Report:

Online teaching and learning in the time of COVID-19: Rapid Evidence Review

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CONTENTS

1.   SUMMARY

1.1   Context

This rapid review provides a summary of the existing evidence surrounding the impact of online teaching, learning and assessment in higher education (HE) on the academic performance of learners from disadvantaged backgrounds during the COVID-19 pandemic.

Before the pandemic, HE was one of the least digitised sectors, although some institutions were using a blended, and in some cases fully online, format. As an area of emerging practice, there is a small body of experimental research comparing online and in-person teaching and learning before the pandemic, although little of this is in a UK context.

During the pandemic, quasi-experimental and empirical research designs were used to evaluate the impact of the rapid shift to online teaching and learning on the academic performance and engagement of HE students. However, high quality evidence on this topic is still lacking, particularly in the context of the UK, as the existing literature is based on studies mostly conducted in the US and Europe.

As higher education providers' (HEPs) plan to continue, and potentially expand, online teaching, learning and assessment beyond the pandemic, this paper seeks to summarise the current evidence and provide recommendations.

1.2   Evidence review findings

- The existing evidence is somewhat mixed; there are a small number of studies which suggest online teaching and learning can maintain or improve outcomes for some groups, but overall, the move to online learning appears associated with worse student outcomes.

- The pre-pandemic literature suggests that, compared to purely online learning, 'blended' learning (e.g., a combination of face-to-face and online learning) is more likely to improve student attainment. Whereas the literature produced during the pandemic demonstrates that the rapid shift to an online format had a negative impact on student outcomes.

- In the post-pandemic literature, there is some evidence that, prior to applying any type of 'no detriment' control in an attempt to account for the impact of the pandemic on students' performance, learners from low-income backgrounds and academically at-risk students may be most likely to be negatively impacted by the shift online. However, this is not universally the case in the studies we reviewed.

- Course design appears to be an important factor to consider when planning online learning, as its efficacy is highly dependent on a number of design choices. However, this planning was not possible with the emergency switch to remote learning, where the priority was to adapt promptly to unforeseen crisis circumstances.

- Looking at design features, the existing evidence suggests that courses which encourage active engagement through planned student-student interactions and opportunities for feedback between teaching staff and students increase student attainment.

- Digital poverty is thought to be the largest barrier to the success of online teaching and learning and will most likely disproportionately impact disadvantaged groups. Students from more privileged backgrounds may have better access to the internet and more sophisticated devices.

1.3   Recommendations

- The design of online courses is important: A concerted effort should be made to design online courses rather than simply moving face-to-face materials into the online environment. Effective design features include:
  - Coordinated student-to-student interaction via discussion boards and chat rooms.
  - Feedback between teaching staff and students.
  - Appropriate frequency and timing of online teaching and assessment to avoid student fatigue.

- HEPs should make use of their institutional data and differing pedagogical approaches to design and conduct the type of experimental and quasi-experimental evaluations that allow us to draw strong conclusions about what works in the UK context.

- As students from disadvantaged backgrounds are more likely to be adversely impacted by the shift to online teaching, learning and assessment, future research should focus on their experiences and outcomes.

2. INTRODUCTION

Given the central role of teaching, learning, and assessment in HE, institutions have historically been cautious about moving towards digital delivery, with only incremental and slow change over recent years (Figaredo et al., 2022). Before the COVID-19 pandemic, HE was one of the least digitised sectors, although some universities had already started to deploy a blended and fully online format (European Commission, 2022). The pandemic initiated an emergency shift to online teaching, learning and assessment from March 2020, but this also precipitated a wider adoption of more digital approaches in HE which extends beyond the period of national crisis.

Online remote learning, sometimes called digital learning, is learning, teaching and support carried out in the absence of face-to-face contact using laptops or computers and often requiring an internet connection (Jarrett et al., 2020). Online learning can either be synchronous (i.e. resources are available at set intervals following the timings of a traditional face-to-face course) or asynchronous (i.e. all resources are available immediately and students are responsible for deciding their study schedule).

