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Navigating the Terrain:

Emerging Frontiers in Learning Spaces, Pedagogies, and Technologies

Inequity in exam experience: Large-scale survey of proctoring and online exam experience by gender, internationality and language

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Online digital exams, both with and without online invigilation, have become a common form of assessment in Higher Education, particularly since the COVID-19 pandemic. However, the impact of online exams and online invigilation (proctoring) on student experience, stress levels, and academic performance remains underexplored, especially for disadvantaged or underrepresented student groups. Despite growing concerns over inequitable outcomes in Higher Education, there is limited large-scale research investigating how these online assessment methods may exacerbate existing disparities. This paper addresses this gap by analysing data from a large-scale survey (N = 16,010) conducted across five semesters at an Australian University (2021-2023). Specifically, it examines the exam preparedness and experiences of on-campus students who sat online digital exams with and without proctoring. By exploring the intersectionality of gender, international status, and language, the study aims to assess whether and how online proctoring exacerbates inequities among disadvantaged student populations. Our findings suggest that social and cultural factors significantly influence exam preparedness, stress levels, and perceived academic performance, with proctoring amplifying these disparities.

Keywords: Exam, student experience, invigilation, equity, disadvantaged, large survey

Introduction

The increasing shift from paper-based exams to online (digital) exams has brought about significant changes to how students experience their assessment (Elsalem et al., 2020). In addition, many universities, leadership and educators have made the decision to invigilate students' digital exams using online proctoring. Yet, how students experience these digital systems and functionalities and the impact on their stress and academic performance remains largely unclear. It is crucial to understand how various factors and different groups of students are experiencing online exams and proctoring and if there are potential inequities between students (Barrett, 2022; Coghlan et al., 2021). Among these factors, gender, international enrolment status and primary language as well as the intersectionality of all three factors may be impacting student experience and performance. Studies show that students who identify as women or female may be more likely to experience stress and anxiety (Graves et al., 2021) especially in high stakes assessments such as exams (Montolio, & Taberne, 2021), compared to male counterparts. In regard to invigilation, Edeigba et al. (2024) found little performance gap between men and women in online proctored exams. In Butler-Henderson & Crawford's (2020) systematic review of student experiences in online exams, while one study explored the effect of gender and found it to be a non-significant factor in proctored and non-proctored online exams; there remains no large-scale research that has examine gender and online proctored exams.

In addition to gender, students' language and cultural backgrounds have also been shown to mediate their experiences during examinations (Devos, 2003; Morrison et al., 2005; Smith, 2011). Challenges with comprehending exam materials and communicating responses in English could be exacerbated by the time pressure, which further complicates the assessment outcome by blurring the lines between language

proficiency and actual subject knowledge (Jackson et al., 2006; Webb, 2002). Further, language difficulties experienced by English as an Additional Language learners may affect their thinking and writing time (Smith, 2011).

While it might be intuitively tempting to assume that English-speaking students generally outperform their English as an Additional Language counterparts (Smith, 2011), research indicates that the relationship between language and assessment is more nuanced and could be dependent on other factors such as culture or international status. As highlighted in previous studies, homogenizing labels such as 'international student' do not capture all the cultures and languages represented and hence their underlying influences (Devita, 2000; Morrison et al., 2005). While the two variables often overlap, students may fall under one category, but not the other, as such they are potentially confounding or even compounding factors. Teasing out the nuances of these two related yet distinct demographic variables is essential.

Gender, internationality and language are all factors that have been shown to influence higher education student experience and outcomes. However, there is less evidence about the interaction of these factors and exam experience. Therefore, this paper sets out to investigate if gender, international enrolment status, and language are correlated with student self-reported perceptions of exam preparedness, exam experience and attitudes towards online exams and proctoring. Additionally, this paper aims to build upon existing research generally utilising small to medium datasets, by reporting on the findings of a survey that was conducted university-wide at a large metropolitan institution, over three years and five semesters.

Method

Design and procedure

This study uses a cross-sectional survey to explore students' experiences, attitudes and perceptions of the in-house online examination platform and online proctoring. At this institution, all exams were online, that is, they were conducted via a digital platform. Students access the exam platform via their own laptop, and may be on campus or remote at the time. The exams had different conditions, with some online exams being supervised (proctored) via audio and webcam recording, as well as audio-visual interaction with an exam staff member. A limited alert system is used in conjunction with the recording which may flag points in the recording for later review if unusual behaviour of a student has occurred (e.g. a student looks away from the computer screen for an extended period of time). Some exams were also unsupervised (non-proctored). These included online exams with Safe Exam Browser lockdown, or exams with no webcam and audio recording. Human Research Ethics Committee approval was granted prior to conducting this study. The survey was open for 3.5 weeks (length of the examination period plus seven days) and took approximately 20 mins to complete via Qualtrics. The survey was anonymous and no identifying information was collected.

