The Impact of Online Exams on the Quality of Distance Learners' Exam and Exam Revision Experience: Perspectives from the Open University UK

Simon Cross
Maria Aristeidou
Klaus-Dieter Rossade
Carlton Wood
Andrew Brasher
The Open University, United Kingdom

Abstract
This paper reports findings from a research study at The Open University, UK into the quality of distance learners' online exam experience and the differences in experience between online (pandemic) and in-person (pre-pandemic) modes of examination. Our research responds to the ongoing need for greater insight into the exam experience and is uniquely positioned in two ways. First, we made use of a robust reference dataset collected before the COVID-19 pandemic and compared this with a second survey administered a year after the pandemic started; second, we asked students about their experience preparing and revising for the exam as well as the exam itself. Exam revision represents an important transitional period for learners. Our results show that, overall, the shift to online remote exams did not impact the quality of distance learners' experience of revising for exams or taking the exam itself. We found no significant change in the revision experience across six of eight measures, including the learning benefits of learning while revising, enjoyment, and support. However, students reported feeling less anxious when revising for online exams. The quality of the exam experience itself was largely unaffected by the move from in-person to online remote exams. No significant differences were found for seven of the nine measures of exam experience. However, we found satisfaction with the exam environment was significantly higher for online exams and that learners felt the online exam was harder than they expected. Age and gender differences are also explored.

Keywords: online examinations, digital assessment, exam revision, student experience, higher education

Cross, S., Aristeidou, M., Rossade, K.-D., Wood, C., Brasher, A. (2023). The impact of online exams on the quality of distance learners' exam and exam revision experience: Perspectives from the Open University UK, *Online Learning, 27*(2), 27-45.

Interest in online e-assessment has intensified since the outbreak of COVID-19 pandemic in 2020, resulting in often substantial changes in how, where, and when assessment happens (Aristeidou & Cross, 2021) and with universities now planning to make more use of online assessment (Universities UK, 2022). However, while there is an ongoing need for greater insight into the exam experience (Bevitt, 2015; QAA, 2007), the novel changes that students have experienced in the last few years require specific attention.

One key area of change has been summative assessment and, most notably, the end-of-course examination. Hillier (2014) describes eight aspects that influence the student experience of using technology during exams: affective factors, teaching and learning, validity, reliability, security (including cheating), practicality, production (taking the exam), and adoption (attitude towards the exam). While such factors should relate to how students experience any examination, practices associated with conventional exams have been so normalised that they only become of interest if there is pedagogic or practical deviation or change.

Technology-mediated exams represent one such deviation from normative practice, whether this relates to technology being used to directly answer exam questions regardless of location (e.g., Böhmer et al., 2018), monitoring of the (usually home) environment in which the exam is being taken (e.g., Patael et al., 2022), and/or the exchange and transmission of hand-written manuscripts for marking. Reedy et al. (2021) note a significant variety in online assessment strategies and formats.

This paper reports findings from a research study at the Open University, UK into the quality of distance learners' online exam experience and the differences in experience between online and in-person modes of examination. Our research is uniquely positioned in two ways. First, we made use of a robust reference dataset collected before the COVID-19 pandemic and compared this with a second survey conducted since the pandemic started; second, we asked students about their experience preparing and revising for the exam as well as the exam itself. Exam revision represents an important transitional period for learners (Entwistle & Entwistle, 2003). This paper contrasts 16 measures relating to the exam revision and exam taking experience to determine whether the shift in assessment mode from conventional in-person exams to online remote exams has impacted learners' assessment experiences. Data from STEM subjects and from arts and social science subjects are analysed individually and compared. The second part of the paper investigates age- and gender-related differences. A discussion section reviews the key findings.

Literature Review

Researchers have explored a range of innovation in online exams including the method of production (paper, bring-your-own-device, home computer), modes of submission (by hand, digital scan, digital), location in which the exam is taken (exam hall, home study), assessment method (same or different assessment format, questions, procedure) or several in combination. When a practitioner speaks of using an "online exam" this could be a reference to anything from an online essay submission to a fully automated, computer-marked online examination (James, 2016). Consequently, care should be taken when interpreting headline research findings about online exams without acknowledgement of the necessary nuance and context. Sometimes a comparative study is possible, but, where not, researchers will ask respondents to self-report whether and how they perceive the difference or change.

Ilgaz and Afacan Adanir (2019) contrasted student performance in online and face-to-face exams while controlling for assessment approach. They found that distance learners generally had positive perceptions of online exams and performed better in a mid-term, online, multiple-choice exam than in an end-of-course, face-to-face, multiple-choice exam (p.1262). They reported no significant difference between learners' perceptions about online exams and their academic achievement, age, gender, or subject area.

Others have made comparisons between online and physical locations. These tend to find that most students, albeit a sometimes-slim majority, prefer online exams to written exams taken collectively in an exam hall. For example, in the US, a study by Stowell and Bennett (2010) (n=69) found that just over half of students indicated a preference for the online exams and those that did scored higher for classroom test anxiety (i.e., anxiety related to taking face-to-face exams). Recently, a survey (n=185) by Afacan Adanır et al. (2020) found that more than half of students at a state university in Turkey preferred online exams over traditional paper-based exams and valued the benefits to logistics and improved teaching and learning. The study also notes differences in student perception and experience between countries, potentially indicating cultural differences. Khan et al.'s (2021) survey of university students studying in India and Saudi Arabia (n=207) report that learners believe online exams to be "more advantageous" than conventional exams, highlighting perceived value in authenticity of grading and efficiency of time, effort, and expenditure.