This review includes evidence from the wider research related to online teaching, learning and assessment in HE, both before and after the COVID-19 pandemic. Where possible, we have focused on the experiences and outcomes of learners from disadvantaged backgrounds and underrepresented groups.
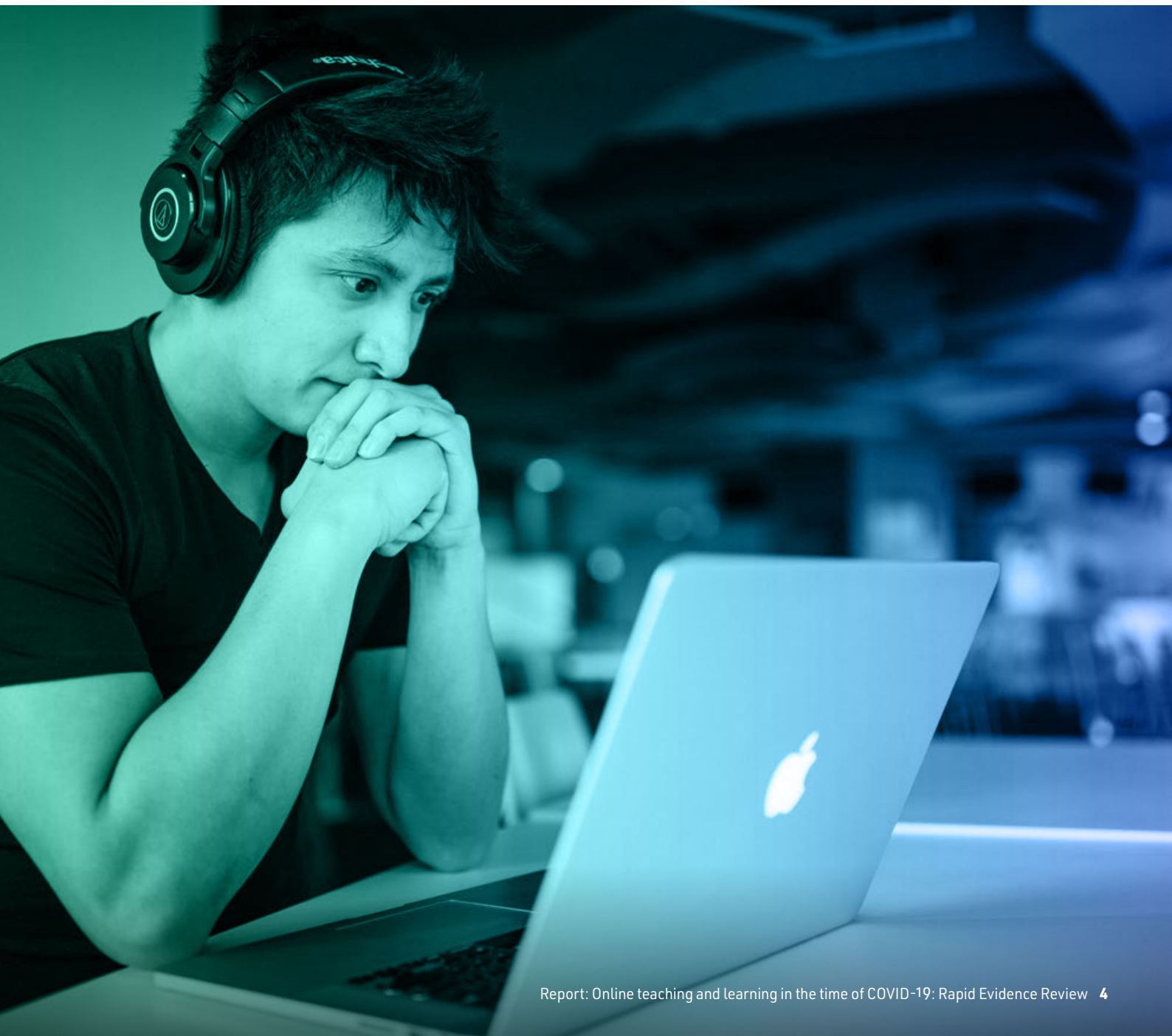
3. METHODS

The rapid evidence review is guided by the following research questions (RQs):

- RQ 1: What kind of interventions have been studied in the literature pre-pandemic and during the pandemic?

- RQ 2: When pure face-to-face learning is not possible, what is the best way of structuring HE courses to minimise equality gaps?

- RQ 3: Are there gaps in the evidence which need to be addressed?

The review outlines and assesses evidence from a variety of sources including academic literature, peer-reviewed publications and 'grey literature', such as working papers. The evidence is categorised in line with the Office for Students' 'Standards of Evidence' - further outlined in Appendix A.

Type 1 – Narrative: there is a clear narrative for why an activity may be effective, and this is often based on findings of other research or evaluation.

Type 2 – Empirical Enquiry: data suggests that an activity is associated with better outcomes for students.

Type 3 – Causality: methods are used which demonstrate that an activity has a 'causal impact' on outcomes for students.

We took a two-phased approach to reviewing the literature. The initial phase considered two rapid evidence reviews that were produced in response to the COVID-19 pandemic:

- Firstly, the What Works Clearinghouse (WWC) rapid evidence review which collates evidence on distance learning courses (What Works Clearinghouse, 2021). Thirty-six studies meet the WWC standards for review and of these, three are related to postsecondary students. These three studies are reviewed in this report.

- Secondly, a rapid evidence assessment undertaken by the Education Endowment Foundation (Education Endowment Foundation, 2020) which summarised the findings from 60 systematic reviews and meta-analyses. The scope of the review was to understand the evidence surrounding online learning for school aged children but, two studies reported on evidence for post-school aged students. We selected these two studies for review in this report.

The second phase of the review developed inclusion criteria for an online literature search to further investigate the impact of online teaching and learning on student outcomes (see Appendix B). Google Scholar and NBER were the search engines used to identify academic papers and 'grey' literature such as working papers.

