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Online exam proctoring technologies: Educational innovation or deterioration?

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Abstract

During the coronavirus disease-2019 (Covid-19) pandemic, many universities have adopted online exam proctoring technologies to monitor and control an increasing number of student cheating incidents. Although it looks like a natural and effective solution for a fair assessment of student online learning performance, the authors argue that proctoring technologies are rooted in problematic assumptions about educational fairness and authoritarian pedagogical approaches. The authors have conducted a qualitative case study in a large-sized, top-tier university in South Korea to investigate the negative impacts of adopting proctoring technologies on student subjectivities, pedagogical relationships and educational outcomes, which have not been fully discussed in previous studies. By utilising Foucault's theorisation of disciplinary governmentality, the authors effectively demonstrate that the binary subjectification of students as cheaters and the cheated has degraded the value of student engagement in university education whilst creating more competitive and distrusting relationships amongst students and between students and teachers. Nevertheless, without challenging the unethical consequences of online proctoring technologies or fundamentally unfair social and educational

systems, students willingly accept and adopt them as docile bodies, which has led to educational deterioration rather than innovation.

KEYWORDS
cheating, Covid-19, exam proctoring technology, Foucault, governmentality, online exam, South Korea

Practitioner notes

What is already known about this topic
- There is an increasing number of online exam proctoring technologies available with advanced technical features.
- During the coronavirus disease-2019 (Covid-19) pandemic, many universities have adopted online exam proctoring technologies with exam-related policies and regulations to stop student cheating behaviours.
- Previous studies have discussed both advantages and disadvantages of adopting online exam proctoring technologies, including specific ethical concerns.

What this paper adds
- Online exam proctoring technologies are deeply rooted in problematic educational approaches such as teacher-centred knowledge transmission.
- The adoption of online exam proctoring technologies has produced negative impacts on student subjectivities, pedagogical relationships and educational outcomes.
- Focusing on student cheating as an individual and interpersonal problem neglects the more fundamental issue of social and educational inequality.

Implications for practice and/or policy
- The negative consequences and damages created by the adoption of online exams and online exam proctoring technologies need to be carefully reflected.
- The notion of academic fairness needs to be approached with a broader perspective, considering the different social and academic circumstances each student is in.
- It is essential to critically engage students with the broader conversation about educational fairness to develop them as critical thinkers and future leaders in their chosen fields.

INTRODUCTION

Imagine being in a room where a machine with 360-degree vision is proctoring an exam. To assist with this visualisation, here are some excerpts from the recent academic papers describing the major features of two online exam proctoring systems:

> [The system] works as a Google Chrome extension that disables copypaste and printing functions, preventing the use of multiple monitors and access to materials stored on the computer. Before starting the exam, the system records the student's face and ID for authentication and creates a 360-degree room scan. During the exam, the system records the screen, audio/video and web

> activities of the student's computer. AI algorithms detect the presence of extraneous voices and the use of secondary devices such as smartphones, tablets or laptops. In addition, a live proctor pop-out during the exam is shown if the student conducts anomalous activities. (Arnò et al., 2021, p. 63)

> The system works by categorizing the student's VFOA (visual focus of attention) data by capturing the head pose estimates and eye gaze estimates using state-of-the-art machine learning techniques. The examiner is alerted when the student wavers in his VFOA from the screen greater than X, a predefined threshold of times; the application will save the person's data when his VFOA is off the screen and send it to the examiner to be manually checked and marked whether the student's action was attempted malpractice or just a momentary lapse in concentration. (Indi et al., 2021, p. 47)

During the ongoing coronavirus disease-2019 (Covid-19) pandemic, higher education institutions worldwide have moved their teaching online, as face-to-face teaching was banned due to the rapid spread of the virus (Lee, Fanguy, Lu, et al., 2021). However, many universities and faculty members lacking experience and expertise with online course design and delivery have found this rapid and radical pedagogical shift very challenging (Rapanta et al., 2020). Consequently, several areas of pedagogical concern emerged regarding teaching and learning quality during the Covid-19 pandemic. Amongst these areas, fair and accurate assessment of student learning performance became a focal point (Coghlan et al., 2021).

