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The Multidimensional Model of the One-Minute Paper: Advancing theory through theoretical elaboration

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ABSTRACT

The One Minute Paper (OMP) is a formative assessment technique which provides scaffolding for students to build knowledge. This study uses a theory elaboration approach to develop the Multidimensional Model of the One-Minute Paper. The model is conceptualised by connecting preliminary models with the empirical observations from a qualitative study. The findings are based on the results from student OMP responses, student focus groups and lecturer interviews.

The study takes advantage of a natural experiment to provide a multidimensional view across five facets (student/teacher perspective; time; culture; teaching delivery method; and class size). Thematic analysis supported a re-conceptualisation of the model. Using economics as an exemplar, the research indicated that the OMP supports learning and teaching via the three core constructs (Connections; Functionings; and Environmental Context), which are all influenced by a number of identified and distinguishable sub-constructs.

The identification of the importance of the Environmental Context was a novel finding, as were two of its distinguishable sub-constructs. First, cultural differences can impact the perceived effectiveness of the OMP and therefore they should be accounted for in the design and implementation phase. Second, there are potential additional benefits to the OMP when used in an online environment. These findings take on greater significance in a post-pandemic world where inevitably more teaching will be delivered virtually.

1. Introduction

Since the start of the global pandemic in 2020, teaching has undergone a seismic change. For example, material that once taught in a face-to-face environment was redeveloped at short notice for delivery online. Given the rapid move towards online delivery, many new challenges are emerging.

One such challenge is in relation to assessment (Verma, 2020). In particular, from a formative assessment perspective, lecturers may find it increasingly difficult to gauge the reactions as students are either unable (e.g. connectivity issues) or unwilling to turn on their cameras.

While the findings of this study are not specific to teaching economics, the subject is a useful exemplar as (a) there is nothing within which cannot be taught online, in theory, and (b) there is some pre-pandemic evidence on the negative effect of online teaching

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(Wunder et al., 2013).

In economics, online teaching practices are widely recognised as being very useful for students to reinforce their understanding, while also helpful for instructors as formative and summative assessment tools (Chen and Lin, 2012; Economics Network, 2020). One such formative assessment tool is the One Minute Paper (OMP). The OMP is a student survey primarily used to assess comprehension, but offers additional benefits such as providing the lecturer with feedback on their teaching style. The questionnaire consists of just a few short questions, which is typically administered at the end of the lesson, allowing students to reflect and provide feedback on the day's class (Davis et al., 1983; Lutterodt, 2017). Use of the OMP in class has been found to be a significant predictor in improving students' overall performance (Arfi and Merrouche, 2017; Yamagishi, 2016).

Although the OMP has become rather ubiquitous in higher education there is less evidence of its adoption in teaching economics and business (Becker and Watts, 2001; Stead, 2005). Chizmar and Ostrosky (1998), however, undertook an empirical analysis of the effect of using the OMP on an introductory economics course. They concluded that OMP enhances economic knowledge, varies little across instructor and does not depend on the students' ability level. More recently assessing the perceived effects on Level 3 Business and Economics students, Whittard, (2015) reported strong supporting evidence of the benefits to both student and lecturer.

Although a body of research has examined the effect of the OMP on learning outcomes, the research has predominately focussed on limited dimensions, meaning that pre-existing models and frameworks are underdeveloped. For example, Whittard, (2015) cost and benefit framework outlined in Table 1, which built on the work of Angelo and Cross (1993), was based on findings from just two cohorts studied over a six month period.

Campbell et al. (2019) thematic model (see Table 2) was derived from a qualitative analysis of student responses of Research Methods and Advance Practice graduate course over a twelve month period (autumn 2016–2107). Although conducted over four cohorts, all were local, the strategy only took the student perspective, and the study failed to explore issues in relation to the environmental context in any meaningful way.

This paper advances these theoretical models by using a theory elaboration approach to explore OMP over multidimensions.

Fisher and Aguinis (2017, p.441) state that "theory elaboration is the process of conceptualising and executing research using pre-existing ideas or a preliminary model as the basis for developing new theoretical insights by contrasting, specifying, or structuring theoretical constructs and relations to account for and explain empirical observations". This study applies Fisher and Aguinis (2017) guidelines and recommendations for actionable research approach to theory elaboration, to advance two pre-existing preliminary frameworks with the empirical findings from a multidimensional study. The study covered four cohorts studying the same/similar modules in two different places, over a four year period, before and after the Covid-19 pandemic. This enabled the following dimensions to be examined:

(1) Perspective (student/lecturer).
(2) Time (pre and post Covid-19).
(3) Culture (UK/Maldives).
(4) Teaching method (face-to-face/online).
(5) Class size to (small-up to 25/ medium 26-75.

As far as the authors are aware, this study is unique in that it assesses the use of the OMP across two distinct cultures. It also adds to the literature as relatively few authors have examined the OMP use to support online teaching, while none have compared the effects of using the OMP in a face-to-face environment and an online environment.

Table 1
Benefits and costs of OMP.

Category	Main recipient	Effect
Benefit	Lecturer	Immediate feedback
		Responses analysed quickly
	Student	Clarifies (mis) understandings
		Demonstrates respect and interest in students
		Encourages active listening and engagement
		Students can compare levels of understanding
Cost	Lecturer	Over reliance on technique to assess learning
		Student trivial/inappropriate responses can be frustrating
		Responding to OMP can be time consuming
	Student	If over/poorly used can be viewed as a gimmick
		Questions can be ambiguous and difficult to answer in a short time frame
		Lecturer's feedback is limited to 'average' response
		The OMP uses up valuable lecturing time

Source: Whittard, (2015).

Table 2
Primary and other themes.

	% of total (rounded) (%)
Primary Themes (50 or more coded segments)	
Activity Based Learning	29
Course Content	29
Connection with Asynchronous Content	13
Critical Thinking	12
Relationship Building	9
Other Themes (Less than 50 coded segments)	
Technical Issues	4
Flow of class	3
Negative feedback	2
Programmatic Discussion	1
Professionalism	0
TOTAL of all Themes/Coded Segments	100

Source: Campbell et al. (2019).

2. Literature review

2.1. Theory elaboration

Van Maanen Sørensen and Mitchell (2007) argue that theory elaboration connects the conceptual and empirical, which promotes a logic of discovery rather than just a logic of validation, whilst, Lee et al. (1999) remind us of the need of the researcher to be fully aware of existing theoretical research, given this provides the foundation for new study.