For further information on the evidence discussed in this review see Table 1. In total we reviewed 18 relevant papers, seven of these focussed on the pre-pandemic context, including two meta-reviews, four randomised controlled trials (RCT) and one study using empirical analysis. The remaining 11 papers focus on studies conducted since the pandemic, including one RCT, four quasi-experimental studies and six studies using empirical analysis.

Table 1: Matrix of the timing and type of evidence

Evidence Timing	Evidence Type			Total
	Narrative	**Empirical Evidence**	**Causality**	
Pre-pandemic	0	1	6	7
Post-pandemic	0	6	5	11
Total	0	7	11	**18**

Note: evidence types are based on the Office for Students standards of evidence.[1]

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[1] The Office for Students' standards of evidence: https://www.officeforstudents.org.uk/

4. FINDINGS

The findings are summarised in three sub-sections below. The first two sub-sections cover the pre-and post-pandemic evidence landscape. The third sub-section focuses on the impact of online learning for students from disadvantaged or underrepresented groups.

4.1 Online teaching and learning: pre-pandemic

Seven studies from this review, including two meta-analyses, examined the impact of online teaching and learning on student outcomes prior to the COVID-19 pandemic. The existing evidence is somewhat mixed; there are a small number of studies which suggest online teaching and learning can maintain or improve outcomes for some groups, but academic performance and engagement seem to decrease when HE courses are delivered online. Both the course design (frequency and timing of online tuition) and students' prior attainment and academic ability remain influential in determining the outcomes for students learning online. All of the studies reviewed in this section of the paper were conducted outside the UK, mostly in the US, meaning that the results may not reflect the experience of HE students in the UK and highlighting the need for further research in the UK widening participation context.

Meta-analyses

A meta-analysis by Means et al. (2013) compared the learning outcomes of face-to-face courses to either fully online or blended learning courses in the US. The study synthesised findings from 45 separate studies, including those focused on learners in compulsory schooling, HE, graduate programmes or professional training. Studies were only included if they reported on a learning outcome that was measured across different study conditions, including scores on standardised tests, scores on researcher-created assessments, grades/scores on teacher-created assessments or grade point averages. The studies included were either experimental studies using random assignment or quasi-experiments which controlled for pre-existing group differences. The meta-analysis found that students performed better on blended courses than purely face-to-face, but there was no significant advantage to students learning purely online compared to face-to-face. These results suggest that we should not expect online learning to lead to poorer outcomes

and that blended learning can actually enhance face-to-face instruction. However, an important limitation to this research is that the analysis draws on a variety of studies with participants varying in age from 13 and 44, and at different points in their education. Therefore, the results may not reflect the experience of HE students, highlighting the need for more HE-specific research in this area.

Borokhovski et al. (2012) conducted a meta-analysis of the achievement outcomes of three types of interaction experienced in remote education: student–student, student–teacher, and student–content. Achievement was defined as test scores, grade point averages, assignment marks or other learning outcomes. After analysing 32 papers, they found that student-student interactions increase achievement on online courses. This effect appeared amplified if the student-student interaction was designed into the distance learning course to give students the opportunity to work collaboratively. In contrast, studies which provided the means for students to interact but did not actively encourage collaboration had a smaller positive effect. Like the study carried out by Means et al. (2013) this analysis included studies with participants at different stages of education; therefore, these results may not reflect the experience of online learning for HE students in the UK.

Randomised controlled trials / quasi-experimental studies

Baker et al. (2019) carried out an RCT to examine the efficacy of a scheduling intervention aimed at improving students' time management when learning online. At a US university, 145 students participating in an online course were randomly assigned into a treatment or control group on the first day of the course. Students in the treatment group were asked to create a schedule specifying the day and time they would watch the five online lectures for that week. The control group students were not asked to schedule the lectures. Encouraging online students to schedule when to watch lecture videos appeared to improve achievement early in the course which was measured via weekly test scores, daily homework scores and final course grades. Students assigned to the treatment group scored 0.341 standard deviations higher on the weekly quiz than students assigned to the control group. Positive outcomes were concentrated among students who self-reported time management skills, but the effect

declined over subsequent weeks, when scheduling had stopped. This study only reflects outcomes from a relatively small sample of students on one science, technology, engineering and mathematics (STEM) course so further research needs to be carried out to determine whether this time management intervention is effective for students studying other disciplines.

Selhorst et al. (2017) also carried out a cluster RCT examining the effect of online discussions board use on student performance in adult learners. Carried out in the US, 908 students from seven courses were randomly assigned to a treatment or control group. Both groups were assigned the same weekly readings, assignments and quizzes but the treatment group had only one mandatory group discussion whereas the control group had the usual two mandatory group discussions. These discussions required students to participate in an online, open forum where they posted thoughts and questions about the course and could respond to other classmates' posts. There was no significant difference in grade point average between students in the treatment and control group. In other words there was no negative impact of reducing the number of mandatory hours for an online group discussion. Further research is required to find the optimal structure for online learning to prevent fatigue while maintaining attainment.