As universities and teachers were under massive pressure to keep their 'business as usual' but online, they may not have paid sufficient attention to assessment practices during the first part of the pandemic (Lee, Fanguy, Bligh, et al., 2021). Subsequently, the unprepared administration of online exams, using the same tool implemented for live lectures, led to an increased number of student cheating behaviours. Whilst teleconferencing software allows faculty members to deliver content and interact with students to some degree, it does not provide features suitable for effective and secure online proctoring. Thus, online proctoring is severely hindered by the human teachers' limited ability to watch and monitor student behaviours as the students are only partially displayed within tiny rectangles of a gallery view of participants—not to mention the additional challenge when a class is large enough for audience views to go onto multiple pages.

In such ill-proctored exam situations, it is not surprising that many students found it difficult to resist the temptation to cheat. With a range of possibilities, including looking up online resources, communicating with others and even taking exams for someone else (Peled et al., 2019), student malpractices in online exams were increasingly noted. To reduce the cheating possibilities in the subsequent terms, many universities adopted online exam proctoring systems, predominantly commercial products with high prices. As the demand grew fast, research attempts to evaluate the effectiveness of those products and compare various technical features offered by the products have rapidly emerged in the academic field of educational technology.

Recently, for example, Arnò et al. (2021) have provided a comprehensive review of 29 online proctoring products available in the market, suggesting 'the options offered by the proctoring systems are various, with many types of technological features' (p. 71). Nigam et al. (2021) have also conducted a systematic literature review on online proctoring products based on 43 papers published between 2015 and 2021, providing a comparative perspective on the effectiveness of AI- and non-AI-based products. Both studies discuss a set of technical limitations of those reviewed products in accurately detecting and reporting student malpractices during online exams, consequently posing issues of the excessive manual work required in the post-exam evaluation. In addition, Nigam et al. (2021) raise

several ethical concerns over security and privacy and operational issues caused by a lack of training amongst the system users and high costs. They further remark:

> It is difficult to know whether the benefits of these online proctoring technologies outweigh their risks. The most reasonable conclusion we can reach in the present is that the ethical justification of these technologies and their various capabilities requires us to rigorously ensure that a balance is struck between the concerns with the possible benefits to the best of our abilities. (p. 6421)

Nevertheless, in the ongoing Covid-19 pandemic, universities have not had better alternatives than using online proctoring products. On the surface, it may be seen as a natural solution (ie, more secure and effective proctoring using technology) to the identified problems (ie, growing incidents and possibilities of student cheating on online exams). However, we will argue that this seemingly effective decision to use online proctoring technologies is deeply rooted in rather problematic and authoritarian educational approaches, which the field of educational technology has strived to subvert for the past several decades—arguably, teacher-centred knowledge-transmitting approaches (ie, banking model in Freire, 1970). Although some papers are overly optimistic about the effectiveness of the technology in reducing the amount of student malpractice on online exams (Indi et al., 2021), the consequences are ruthless in our view.

The negative impacts of adopting proctoring technologies on student subjectivities, pedagogical relationships and educational outcomes are significant but have not been fully discussed (or even noticed). Therefore, this paper aims to reveal and unpack such negative impacts, concretising through a qualitative case study on one university in South Korea. We utilise French philosopher Michel Foucault's (1995) theorisation of 'disciplinary governmentality' to analyse the educational re-configurations caused by the online exam proctoring policies, technologies and practice in the Korean university during the Covid-19 pandemic.

LITERATURE REVIEW

Academic assessment and cheating

Academic dishonesty can be broadly defined as an attempt by a student to use deception in taking credit for academic work not produced by him/herself (Golden & Kohlbeck, 2020). Academic dishonesty can occur for a variety of reasons, which include feelings of disinterest or unpreparedness with regard to the topic, a sense that cheating behaviours are rampant and the notion that such behaviours will not be punished if discovered (Yang et al., 2013). Originally from the field of business, the fraud triangle framework was applied by Becker et al. (2006) to diagnose motives for cheating according to three factors: incentive, opportunity and rationalization. The researchers found all three elements drive cheating behaviours amongst students.

Concerning the fraud triangle, *incentive* refers to the role of internal and external pressures as a motivation for dishonesty. A large body of research has shown that external pressure from the expectations of others as well as the demanding workload of a challenging curriculum can drive cheating behaviours (Finchilescu & Cooper, 2018; Jian et al., 2020). On the contrary, Day et al. (2011) found that learning contexts that emphasize learning and diminish the importance of grades tend to disincentive cheating. Similarly, research has also shown that cheating is reduced in learning environments where students are motivated to gain mastery rather than merely exhibit high learning performance (Pulfrey et al., 2019).