This survey is conducted at the end of each semester at a Victorian, Australian university. This research is on-going and was first conducted in Semester 1, 2021. The research data reported in this paper relates to the data collected at the end of each semester between Semester 2, 2021 and Semester 2, 2023, totaling data across five semesters and examination periods. Covid-19 stay-at-home restrictions were in effect in Semester 1, 2021, whereas they were no longer in effect in Semester 2, 2021. As such, the overall learning experience for students in the chosen time period (and reported here) is considered consistent and has been chosen to be reported as one whole dataset.

Participants

Participation was voluntary. All students who sat an online examination during the Semester 2, 2021, Semester 1 & 2, 2022, and Semester 1 & 2, 2023 examination periods were invited. Students were invited to participate via an invitation email from the Central Communications and Marketing division (and one reminder email), as well as via a button at the end of the online examination.

Across the five semesters there were 2671 examinations resulting in 406,459 sittings by 194,999 students. The survey was opened 57,028 times, with 28,314 participants completing more than half of the survey. Across the five semesters there were 25,677 fully completed surveys. This represents an average 14.0% response rate. It is possible that students may have completed the survey more than once in a particular semester, however this risk to reliability is partially mitigated by the sheer scale of the survey, as well as the majority of questions being focused on their immediate exam experience.

Survey

The survey was informed by relevant research literature, and experiences related to the university's examination and online security platforms. The survey contains four main sections including: demographics, exam conditions, exam experience, and academic integrity. The survey was developed and refined following a pilot with 488 students, as well as with 7,839 students and fully completed surveys in Semester 1, 2021. Further details of the survey development process and item construction can be found in Author et al. (2022). Survey items are rated on a 5-point agreement Likert scale or an equivalent scale was used that was more appropriate to the topic of the question. This paper presents key descriptive data and summaries of statistical analysis in relation to three demographic variables and the specific survey items relating to exam preparedness, system (both exam and online proctoring) experience, exam experience, academic impact and security appropriateness.

Selection criteria in this paper

The demographic variables examined in this paper include gender (men, women) enrollment type (domestic, international) and language mainly spoken at home (English, or other). This paper only includes students who were enrolled in an on campus study mode (as opposed to online study mode). This criteria enables us to focus on the experience of domestic and international students who are enrolled at an Australian campus, and who are based in Australia. In regards to gender, although participants could also select non-binary / gender-diverse, my gender identity isn't listed, and prefer not to say, binary categories of men and women are reported in this paper. In line with our survey question, hereafter we will refer to those who selected English as their main language as English Main Language (EML), and English as Additional Language (EAL) for those who selected a language other than English. As such, the findings in this report are based on 16,010 selected cases who meet all the above criteria.

Statistical analysis

Survey data exported from Qualtrics was imported into SPSS Version 29.0 and data cleaning was conducted. Survey items of interest were grouped thematically. Groups that contained more than one survey item were combined by averaging the mean values of each item. These combined groups are referred to as experience factors and seven factors are reported in Table 1.

The primary focus of this paper is the intersectionality of demographic learner groups based on gender, international enrolment type and language. As such, this paper reports on eight groups of learners. The secondary focus of this paper aims to compare and contrast the experience of students across learner groups who had an exam with online supervision, and without supervision.

To understand if there are statistically significant differences in experience of students across the learner groups, ANOVA analyses were conducted for each of the seven experience factors. This analysis was repeated for students who experienced supervised exams, as well as for those who were not supervised. Where Homogeneity of variance tests were violated, Welch's tests were reported with omega-squared effects sizes. Following significant ANOVA analyses, post-hoc comparisons were conducted that showed significant

differences across each learner group pair (e.g. Domestic, male, EML students versus International, male, EML students).