Although quantitative research can be used to support theory elaboration, Bacharach (1989, pp. 508–509) suggested that qualitative research can go further in enhancing the explanatory adequacy of a theory, arguing that "[qualitative] techniques are ideal when the theory constructionist is seeking to find and explain causal relations, while quantitative methods are better when the researcher wishes to test these relations." Indeed the importance of qualitative research in theory elaboration is also highlighted in Lee et al. (1999) review of qualitative management research.

In line with Bacharach (1989) framework, Fisher and Aguinis (2017) argue that advancements in theory can occur in five ways (construct validity; construct scope; logical adequacy; empirical adequacy; explanatory potential and predictive adequacy). In order to achieve such advancements they describe three broad approaches and seven tactics. Although each tactic is independently described, they note that in theoretical elaboration it is common and even desirable to use multiple tactics in a single study.

Given that only partial attempts have been made to develop an overarching OMP framework, it is clear that there is potential to use a theory elaboration approach to advance current frameworks. As such, this study applies Fisher and Aguinis (2017) guidelines to develop a multidimensional model of the OMP.

2.2. The One Minute Paper

The origins of the OMP date back to Charles Schwartz in 1977. It is a diagnostic and formative student learning assessment technique that is aligned with the philosophy of continuous quality improvement (Soetaert, 1998). Previous studies report that the use of OMP helps students' learning by building connections (Anderson and Burns, 2013). While Stead's (2005) assessment of the OMP was that there are sizeable benefits to both students and teachers.

The format and content of the OMP have been subject to numerous variations (Dietz-Uhler and Lanter, 2009; Lucas, 2010), but the overall premise remains the same - asking students to write down their reflections in a short allotted amount of time. Stead (2005) found evidence that the OMP moves students from passive note takers towards active learning. Davis et al. (1983) argue that the OMP encourages students to be reflective, while Black and Wiliam (1998) emphasised the need for communication between student and teacher, such that students are encouraged to think and to express ideas. Indeed, Anderson and Burns (2013) reported that students indicated that the OMP helped them to build a connection with their prior knowledge.

Although the operationalisation of the OMP is subject to debate (Anderson and Burns, 2013), the general consensus is that students are much more willing to engage on a deeper level with the OMP if their anonymity is maintained (Jong et al., 2012; Ludwig, 1995; Meagher and Whelan, 2001). This issue of anonymity is further explored in this study.

Research also suggests that the cyclical flow of information provided a strong foundation for the student and teacher relationship to prosper, promoting learning to occur (Karlsson-Brown et al., 2020; Stevens, 2019; Whittard, 2015). Most research on the OMP relates to its use in face-to-face teaching, while its effectiveness in the virtual or online teaching environment has not been widely studied (Campbell et al., 2019). Vonderwell (2004) is one such exception with the author reporting the OMP created a formal communication channel that allowed the lecturer to gauge student online learning.

Given the increased focus on a blended approach to learning following the global Covid-19 pandemic, the issue of trust and communication between teacher and student becomes increasing important. In Elphick and Sims' (2017) study, they report that technology is a tool that can be used to enhance practices, but stress the importance of the pedagogy of the application of the technology.

With technologies increased importance in teaching and learning, it is surprising that there is only a limited number of studies exploring the effect of the OMP in such an environment. One example is Campbell et al. (2019) who used a qualitative approach to assess master students' perceptions studying social work. They reported that the utility arose from a number of key themes including activity-based learning, course content, critical thinking, relationship building and connection with asynchronous material. There are also examples within the literature of how the OMP has been adapted for the use of technology and social media during the learning process. For example, Meehlhause (2016) combined the principles of the OMP with the use of selfies in an assessment of the students' skill development and retention after a library session.

Although the research has demonstrated a raft of benefits of using the OMP, it is not without its costs. For example, Whittard, (2015) noted three categories of potential costs to the lecturer and four to the student, but judged the benefits far outweighed the costs.

The unique timing of this study takes advantage of the conditions for a natural experiment to not only provide insights into the effectiveness of the OMP before and after the Covid-19 pandemic, but allows for direct comparisons of students studying the same, or similar modules, in two separate locations after the pandemic. This study uses the observations from the four cohorts to inform a theoretical elaboration of Whittard, (2015) and Campbell et al. (2019) preliminary models/frameworks, to develop the Multidimensional Model of the One-Minute Paper.

3. Material and methods

This study builds on existing models (Campbell et al., 2019; Whittard, 2015) to develop an overarching theoretical framework of the OMP based on three qualitative studies. The first method uses four semi-structured interviews to capture the lecturers' perspective. The students' perspective is captured through four Focus Groups (FGs). The results are triangulated with reference to the OMPs completed by the students.

3.1. Sampling

Four cohorts were studied; three cohorts were studying the same Level 3 economics module on a Business and Economic Programme – this allowed for cohort-specific nuances to be explored, while controlling for the same subject matter. As the same module was not run at the same time of year in the UK and Maldives, however, we were not able to study the same module at the same time. Therefore in 2022, in an attempt to account for time inconsistency bias between the results collected in 2019 and 2020, a similar yet distinct Level 2 business and economics module was selected to be studied in the Maldives, alongside the original Level 3 module studied in the UK. By controlling for time inconsistency in the second round of data collection, we acknowledge this limits the control for module content when comparing results from the Maldives 2022 students with the three other student cohorts. Table 3 provides information on students studying and contributing to the FGs.

In the UK across the two cohorts, male students outnumbered female students by nearly 3:1. In the Maldives, however, female students outnumbered males by over 2:1. Given this gender disparity between the two locations, where possible, the sampling strategy was set up to include equal number of female and male students within each of the four FGs. Although a potential source of sample selection bias, the decision to ensure equal gender representation across all FGs was made in order to enable an adequate exploration of the impact of gender in the different cultures. It was acknowledged, however, that this would mean the gender make-up of the FGs would not be fully representative of the make-up of the individual modules.

As both were dual honours modules (Business and Economics), the course content was designed at the intermediate level, covering the identification, interpretation and evaluation of a range of economic theories and their applicability to 'real world' problems. The three core themes running through both modules were; pluralism (alternative theories), application (tools and techniques) and communication.