The impact of online exams on students' learning (both as they revise, take, and reflect on the assessment) and their confidence and ability to demonstrate that learning have been considered by several studies. Khan et al. (2021) report that students agree that "online exams could facilitate a more adaptive learning approach than pre-paper-based ones" and that "using cutting-edge technology in online examples enables students to take a new learning approach." Eltahir et al. (2022) report that, on average, the 1742 students responding to their survey at Ajman University (UAE) rated as "moderate" (on a five-point scale from "very low" to "very high") question items such as "e-exams enable me to show a better academic achievement" although there is reasonable variability. Earlier, Hillier (2014) found that students did not believe that taking an exam on a computer had impacted their ability to demonstrate knowledge in more ways than paper-based exams. Recently, Domínguez et al. (2022) have found academic performance during online exams was higher than for face-to-face exams and preference for online exams is higher than for face-to-face exams.

One drawback of most recent studies comparing student experiences of online and conventional approaches to exams is that they tend to ask about one relative to the other. Less common are the use of context-independent question items (i.e., questions that could be asked of any exam experience without regard to mode, location or technology used). This is, in part, because such a comparison requires the same quality of data to be collected before the change or intervention took place and, in the case of reactive studies such as those relating to the COVID-19 pandemic started, this is not possible.

One research project already conducting detailed investigations into the student experience of assessment, including exams, before the COVID-19 pandemic started was the Open University (UK) Student Experience of Feedback, Assessment and Revision (SEFAR) project. Predicated on a long-standing interest in understanding the student assessment experience, this project administered two comprehensive surveys to a representative sample of undergraduate distance learners in 2015 (Cross et al., 2016) and early 2020. The study investigated the relationship between the learning experience revising for an exam and the

experience of the exam itself. Cross et al. (2016) identified five distinct factors: exam experience, learning from revision, revision design, revision resource quality, and question literacy (ability of the student to understand what the exam question were asking). The study found a strong correlation between how much learners enjoyed revising and how much they enjoyed the exam itself, and a moderate correlation was found between the degree that learners used revision as a reflective activity and their satisfaction with the exam grades that they received, their sense of exam preparedness, and feeling satisfied the exam gave them the opportunity to perform to their best.

Test anxiety prior to and during examinations is a well-studied aspect of the assessment experience. Gender differences (male/female) have been identified across a range of studies (e.g., Ajmal & Ahmad, 2019; Ballen et al., 2017; Conijn et al., 2022). However, there has been less research into how age interacts with perceived experience and while some examples exist (e.g., Arora, 2021; Okada et al., 2018), there is a need for further study in this area.

The literature signals a need to understand whether a transition to online exams impacts the student experience of preparing for and taking the assessment. Furthermore, it indicates that the effects of this transition on student anxiety may differ by gender and age. Consequently, our four research questions were:

RQ1: Do student experiences of revising for a conventional exam and a remote online exam differ?

RQ2: Do student experiences of sitting a conventional and a remote online exam differ?

RQ3. Are older students' experiences similar to those of younger students with respect to pre-exam anxiety and mark satisfaction?

RQ4. Are female students' experiences similar to those of male students with respect to pre-exam anxiety and mark satisfaction?

Method

In this study, we compare survey data about the student experience of revising for and taking conventional examinations before the COVID-19 pandemic (our reference dataset) with data about the student experience of taking remote online exams at home from a second survey conducted after the pandemic started.

Survey Instruments

We focus on student responses to 16 question items in both surveys. The first set of questions contained seven items asking about the experience of revising for the exam (revision experience instrument). The second set of questions contained nine items about their exam experience (exam experience instrument). The question items used were, in part, developed from, or extended from, item constructs used previously (Dermo, 2009; Gibbs & Dunbar-Goddet; 2007; Vattøy et al., 2021) and piloted in 2015 (Cross et al., 2016). The survey questions, in part, seek to probe additional exam aspects such as anxiety (Falcikov & Boud, 2007), exam preparedness (Payne & Brown, 2011), grade satisfaction and enjoyment. The experience of revising for an exam is quite distinct from the experience of taking the exam and the relationship between the two, where it exists at all, is not straightforward (Cross et al., 2016). The two sets of

questions were piloted with students and their feedback was integrated into the final version of the survey.

Two items in the revision experience instrument ask whether the student felt prepared and understood what they needed to revise (important for the interpretation of the learning experience of the activity itself); two ask about their learning experience (revision as a reflective activity and an opportunity for new learning such as from previously skipped content); one confirms whether workload (allocated revision time) may have been an issue (this could also be used as a surrogate to indicate good revision design); and two ask about how they felt about the experience (anxiety and enjoyment).

Where possible, the exam experience instrument questions matched those of the revision experience instrument. They asked whether the student felt prepared for the exam, whether they understood the questions (the questions were clear), whether the question mapped well against learning outcomes (that they were able to demonstrate what they had learned) and how they felt about the experience (anxiety, enjoyment, and difficulty). One question item asked about the quality of the exam environment (physical location of the student to take the exam online), and two asked about the post-exam experience to gauge how positively the exam was viewed after it happened (whether there was a sense of achievement and whether students were satisfied with the principal output of an exam—the quality of the grade received).