The second element of the fraud triangle, *opportunity,* refers to the ability to engage in dishonest behaviour because of inadequate mechanisms to prevent it. Research has shown

that learning environments that lack clear and sufficient rules and punishments regarding cheating can lead to academic dishonesty (Finchilescu & Cooper, 2018; Peled et al., 2019). A large number of studies have noted the benefits of honour code systems and efforts to educate students on the importance of academic integrity (Arnold et al., 2007; Burrus et al., 2007; Tatum & Schwartz, 2017).

The last element of the fraud triangle, *rationalization,* refers to the notion that a learner considers dishonest behaviours as not violating his/her own sense of ethics. Along these lines, the role of personality characteristics has been another major area of research about academic dishonesty. Researchers have theorized how the Big Five personality traits (neuroticism, extraversion, openness, agreeableness and conscientiousness) may moderate academic dishonesty and a learner's ability to rationalize such behaviour (Nathanson et al., 2006; Williams et al., 2010). The Theory of Planned Behaviour has also been used to explain and predict academic dishonesty (Chudzicka-Czupała et al., 2016; Lonsdale, 2017).

Cheating on online exams

There is a long-standing perception that more cheating in online courses than in traditional face-to-face ones (Young, 2013). When considering the three elements of the fraud triangle mentioned previously, it seems reasonable to expect that although incentives may be similar in the two types of learning environments, the opportunity for cheating may be greater in online environments since many dishonest behaviours and actions may be harder for a proctor to detect within a teleconferencing environment.

Regardless of whether courses are taught online or face-to-face, however, students indicate that proctoring is the main factor in preventing cheating on exams (Harmon et al., 2010). Although previous studies report more cheating in unproctored exams than proctored ones, there was no difference between online and face-to-face courses when exams were proctored (Owens, 2015). Students have also indicated that cheating is more common in unproctored online exams (and less in proctored online exams) and that they would be more likely to engage in academic dishonesty in such contexts (Dyer et al., 2020). That is, students in online learning environments tend to view proctoring as a sign that the university considers cheating a serious issue, and this signal may cause students to alter their test-taking behaviours (Dendir & Maxwell, 2020).

Previous research also agrees that cheating becomes a severe problem when online exams are not (effectively) proctored (Alessio et al., 2017; Daffin & Jones, 2018; Fask et al., 2014). Unsurprisingly, these authors successfully demonstrate that the average test score is substantially higher amongst students who wrote an unproctored version of the test than their counterparts who wrote a proctored version of the test. A recent study also found that students performed substantially better on exams made up of items from a test question bank than on exams made up of paraphrased questions (Golden & Kohlbeck, 2020). The researchers surmised that this performance difference was due to test takers looking up the items from the question bank online. The researchers also found that the gap in performance between the question bank and paraphrased questions was reduced when the exams were proctored, suggesting that proctoring goes some way in reducing academic dishonesty.

Online proctoring systems

Online proctoring software, which first emerged in 2008, has now become extremely common in institutions of higher learning (ProctorU, 2020), particularly since the Covid-19 pandemic caused many courses to shift instruction from F2F to online modes of instruction

(Coghlan et al., 2021). Whilst some online proctoring software works by restricting the number of applications a computer can run during the exam period (Safe Exam Browser, 2020), other proctoring software utilizes AI and machine learning algorithms to identify suspicious behaviours when examining recordings of online exams (Coghlan et al., 2021). Although universities find such benefits to online proctoring highly attractive, students have sometimes complained about an uncomfortable sense of being watched and having their privacy violated (Hubler, 2020). It is also important to note that as online proctoring software improves, students are finding new ways to circumvent the watchful eye of such platforms (Binstein, 2015).

THEORETICAL FRAMEWORK

Foucault's theory focuses on the power and knowledge relationships operated by the dominant discourse—a regime of truth at a historical period that decides which knowledge, thoughts and statements count as true and false in each society, thereby producing and circulating power to 'enable' as well as 'disable' people to think, talk and behave in a particular way (Lee, 2020b; Foucault, 1995). Foucault sees power not only as oppressive and possessive but as productive and progressive (or process-oriented). That is, power works in an institution in the same manner as capillaries work in our body—complicated, multi-directional and ever-changing. There is no simple power relationship such as oppressors exercising power upon the oppressed under control. Instead, people (their thoughts and behaviours) are not directly subjected to power but are indirectly controlled through being subjected to knowledge. For example, psychiatry, as a field of scholarship, decides what is normal (sane) and what is abnormal (insane), and subsequently, how to 'correct' and treat the abnormalities (Foucault, 1989). Whether particular knowledge is true or false is not so important to Foucault compared to how the knowledge exerts disciplinary power upon people who are subjectified as a problem needing to be solved and corrected (often self-corrected).

