HYBRID ENGINEERING EDUCATION RESEARCH: THE CHALLENGES & BENEFITS OF AN EMERGENT METHODOLOGY.

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ABSTRACT

Engaging students of any discipline in meaningful and constructive research about their university experience can be challenging[1]. During the Pandemic maintaining a balanced approach to sampling and data collection when conducting pedagogical research proved to be more than a little problematic, with many students seemingly experiencing 'online fatigue'. Moving slowly out of the Pandemic, the issues have changed, with students now hesitant to participate in face-to-face research. This short concept paper discusses the practical and theoretical challenges encountered in undertaking Engineering Education Research (EER) at a time of unprecedented social and educational change. In focusing very much on methodology this paper does not report on the emergent findings of the study discussed but instead focuses on the methodology itself.

1. INTRODUCTION

Starting with an overview of the organisation in which the study is set, this paper discusses a current project aimed at promoting a culture of scholarship and evidence-based learning and teaching across all undergraduate and postgraduate programmes within a UK Russell Group University Department of Engineering & Management.

Starting with a short precis of the literature, attention is drawn to three student-focused areas prioritised by the project team: The quality of the student experience: Blended learning: Student engagement. Following this, a reflexive account of the use of hybrid research to promote scholarship is given whereupon the paper critiques the use of an online platform as a contemporaneous structured **and** reflective unstructured data collection tool (Miro, 2022[2]).

The virtual and traditional strands of a current hybrid research approach are discussed and the benefits and challenges of using tools such as *Miro* for data collection considered. In reflecting upon some of the unforeseen challenges of engaging students in hybrid research, the paper contributes to current debates about how EER is emerging as a new research discipline in its own right.

2. BACKGROUND

One of the largest applied engineering faculties in the UK, WMG has a long history of applied research, working alongside global and local employers to produce innovative solutions to contemporary real-world engineering challenges[3]. Alongside this, a steady, but increasingly strong history of high quality, practical engineering and applied management education has emerged; producing graduates able to impact the workplace from the date of employment, whilst also being equipped to deal with the unknown problems of the future.

Like elsewhere, over the past two years or so, the Covid19 pandemic has affected a paradigm shift in how education is provided offered within WMG. Almost overnight, the

Spring of 2020 saw a c-change in how all aspects of education were provided and managed. Previously 'tried and tested' pedagogies were suddenly not available for use as, like elsewhere, WMG switched all of its education provision to being 100% online. Over two years later, as the globe begins slowly but surely to emerge out of the Pandemic, both colleagues and students find themselves metaphorically blinking in the *light of day*. Whilst some are reluctant to re-enter the classrooms and labs, others cautiously are embracing the return.

In this unprecedented situation, the notion of 'hybrid learning' has emerged. Differing from blended learning in that many 'live' lectures are contemporaneously provided online **and** face-to-face in the classroom, questions of how students' are experiencing the 'new normal' in engineering education have arisen. Tasked with evaluating students' perceptions of learning after lockdown, National Student Survey (2021)[4] results were used to identify and prioritise which programmes to evaluate as a priority.

In seeking to empirically critique what continues to be a fluid pedagogical picture, it soon became clear that capturing the student experience, whilst traditionally tricky, is now even more difficult – with many students reluctant to engage in conversations and some avoiding attending university in person. With a need to capture the views of as many students as possible the idea of a 'hybrid methodology' was born.

Aimed at providing as many students as possible with the opportunity to engage anonymously either online or in person in the evaluation, the decision was taken to use an online 'learning platform', *Miro* to explore the student experience. This paper focuses primarily on the process of developing and using an 'online' contemporaneous research tool. It highlights the benefits and drawbacks of 'hybrid research' and reflects upon how this approach may be used in future.

3. THE LITERATURE

Prior to considering how to accurately capture the breadth and depth of students' and colleagues' perceptions and experiences as we emerge out of the pandemic, a short literature review was undertaken. With the aim of thematically determining where the study should focus three key themes were explored:

- **The quality of the student experience**: Much has been written about the quality of the student experience, both in traditional, face-to-face scenarios and also with regards to online and blended learning[5,6,7,8]. Whilst acknowledging that the concept of 'quality' is in-itself much debated, the researchers' turned their attention to the need to holistically capture students' lived experiences. Conducting research at the end of the pandemic saw a number of unforeseen practical problems including a reluctance to engage with any face-to-face live activities. Manifested by what appeared to be an innate shyness in many students an initial call for participants did not heed any respondents. At a time when the vast majority of 1st and 2nd year undergraduates have not undertaken any written examinations to get into university, and postgraduate students have completed their undergraduate education alone in their bedrooms, the question

of how *liveliness* of the university environment was impacting individual student's academic and social behaviour arose before the study had even started.