In line with Gates and Statham's (2013) recommendation for optimal group size, all FGs consisted of six students (three male and three female); all students were self-selected. The exception to this was in the Maldives in 2020. This was due to the small class size and the willingness of just three of the six students to take part in the FG.

Table 3
Cohort information.

Module studied	Date studied	Number of students	Female	Male	Number in focus group	Female	Male
Same Level 3 Module							
UK	2019	52	12 (23 %)	40 (77 %)	6	3 (50 %)	3 (50 %)
Maldives	2020	6	4 (67 %)	2 (33 %)	3	3 (100 %)	
UK	2022	43	13 (30 %)	30 (60 %)	6	3 (50 %)	3 (50 %)
Similar Level 2 Module							
Maldives	2022	13	9 (69 %)	4 (31 %)	6	3 (50 %)	3 (50 %)
Total		114	38 (33 %)	76 (67 %)	21	12 (57 %)	9 (43 %)

The fact that all members of both FGs were self-selecting added a potential source of sample selection bias. Given that students who volunteered are more likely to be positive towards the lecturer and therefore potentially the OMP intervention, the research team identified this assumption and were mindful of this when interpreting the data.

Class sizes in the Maldives were smaller, all having less than 15 students, while class sizes in the UK both exceeded 40 students. In terms of class size, a priori, it was unclear as to what effect class size would have on the perceived effectiveness of the OMP. For example, students in smaller class sizes could engage more with the OMP as they are likely to have a deeper relationship with the lecturer. Alternatively, however, it may be assumed that the students may engage less because of a lack of anonymity.

3.2. Procedure

In a departure for much of the pre-existing literature that focusses on administering the OMP in hard copy format (Chizmar and Ostrosky, 1998; Harwood, 1996; Stead, 2005; Whittard, 2015), for all four cohorts, the OMP was administered electronically. Students were required to use an electronic device (e.g. mobile phone or tablet) to log-on to third party software (Socrative) to anonymously answer a number of pre-set questions. To avoid 'herd behaviour' students were only able to see the (anonymous) responses of their peers once the activity was complete. They could do this by accessing an excel file with all feedback which was automatically generated by the software and uploaded to the virtual learning environment by the lecturer. The lecturer also analysed the results and reported on the main findings at the start of the next lecture.

In order to ensure consistency of approach, the lecturer either chose both questions from set 1; both from set 2; or all questions in set 1 and 2:

- 1a. What concepts did you clearly understand in the lecture today?
- 1b. What concepts were less clear in the lecture today?
- 2a. What did the lecturer do today that was effective and enhanced my learning?
- 2b. What could the lecturer do to improve their effectiveness and therefore enhance my learning?

The responses from the first set of questions (content focussed) relates to the understanding of the subject matter. This allows the lecturer to re-address any areas that are less understood. The second set enables the lecturer to gain a better understanding of the students' perception of their effectiveness as a teacher. This enables the lecturer to reflect on their approach and amend it to meet the needs of the student cohort.

Following the completion of the module, student reflections on the usefulness of the OMP were captured via a student FG. A qualitative methodology was employed as this is best suited for exploratory work, when the focus is explicitly on participants' situations and experiences. Guler (2013) reports that the FG is most useful and suitable when the study needs to be objectively and thoroughly analysed.

The students were asked questions on topics included, but was not limited to, experiences surrounding the process of responding, the types of questions, the effect on the relationship, and use in face-to-face and online teaching. Students were also asked about whether they valued the OMP and were encouraged to propose developments for its future use.

The UK FG in 2019 took place face-to-face in a private room on-site at University, while the UK FG in 2022 was online using Microsoft Teams. Both FGs in the Maldives were also conducted online. All FGs lasted approximately 30 minutes with the discussion recorded and transcribed with consent of all members. Once the interviewer had coded the transcripts to ensure anonymity, they were released to the full research team for analytical purposes.

In FGs, it is widely recognised that the interviewer plays is an integral part of the data collection process and therefore is a potential source of both moderator and confirmation bias (e.g. see Patterson and Levitt, 2012). In order to manage this risk, the same interviewer, who was independent from the teaching team and previously had no experience of the OMP, conducted all FGs.

Each lecturer was interviewed following the completion of the student FGs. In the UK the same lecturer was interviewed in 2019 and then again in 2022 because they were still teaching the same module. In the Maldives a different lecturer was interviewed for each of the modules. The interviews followed a semi-structured format and lasted approximately 20 minutes each. All interviews were recorded, transcribed and coded prior to being submitted for analysis.

3.3. Analysis

The study took a qualitative approach in order to advance theory by identifying and explaining underlying relations.

In 2019/20 the analysis was guided by the emergent themes identified from the FG and interviews, rather than being structured around the pre-existing theoretical frameworks. This was done in order to avoid imposing constraints on the analysis. Thematic analysis (TA) was chosen as the method of qualitative analysis, while applying an inductive approach to TA (Braun and Clarke, 2006). The primary coder familiarised herself with the data through the transcription of the interview recordings, reading the data and noting ideas. Initial codes were generated so that the coding within this project was 'data-driven'. The codes were then categorised into potential themes. These themes were then compared with the pre-existing theoretical frameworks and a thematic map of the analysis generated using NVivo software. Preliminary data analysis of the first FG took place ahead of the second FG, and the second FG ahead of the interviews with the lecturer. This was done to ensure that any emergent themes were identified and explored in subsequent FGs/interviews. The data collected from the OMP was only formally analysed after the completion of both FGs and interviews.

After reviewing 2019/2020 study it was decided to collect additional data as the initial study was too limited to support the

multiple hypotheses generated. It was recognised that this may lead to retrospective bias in setting questions. Therefore in the subsequent round of data collection in 2022, the research team attempted to replicate initial conditions as much as possible (e.g. using the same semi-structured format). All data from FGs and interviews were collected before any coding and analysis was undertaken. The analysis was the used to test and refine the original thematic framework developed following the initial round of data collection in 2019/20.

3.3.1. Limitations

Given the challenges of a limited and unbalanced sample, the authors recognise that the empirical base can only be viewed as explorative. The purposive samples are intentional, but potentially subject to producing skewed and bias qualitative data. This is because the data accounts for a considerable mismatch between the number and in-depth information provided by the different cohorts, with data gathered at different times. However, given that the study supports and builds on results from previous studies, this provides confidence in the following results generated.