Stanley and Zhang (2018) carried out an RCT with a sample of 87 students enrolled in an online economics course. All students received the same lecture content, completed the same homework assignments and took the same exams. Students in the treatment group were also asked to develop a video project outlining the steps to solve a multiple-choice question. Each student produced and narrated a video which was then posted on a group discussion board. Other students were asked to provide ratings and comments on the videos. Qualitative comments implied that the treatment group thought their learning had improved but final grades were not significantly higher in the treatment group compared to the control group. Students with low incoming grade point averages were found to have taken fewer online courses in the past and were less engaged, had reduced attainment and lower learning outcomes in both groups. As the sample size was small the difference in final grades between the groups would have to be large to see a significant difference, highlighting the need for studies with larger samples.

Cacault et al. (2021) carried out an RCT with a sample of over 1,400 students in a Swiss public university, to evaluate the impact of online live streaming of lectures on student achievement and attendance. First-year undergraduate students were offered access to a live streaming platform for many of their compulsory courses. Access to the platform was randomised

across students and over weeks of the term, meaning that the same student could attend the classes online in some weeks but not others. Students were not obliged to attend classes online and could decide to attend in person. The research found that access to online lectures lowered achievement for low-ability students, with those in the bottom quintile of the ability distribution obtaining lower test scores, by approximately 2 percentage points. In contrast, the achievement of high-ability students increased, with the effect being even larger (2.5 percentage point) for those at the top of the ability distribution. The authors suggest that these findings may reflect the fact that high-ability students are better able to read material and follow content independently, whereas lower ability students are less effective independent learners and prefer to attend in-person. Results also showed that students only used the live streaming technology occasionally (about 10% of the time they had access to it) which the authors consider consistent with their understanding that students use the service only when random events make the cost of class attendance particularly high. Although this study does not focus on students from disadvantaged backgrounds, the findings are interesting when considering what the results could mean for low-income students for whom the cost of attendance in-person is a barrier.

Empirical studies

Cellini and Grueso (2021) examined the attainment of Columbian students on HE exit exams, comparing those who chose to study online versus on campus in the years 2012-2017. This large-scale study of more than 400,000 on-campus students and more than 60,000 online students found that online students performed significantly worse on exit exams (in maths, reading, writing and English skills) than students on campus at undergraduate degree level overall. However, when looking at different institution types, online students performed worse than on-campus students in private institutions, but online students performed better in the main public vocational, HE institutions of the country. Numerous factors may influence the discrepancy observed: differences in the cohorts of students who choose to study online at different institutions; a difference in the quality of online courses across different HEPs; and suitability of subject content for online tuition, rather than face-to-face. As the study uses exit exams to assess attainment, it relies on students completing the course and doesn't analyse attrition rates among students learning online versus on-campus. Therefore, more motivated and engaged students are likely to be disproportionately represented in the final sample, limiting the validity of the study.

4.2 Online teaching and learning: post-pandemic

Since the start of the COVID-19 pandemic, evidence on the impact of the sudden shift to online teaching and learning has been emerging. This section examines 11 studies conducted since the pandemic started in March 2022. The evidence shows that the shift to online teaching and learning had a negative impact on students' outcomes and engagement, with low-income and academically at-risk students being most impacted.

The strength of evidence differs from that in the previous section, partially due to the methodological challenges associated with the unexpected nature of the pandemic and subsequent switch to online learning. Nonetheless, a number of studies have used experimental or quasi-experimental methods to assess the impact of online learning on outcomes for students. Other studies reviewed in the following section primarily provide empirical evidence on the impact of COVID-19 on learning in HE environments and highlight the need for more comprehensive studies to provide stronger, more robust causal evidence on this topic.

Randomised controlled trials / quasi-experimental studies

Kofoed et al. (2021) conducted a randomised controlled trial comparing online and in-person learning in an introductory economics course run at the United States Military Academy, during the autumn of 2020. The experimental study involving 551 students found that the shift to online education negatively impacted learning, as final grades for online students dropped by 0.215 standard deviations. The mode of delivery impacted both assignments and exam grades, and the impact was largest for academically at-risk students. Additional survey data found that online students were struggling to concentrate in class and felt less connected to their instructors and peers than in-person students.

Foo et al. (2021) used a quasi-experimental design involving propensity score matching to compare two groups of fourth-year medical students in a Hong Kong university from the same class: one using an online peer-to-peer platform and the other using a face-to-face approach. A total of 62 students were matched in each group, and online students were found to have significantly lower scores for five areas of proficiency (participation, communication, preparation, critical thinking and group skills) compared to their face-to-face peers. The study highlights the need for further evaluation to understand the underlying cause for the differences.

Bird et al. (2022) conducted a quasi-experimental study with a sample of over 300,000, using a difference-in-difference design and student data from administrative records, to evaluate the impact of the switch to online learning on the performance of US community college students. The analysis found modest negative impacts of online learning on course completion, with the negative effect being most evident for less-experienced and low-performing students. The authors suggest that, in line with these results, HEPs and teaching staff likely need to target outreach and support efforts to students who are most likely to struggle with virtual learning.