- **The Challenges and Benefits of Blended Learning**[9,10]: With the term 'hybrid' learning emerging out of the Pandemic, the literature review identified a range of challenges and benefits in the area of Blended Learning. A number of key areas for exploration emerged out of the literature including the need to investigate: *how* learning technologies are used at university level, particularly in the area of active learning: *what* previous technologies used in the university had proved to be successful in engendering learning and which ones had not: *why* some platforms, whilst multifunctional and able to support a range of learning approaches, were used by colleagues to simply 'dump' lecture notes and readings: *how* to better engage students in online learning.

- **Improving Student Engagement**[11,12,13]: Learning technologies have traditionally attracted both positive and negative student responses, with student engagement key to pedagogical success. The incept of mandated online learning during the pandemic saw virtual engagement increase as students had little or no choice but to engage with the various learning platforms. Yet ironically, as society is emerging out of the pandemic, students have become comfortable in their study rooms and bedrooms. Used to being able to listen to a lecture whilst perhaps not fully engaging, the question of how we can better engage learners is perhaps more pressing than ever.

As previously acknowledged, at the beginning of the study students' reluctance to engage in 'on-campus' learning was manifest by difficulties in finding participants willing to take part in qualitative research. Thus, in considering how to investigate the student experience of the past two to three years, the need for a hybrid methodology arose.

4. HYBRID EDUCATIONAL RESEARCH: AN EMERGENT METHODOLOGICAL APPROACH

Having been tasked with critically analysing student perceptions' across the undergraduate population, two of the research team initially planned to undertake a *traditional* qualitative Action Research study following a methodology based upon Grounded Theory[14]. Whilst the initial intention was to run face-to-face focus groups and interviews with students to look at the issues raised in the National Student Survey (2021), it quickly became apparent that whilst conceptually guided semi-structured interviews are indeed a tried and tested method of gaining a depth of insight of the student experience, this year's undergraduate cohorts were very reluctant to meet face-to-face and also unwilling to discuss their concerns verbally in any forum.

Difficulties in accessing the student voice using traditional methods resulted in a number of alternative approaches being considered, including online group interviews and individual face-to-face meetings (both online and face-to-face). Such approaches were quickly put to one side as some undergraduate students made it clear that they

felt very uncomfortable talking in front of their peers, whilst others simply did not want to come onto campus. The primary reason for such reluctance appeared not only to be a fear of Covid, but also a lack of group cohesion and familiarity across each of the cohorts. Used to working alone and having made friends only with a very small group of peers, students simply did not want to engage in any type of activities where they needed to talk in front of each other.

Having used Miro successfully in teaching the research team took the decision to adapt this learning technology and use it for research. Numerous practical questions about how to maximise participation whilst assuring student confidentiality were dealt with within the tool itself, which automatically pseudonymised the participants as they logged in.

Three key *concepts* were written onto the Miro Board and a series of semi-structured questions asked verbally around each concept. These concepts were: Student Perceptions of Learning & Teaching: How learning is organised: The overall student experience.

Facilitated by two of the research team, with one colleague talking and the other taking notes, students were provided with the opportunity to answer the various questions 'live' online. Like traditional focus groups, additional questions were included as matters arose during the discussions. Similarly, the students, able to read each other's comments reacted in real-time, indicating approval or disagreement through the use of a 'thumbs up' or 'thumbs down' e-mojis, whilst also adding in comments about their own experiences and thoughts. Although there was no need for students to talk or to identify themselves, one or two chose to do so, however, the majority remained anonymous; typing their thoughts onto Miro under the guise of an artificially created pseudonym. This technique worked remarkably well, eliciting a greater breadth and depth of data than would usually be acquired during a focus group. Additionally, the use of a 'voting tool' formed the basis for a further discussion – providing all of the participants with an opportunity to give immediate feedback on a give question or topic.

4.1 Using Miro as a Research Tool: Was it a Success?

In total, three focus groups were conducted in February and March 2022 with 32 participants selecting to join the discussions 'live' and a number of students engaging over a period of three days following each focus group whereby the individual boards were left open with no live facilitator (56 different comments were left on the open boards, although the anonymous nature of the approach means that the number of students could not be determined). Overall, the approach proved successful, gaining an unusual breadth **and** depth of data directly from the student participants. The sample was controlled by sending the link to each cohort separately with students required to use their login details to gain access.