4. Results

4.1. Theory elaboration

Following a thematic analysis in 2019/20, which was subsequently revised and refined following the interviews and FGs in 2022, the results were coded and then mapped back to Campbell et al.'s (2019) and Whittard, (2015) preliminary frameworks. Table 4 documents that, at its most parsimonious level, the model can be described by three main constructs (Connections; Functioning; and Environmental Context). This study advances theory as it is the first to explicitly identify the Environmental Context as a core construct, while it also provides a clear definition of distinguishable specific sub- constructs, a number of which were identified for the first time.

For example, in the Multidimensional Model of the OMP, the broad construct of Connections, is broken down into four sub-constructs. The first of these sub-constructs - Communication and feedback loop – captures three of the benefits and costs described

Table 4
Theory elaboration: developing the multidimensional model of the One-Minute Paper.

Preliminary models			Multidimensional model of the One-Minute Paper	
Benefit and cost model Whittard (2015)	Thematic framework Campbell, Abel and Lucio (2019)		Sub construct	Broad construct
- Immediate feedback - Responding to OMP can be time consuming - Lecturer's feedback is limited to average response	- Negative feedback	**THE MATIC ANALYSIS**	- Communication and feedback loop	Connections
- Clarifies misunderstanding - Potential to over rely on technique to assess learning	- Course content - Connections with Asynchronous content		- Understanding content	
- Demonstrates respect and interest in students - Student trivial and/or inappropriate responses can be frustrating	- Relationship building		- Student & teacher relationship - Anonymity	
- Student can compare levels of understanding - Questions can be ambiguous and difficult to answer in a short time frame	- Critical thinking - Programmatic discussion - Professionalism		- Critical thinking & self-reflection - Teaching improvement and development - Building confidence	Functioning
- Encourages active listening and engagement - If over/poorly used can be viewed as a gimmick	- Activity based learning		- Active engagement	
- Responses analysed quickly - The OMP uses up valuable lecturing time	- Technology issues - Flow of class		- Technology - Module delivery - Cultural Differences - Size of class - Contemporary context (e.g. Covid-19)	Environmental Context

by Whittard, (2015) and the negative feedback identified by Campbell et al. (2019). The anonymity sub-construct is an addition to these preliminary models, albeit it is widely reported on in the wider OMP literature. As such the revised model creates clearer, more useful constructs/sub-constructs and a more transparent description of the complex relations between them.

4.2. Constructs and sub-constructs

The coding results for all four student focus groups and lecturer interviews are recorded in Table 5. This table reports how much of the lecturers' and students' commentary was made in relation to the constructs and sub-constructs identified. The information is presented by year and for each student cohort. Constructs and sub-constructs are listed in rank order, based on the highest average percentage of student group commentary coded to each of them.

The thematic analysis of the student and lecturer qualitative responses confirmed that the perceived effectiveness of the OMP was driven by three core constructs – a construct was defined as core if, on average, it was discussed for more than 5 % of the time, by either the students, lecturers, or both. The three core constructs are underpinned by thirteen constructs – a sub-construct was only created if, on average, it was discussed more than 0.5 % of the time, by either the students, lecturers, or both.

While acknowledging the caveat that the results are based on small numbers of observations, and therefore there is a risk of over interpretation, it is worth noting that it appears that lecturers are interested in the process and how this affects teaching effectiveness (e.g. feedback and communication loop and teaching improvement and development) while students seem more interested in improving outcomes (e.g. understanding content and critical thinking and self-reflection).

On average, lecturers spent more time discussing the core constructs than students. This suggests that the lecturers really valued the use of the OMP and had considered how they perceived it to work. However, of the sub-constructs, on average students focussed more often than lecturers on discussing the importance of the OMP in developing critical thinking and self-reflection skills and helping them understand content. This is unsurprising as students are most likely to consider how it affects them directly. Of all sub-constructs, both students and lecturers spent the most time discussing the communication and feedback loop, which by its nature directly benefits both.

The identification of the Environmental Context as a core construct is a novel extension to the preliminary models. Its importance, however, is highlighted by the fact that of all the three core constructs, lecturers spent more time discussing this. Of the Environmental Context sub-constructs, the importance of the technology was the only one to be discussed by all lecturers and student cohorts. Of the Environmental Context sub-constructs, on avaerage, it was the most discussed by the students, suggesting the importance they place on online learning.

In 2019/2020, cultural differences were identified as being particularly strong by both the Maldivian lecturer and students. This was influenced by the fact that lectures in the Maldives were conducted late in the evening, while lectures took place during the day for UK cohorts. The timing of the delivery of the Maldives module also directly coincided with Ramadan in that year, which further highlighted the importance of this cultural difference.

The following analysis further explores the perceived importance of the constructs and sub-constructs through more fine grained textual analysis.

Table 5
Percentage of transcript coded to each construct and sub-construct.

	UK focus group 2019	UK focus group 2022	Maldives focus group 2020	Maldives focus group 2022	Student focus group average	Lecturer interview 2019/20	Lecturer interview 2022	Lecturer interview average
Connections	**13.2**	**27.4**	**4.0**	**6.5**	**12.8**	**24.1**	**18.8**	**21.5**
Communication and feedback loop	10.6	3.3	3.0	2.7	**4.9**	15.2	4.1	**9.6**
Understanding content	0.5	14.3	1.0	1.2	**4.3**	2.7	5.3	**4.0**
Teacher student relationship	2.1	7.1	0.0	2.5	**2.9**	4.6	6.9	**5.8**
Anonymity	0.0	2.7	0.0	0.0	**0.7**	1.7	2.5	**2.1**
Functioning	**9.7**	**24.4**	**4.7**	**6.3**	**11.2**	**15.5**	**15.7**	**15.6**
Critical thinking and self-reflection	0.0	14.2	0.4	2.7	**4.3**	3.3	4.9	**4.1**
Teaching improvement and development	7.8	2.8	4.3	2.0	**4.2**	10.3	5.7	**8.0**
Building confidence	1.8	7.4	0.0	1.4	**2.7**	1.8	1.1	**1.4**
Active engagement	0.0	0.0	0.0	0.1	**0.0**	0.0	4.1	**2.0**
Environmental context	**5.5**	**5.1**	**8.8**	**3.2**	**5.6**	**32.8**	**20.7**	**26.8**
Technology	3.1	1.2	1.4	1.1	**1.7**	3.1	8.1	**5.6**
Module delivery	0.0	3.9	1.9	0.4	**1.5**	6.6	6.0	**6.3**
Cultural differences	0.8	0.0	3.9	0.0	**1.2**	14.1	1.0	**7.5**
Size of class	1.6	0.0	0.0	1.7	**0.8**	9.0	4.7	**6.8**
Contemporary context (Covid-19)	0.0	0.0	1.6	0.0	**0.4**	0.0	1.1	**0.5**
Construct Total	**28.4**	**56.9**	**17.4**	**15.9**	**29.6**	**72.3**	**55.3**	**63.8**