De Paola et al. (2022) also used a difference-in-difference design, taking advantage of the fact that the transition to online instruction took place during the second semester while classes were face-to-face in the first semester, to assess the impact of the shift to online learning on the academic achievement of students in an Italian university. Controlling for COVID-19-specific factors and internet connection quality, the researchers found that the shift had a negative impact on student performance, with online teaching significantly reducing the number of credits students obtained throughout the semester. First year students appeared to suffer the most, while almost no change was found for students studying a masters programme. Thus, the study suggests that the increased need for self-discipline in an online learning context might cause lower achievement and encourage procrastination.

Rodriguez-Planas (2022) also used a quasi-experimental design combining a difference-in-difference model and empirical analysis of administrative student records to estimate the impact of the switch to online learning during the pandemic on the academic achievement of urban US university students. The evidence suggests that low-income, low-performing students outperformed their higher-income peers. However, no grade advantage was observed among top-performing lower-income students. This differential can be explained by the flexible grading policy which counteracted negative shocks for the disadvantaged student population. In other words, in the absence of the flexible grading policy, lower-income bottom-performing students would have underperformed relative to their higher-income counterparts.

Empirical studies

Guo (2020) compared synchronous versus asynchronous online teaching in an introductory physics class at a US HEP during the pandemic. The study compared attainment outcomes of students who attended the three two-hour Zoom classes versus those who learnt in their own time. The small study of 21 students found that, although all students experienced a drop in their average test results, those who attended the synchronous classes had higher attainment outcomes in homework tasks and post-course exams compared to those who did not attend. Those who learnt asynchronously also found the course more difficult and spent more time learning the content. However, since the sample size is very small, we should be cautious about the study's

findings. Looking at larger courses or increasing the number of courses studied would make the analysis more robust and potentially allow further analysis regarding demographics of the participants.

In the US, Orlov et al. (2020) sought to better understand student learning during the COVID-19 pandemic by analysing data from 809 students' end-of-course assessments across seven economics courses. Using simple linear regression models, the researchers found that students performed substantially worse, on average, in Spring 2020 when compared to Spring or Autumn 2019. Interestingly, when adjusting for demographic factors, there was no significant evidence that underrepresented minorities were disproportionately affected by the pandemic. The study also found courses that encourage active engagement and had planned peer-to-peer- interactions had higher end-of-course results, suggesting that synchronous learning may have benefits over asynchronous learning because of the increased interaction and participation this method of teaching allows.

Figaredo et al. (2022) used administrative data of a large sample of over 120,000 undergraduate students in a Spanish distance learning university to observe the impact of the pandemic, and mode of assessment, on student performance. The study examined the academic performance of students before the pandemic, when final assessment was face-to-face exams, and during the pandemic, when assessment was switched to online exams. Researchers also conducted a student questionnaire (n=714) asking about perceptions of the online assessment experience. The results from the study show that indicators of academic performance (average marks obtained, achievement rates, and assessment success) increased when the assessment was held online. Survey data showed that the majority of students favour online assessment methods, rather than face-to-face, although they did not find it easier and found the short time available for completing online exams challenging. However, the context of this study being undertaken in a distance learning university limits its applicability to more traditional HE contexts.

Salta et al. (2022) analysed data on the emotional engagement - defined as positive and negative reactions to teachers, classmates, academics, and school - of 347 undergraduate students and 13 postgraduate students in two Greek universities during the shift from face-to-face learning to online learning following the COVID-19 pandemic. The study found that there is a significantly lower level of emotional engagement in the online learning environment compared to the traditional in-person environment for

undergraduate students. Using multiple regression analysis, the data shows that the decrease in emotional engagement is primarily explained by the decrease in human interaction with instructors or fellow students in the online learning environment. Therefore, the authors suggest that upon adoption of an online learning scheme, course convenors should make design choices that encourage communication, collaboration, and personal interaction between students and teaching staff.

In Egypt, El Said (2021) compared the academic performance of students (n=376) who completed a face-to-face 'introduction to programming' course before the pandemic with students (n=372) who completed the same course fully online during the lockdown. The results showed no statistically significant difference between the academic performance (quizzes, course work, and final exam grades) of students who took the course online versus face-to-face. Although not significant, the results suggest that students with higher academic capabilities (grade point average) performed better when taught online while students with lower academic capabilities performed worse. The authors of this study suggest that, in order to ensure lower-performing students are not further disadvantaged, course instructors should be methodical in their design of online courses, rather than simply moving face-to-face materials into an online environment.