On reflection, some of the most notable benefits of using this 'in the moment' research technique were:

i. Students were able to type in their thoughts, feelings, reflections, and comments anonymously – meaning that some went into depth whilst others raised issues that it would have been difficult to discuss in a more traditional group (for example, the demographic mix of the groups reflected the wider student body of different ethnicities, genders and disabilities and enabled the students to anonymously raise sensitive issues indicative of their demographic background).

ii. The contemporaneous nature of the 'live' focus groups meant that problems were quickly identified, reported to senior management, and action taken almost immediately. Having a written record of students' own words added to the evidence base, enabling programme and faculty management to take informed decisions and, more importantly, to be seen to be listening to the student perspective.

iii. The online methodology and managerial response gave some students the confidence to participate in further, in-depth interviews and focus groups. Whereas the initial call for participants to take part in 'face-to-face', live research had not elicited a response, students actively approached the research team after the Miro sessions asking to be heard in person.

Conversely, in addition to the above benefits, two unforeseen problems with the technique arose – one during the focus groups, the other during the short period when the boards were left open:

i. Whilst the online nature of the technique meant that the students were able to participate anonymously, the Miro boards were hosted on MS Teams. This meant that whilst the students' comments were anonymous, the research team were theoretically able to identify which students participated in the live discussions. It is important to note that the decision was taken not to record the MS team discussion as it went live (whilst the Miro boards were recorded). Likewise, no record was made of student names or any other details.

ii. Leaving the Miro boards open for two-three days following the live events was deemed to be important as only around 1/3 of each cohort had participated in the live events. This proved to be a little risky, as a small number of the less mature students selected to write inappropriate comments on the board. Fortunately, the boards were checked frequently by one of the researchers who, whilst reluctant to remove anything, took the decision that inscriptions which could potentially undermine the very real issues raised by the majority would be damaging to the whole process and so removed inappropriate content as soon as it was noticed.

Having participated in the online research some of the students requested to further explore the issues with the research team face-to-face. A number of different tools were utilised including:

i. In person focus-groups using purposive sampling techniques provided women students and those from ethnic minorities with the opportunity to further explore some of the more sensitive issues raised in the online forum.

iii. Individual one-to-one interviews utilising a blanket sampling technique meant that all students in each of the cohorts had the opportunity to participate further. This technique enabled male and female students who felt they would like to further discuss the various issues to do so in a confidential and supportive manner. Interviews were held in the university and online with four students.

With regards to the research approach issues of academic validity have been dealt with as a matter of some importance. The questions were guided by both the literature and by the researchers' individual observations and insights. The findings of both the hybrid and face-to-face research have been recorded contemporaneously and grounded theory methodological approaches will be used to conduct a rigorous analysis. The use of 'live virtual anonymous focus-groups' using Miro proved successful, although leaving the boards open for students to 'drop in and comment' afterwards was not as useful as it was hoped. A few immature students left comments, not connected to the study, but aimed at causing mischief.

This work is very much ongoing. The emergent study findings have been reported both to senior management and to the teaching team on the programme concerned. Additionally, three 'feedback-feedforward' sessions have been held with the students to inform them of the findings and to explain what changes are being made.

5. CONCLUSION: HYBRID RESEARCH – DOES IT WORK?

The use of the Miro board as a research tool proved to be an appropriate and worthwhile methodological approach. The ongoing nature of the study means that the approach will continue to be used in ongoing research being conducted across the undergraduate body of students, with contemporaneous records kept and more traditional approaches used to follow up. Whilst this first attempt at 'hybrid educational research' has provided successful a number of ethical and practical questions have yet to be addressed, particularly in relation to the potential for identifying participants logging on through MS Teams.

In conclusion, whilst the suitability of the approach for more detailed or sensitive research has yet to be tested, there is little doubt of the potential of this approach as a way to engage students in contemporaneous educational research using a media that they are happy to work with. Engineering Education should, by its very nature, be forward-thinking and innovative; Engineering Education Research (EER) needs to reflect this. As an emergent academic field of study those of us working in EER, whatever our background, need to be seen to be leading the way in developing and testing new pedagogical methodological approaches and tools. Miro is one single tool, there are many other virtual platforms and non-digital tools that we have access to. The question this paper leaves us with is *"How can we make sure engineering*

education is empirically grounded whilst making best use of emergent technologies and thinking?" This question is, of course, for future consideration … …

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