions may need to be reconsidered from the traditional paper-based questions. For example, questions related to classes, typically the physical classroom-based experience, such as "What was the most important thing you learned during today's class?" might no longer be relevant, if students are not doing traditional style classes in an online learning environment. If teaching is broken into Units, rather than Weeks, as we have done at the Adam Smith Business School, teachers might want to frame their questions around what was learned in a particular unit.

5. RECOMMENDATIONS

Pedagogical recommendations

If teaching staff decide to use software in their teaching, for DOMP or other purposes, the importance of routine was highlighted. Students get confused if teachers use multiple software tools, so it is better to stick to one rather than mixing software in any one course. One way to counter this would be to have the DOMP implemented as a VLE plugin, embedded in the environment where the students are already working.

An overall takeaway message for when using software (including DOMP) is that software should be used in an integrative way as part of the teaching, not as an add-on for feedback collection for example. In terms of the DOMP, it could be used for instance to interlink classes. Effectively, software should be designed into teaching in a seamless way so as to minimise students experiencing it as a separate tool.

Key points to keep in mind include:

- Embed the DOMP as part of learning activities
- Be structured about how to use it, considering pedagogically what you want to get out of it
- Consider the effect of the length of a class, e.g., it may be counterproductive to try to squeeze in a DOMP exercise into a 1-hour lecture, whereas it could be implemented at different points, e.g., start, middle or end in a 3-hour workshop
- Consider the type of student, e.g., it seems to work best for students further along in their studies or more mature students
- It is important to close the feedback loop, so if you choose to use the OMP/DOMP, you must respond to student feedback in some way.

An overall takeaway message for when using software is that software should be used in an integrative way as part of the teaching.

Specific methods for using DOMP include:

- Use DOMP results to form the basis of group discussion in a class, for instance by showing the word cloud and answers to discuss from
- Use the DOMP between lectures to inform the direction of tutorial discussion. Consequently, each tutorial group would get different discussion based on their DOMP answers and in that way the teaching would be responsive to individual needs
- Use DOMP results to tweak teaching material/content, thus showing that you are responsive to current student cohort needs.

The following example is one way of how to design the DOMP into a course so that it is integrated into the teaching:

STEP 1 Explain how the DOMP tool will be used throughout the course and the rationale. For example, stating that the DOMP will be used to collect anonymous written feedback (formative) to which teachers will provide a collective feedback response to all students.

STEP 2 Ask students to answer questions that are generic towards the course content, to establish what the baseline assumptions of students are, using the DOMP tool. For example, in a project management course: What is your understanding of project management? Have you been involved in a project of any kind before; and if so, please give some detail?

STEP 3 After each Unit, week, or whatever interval you consider appropriate, include a DOMP question, such as: Reflecting on this unit, what was the key takeaway messages for you? In the example project management course, there are four units over ten weeks, so the DOMP will be used four times for students to reflect on their understanding.

STEP 4 After each DOMP exercise, the teacher responds to the student answers, potentially makes changes to course content as an action from student feedback and/or builds the student answers into any 'tutorial' style session, thus closing the feedback loop.

This one has been designed for an online course but could easily be transferred to a classroom-based course. Specifically, in an online teaching environment, teachers need to consider the questions they set as the usual OMP questions may not be entirely transferable to DOMP in an online 'class'.

Example questions include:

- What was the most important thing you learned this week/during the Unit?
- Was there something you did not understand in this activity that you would like explained more clearly/discussed further?
- What was least clear in this Unit's content?
- What was the muddiest point this week?
- What was the main point of this learning activity?

Software recommendations

Our suggestion is that Universities use an in-house system similar to ours, amend their existing in-house system to reflect our findings, or introduce one based on ours but operating it in-house with their own IT support, to host the DOMP. This strategy would be the 'safest' option from a GDPR perspective and would ensure stability of the system. Alternatively, the creation of a VLE plugin – in our case Moodle – would successfully integrate the DOMP into the digital environment that students are already using and familiar with.