Students were asked to agree or disagree with each one of the instrument questions, on a scale of 1 to 5 (where 1 = strongly disagree; 5 = strongly agree), and survey design good practice was followed (Oppenheim, 1992).

Student Experience of Feedback, Assessment and Revision (SEFAR) study

The two survey instruments were used in both surveys. The first survey was conducted early in 2020 and is hereafter referred to as the SEFAR2020 survey. This was the second iteration of the university's SEFAR survey. The sample used for the survey (n=6,300) comprised an equal number of undergraduate students studying Open University Levels 1, 2, and 3 modules (this was considered a good approximation for Year 1, 2 and 3) and representation from our four subject faculty areas was proportional to the number of students studying based in each. Besides questions about exams, the SEFAR2020 survey included approximately 100 other question items covering assessment criteria, formative assessment, tutor grading and feedback, assessment literacies, assessment networks, and innovation in assessment practice. At the university, when a module ends in an exam, the grade that a student receives is usually based on a combination of the scores received for coursework and final exam itself. Hereafter we use the term 'exam score' (what students often refer to as their 'mark') to acknowledge this subtle but important distinction. While not used in this analysis, the dataset offers further opportunities for exploring the relationships among various aspects of the assessment experience (Cross et al., 2016).

Student Experience of Pandemic Exams (SEPE) study

The second survey was administered between February and March 2022. For the purposes of this paper the survey will hereafter be referred to as the Student Experience of Pandemic Exams (SEPE) survey. The sample predominantly consisted of students who took online remote exams in 2020 or 2021; however, a sub-group who had had their exams cancelled in 2020 or 2021 and a group who had never taken a university exam were also included. Survey branching accommodated these different experiences. Besides questions relating to the analysis presented below, the survey asked about other aspects of the online assessment experience: what

they liked and disliked about taking an online exam; issues of trust, validity, reliability, security, and practicality; and barriers to adoption. Both surveys received approval from the university's human research ethics committee.

Participants and Context

The total number of responses for the two surveys was similar (Table 1) and the response rates were considered acceptable. Both surveys were conducted online using a sample provided by the university's Student Research Panel and participants were recruited from the university's four faculties: the Science, Technology, Engineering and Maths (STEM) faculty; the Faculty of Social Sciences and Humanities (FASS); the Faculty of Business and Law (FBL); and the Faculty of Wellbeing, Education, and Language Studies (WELS). Basic demographic data drawn from university records was added to the survey results prior to analysis. One limitation of this is that the university only records gender by the binary "male" or "female" designations.

Table 1

Total Number of Responses, Response Rates, Summary of Respondent Age, Gender and Number of Respondents with a Declared Disability

Survey name		**SEFAR2020**	**SEPE**
Response rate		9.1%	5.6%
Responses	Total	572	562
	35 years old or younger	212	201
	36-55 years old	243	242
	56 years old or older	117	119
	Male	200	226
	Female	372	336
	Declared disability	79	77

There is no statistically significant difference between the two datasets with respect to age ($t(1132) = .033$, $p = .212$), gender ($\chi^2(1) = 3.33$, $p = .068$) and declared disability ($\chi^2(1) = .03$, $p = .862$). The data is considered to adequately represent the university's population of undergraduate learners although, in both surveys, a slightly greater portion of older learners responded to the invitation to participate than did younger learners. The authors judged the response rates to be like other comparable surveys conducted by the university.

We used a subset of these responses for the purpose of our analysis. The reason for doing so was two-fold. First, both surveys related to the broader assessment experience so only a proportion of those responding had taken an exam (the remaining students had experienced different end-of-module assessment such as a report, essay, or other assignment). Second, during the pandemic, some modules cancelled or substituted exams, meaning students did not have the opportunity of taking an exam remotely.

A sub-set comprising 168 responses to the SEFAR2020 survey and a sub-set comprising 190 responses to the SEPE (from students who had taken at least one online remote exam) were selected for use in our analysis. The latter sample included students from 57 modules who had participated in a great range of different types of online remote exam. This distinguishes our study from those that tend to focus on a particular assessment configuration. Of those selected

from the SEPE survey (n =190), 88.9% had participated in a remote online exam that was "extensively or mostly completed using a computer" while 20.0% had taken remote exam at home using a paper script that was scanned and sent back. In this report we use the term "online remote exam" (often shortened simply to "online exam") to collectively to refer to this range of exam taking although we acknowledge that for a small proportion of respondents, this was not a predominantly digital experience.

There was also substantial variation in the question types used in the online remote exams included in our SEPE sample (Table 2). Equations or other numerical working, short answer questions and multiple-choice questions were most often used for STEM subjects while long answer questions were more common for FASS subjects. In most cases, students were offered a degree of flexibility as to when to take the exam. This is considered a reasonable representation of the exam assessment adopted by the modules included. The period over which students were permitted to start the exam differed between the online exams. The most widely adopted approach was offering a 24-hour time window (39%) but periods of three days (19%) and seven or more days (20%) were also common. Conventional exams are usually hand-written and administered simultaneously in hired halls across the UK although a range of adjustments, such as support for students with disability to take exams at home, is provided. While there is no detailed breakdown of question types, these will be like those taken remotely because the remote exam scripts were derived from those developed for conventional exams.