In a US university, Altindag et al. (2021) used longitudinal data from student transcripts, pre-and post-pandemic, to analyse the effect of online versus in-person instruction on student achievement. The study found that, on average, students enrolled in face-to-face courses obtain better grades than their peers enrolled in online courses. Face-to-face learners also perform better in terms of retention and likelihood of receiving a pass grade. However, the study also finds a significant increase in all student grades in Spring 2020, after the COVID-19 pandemic was announced. This result is consistent with sector-wide reports that HE providers adopted changes to assessment policies that would support students and alleviate difficulties caused by COVID-19. The authors of this paper note that factors such as lenient grading policies and a flexible approach to assessment, prompted by the pandemic, may lead researchers to mistakenly conclude that online instruction is better for student learning than face-to-face.
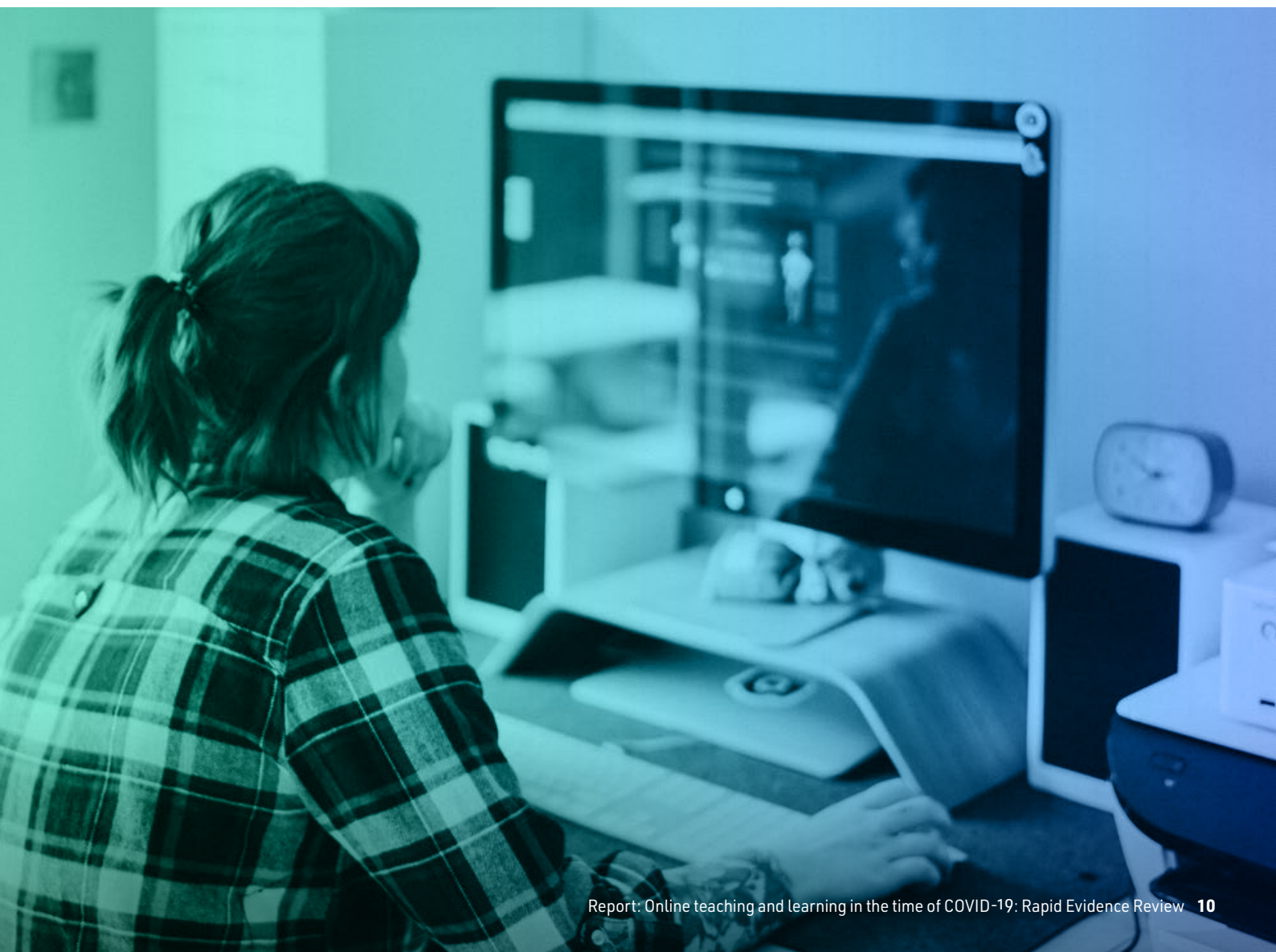
4.3 The impact of online learning during the COVID-19 pandemic for students from disadvantaged and underrepresented backgrounds

There are concerns regarding the impact of the COVID-19 pandemic on students from underrepresented and disadvantaged backgrounds, including factors such as access to IT systems and student mental wellbeing. These potential barriers to success when learning online are likely to be exacerbated for students who are disadvantaged or underrepresented. Even when controlling for gender and qualifications upon entry, certain groups including Black and Asian Minority Ethnic (BAME) students, disabled students and those from low-socioeconomic status households or highly deprived areas are awarded lower final degree awards (Office for Students, 2021).