4.3. Connections

4.3.1. Communication and feedback loop

Even though the UK students only knew the lecturer for a short time, they had a strong bond with them, and they partly attributed this rapid connection to the OMP. They also felt the OMP encouraged an open and honest conversation and allowed them to learn from each other – "*something that comes from what you are writing and… you get feedback… and hear about what other people are talking about*".

From the first cohort in particular, it was explicitly recognised by the lecturer in the Maldives and the students in the UK that the value of the OMP was that it acted as the initial feedback mechanism to a wider conversation between the lecturer and their students. While students and lecturers from all cohorts indicated that the value from the OMP was only achieved once the lecturer acted upon the initial feedback. It is clear that the two-way process of the feedback loop is important to maximise the benefit to the students' learning experience.

4.3.2. Understanding content

This study found 'understanding content' was pervasive throughout all lecturer interviews and student FGs, with one commenting:

> *"if you haven't quite understood something, it picks it up there and then"*

In a novel finding, however, the study picked up the importance of such mechanisms in helping less traditional students build confidence and find their own voice.

> *"I'm a mature student… I was way out of my depth…I've got four children… I haven't been in education for such a long time… I was kind of frightened… stupid… and what I've actually found is other students… don't understand that as well'.*

4.3.3. Student and teacher relationship

There was considerable support from students and lecturers in both the UK and the Maldives that the OMP played an important role in building relationships between them. As one Maldivian student commented: *"it really improves the relationship with the lecturer"*. It is, however, difficult to unpick the direction of causation, as potentially this may just be a reflection of attentive teachers being more likely to use the OMP, rather than the characteristics of the OMP itself.

Although the lecturers were aware of this potential benefit, from their perspective they reflected on the speed at which it enabled them to *"build a rapport"* with the students. This benefit was considered to be of particular importance where classes are larger and individual contact can be limited; especially when there is no pre-existing relationship between the lecturer and the students.

4.3.4. Anonymity

Although well documented within the literature, anonymity was absent from the preliminary overarching frameworks, but was considered important by all lecturers and accounted for 2.7 % of the discussion held in one FG. As such it is included in the model in its own right. The lecture in the UK (2022) reported that *"[the OMP] encourages people to show their weaknesses. I think people don't really necessarily always feel that comfortable to show what they don't understand"*.

This was corroborated by the lecturer in the Maldives (2020) who reported that for some students *"it's easier for them to write in the [OMP]"*.

This was further supported by UK students in the 2022 FG, who commented that they could safely contribute, although there was no requirement on them to do so. They felt that it allowed them to build confidence, which in turn encouraged their engagement in the class; and it helped them connect and learn from their peers, while reassuring themselves that they are not the only one struggling with a particular concept.

4.4. Functioning (practical use or purpose in design)

4.4.1. Critical thinking and self-reflection

This study repeatedly identified evidence of critical think and self-reflection across three student cohort groups and all lecturers. For example, one UK student (2020) commented that the process had led them through an iterative process of initially believing they *"knew something"*, when through reflection their understanding developed, deepened and changed. Another student in the same FG commented

> *"being able to articulate it in the form of a sentence… kind of enables you to think whether you really understand it or not"*.

Campbell et al. (2019) had previously reported that OMP had allowed students to reflect and make connections to both the wider programme and the world of work. This was also reflected in our results as there was evidence that the OMP had encouraged both students and lecturers to make connections between the syllabus and wider environment. For example, not only did the students apply the process to *"my other modules… when I was driving home, I was kind of like recapping where usually I don't, I just you know cut off"*, the Maldivian students also used the process to link between *"working and studying"* and encourage the lecturer to make changes in their teaching to include "*real life examples… both local and international*".

4.4.2. Teaching improvement and development

There was recurrent evidence that the use of the OMP had driven innovations in teaching over the course of the module. For

example, the Maldivian lecturer (2022) commented:

> *"I did that based on their suggestions… I was able to use different techniques like the discussion, plus international perspective, plus some videos as well… facilitated for them to be more familiar with the context they study"*.

The interviews and first round of FG also brought up suggestions for how improvements could be made to benefit future cohorts. The timing of the OMP was discussed, and alternatives suggested including having the OMP questionnaire online and open throughout the lecture. That way the students could respond to the questionnaire in real time during the lesson and when the issue identified was fresh. The Maldivian students wanted to go one stage further, by suggesting that the lecturer also provide real time feedback by simultaneously reporting via a live feed.

4.4.3. Building confidence

Reflecting on the lecture and draughting a written response to the questions posed can help students to build confidence, especially if students find it difficult to engage in a classroom setting where discussions can be dominated by just a few *"loud voices"*.

In the post Covid-19 online teaching environment, it can be harder for less confident students to engage, particularly if they chose to attend with cameras and microphones off. The OMP can therefore be seen as a democratic tool to support engagement, as it can give a voice to those lacking confidence to engage in discussion and debate in the formal teaching environment. This was elaborated on by a Maldivian student (2022) who commented:

> "*There is a boost of confidence… when you hear about what other people are talking about"*.

The wider aim, however, is that the confidence gained by engaging and learning through the OMP, will eventually spill over into greater engagement in class. This evidently happened to at least one UK student (2022) who commented:

> *"My confidence has grown quite a lot… I went from not saying anything at all to, towards one of our last sessions, asking quite a few questions"*.