Table 1
Development of experience factors based on individual survey items

Experience factors	Survey item
Exam experience	1. My computer technology (e.g. laptop, webcam, keyboard, etc) was reliable[1] 2. My internet/connection was reliable (e.g. internet/connection was stable throughout the exam)[1] 3. My environment was free from distraction (e.g. it was calm, quiet and did not distract me)[1] 4. Apart from university approved employees/officials, such as invigilators, I had privacy during my exam. No-one else was watching me or could see my answers (e.g., other students/people in my household or exam space) [1]
Exam preparedness	1. Prior to the exam I was confident that I knew the unit content[1] 2. The content of the exam was what I expected (e.g. the questions were about topics consistent with what I was told)[1] 3. During the semester, my lecturer/tutor ensured that I understood what was required for the exam[1] 4. I received sufficient feedback from my lecturer/tutor during the semester[1] 5. I had opportunities to approach my lecturers and tutors for assistance when needed to prepare for the exam[1]
Exam functionality	1. Overall, I felt the computer-based exam system functionality was easy to use[2] 2. Overall, I felt the computer-based exam system functionality was helpful[2]
Security appropriateness	Overall, I felt the computer-based exam security was reasonable and appropriate[2]
Academic impact	How was your academic performance impacted by the computer-based exam system and security?[3]
Exam stress	Overall, the exam experience was stressful[1]
Overall system experience	Overall, my experience of the computer-based exam system and security was:[3]

Note: [1]Scale. *1* = strongly disagree to *5* = strongly agree. [2]Scale. *1* = Not at all to *5* = Extremely. [3]Scale. *1* = strongly negative to *5* = strongly positive.

Results and Discussion

Table 2 and 3 presents descriptive statistics (Mean and SD) of each learner group, across the seven experience factors, in the total sample and by online supervision type. Due to the length restrictions of this conference paper, the results of each ANOVA cannot be provided here, but will be provided in the full presentation, as well as the individual findings of post-hoc pairs. A summary is provided below.

Effect of gender, international enrolment type and language

The ANOVA analyses revealed significant differences across the eight learner groups for each of the seven experience factors ($p < .001$), all with small effect sizes. In other words, students' perceptions of their exam experience, exam preparation, exam functionality, ratings of security appropriateness, perceptions of academic impact, exam stress and overall system experience, differed across the eight groups of learners.

However, both the perceptions of exam functionality and exam stress revealed the least number of significant pairs. In other words, the learner groups rated these factors relatively similarly. These findings are positive as it reveals that the exam system and functionality (e.g. the tools and functions were helpful and easy to use) are equally beneficial to all types of students including between students from various cultural backgrounds, and regardless of their primary language. Regarding exam stress, although relatively few pairs were significant, upon inspection, it is found that students who are International, EAL, male or female, as well as Domestic, females and EML report significantly higher stress than Domestic, male, EML students. While majority of the group report similar stress levels, this demonstrates evidence of potential inequities of students from traditionally under-represented or disadvantaged groups.

Exam preparedness and impact on academic performance revealed the greatest number of significant pairs across groups. In other words, the ratings of exam preparedness and academic performance impact greatly differed across all the groups of learners. For example, International, female, and EAL students rated greater positive impacts on academic performance compared to Domestic, female, and EML students. Domestic, male, and EML students were more likely to rate the exam system and security to have a negative impact on their academic performance, compared to all other groups of learners. In summary, findings indicate that gender, enrolment type and language is found to have impact across all experience factors, but that exam preparedness and impact on academic performance are the two factors where we see the greatest difference between equity groups. Some of these findings are at-first-glance counter intuitive or surprising compared to other literature (e.g. Graves et al., 2021; Montolio, & Taberne, 2021 where females report higher stress). Disparity in exam preparedness and perceived impact on academic performance should be considered by institutions and educators and underlying factors associated with some groups of students feeling less prepared for exams needs to be explored.

Table 2

Experience factors across learner groups

Learner groups	Total (*n*)	Exam experience[1]	Exam preparation[1]	Exam functionality[2]	Security appropriateness[2]	Academic impact[3]	Exam stress[1]	Overall system experience[2]
Domestic, male, EML	3424	4.31 (0.75)	3.91 (0.81)	3.69 (1.05)	3.71 (1.23)	3.24 (1.03)	3.68 (1.17)	3.62 (1.16)
International, male, EML	704	4.37 (0.72)	4.05 (0.80)	3.76 (1.03)	3.82 (1.13)	3.53 (1.04)	3.72 (1.15)	3.82 (1.08)
Domestic, male, EAL	1063	4.31 (0.71)	4.00 (0.75)	3.75 (0.96)	3.82 (1.11)	3.39 (0.97)	3.78 (1.07)	3.76 (1.03)
International, male, EAL	1895	4.41 (0.70)	4.14 (0.77)	3.80 (0.99)	3.90 (1.04)	3.73 (1.03)	3.84 (1.08)	3.96 (1.03)
Domestic, female, EML	4547	4.24 (0.76)	3.80 (0.81)	3.82 (1.01)	3.85 (1.16)	3.30 (1.04)	3.77 (1.11)	3.69 (1.12)
International, female, EML	682	4.38 (0.68)	3.97 (0.80)	3.80 (1.04)	3.90 (1.11)	3.56 (1.02)	3.82 (1.12)	3.88 (1.02)
Domestic, female, EAL	1730	4.29 (0.69)	3.86 (0.76)	3.79 (0.99)	3.85 (1.07)	3.47 (0.96)	3.76 (1.05)	3.80 (1.01)
International, female, EAL	1965	4.36 (0.70)	4.02 (0.78)	3.75 (0.96)	3.88 (1.01)	3.68 (1.00)	3.87 (1.06)	3.93 (0.98)