Table 2

Online Remote Exam Question Types Experienced by SEPE Participants

Question type	**n**	**%**
Equations or other numerical workings	115	60.5%
Multiple choice questions	83	43.7%
Writing short answers of a paragraph or less	93	48.9%
Writing longer answers of more than a paragraph but less than a page	80	47.3%
Writing more than a page (e.g., an essay)	76	40.0%
Producing visual output such as drawings, photographs, or diagrams	39	20.5%
Producing audio output such as speaking (either recording or live)	3	1.6%
Self-reflection	17	8.9%

Note: Exams could include more than one question type.

The following table (Table 3) shows the number of responses received from all four of the main university faculties (FASS, FBL, STEM, and WELS). A small number of responses from students studying access modules or the university's Open degree were removed because these categories were not directly comparable. Our intention had been to analyse data from each of the four faculties separately in case differences among subject areas emerged. Responses from FBL and WELS were considered too low, so we decided to focus analysis on responses from the faculties of STEM and FASS. This enabled us to compare two distinct subject areas (between STEM modules, and arts and social science modules).

Table 3
Survey Response by Faculty

Faculty	SEFAR2020 survey (Conventional exam)	SEPE survey (Online remote exam)
FASS	55	42
FBL	18	17
STEM	61	118
WELS	8	8

In summary, our dataset comprised students from different subject disciplines with experience with a variety of conventional exams (taken pre-pandemic) and online remote exams (taken mostly during the pandemic).

Data Analysis

SPSS Version 26 was used for our statistical analysis. Mann-Whitney U tests were performed on survey responses to each scale item individually to explore students' revision (RQ1) and exam (RQ2) experience differences between conventional and online remote exams. Mean (M) and, where relevant, standard deviation (SD) are reported. Sample sizes are given in the tables. Prior to the assessment of the relationship between our variables, groups with a sample size smaller than twenty were removed from the tests (i.e., WELS and FBL student responses). An alpha level of .05 was used for all the analyses. Chi Squared tests were used to explore differences with age (RQ3) and gender (RQ4). To facilitate analysis of our third research question we simplified the response categories to "Agree" (the sum of "agree" and "strongly agree" responses), "Neither agree nor disagree," and "Disagree" (the sum of "strongly disagree" and "disagree" responses). We used data from all four Faculties (Table 3) and divided this into two groups: 35 years and under, and 36 years and older. This broadly separately learners into a group comprising those identified as the "Net generation" or younger (Jones et al., 2010). Within the context of supported distance learning, we felt it appropriate to refer to the first as "younger learners" and the second "older learners." We note that in other contexts these terms may signify different age groupings.

Results

This section reports survey results relating to the experience of revising for an exam and taking an exam for two faculties.

Experience of Revising for Exams

There were no significant differences between the experience of revising for conventional exams and online remote exams among STEM students. Table 4 shows the mean responses score (from a Likert scale ranging from 1=strongly disagree to 5=strongly agree) and the p-value derived from a Mann-Whitney Test that compared the two.

Table 4

STEM Students' Experience Mean Scores of Revising for Their Exam (n = 179)

Question	Conventional exam (n = 61)	Online remote exam (n = 118)	U-value	Sig. (p-value)
I was clear about what I should revise.	3.84	4.04	3203.00	.20
Revising helped me reflect and consolidate what I had learnt earlier in the module.	4.25	4.31	3440.50	.56
I learnt new things when revising.	3.89	3.64	3048.00	.08
The TMAs in the module prepared me well for the end of module exam.	3.64	3.78	3274.50	.30
There was enough time in the module set aside for revision.	3.66	3.81	3234.50	.24
I enjoyed revising the module materials.	3.52	3.77	3102.00	.13
I often felt anxious when revising for my exam.	3.64	3.48	3348.00	.43

Note: *p < 0.05; **p < 0.01

For students studying arts and social sciences, six of the seven question items showed no significant difference between the experience of revising for conventional exams and online exams. Table 5 shows the mean responses score and the p-value derived from a Mann-Whitney Test that compared the two. The only significant difference was found in relation to exam anxiety. The mean for remote exams (M = 3.05, SD = 1.27) was significantly lower than for conventional exams (M = 3.62, SD = 1.24) indicating that, on average, students felt less anxiety revising for an online remote exam.

Table 5

FASS Students' Experience of Revising for Their Exam (n=97)

Question	Conventional exam (n = 55)	Online remote exam (n = 42)	U-value	Sig. (p-value)
I was clear about what I should revise	4.09	4.14	1107.00	.70
Revising helped me reflect and consolidate what I had learnt earlier in the module.	4.18	4.29	1025.50	.30
I learnt new things when revising	3.67	3.64	1138.00	.89
The TMAs in the module prepared me well for the end of module exam	3.51	3.81	917.00	.07
There was enough time in the module set aside for revision.	3.84	4.07	969.50	.15
I enjoyed revising the module materials.	3.62	3.83	963.00	.14
I often felt anxious when revising for my exam	3.62	3.05	**863.00**	.029*

Note: *p < 0.05; **p < 0.01

Experience of Taking an Exam

With respect to STEM students' experience of taking the exam itself, two of the nine question items showed a significant difference between sitting a conventional exam in an exam room and taking an online exam at home (Table 6). The first difference was that students thought taking an online remote exam was harder. The mean for online remote exams (M = 3.69, SD = 1.12) was significantly higher than for conventional exams (M = 3.12, SD = 1.07). The second difference was that students taking online exams were much more satisfied with the quality of the exam environment (physical space in which they took their exam). The mean for online exams (M = 4.50, SD = .78) was significantly higher than for conventional exams (M = 3.96, SD = .98). STEM students reported no difference in feeling prepared for the exam, question quality, enjoyment, anxiety, sense of achievement, and exam score satisfaction.