Grounded in the mechanism of disciplinary power, Foucault (1995) develops a notion of disciplinary governmentality, which starts with the binary subjectification of individual beings as normal and abnormal. Simply speaking, a set of pedagogical norms exist in any educational institution, regulating educational subjects by determining normal and abnormal subjectivities (eg, well-prepared and ill-prepared students, active students and passive students, high-achievers and low-achievers, well-behaved and misbehaving students). Such value-laden subjectification and categorisation are frequently accompanied by constant surveillance. Foucault focuses on Jeremy Bentham's prison design of the Panopticon as the modern technology of surveillance, where a watchtower is located in the centre of the circular prison building with light that reaches the watchtower through hundreds of individual cells, coming from their windows on the outer walls. This design maximises the efficiency of surveillance by enabling guards to have a clear view of the inmates' activities whilst depriving prisoners of the ability to know if guards are watching them. Subsequently, prisoners are put under constant surveillance conditions with 'eyes that must see without being seen' (Foucault, 1995, p. 171), as the prisoners assume and fear that they are constantly watched.

Therefore, educational subjects are examined through the complex interplay between binary subjectification and surveillance technology, eventually leading them to become docile bodies. In other words, disciplinary institutions, including prisons and schools, exert power upon their members by allowing (not allowing) specific bodily movements in a chosen space at a chosen time. The most problematic outcome of this scenario is that individuals willingly govern themselves—controlling and correcting their thoughts and behaviours even without direct contact or corporal punishment (Foucault, 1988). They become docile bodies (or compliant subjects to the institutional norms and regulations). As Foucault (1990) further

explains, 'power is everywhere and always is accompanied by resistance; therefore, resistance is everywhere'. (p. 95); there are always possibilities of resistance (changing discourses and norms). Nevertheless, it is important to acknowledge the danger of disciplinary governmentality in terms of limiting ones' freedom to resist (or will to resist).

RESEARCH SITE AND METHODS

Research site and case description

This case study is situated in one of the large-sized, top-tier Korean universities. Before the Covid-19 outbreak, faculty members (often with teaching assistants, TAs) monitored student behaviours during in-person exams and prevented students from interacting with one another and using smartphones or other devices (textbooks). To facilitate this monitoring process, faculty tended to leave some seats vacant to create space between the test takers and patrol the room to search for signs of cheating. Both students and teachers were quite used to these practices, essentially ingrained into the pedagogical culture at the university. When caught cheating on exams, students were punished, which was not common since the proctoring measures were generally effective for preventing misconduct.

In the Spring 2020 semester, faculty members were forced to quickly move their courses online and subsequently, most courses were operated in real-time using Zoom (see Authors, 2021 for full details). Zoom also allowed teachers to see their students during an online exam, so many decided to use Zoom as an open exam space. However, as students narrowly pointed their webcams at their faces, it was difficult to see what they were reading on the monitor or what they were writing (or viewing) on other devices, papers or books. Naturally, such an environment created numerous chances for students to cheat. Students could surreptitiously perform screen captures and disseminate them to their peers to share the exam questionnaires and answers—sometimes using online messaging applications or even smartphones to share answers during the exam. Accordingly, many faculty members noted grade inflation on online exams and frequent instances of suspicious results as a group of students submitted unusually very similar responses to the exam questions. This situation led to increasing complaints from students (especially those who took their exams honestly) who were worried about their course evaluation becoming unfair: as the university employs a relative evaluation system, 'cheating' students could directly harm the grades of the 'honest' students.

In response, the university adopted an online proctoring system [ie, Safe Exam Browser (https://safeexambrowser.org/about_overview_en.html)] in the Fall 2020 semester. Students were required to access their course LMS via Safe Exam Browser, which prevented them from accessing other websites, messaging software or screen capture features on their computers. Simultaneously, students were asked to log into a Zoom meeting using their smartphones. Whilst they used their computer to view and respond to the test questions, they used smartphones to show their hands and computer monitors together, which could be seen clearly by their teacher, teaching assistant and the other students. The entire exam sessions were recorded so that the recordings could be viewed when suspicious academic misconducts were noticed or reported by students.