Note. Data are Mean (SD). Total *N* = 16,010. EML = English-as-main-language. EAL = English-as-an-additional-language. [1]Scale. *1* = strongly disagree to *5* = strongly agree. [2]Scale. *1* = Not at all to *5* = Extremely. [3]Scale. *1* = strongly negative to *5* = strongly positive. Only on-campus cases from S2 2021 to S2 2023 have been considered.

Table 3
Experience factors across learner groups by supervision type

Learner groups	Supervision type	Exam exp[1]	Exam preparedness[1]	Exam functionality[2]	Security appropriateness[2]	Academic impact[3]	Exam stress[1]	Overall system exp[2]
Domestic, male, EML	S (*n* = 2737)	4.24 (0.78)	3.88 (0.81)	3.64 (1.07)	3.61 (1.24)	3.13 (1.00)	3.72 (1.15)	3.50 (1.16)
	NS (*n* = 687)	4.58 (0.56)	4.01 (0.81)	3.92 (0.94)	4.09 (1.09)	3.68 (1.00)	3.51 (1.21)	4.11 (0.98)
International, male, EML	S (*n* = 561)	4.33 (0.74)	4.01 (0.81)	3.73 (1.02)	3.73 (1.15)	3.44 (1.04)	3.76 (1.12)	3.73 (1.10)
	NS (*n* = 143)	4.53 (0.62)	4.20 (0.75)	3.90 (1.04)	4.17 (0.96)	3.86 (0.99)	3.57 (1.23)	4.17 (0.88)
Domestic, male, EAL	S (*n* = 875)	4.29 (0.71)	4.00 (0.75)	3.73 (0.97)	3.79 (1.09)	3.31 (0.97)	3.78 (1.09)	3.68 (1.04)
	NS (*n* = 188)	4.43 (0.7)	4.01 (0.76)	3.87 (0.91)	3.96 (1.19)	3.72 (0.88)	3.79 (1.02)	4.13 (0.88)
International, male, EAL	S (*n* = 1561)	4.39 (0.71)	4.11 (0.79)	3.77 (1.00)	3.86 (1.05)	3.69 (1.04)	3.87 (1.07)	3.90 (1.05)
	NS (*n* = 334)	4.51 (0.66)	4.26 (0.7)	3.94 (0.95)	4.08 (0.97)	3.91 (0.97)	3.69 (1.10)	4.22 (0.91)
Domestic, female, EML	S (*n* = 3520)	4.16 (0.79)	3.74 (0.82)	3.76 (1.03)	3.73 (1.17)	3.17 (1.02)	3.86 (1.07)	3.54 (1.12)
	NS (*n* = 1027)	4.50 (0.58)	4.00 (0.74)	4.02 (0.94)	4.24 (1.01)	3.77 (0.99)	3.45 (1.19)	4.21 (0.93)
International, female, EML	S (*n* = 517)	4.31 (0.71)	3.93 (0.81)	3.74 (1.05)	3.80 (1.10)	3.42 (0.99)	3.92 (1.03)	3.76 (1.00)
	NS (*n* = 165)	4.58 (0.55)	4.10 (0.72)	3.99 (0.97)	4.21 (1.1)	3.99 (1.01)	3.50 (1.30)	4.25 (0.99)
Domestic, female, EAL	S (*n* = 1381)	4.26 (0.70)	3.84 (0.77)	3.75 (1.01)	3.79 (1.07)	3.41 (0.96)	3.78 (1.04)	3.72 (1.01)
	NS (*n* = 349)	4.38 (0.67)	3.94 (0.7)	3.98 (0.89)	4.07 (1.04)	3.71 (0.92)	3.67 (1.07)	4.09 (0.92)
International, female, EAL	S (*n* = 1516)	4.32 (0.71)	4.00 (0.79)	3.70 (0.96)	3.80 (1.00)	3.62 (1.02)	3.90 (1.05)	3.87 (1.00)
	NS (*n* = 449)	4.50 (0.62)	4.08 (0.75)	3.92 (0.94)	4.14 (0.98)	3.88 (0.91)	3.75 (1.11)	4.13 (0.90)