Table 6

STEM Students' Experience of Taking Their Exam (n=179)

Question	Conventional exam (n = 57)	Online remote exam (n = 118)	U-value	Sig. (p-value)
[Immediately] before starting the exam I felt well prepared.	3.52	3.62	3180.00	.47
The exam questions were clear.	3.95	3.93	3307.50	.85
The exam questions allowed me to demonstrate what I had learnt.	3.86	3.93	3193.50	.45
The exam was harder than I was expecting.	3.12	3.69	**2452.00**	**.003****
I enjoyed the exam.	2.88	3.03	3152.00	.49
I felt anxious what doing the exam.	3.56	3.72	3080.50	.35
I was satisfied with the quality of the [space I used at home/exam room]	3.96	4.50	**2255.00**	**<.001****
Completing the exam gave me a sense of achievement.	4.11	4.19	3163.00	.50
I was satisfied with the mark I got	3.89	3.95	3193.50	.71

Note: *p < 0.05; **p < 0.01

Arts and social sciences students (FASS faculty) also report a significant difference in satisfaction with the quality of the exam environment between conventional and online remote exams (Table 7). The mean for remote exams (M = 4.57, SD = 1.11) was significantly higher than for conventional exams (M = 3.92, SD = .93). These means are very similar to that of the STEM students (Table 6). Arts and social science students reported no difference in feeling prepared for the exam, question quality, enjoyment, anxiety, sense of achievement, and exam score satisfaction.

Table 7
FASS Students' Experience of Taking Their Exam (n=94)

Question	Conventional exam (n = 52)	Online remote exam (n = 42)	U-value	Sig. (p-value)
[Immediately] before starting the exam I felt well prepared.	3.63	3.66	1082.50	.94
The exam questions were clear.	4.17	4.07	1073.50	.88
The exam questions allowed me to demonstrate what I had learnt.	4.10	4.05	1082.50	.94
The exam was harder than I was expecting.	2.83	3.21	930.00	.19
I enjoyed the exam.	2.94	3.26	963.50	.30
I felt anxious what doing the exam.	3.52	3.33	978.00	.37
I was satisfied with the quality of the [space I used at home/exam room].	3.92	4.57	**638.50**	**<.001****
Completing the exam gave me a sense of achievement.	4.17	4.12	1044.00	.86
I was satisfied with the mark I got.	3.79	4.10	952.00	.27

Note: *p < 0.05; **p < 0.01

Contrasting Younger and Older Student Exam Experiences

Our third research question sought to explore potential differences between younger and older distance learners by focusing on the themes of anxiety and grade satisfaction with online and conventional exams. To facilitate analysis, given we had identified little difference between the responses of STEM and FASS students, we divided all valid responses (from across all four subject Faculties listed in Table 3) into two groups: 35 years and under, and 36 years and older. Table 8 shows that significantly fewer younger students reported often feeling anxious when revising for online remote exams (54%) than when revising for conventional exams (76%) ($\chi^2(2) = 9.600$, $p = .008$). This trend was not observed for older students ($\chi^2(2) = 1.679$, $p = .432$).

Table 8
Number of Younger and Older Student Responses to the Statement: "I often felt anxious when revising for my exam."

Group	Exam type	Disagree	Neither agree nor disagree	Agree	χ^2	p
Younger students (35 or under)	Conventional	3	9	37 (76%)	9.600	.008**
	Online remote	20	12	38 (54%)		
Older students (36 and over)	Conventional	24	20	49 (53%)	1.679	.432

Online remote	19	27	56 (55%)

Note: *p < 0.05; **p < 0.01

Additional analysis found that a greater proportion of younger students also reported enjoying the process of revising for online exams (67%) than when revising for conventional exams (45%). A higher proportion of younger students reported enjoying taking the online exam (34%) than the conventional exams (27%). This finding is reversed for older students. Slightly more older students enjoyed taking the conventional exam (32%) than sitting a conventional exam (28%). These differences, however, are not significant.

Younger students report a significant difference between their experience of conventional and online remote exams in relation to satisfaction with the exam score (mark) they achieved ($\chi^2(2) = 6.630$, $p = .036$). More were satisfied with exam score achieved from online exams (74%) compared to those taking conventional exams (55%) (Table 9). This trend was not observed for older students ($\chi^2(2) = 0.843$, $p = .656$). For this group, exam score satisfaction from online exams was similar to conventional exams and similar to younger student mark satisfaction with online remote exams.

Table 9

Number of Younger and Older Student Responses to the Statement: "I was Satisfied with the Mark I Got."

Group	Exam type	Disagree	Neither agree nor disagree	Agree	χ^2	p
Younger students (35 or under)	Conventional	9	11	24 (55%)	6.630	.036*
	Online remote	12	6	52 (74%)		
Older students (36 and over)	Conventional	14	9	67 (53%)	0.843	.656
	Online remote	14	15	80 (55%)		

Note: *p < 0.05; **p < 0.01

Male and Female Experience of Exams

Our final research question asked whether male and female students differ in their anxiety preparing for exams and satisfaction with the exam score received. These are the same two exam-related items reported in the previous section.