Additionally, the university newly drafted and launched the 'Student Honour Code' and made all students sign the code at the beginning of each semester; by doing so, students promised that they would not cheat on exams or commit any acts of academic dishonesty. Some faculty members further devoted their class hours to discuss the importance of academic honesty and reminded students of the honour code. Through the use of online proctoring systems (and Zoom recordings) and the student honour code, the university has mitigated the cheating issues to some degree in the subsequent semesters.

Research methods

This paper will qualitatively analyse the aforementioned case on adopting the online proctoring system at the Korean university, using Foucault's theory of disciplinary governmentality. This study analyses three datasets. The first dataset includes institutional documents related to the online examinations and proctoring (eg, university bulletins, staff notices and student guides). The second dataset was collected by conducting semi-structured interviews with fourteen faculty members recruited using a purposive convenience sampling approach (Creswell, 2014). Utilising our personal contacts, we initially invited a group of eight academics mixed for gender, position, subject and previous online teaching experiences. Six more academics, recommended by the initial interviewees as potentially critical informants, were further invited and interviewed. All interviews were conducted via teleconferencing and lasted between 40 and 90 minutes.

The last dataset was collected by email communications with students taking scientific writing courses where exams were not used to evaluate students' learning outcomes. The course convenor sent an email to their students after the course was finished to ask them to share their perceptions and experiences with online examinations and proctoring during the pandemic. Twelve students replied to the email with some rich and detailed responses from which we have drawn valuable insights. We then cross-compared this dataset with the first two datasets and triangulated them. Nevertheless, we have mainly discussed the institutional policies and academics' perspectives in the present manuscript to develop a coherent and focused narrative within the journal's space limit, with a small number of exceptions where we briefly summarized general student opinions to validate those of academics.

The collected qualitative data were analysed through a deductive coding approach grounded in the chosen theoretical framework—that is, coherent and logical narratives about the disciplinary governmentality that emerged and operated in the online proctoring practice at the university were developed and refined. As a result, several seminal themes closely connected to Foucault's notions were identified, which will be critically discussed in the following section.

FINDINGS AND DISCUSSIONS

Online exams and discourse of fairness

As faculty members rapidly moved their face-to-face teaching online without having an opportunity to meaningfully reflect on and adequately transform their practice, their approaches to online teaching revealed their long-established pedagogical beliefs (Authors, 2021). In a more collective sense, how universities managed and engaged with online educational provisions during the Covid-19 pandemic has effectively demonstrated the dominant educational paradigm controlling and regulating their institutional practice before the pandemic. Although scholarship of educational technology has, for several decades, emphasised the social constructivist learning paradigm (eg, student-centred learning, collaborative knowledge construction, authentic learning assessment, Jonassen, 1991), most teachers in the present case study seemed to take teacher-centred knowledge transmitting models in their online courses. Student learning achievements were evaluated by measuring individual students' course knowledge retention rate and subsequently graded on a relative scale compared to the whole class exam performance, which created a strong sense of comparison and competition amongst students in the same course.

During the pandemic, students were physically separated from each other, attending online lectures (or watching recorded lectures) and taking online exams in an isolated

manner. Rather than fostering a sense of collegiality and community amongst those separated students, which was much needed as recommended by many scholars (Garrison et al., 2010; Kaplan-Rakowski, 2021), the relative grading system operated by high-stake exams worsened the sense of isolation and individualisation amongst them. Under great pressure created by the educational regime of examination and competition and further elevated by the pandemic situations, students in this study found it particularly challenging to focus on exam preparation. As the case description suggested in the previous section, coupled with the limited human capacity for proctoring online exams on Zoom, many 'frustrated' students ended up engaging in a range of cheating behaviours during the Spring semester, 2020. According to Teacher 1, there were many 'suspicious cases', but it was difficult to identify them:

> [So] I opened it up to the class. 'If you think you are the one [who cheated], please, come up front'. And a few students sent me an email saying that 'I might be the one who got suspicious, but I promise you I didn't do it. I could be out of the camera because…' they said, 'my mom called me', or 'my mom opened the door'. They had different excuses. But there was one student who admitted that she had actually looked [her book] up under the desk. She said she just wanted to do well and better, and there was temptation. I understand why she had to do it, and knowing that other students had done the same but just didn't admit, I couldn't give her an F. She already sincerely felt disappointed in herself. However, at the same time, I had to give her a penalty. Otherwise, it was not fair to the other honest students.

Teacher 1, in the following semester, adopted the university-provided online proctoring tool (ie, Safe Exam Browser, SEB) and she additionally required students to handwrite their answers to the exam questions and submit a photograph of their answers to the LMS at the end of the exam.