The Office for Students states that the biggest barrier to the success of online teaching and learning is digital poverty. They propose that the key components of students being able to learn are appropriate devices, good connectivity, reliable back-up options, relevant software, a trained teacher, and the space to work (Office for Students, 2020). This claim is supported by Altindag et al. (2021) who found that, during the pandemic, unequal access to broadband technology was associated with disparities in students' learning outcomes. To counteract the impact of insufficient technology during the pandemic, some UK HEPs delivered 4G dongles to students, expanded laptop loan schemes and developed alternative modes of assessment. Nonetheless, the Office for Students found that 30% of students did not have good enough internet access or adequate study space to work effectively at home. Additionally, a survey of over 21,000 students found that 62% of students studying online had issues relating to poor Wi-Fi and 22% found mobile data costs were a barrier to learning (Jisc, 2021). Students from low-socioeconomic status backgrounds are more likely to have reduced access to technology at home (Office for National Statistics,

2019) and they often rely on HE facilities such as laptop loans and libraries. Therefore these students were likely to be disproportionately affected by the pandemic.

Additionally, BAME communities are more likely to live in overcrowded households as seen in the English Housing Survey where 30% of Bangladeshi households, 16% of Pakistani households and 15% of Black African households experienced overcrowding, compared to 2% of White British households (Ministry of Housing, Communities & Local Government, 2018). Not having adequate living space can reduce mental wellbeing (Clifford et al., 2020) and may impact learning if students struggle to find a quiet place to study.

When learning online, BAME students may also be less engaged with online content due to feelings of a reduced sense of belonging, reduced self-esteem, difficulty in engaging with class work, increased likelihood of having part time jobs and caring responsibilities (Eboka, 2020). BAME students were also more likely to be vulnerable to the economic fallout of COVID-19 which may impact their engagement with the course content (Singh, 2020) and worsen the already prevalent digital divide (Office for National Statistics, 2019).

During the COVID-19 induced lockdowns, disabled students were more likely to be shielding than their non-disabled peers which may have led to financial hardship. Their Disabled Students' Allowance (DSA) needs assessment is also likely to have been impacted by the pandemic and may not have been updated to reflect an increased need for additional technology to be able to effectively work at home, further increasing the financial burden on this group (Office for Students, 2020). The transition to online learning may also cause difficulties for students with particular needs; for example some students may find online webinars challenging if they usually are assisted by sign language interpreters and if there is a delay in producing captioned or transcribed lectures (Nadp-uk.org, 2020).

5. CONCLUSION

This rapid review has provided a summary of the academic and grey literature on online teaching, learning and assessment published pre-and post-pandemic. It indicates that further research and evaluation is required in this field, especially as online teaching and learning is predicted to be a lasting trend in a post-COVID-19 world.

Overall, the evidence we found suggests that the move to online learning is generally associated with worse student outcomes.

Blended learning (e.g., a combination of face-to-face and online learning) appears to improve attainment when compared to purely online learning. The existing evidence also suggests that course design is key to effective online provision. Building student-student interactions into an online course, such as discussion boards between peers, allows for increased engagement which is often positively associated with attainment. The literature also highlights the need for a balance between encouraging interaction and engagement and managing online fatigue. This is particularly the case for retention levels as results from some studies suggest that increasing the number of online sessions is not linked with increased attainment.
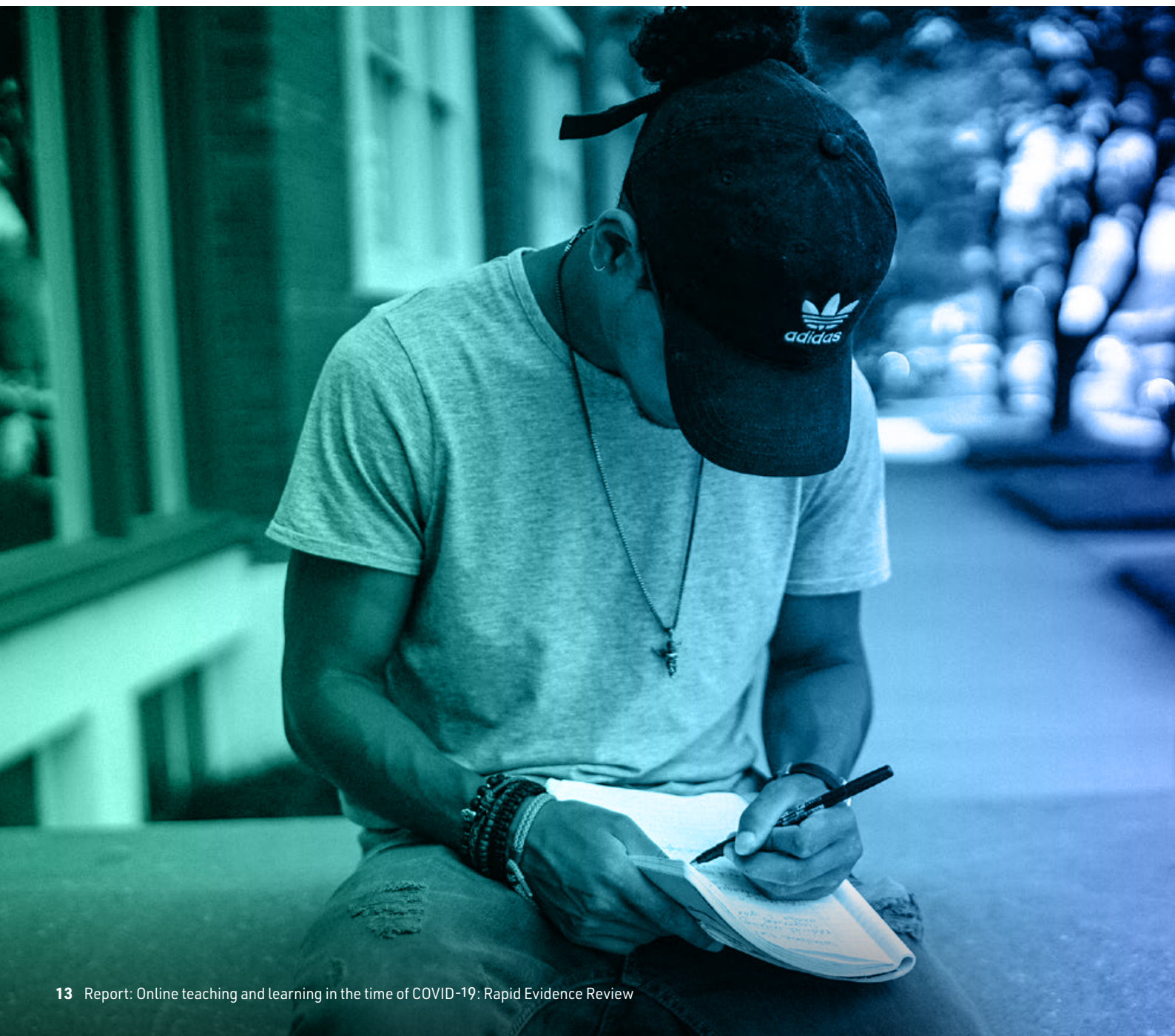
Importantly, more evidence is required to understand the impact of the pandemic on the awarding gap of disadvantaged students. As disadvantaged and low-income groups are more likely to suffer from 'digital poverty', which means they may not have appropriate technology, good connectivity, reliable back-up options or relevant software to be able to learn successfully at home, HEPs must consider these groups when planning online teaching, learning and assessment, to ensure the gap does not widen further.