Fewer male students felt anxious while revising for their online exam (45%) than conventional exams (54%) (Table 10). A similar pattern is observed for female students, with the survey showing that 67% often felt anxious when revising for a conventional exam while 59% reported anxiety when revising for online exams. Neither difference is significant ($\chi^2(2) = 2.148$, $p = .342$ and $\chi^2(2) = 0.889$, $p = .641$ respectively). There was no significant difference between the male and female experience of conventional exams $\chi^2(2) = 2.48$, $p = .289$) or online remote exams ($\chi^2(2) = 4.576$, $p = .102$).

Table 10

Number of Male and Female Student Responses to the Statement: "I Often Felt Anxious When Revising for My Exam."

Group	Exam type	Disagree	Neither agree nor disagree	Agree	χ^2	p
Male	Conventional	15	16	36 (54%)	2.148	.342
	Online remote	32	22	44 (45%)		
Female	Conventional	12	13	50 (67%)	.889	.641
	Online remote	17	17	50 (59%)		

Note: *p < 0.05; **p < 0.01

Table 11 shows that while a similar percentage of male and female students were satisfied with the exam score achieved (67% and 69% respectively), a greater proportion of male students reported score satisfaction with online exams (81%) than female students (65%). Male students show a significant difference in exam score satisfaction between conventional and online exams while satisfaction for female students is similar.

Table 11

Number of Male and Female Student Responses to the Statement: "I Was Satisfied with the Mark I Got."

Group	Exam type	Disagree	Neither agree nor disagree	Agree	χ^2	p
Male	Conventional	14	7	43 (67%)	4.643	.098
	Online remote	10	8	78 (81%)		
Female	Conventional	9	13	48 (69%)	1.217	.544
	Online remote	16	13	54 (65%)		

Note: *p < 0.05; **p < 0.01

Discussion

Our analysis shows that across most measures, there is no evidence of students reporting differences between revising for a conventional exam and revising for an online remote exam (RQ1) and no difference between taking a conventional and taking an online remote exam (RQ2). While it would have been expected that many measures—such as question clarity or ability to demonstrate what had been learned—would not have been affected by a move from conventional to online exam, it is reassuring to see this confirmed in our data. However, our analysis identified one area of potential concern relating to the perception of online exams as

harder. This was flagged by STEM students but not by FASS students and it remains unclear why this would be the case.

The only other major difference when comparing conventional and online remote exams satisfaction is with the quality of the exam room. Many students reported that exam rooms can be noisy, disruptive, and unsettling environments which can have an adverse impact on their ability to perform. Our analysis suggests that the use of a more familiar, usually home-located, space might improve the satisfaction with the exam environment. However, the online exam assessments experienced by learners in this research did not include remote proctoring or other forms of surveillance (Okada et al., 2018; Lee & Fanguy, 2022) which could potentially offset positive perceptions associated with the use of private home space.

The data did not indicate that greater satisfaction with the assessment space leads to greater enjoyment of the exam, lower anxiety, or an increase in student perception of performance or preparedness. One reason for this observation could be that distance learners tend to study mostly at home, meaning that they will likely be using an established, familiar study space for their exam. The lack of discernible change in the student assessment experience when moving to online exams could be because, alongside the familiarity of space, there is already a familiarity with using technology for learning. Students at the distance learning university used in this study will certainly have been familiar with using technology in a home setting to participate in online tutorials, communicate with other students, and submit assignments. This is perhaps likely also to be true in emerging hybrid campus-based teaching models.

Prior research suggests that some uncertainty remains as to whether online exams reduce stress (Elmehdi, 2019) or increase it (Ilgaz & Afacan Adanir, 2019). In our study we surveyed adult learners of all ages, and this enabled us to compare the experience of younger and older distance learners (RQ3). Students aged 35 years old or under found revising for online remote exams less stressful than conventional exams, yet older students report no difference in revision anxiety between online and conventional exams. These findings appear to contrast with Ilgaz and Afacan Adanir's (2019) study that found no difference in perceptions with age or gender but to be broadly consistent with Stowell and Bennett's (2010) finding that students with higher test anxiety show a preference for online assessment. Younger students also appear to have enjoyed revising for and taking online exams more than conventional in-person exams. While a link between enjoyment and anxiety cannot be assumed, the dimensions and interaction between could be investigated further. We also found that more younger students were satisfied with the exam score they achieved in their online exams when compared to their experience of conventional exams. Ahmad et al. (2022) observed that students felt online exams supported their ability to perform well and our findings indicate that this may be the case for younger students in our study.

With respect to RQ4, we observed some difference in male and female experiences with an indication that male students were more satisfied with the exam score (grade) they achieved from their online exams. These tentative results indicate that measures of age and gender (expanded to include additional gender identifications) along perhaps with other diversity measures would benefit from further investigation.

In a study on the impact of the COVID-19 pandemic on distance learners' study habits, Aristeidou and Cross (2021) found that 50% of students spent less time than usual revising for assessment and 14% spent more. While there are undoubtedly many reasons for this observation, such findings raise important questions about whether learning activities such as reflection,

consolidation of learning, and new learning are affected by a move to remote exams. We found evidence to indicate that differences between the revision experience of distance learning students taking conventional and remote exams may exist. Further work will be required to unpack these and determine whether the correlations that Cross et al. (2016) found between revision and exam experiences are the same for online remote exams.