Note. Data are Mean (SD). Supervised (S) *N* = 12,668; Not supervised (NS) *N* = 3,342. EML = English-as-main-language EAL = English-as-an-additional-language. [1]Scale. *1* = strongly disagree to *5* = strongly agree. [2]Scale. *1* = Not at all to *5* = Extremely. [3]Scale. *1* = strongly negative to *5* = strongly positive. Only on-campus cases from S2 2021 to S2 2023 have been considered.

Effect of online proctoring

When considering students who sat proctored or online supervised exams, ANOVA analyses revealed significant differences ($p < .001$, all with small effect sizes) across the eight learner groups for each of the seven experience factors. In other words, when considering only students who sat supervised exams, perceptions of their exam experience, exam preparation, exam functionality, ratings of security appropriateness, perceptions of academic impact, exam stress and overall system experience, differed across the eight groups of learners. Students who were domestic, male, and EML, were significantly more likely to rate the online supervised component of the exam, as less appropriate, compared to all other groups of students. Similarly, they were also more likely to report the supervised exam as negatively impacting their academic performance. Nevertheless, the same

students (domestic, male, EML) reported significantly lower stress than female domestic and international students. These findings support Montolio and Taberne (2021) where females report higher stress in high stakes exam, and in tension with Rios and Liu (2017) who report no differences in gender in both proctored and non-proctored online exams.

When considering students who sat unsupervised or non-proctored online exams, ANOVA analyses revealed significant differences across the eight learner groups for only four of the seven experience factors. These factors include exam experience, exam preparation, perceptions of academic impact, and exam stress (all $p <$ .001, and small effect sizes). No significant differences were found between the learner groups in exam functionality, security appropriateness, or overall system experience. Furthermore, of the four experience factors that did show statistically significant differences across learner groups, only a few pairs (up to six) were shown to differ from each other. Indicating that overall, students who sat unsupervised exams were much less likely to report differences in experience across learner groups. In other words, for students who sat unsupervised exams, belonging to a learner group had little impact on how the exam was experienced. These findings require further exploration as to unpack and understand why we are seeing differences in exam experience. It may be due to other exam conditions that have not been explored in this paper such as open or closed book, exam length, exam type and so on.

Nonetheless when we compare the large number of significant pairs in learner groups of students who experienced online supervision, versus the relatively few numbers of significant pairs of students who did not experience online supervision – it suggests that online supervision or proctoring acts as a strong moderating variable in the exam experience. This implies that online supervision may amplify inequities relating to student gender, international enrolment status, and primary language. Our findings suggest that the nature of online supervision (monitoring via audio and video) may impact students differently depending on an individual's social and cultural characteristics. It suggests that online supervision is not merely a procedural experience for students (i.e. being required to turn on webcam, versus not having to turn on webcam), it is far more impactful and significantly shapes the experience, stress and academic performance of students.

Conclusion

The findings reported in this paper suggest that gender, international enrolment status and language all play a role in how prepared students feel for their exam, how the online exam system and security is experienced, including its impact on academic performance and stress. The implication for universities is that these groups of students may need additional support to help prepare them for their exams, and support to mitigate the stress and academic. However, to fully understand the implications of these three demographic factors, further research will be necessary to tease apart the impact of each of these factors and understand the significance that each play in how the online exam and security is experienced.

Interestingly, when we examine the role of proctoring on experience, our data strongly indicates that online supervision is indeed experienced and perceived differently between different groups of students. Online supervision is not simply a procedural experience, it is far more impactful, shaping the experience, stress and academic performance of students, especially female, international or those students with English as Additional Language.

If online exams and online invigilation in Higher Education are here to stay, and we know that student experience is largely impacted by social and cultural demographic factors resulting in potential inequities, it is vital that institutions seek to further explore and understand the nuance in how these factors influence student experience, success and wellbeing. Understanding challenges faced by various demographic groups, including other demographic factors not explored in this paper is essential to fostering a more inclusive, supportive and sustainable experience for all students.

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