Unfortunately, there is not sufficient data to determine whether any widening attainment gap is due to the move to online teaching/assessment or due to COVID-19 itself. Because the pandemic led to rapid and widespread changes, it is impossible to untangle the effect of a module being taught online from the effect of it being taught in the context of the pandemic, using the available data.

Beyond the pandemic, it is expected that HEPs will continue to expand their use of online teaching, learning and assessment. However, there is currently little guidance on how this should be designed. This further confirms the need for more rigorous research into the impact of these new educational approaches on present and future equality gaps.

Appendix A: Types of evidence (Office for Students, 2019)

Type	Description	Evidence	Claims
Type 1: Narrative	The impact evaluation provides a narrative or a coherent theory of change to motivate its selection of activities in the context of a coherent strategy.	Evidence of impact elsewhere and/or in the research literature on access and participation activity effectiveness or from existing evaluation results.	Coherent explanation of what it is done and why. Claims are research-based.
Type 2: Empirical Evidence	The impact evaluation collects data on impact and reports evidence that those receiving an intervention have better outcomes but does not establish any direct causal effect.	Quantitative and/or qualitative evidence of a pre/post intervention change, or a difference compared to what might otherwise have happened.	Can demonstrate that interventions are associated with positive results.
Type 3: Causality	The impact evaluation methodology provides evidence of a causal effect of an intervention.	Quantitative and/or qualitative evidence of a pre/post treatment change on participants relative to an appropriate control or comparison group who did not take part in the intervention	Can demonstrate that the intervention causes improvement using an appropriate control or comparison group.

Appendix B: Inclusion criteria for the rapid review

Criteria	Inclusion	Exclusion
Population	HE students	School aged learners
Interventions	Online learning and distance learning	In person learning with no comparison to online learning
Study Design **(OfS Type 1)**	**Include studies that show:** • Coherent strategy • Approach/activities backed by evidence from literature or other evaluations • Shared understanding of processes • Reason for activity • Clear conception of why the changes sought to make are important • Programme reviews	**Exclude studies that show:** • Disjointed activities • No rationale for developing approach and activities • Model of change that is not shared • Ad-hoc activities • No understanding of needs of target groups • No review or evaluation
Study Design **(OfS Type 2)**	**Include studies that show:** • Clear aim of what it is sought to achieve • Selected indicators of impact • Use of quantitative or qualitative data or both • Pre/post data (minimum two points in time) • Analysis competently undertaken • Sharing of results and review of activity	**Exclude studies that show:** • Aims developed after activity • No concept of measuring success • Information that is not systematically collected • No pre/post data • Data not related to the intervention • Results not used to inform decisions
Study Design **(OfS Type 3)**	**Include studies that:** • Have a treatment and a control group • Use an experimental or quasi-experimental design • Consider selection bias and try to avoid it	**Exclude studies that:** • Do not have a control group • Use groups that are not comparable • Have selection bias in control groups

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