One limitation of our analysis is that the remote exams we report on were conducted during a period of major societal disruption. Consequently, student expectations for their exam experience may have been lower during this period or they may have just been grateful to have still had the opportunity to take them. Potentially this could result in a more generous rating of satisfaction scores for remote exams. However, we see no evidence in our findings to support this. Second, student perceptions of assessment may be shaped by the quality and nature of communication and support and, while it is possible that more effort was made in this regard during the pandemic, we do not believe the difference to be substantial. Finally, our research focused on self-reported data and therefore made no comparisons with other measures of performance, such as grades.

Conclusion

This paper has compared the experience of students taking online and conventional exams. It offers a unique perspective from a large distance learning provider by contrasting survey data about conventional exams collected before major assessment changes were made in response to the COVID-19 pandemic with data from a second survey about online remote exams that took place as a response to the pandemic.

Our results show that the quality of the distance learner's experience of revising for and taking online exams does not differ significantly from that of conventional exams for almost all measures considered. We found no significant difference in the revision experience across measures including learning whilst revising, assessment design, and enjoyment. However, one significant finding was that arts and social science students appear to have felt less anxious revising for online exams.

The quality of the exam experience itself also did not differ significantly between online and conventional exams for seven of the nine measures examined. No difference was found with respect to question clarity, question relevance, satisfaction with exam score received, enjoyment, exam anxiety, and sense of achievement on completion. The most significant difference was with student satisfaction with the exam environment. Students were much more satisfied with the quality of their home space when taking an exam remotely online than with the conventional exam room. Compared to those taking in-person conventional exams, we also found that STEM students felt the online exam was harder than expected.

Finally, we found indications that student age may influence perceptions of the revision and assessment experience. More younger learners (35 years and under) reported often feeling anxious when revising for conventional exams while this difference was not observed for older students (over 35 years). Younger students were also more satisfied with the exam score they achieved for online exams than for conventional exams.

Our findings underscore the importance of implementing ongoing monitoring and evaluation of the quality of assessment experiences. In this instance, doing so has enabled us to compare the experience of online remote exams implemented in response to the COVID-19 pandemic with the exam experience before it started. Our findings will be of interest to existing

distance learning providers and campus-based universities as they move to adopt more hybrid teaching approaches (Universities UK, 2022).

Declarations
The authors declare no conflict of interests for this study.
The authors declared no funding sources for this study.
The authors received approval from the Human Research Ethics Committee of The Open University for this study.

References

Afacan Adanır, G., Ismailova, R., Omuralev, A. & Muhametjanova, G. (2020). Learners' perceptions of online exams: A comparative study in Turkey and Kyrgyzstan. *International Review of Research in Open and Distance Learning*, 21(3), 1–17. https://doi.org/10.19173/irrodl.v21i3.4679

Ahmad, I., Gul, R. & Zeb, M. (2022). A qualitative inquiry of university student's experiences of exam stress and its effect on their academic performance. *Human Arenas* [Preprint]. https://doi.org/10.1007/s42087-022-00285-8

Ajmal, M. & Saghir, A. (2019). Exploration of anxiety factors among students of distance learning: a case study of Allama Iqbal Open University. *Bulletin of Education and Research, 41(*2), 67–78.

Arora, S., Chaudhary, P. & Reetesh Kr Singh (2021). Impact of coronavirus and online exam anxiety on self-efficacy: the moderating role of coping strategy. *Interactive Technology and Smart Education*, *18*(3), 475–492. https://doi.org/10.1108/ITSE-08-2020-0158

Aristeidou, M. & Cross, S. (2021). Disrupted distance learning: The impact of Covid-19 on study habits of distance learning university students. *Open Learning: The Journal of Open, Distance and e-learning*, 36(3), 263–282. : https://doi.org/10.1080/02680513.2021.1973400

Ballen, C.J., Salehi, S. & Cotner, S. (2017). Exams disadvantage women in introductory biology. *PloS One*, 12(10), e0186419–e0186419. https://doi.org/10.1371/journal.pone.0186419

Bevitt, S. (2015). Assessment innovation and student experience: a new assessment challenge and call for a multi-perspective approach to assessment research. *Assessment and Evaluation in Higher Education*, 40(1), 103-119.

Böhmer, C., Feldmann, N., & Ibsen, M. (2018). E-exams in engineering education — online testing of engineering competencies: Experiences and lessons learned. Paper presented at the 2018 IEEE Global Engineering Education Conference (EDUCON). https://doi.org/10.1109/EDUCON.2018.8363281

Conijn, R., Kleingeld, A., Matzat, U. & Snijders, C. (2022). The fear of big brother: The potential negative side-effects of proctored exams. *Journal of Computer Assisted Learning*, 38(6), 1521–1534. https://doi.org/10.1111/jcal.12651

Cross, S., Whitellock, D. & Mittelmeier, J. (2016). Does the quality of quantity of exam revision impact on student satisfaction and performance in the exam itself? Perspectives from undergraduate distance learners. *EDULEARN16 Proceedings*. IATED Academy (pp. 5052-5061). https://doi.org/10.21125/edulearn.2016

Domínguez, D., Gil-Jaurena, I., & Morentin, J. (2022). The impact of rapid adoption of online assessment on students' performance and perceptions: Evidence from a distance learning university. *Electronic Journal of e-Learning*, *20*(3), 224–241. https://doi.org/10.34190/ejel.20.3.2399

Dermo, J. (2009). e-Assessment and the student learning experience: A survey of student perceptions of e-assessment. *British journal of educational technology*, 40(2), 203–214. https://doi.org/10.1111/j.1467-8535.2008.00915.x

Elmehdi, H.M. & Ibrahem, A.-M. (2019). Online summative assessment and its impact on students' academic performance, perception, and attitude towards online exams: University of Sharjah study case. In M, Mateev & P. Poutziouris (Eds.), *Creative Business and Social Innovations for a Sustainable Future* (pp. 211–218). Springer International Publishing. https://doi.org/10.1007/978-3-030-01662-3_24.