Similar software packages already exist that could have the digital one minute paper included as an add-on. This would likely enable greater reach across teaching staff more broadly, as many already use such software. However, this may pose challenges in terms of GDPR. A further option is that some creative software developer comes along and develops an amalgamation of all the good software tools currently available as at the moment there is no one piece of software that meets all the needs of teaching staff.

Whatever the hosting software, the key features of any DOMP implementation should:

- Be intuitive for the user – staff and students
- Be quick and easy to set up, with supporting quick start documentation or equivalent for new users
- Be appealing, up to date and clear
- Work effectively across all main user platforms (Apple, Microsoft) and devices (desktop and mobile)
- Enable quick access via a QR code or share screen
- Enable visibility of questions on the question screen to improve student experience.

The word cloud as it stands is sufficient as a quick way of sharing the feedback with students – what is key to the success of the DOMP is responding in a timely manner.

6. CONCLUSIONS

Although teaching may feel like it is less valued at research intensive universities (as identified by Kreber, 2002; Vajoczik et al., 2011), even with many initiatives having been implemented to change this (the TEF most recently), there is now real need to invoke change as student satisfaction scores are ever more important. While this scholarship study was not focused directly on the student experience, in focusing on the teacher experience it can indirectly lead to improvements in teaching and learning if the teacher experience of using the OMP/DOMP is found to be largely positive. We are not by any means suggesting that the DOMP will provide a solution for everything, however, it does have the power to give teachers a sense of what students picked up during teaching, allowing them to form a perception of the class, both in relation to how well students have understood something and how well teachers have managed to explain something.

Overall, we found that our colleagues fit on a continuum, going from those completely against the use of software in their teaching to those who were excited about trying new technologies and had no fear of it, even if the technology had potential to result in embarrassing teaching moments. In between these two extremes are teachers who are on the fence about the use of technology in teaching. They may be happy to try new technology but would prefer it to work flawlessly before they give it a go. In the current remote learning environment, even those most hesitant to use technology have needed to give in a little and have had to embed technology as an integral part of their teaching. The DOMP is an extremely simple tool to implement, where the potential rewards can far outweigh the "cost" of using a software in teaching. It can help teachers create a more participative, engaged and co-produced learning journey, whether in a physical classroom or online learning environment.

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APPENDIX

Stage 1 interview questions

Background questions

1. Can you explain a little bit about you background in terms of teaching experience, e.g:
   a. How long have you been teaching?
   b. Do you consider yourself experienced or relatively new to the role?
   c. What courses/subjects do you teach?
   d. What size classes do you have?

Current approach

2. How do you currently get students to participate and engage e.g. in:
   a. Large classes?
   b. Multinational classes?
   c. Online classes?
3. How do you currently overcome the challenge of:
   a. Getting feedback from students?
   b. Responding in a timely manner?

One Minute Paper

4. Are you aware of the OMP teaching tool?
   a. If yes – Have you used it? How do you find it works?
   b. If no – explain briefly what it is about, and then ask if the participant would consider using it in any of their classes and if they foresee any challenges in its implementation

DOMP

5. Would you find a digital tool with real-time analysis of the feedback useful?
   a. Why/why not?
6. What functionality would you like to see included in a DOMP (or a digital classroom response) tool?
   a. If you were to get creative and got to add anything you wanted that could be helpful for your own work, what would it be?

Stage 2 interview questions

DOMP

1. How did you experience the use of the DOMP?
   a. Is it easy to use?
      i. If yes – can you elaborate?
      ii. If no – can you elaborate?
   b. Does/can it result in any clear benefits?
   c. Does/can it help you understand your current student population?
2. If you have used both traditional paper-based OMP and DOMP formats, what rationale have you got for using either or in various circumstances
   a. How have the experiences differed?
3. Now that you have tested one version of DOMP, would you find a digital tool like this with real-time analysis of the feedback useful?
   a. Is it something you think could be valuable to some of your other colleagues?
   b. If yes – any subject/level of study/class type in particular?
   c. If no – why not?
4. Is there anything you would like to add/discuss further around this topic?
   a. Is there anything we may have missed?
   b. Something we should ask the software developer to add into the tool?

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