4.4.4. Active engagement

The OMP itself encourages the students to take responsibility for their own learning as they know they will be asked to reflect on their knowledge at the end of the lesson and to relate that back in the form of a couple of sentences. As well as this direct activity, however, one of the indirect benefits is that this type of engagement and feedback loop can spill in to other parts of the lesson itself. For example, one Maldivian student (2022) commented:

> *"[the OMP] actually leads us to have very open conversations during class"*.

While the UK lecturer (2022) commented:

> *"It encourages that engagement, encourages that respect… it's a place where people feel happy to discuss and debate and ask questions. And I think it [the OMP] contributes to that"*.

4.5. Environmental context

4.5.1. Technology

For all cohorts of students, the OMP was administered electronically and there were clear benefits to this. The students felt it more efficient, as well as being easier for them as they were used to operating technology to communicate via other social media apps. They also believed that by using technology the response rate and level of engagement with the process was likely to be higher. As one Maldivian student succinctly put it *"the gens Z are taking over now. So everyone is very digitalised. So I think we all prefer it on the phones"*.

However, on the negative side, students did report challenges with using the online platform at times. This was a particular problem for the Maldives students who were being taught late into the evening and then had to "*stay back waiting for 15 minutes after the class because the website itself was not opening"*.

From the lecturer's perspective, it saved time in terms of collating, analysing and reporting the results. It also made the process more transparent as all (anonymous) responses could easily be uploaded online for all students to read and therefore allow them to reflect on other students' observations as well as their own.

4.5.2. Module delivery

The OMP was used in both face-to-face teaching (UK both cohorts), online only teaching (Maldives 2020), and blended teaching with a mix of face-to-face and online teaching (Maldives – 2022). When asked about the effectiveness of the OMP in each of these environments, the students were unanimous for their support, indeed one Maldives student commented *"whether it is face to face or online or blended. I think we can use the OMP in every situation"*.

4.5.3. Cultural differences

The cultural issue that had the greatest impact was the composition of the student cohorts. In the Maldives, the lecturers estimated that *"80–90 % of the students are full-time working and then studying"*. While recognising that this was beneficial in terms of students *"coming with a huge depth of knowledge from… practice"*.

Due to student composition, in the Maldives all modules are taught at the end of the working day. Therefore the lecturer (2020) reported that asking students to stay at the end of their final lesson (10 pm) to fill in the OMP can be very challenging.

Due to the timing of the study in the Maldives in 2020, where the first few lectures of the class were completed during the month of Ramadan, a noticeable cultural difference was observed. At this time of year, Muslim students fast during day light hours and hence have a sizeable meal ahead of studying. These students reported that potentially this did affect the level of engagement with both the module and the OMP, reporting that *"we don't do classes while we are fasting. It's like right after, right when we are most tired, we start studying"*.

The cultural context was also a clear issue in terms of the curriculum. The modules taught in the Maldives were accredited with the UK University and based on the UK programme. This proved problematic to the Maldivian students who through the use of the OMP were able to influence the way the module was taught. The Maldivian lecture commented

> *"the syllabus is based on the UK…. A lot of students are not familiar with the context. In that case I was I was able to use different techniques… according to their suggestions"*.

4.5.4. Size of class

The lecturer and student response to the effectiveness of the OMP and its relation to the size of the class was mixed. This ambiguity was succinctly summed-up by the Maldivian lecturer (2022) who commented on the value of the OMP in classes which are *"very small… [because] some maybe not willing to share their view*", while also suggesting the OMP is *"more useful for bigger groups because smaller groups, we can use some other mechanisms [to meet] the need of the individuals"*.

The support for bigger groups was also supported by Maldivian lecturer (2020) and UK students studying in 2019. They suggested