Eltahir, M.E., Alsalhi, N.R. & Al-Qatawneh, S.S. (2022). Implementation of E-exams during the COVID-19 pandemic: A quantitative study in higher education. *PloS One*, 17(5), e0266940–e0266940. https://doi.org/10.1371/journal.pone.0266940

Entwistle, N. & Entwistle, D. (2003). Preparing for examinations: The interplay of memorizing and understanding, and the development of knowledge objects. *Higher Education Research and Development*, 22(1), 19-41.

Falchikov, N., & Boud, D. (2007). Assessment and emotion: The impact of being assessed. In D. Boud and N. Falchikov (Eds.), *Rethinking Assessment in Higher Education, Learning for the Longer Term* (pp. 144–156). Routledge.

Gibbs, G. & Dunbar-Goddet, H. (2007). *The effects of programme assessment environments on student learning.* Higher Education Academy.

Hillier, M. (2014). The very idea of e-exams: student (pre)conceptions. In B. Hegarty, J. McDonald, & S.-K. Loke (Eds.), *Rhetoric and Reality: Critical perspectives on educational technology. Proceedings ascilite Dunedin* (pp. 77-88). https://ascilite.org/conferences/dunedin2014/files/fullpapers/91-Hillier.pdf

Ilgaz, H. & Afacan Adanir, G. (2019). Providing online exams for online learners: does it really matter for them? *Education and Information Technologies*, 25(2), 1255-1269. https://doi.org/10.1007/s10639-019-10020-6

James R. (2016). Tertiary student attitudes to invigilated, online summative examinations. *International Journal of Educational Technology in Higher Education*, 13(19), 1–13. https://doi.org/10.1186/s41239-016-0015-0

Jones, C., Ramanau, R., Cross, S. & Healing, G. (2010). Net generation or digital natives: Is there a distinct new generation entering university? *Computers & Education*, 54(3), 722–732. https://doi.org/10.1016/j.compedu.2009.09.022

Khan, M.A., Vivek, V., Khojah, M., Nabi, M.K., Paul, M. & Minhaj, S.M. (2021). Learners' perspective towards e-exams during COVID-19 outbreak: Evidence from higher educational institutions of India and Saudi Arabia. *International Journal of Environmental Research and Public Health*, 18(12), 6534. https://doi.org/10.3390/ijerph18126534.

Lee, K. & Fanguy, M. (2022). Online exam proctoring technologies: Educational innovation or deterioration? *British Journal of Educational Technology*, 53(3), 475–490. https://doi.org/10.1111/bjet.13182

Okada, A., Whitelock, D., Holmes, W. & Edwards, C. (2018). Student acceptance of online assessment with e-authentication in the UK. In E. Ras & R. Guerrero (Eds.), *Technology Enhanced assessment Conference, TEA 2017. Communications in Computer and Information Science* (pp. 109–122). Cham: Springer. https://doi.org/10.1007/978-3-319-97807-9

Oppenheim, A. N. (1992). *Questionnaire design, interviewing and attitude measurement*. Continuum International.

Patael, S.J., Soffer, T., Livne, E., Fogel-Grinvald, H. & Kishon-Rabin, L. (2022). Remote proctoring: Lessons learned from the COVID-19 pandemic effect on the large scale online assessment at Tel Aviv University. *Journal of Computer Assisted Learning*, *38*(6), 1554–1573. https://doi.org/10.1111/jcal.12746

Payne, E. & Brown, G. (2011). Communication and practice with examination criteria. Does this influence performance in examinations? *Assessment and Evaluation in Higher Education*, 36(6), 619-626. https://doi.org/10.1080/02602931003632373

Reedy, A., Pfitzner, D., Rook, L. & Ellis, L. (2021). Responding to the COVID-19 emergency: Student and academic staff perceptions of academic integrity in the transition to online exams at three Australian universities. *International Journal for Educational Integrity*, *17*(1), 1–32. https://doi.org/10.1007/s40979-021-00075-9

Stowell, J.R. & Bennett, D. (2010) Effects of online testing on student exam performance and test anxiety, *Journal of Educational Computing Research*, 42(2), 161–171. https://doi.org/10.2190/EC.42.2.b

Universities UK (2022). *Lessons from the pandemic: Making the most of technologies in teaching*. https://www.universitiesuk.ac.uk/what-we-do/policy-and-research/publications/lessons-pandemic-making-most

Vattøy. K.-D., Gamlem, S.M. & Rogne, W.M. (2021). Examining students' feedback engagement and assessment experiences: a mixed study. *Studies in Higher Education,* 46(11), pp. 2325-2337.

Whitelock, D., Herodotou, C., Cross, S. & Scanlon, E. (2021). Open voices on Covid-19: Covid challenges and opportunities driving the research agenda. *Open Learning: The Journal of Open, Distance and E-learning,* 36(3), 201-211. https://doi.org/10.1080/02680513.2021.1985445