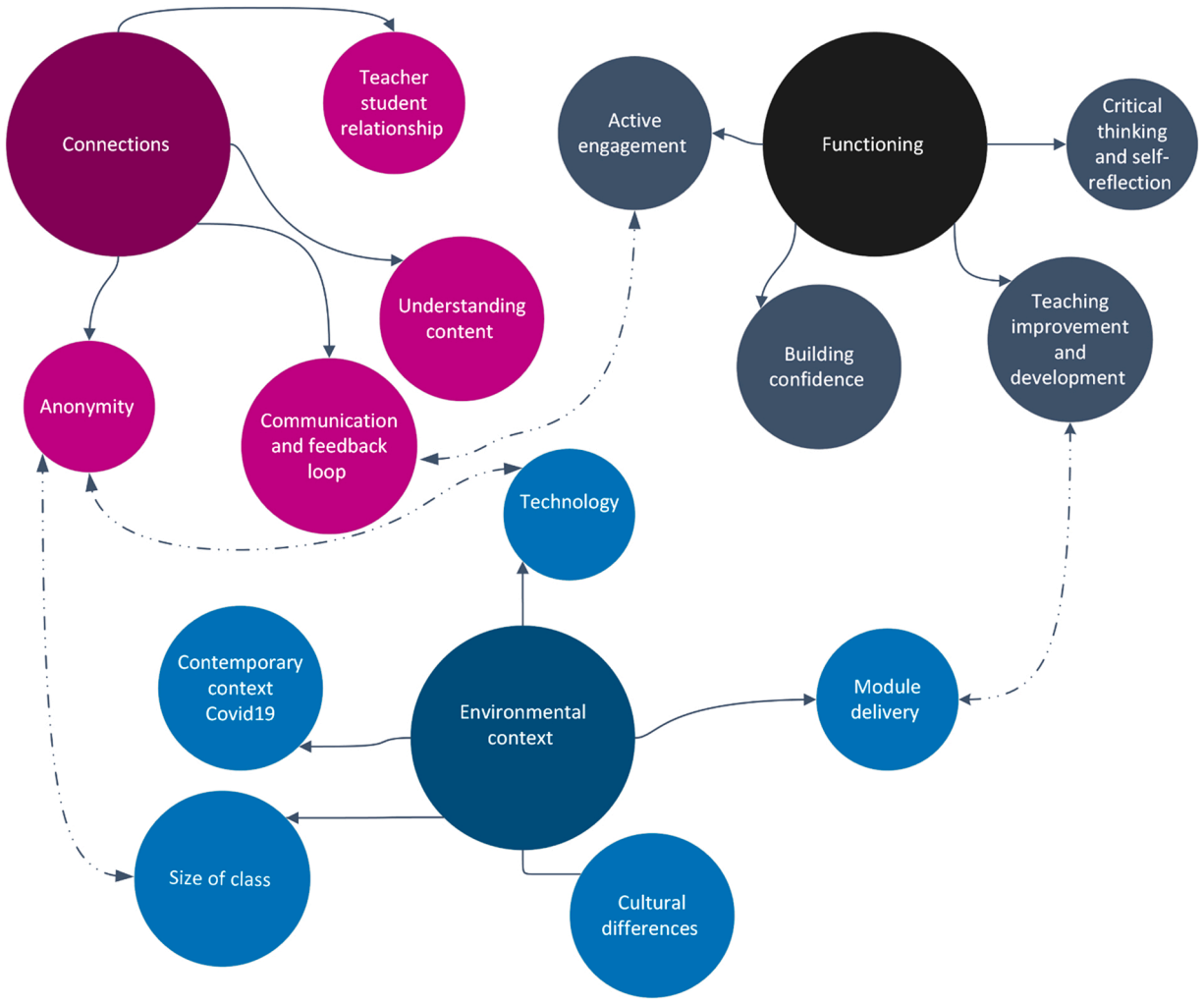

Fig. 1. Multidimensional model of the One-Minute Paper.
Source: Authors' model.

there would be greater value if it were used in modules with more students, particularly if these students were previously unknown to the lecturer. They did, however comment that the time invested needed for the lecturer to administer and analyse the responses effectively would grow in proportion to the size of the student cohort and therefore could be a potential barrier to its use in larger class sizes.

4.5.5. Contemporary context (Covid-19)

This study covered four years including pre and post the Covid-19 pandemic period. As such, it witnessed a considerable shift away from face-to-face lessons, to full online education and then a move towards a mixture of online and blended teaching. As such, there was some, albeit limited, evidence of the relationship of the OMP with this contemporary context.

Most noticeably the Maldivian students commented that this loss of face-to-face contact with other students, as well of the lecturer, was difficult. Others commented that the fact of having to balance work with studying in a pandemic was *"really something hard and challenging"*. Indeed, for students with particular frontline jobs, such as working in the health service, this was even more problematic and led to them *"missing a lot of classes"*.

The lecturer in the Maldives commented that one of the biggest challenges of online teaching was that they were less able to get visual cues and instant feedback from the students to *"understand [whether they were] able to get through to the students"*. They commented that the OMP was able to fill this gap somewhat by providing this timely feedback.

4.5.6. Relationships between sub-constructs

A detailed analysis of the commentary revealed the importance of the constructs and sub-constructs, while simultaneously highlighting the challenge to isolate the precise mechanisms through which the OMP is perceived to work. This is because many of the sub-constructs are interlinked and have a subtle and nuanced effect when interacting with each other. For example, the analysis revealed that the two main constructs of 'Connections' and 'Functioning' are linked through the sub-themes of 'communication and feedback loop' and 'active engagement'. This was demonstrated by one Maldivian student (2022) who commented that *"he [the lecturer]… incorporate [student] comments and feedback… and that actually leads us to have very open conversations during class"*. There is a self-reinforcing relationship here. The feedback loop between student and teacher helps to improve the connection, which in turn leads to more willingness to actively engage.

The commentary also revealed that 'Functioning' and 'Environmental Context' were linked through the sub-constructs of 'teaching improvement' and 'module delivery'. This was highlighted by the UK lecturer (2022) who stated

> *"when they feedback in terms of what they enjoy about the lectures we can build on that…they like the… dialogic approach [but] there's been issues around the [module] delivery… failures with technology, which was brought to my attention through the one minute paper"*.

While completing the feedback loop between the three main constructs, 'Environmental Context' was linked to 'Connections' through 'size of class' and 'anonymity'. As one Maldivian student put it (2022) *"our classrooms are very tiny and obviously a lot smaller in the size of group… so considering that it's a lot, lot better when it's anonymous to be honest"*.

By identifying the existence of links between the main constructs through the interlay of the sub-constructs, we begin to draw out the complexity and nuances at work. We have attempted to illustrate these secondary links in Fig. 1, which depict the links with a dotted line. In the model, however, the secondary links identified are by no means exhaustive and are only included to be illustrative. The study has chosen not to detail the full extent and subtleties of these interconnections in favour of presenting a parsimonious model, rather than an overly complex theory, which is less likely to have broad appeal or utility (Fisher and Aguinis, 2017).

4.6. Multidimensional model of the OMP

The qualitative analysis informed the final construction of a conceptual model to provide a visual representation of the processes through which the OMP supports learning and teaching – see Fig. 1. A particular strength of this model is that it extends and more accurately reflects the constructs and sub-constructs. It also begins to map out the complex relationships between the sub-constructs through which the OMP is perceived to work.

The multidimensional model of the OMP confirms support for the constructs of 'Connections'; and 'Functionings' which both have previously been identified in the literature. However, the multidimensional model provides an extension to the literature by improving construct scope, as it brings to the fore the importance of Environment Context. This is largely a reflection of the increased availability of affordable technology; dramatic shift towards online and blended teaching; and the cultural differences recognised by comparing cohorts from two different countries.

The model also extends understanding by identified and mapping distinguishable sub-constructs, while illustrating the potential relationships between them. In the model a solid line indicates a broad construct has been split into its specific sub-constructs to provide a more complete portrayal of the model, thus improving construct validity. The dotted line indicates specific structural relationships between the sub-constructs. These have not previously been described in the literature, but our research suggests that they can work together to influence the effectiveness of the OMP. Such developments in structure should enable models to more accurately explain and/or predict outcomes. In line with Fisher and Aguinis' (2017) actionable research approach to theory elaboration, Appendix 1 provides a detailed breakdown of potential theoretical advancements resulting from the extended framework.

5. Discussion and conclusion

The OMP is a simple tool that provides lecturers with formative feedback and allows students to reflect on their own learning, while potentially giving students the opportunity to feedback and influence the lecturer's approach to teaching. This study used theory elaboration to build on two preliminary models to develop a new theoretical framework – the Multidimensional Model of the OMP.

A natural experiment provided an insight across five facets (perspective; time; culture; teaching method and class size). Thematic analysis revealed that the OMP supports learning and teaching via the three core constructs (Connections; Functionings; and Environmental Context), all of which are underpinned by a number of distinguishable sub-constructs. Theory was advanced in two main ways – construct scope is expanded to include the Environmental Context as a new core construct, while construct validity is improved through construct splitting and the clear definition of distinguishable specific sub- constructs.

The new framework illustrates the interlinked nature of constructs which support learning and teaching when using the OMP. The significance of this updated model means that there is a clearer understanding of how the OMP works, making it possible for lecturers to refine and target their approach when using the tool to improve learning and teaching outcomes.

Of particular note, was the identification of the cultural differences and technology sub-constructs, and in particular the influence they can have the OMP's impact on learning and teaching. These results suggest that the OMP can be adapted to help meet the current global challenge faced by higher education, as online and blended delivery becomes the norm.

In this study, the main cultural differences arose because of the differences in the make-up of the students and its impact on module delivery. In the Maldives, students generally work while studying, resulting in the modules being delivered at the end of a working day when students are tired. This meant that these students were potentially less likely to positively engage with the OMP as it was the last thing after a very long day, particularly when coinciding with Ramadan when they studied after breaking long periods of fasting. To negate this, lecturers could consider running the OMP in real time, rather than waiting to implement it at the end of the lesson. On the flip side, however, the OMP was also seen positively by the same students, as it was instrumental in getting their lecture to tailor the content of the module to their cultural context.

The study also revealed that the OMP was particularly useful in a post Covid-19 world of online and blended teaching. The increased availability of technology to students, combined with the freely available teaching software to administer the OMP makes the simplicity and flexibility of the OMP a very attractive and useful tool to help with the teaching and learning process in higher education.

The multidimensional approach revealed that the OMP was perceived to support improvements in teaching and learning, regardless of the facet explored. This suggests that the OMP is a universal tool that can deliver positive outcomes for both students and lecturers in all contexts. This study therefore implies that it may be time for lecturers to revisit and implement the simple, yet highly effective OMP into their teaching practice. These findings take on greater significance in a post pandemic world where inevitably more teaching will be delivered online.

5.1. Study limitations and future research

Given the authors acknowledgement that the framework was intentionally underdeveloped in terms of mapping the relationships and independencies between the sub-constructs, there is obviously potential to explore how the interconnections may be better understood through undertaking a further round of theory elaboration.

Although the qualitative study has been important to identify, split, and structure new and existing constructs and sub-constructs, it does mean that a limitation of the study is that the model lacks robust empirical support. As such, it would now be appropriate to test the model empirically, potentially through a randomised control trial, measuring the "before-after" effect. Alternatively, it may be possible to set up an experiment to measure change in students' learning outcomes before and after the teacher changed their teaching strategy in response to the OMP.

Further research is also needed into using the OMP in alternative environments. For example, students in the study suggested using the OMP as a real time feedback mechanism. Such innovations in the use of the OMP could provide additional support to improve learning and teaching outcomes.

Although the study was run across four students groups, it remains a small-scale research project and as such was unable to isolate each dimension. In addition, as with all case studies, generalisations are naturally limited. Confidence in the model, however, is supported by the fact that the framework was built on the results from prevailing studies.

Ethics approval

Faculty Research Ethics Committee, UWE, Bristol.

CRediT authorship contribution statement

Damian Whittard: Conceptualization, Methodology, Formal analysis, Resources, Writing – original draft, Writing – review & editing, Supervision, Project administration. **Elizabeth Green:** Software, Validation, Formal analysis, Investigation, Writing – review & editing, Visualization. **Mariyam Shaffau Shareef:** Investigation, Writing – review & editing. **Idrees Ismail:** Investigation.

Declaration of interest statement

The authors declare none.

Data Availability

The data that has been used is confidential.

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Appendix 1. Theoretical advancements of the extended framework

Broad and sub-constructs	Extended frame work	Construct scope	Construct validity	Logical/ empirical adequacy	Explanatory/ predictive adequacy
Connections	Broad construct defined to aid theoretical parsimony – aspect of theory is supported by previous studies and empirically here, hence it should be deemed as generalisable		✓		
- Student teacher relationship	Builds on previous framework, but is less prescriptive in the assumed direction as allows for both improvements and deterioration of the relationship. This approach – generalisable	✓			
- Communication and feedback loop	Builds on previous frameworks, while allowing for the accounting of a recursive relation, potentially improving both explanatory and predictive power – generalizable.				✓
- External connections	Build on previous frameworks, however but is less context specific (e.g. professionalism) than identified in previous - generalisable		✓		
- Understanding content	Support from literature – generalisable				
- Anonymity	Sub-construct has been identified in the literature (e.g. Jong et al., 2012) but was excluded from previous frameworks, as such the 'new' construct adds to the validity of the model - generalisable	✓			
Critical thinking and active engagement	Broad construct defined to aid theoretical parsimony - generalisable				
- Student self-reflection	Although indirectly included in Whittard, (2015), this definition provides a more accurate description of the reality - generalisable	✓			
- Student critical thinking	Builds on previous framework - generalisable				
- Student active engagement	Builds on previous framework - generalisable				
- Building confidence	New construct identified which is identified across the different cohorts, suggesting generalisability and therefore increases the scope and validity of the model.	✓			
- Developments in teaching	New concept although indirectly discussed in Whittard, (2015) - generalisable	✓			
Environmental Context	New broad construct defined in order to enable to aid theoretical parsimony, but also more accurately account for contextual factors.	✓		✓	
- Module delivery	The relationship to module delivery is only partially discussed in previous frameworks. This construct is broader and including approaches to online/blended learning- generalisable		✓	✓	
- Technology	This is a new construct and captures the use of technology in both teaching practices and the administration of the OMP – generalisable	✓		✓	
- Contemporary context (e.g. Covid-19)	This is a new construct and captures the interplay between events and shifts in practices, this was partially important for this study as it spanned the Covid-19 global epidemic – context specific	✓			
- Cultural Differences		✓		✓	

(*continued on next page*)

(*continued*)

Broad and sub-constructs	Extended frame work	Construct scope	Construct validity	Logical/ empirical adequacy	Explanatory/ predictive adequacy
	This is a new construct which allows the identification of cultural factors – context specific				
Size of class	This is a new construct which allows for consideration of size of – generalisable	✓		✓	
Sub-construct relationships	This is the first time that the recursive interactions between subcontracts have been identified. They allow an understanding of how the different sub-contracts impact and influence each other.	✓			✓

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