Some optimistic scholars have seen the adoption of educational technologies during the pandemic as evidence for pedagogical innovation and educational transformation (Bonk, 2020; Raman et al., 2021; Yang & Huang, 2021). However, as the excerpt demonstrates, it seemed difficult to challenge the long-lasting and taken-for-granted assumptions underlying the university's and its members' practice. Even in the pandemic situation, where teachers 'understood' the extremely difficult learning circumstances their students were in, they did not challenge the knowledge-transmitting and testing regime. Instead, those teachers strived towards the 'fairer' evaluation system by strengthening their online proctoring capacity through adopting technologies. Teacher 2, who had previously used pass-fail criteria, also adopted the relative grading system during the pandemic to make the evaluation process fairer to students, 'acknowledging different amounts of effort put into preparing exams by individual students'. Somewhat unexpectedly, exam fairness emerged as one of the most frequently stressed educational values (thus, dominant discourse) during the pandemic that consequently increased the importance of knowledge retention and testing in the case study.

Cheaters and subjectification of students

Within the discourse of exam fairness, the student subjects are clearly divided into two groups: cheaters and non-cheaters (dishonest and honest students). It is straightforward to judge the normality (and abnormality) of the two subjectivities. On the surface, it appears to be fair and natural to control and correct students' cheating behaviours. However, such a binary subjectification problematises certain individuals and their behaviours (ie, cheaters and cheating); by doing so, it effectively shifts the university's and teachers' attention from

more fundamental problems (or societal issues and unfairness) to specific individual actions (or interpersonal issues and relationships). During the Covid-19 pandemic, the unprepared adoption of online learning has unmasked and worsened profound issues of social inequality (Karakose, 2021). As students have unequal access to technology, study space at home, and family support, achieving educational fairness has a much broader context than individual students' behaviours during online exams. In fact, many researchers have identified a range of factors (eg, technology access, study conditions, family circumstances, physical/psychological health) that affected student learning achievements during the Spring 2020 semester (Katz et al., 2021).

Nevertheless, the narrowly focused discourse about fairness on online exams unintentionally, but unavoidably, neglects the importance of the surrounding environments of each student. Many educational critics have previously analysed the negative impacts of neoliberalism on the higher education sector, including an exclusive emphasis on individuals' accountability and ability to participate in a market-driven competition (Giroux, 2014; Jankowski & Provezis, 2014). Neoliberalism is a modern political approach pushing the ideals of the free market and global competition (with minimal governmental regulations) as an effective social and economic development mechanism. In this scenario, however, unequal social and cultural conditions that make 'fair' competition impossible tend to be overlooked. To make it worse, the outcomes of unfair competition are uncritically attributed to the individual level of success and failure, increasing the gap amongst different social groups (Okuda, 2019). Such critiques of neoliberal education are particularly relevant to the present analysis of how students have become subject to the normalising process, being treated as autonomous individuals with full control over their behaviours regardless of their surrounding situations. Through the process, the complex notion of educational 'fairness' became an individual student's moral responsibility.

The categorisation of cheaters and non-cheater (thus, the cheated) also framed the difficult pedagogical situation during the pandemic as a relatively simple interpersonal problem by oppositionally positioning the two student groups against each other. Whilst providing a solid rationale for taking precautions to stop cheaters, such positionality prevented both teachers and students from engaging with more constructive discussions and supportive relationships that enable positive changes. Likewise, other problems (eg, educational inequalities, digital divide, social isolation) and the surrounding contexts of those problems were not fully addressed in institutional conversation. It then became all about how to stop cheating in order 'not to disadvantage students who choose not to cheat' (Teacher 3). It is important to recognise that Teacher 3, a science professor, has a pedagogical belief aligned with social constructivism:

> What is the purpose of our teaching? Because we aim to train leaders in the fields, we need to help students become good scientists who can solve real-life problems. And, I believe, [science] is not only the intelligence problem, but it's also about human network and emotional intelligence. Scientists have to mingle with other people. They work with other people to tackle common problems. Therefore, in my classroom settings, I encourage students to work together to solve problems.

Before the pandemic, therefore, Teacher 3 had implemented an open-book exam and a project-based assessment in his courses because he did not believe that 'students need to memorize all of the stuff because real life is not like that'. However, when his teaching moved online in Spring 2020, he found it challenging to execute the project-based assessment online; thus, made the exam 100% of the course grade. Subsequently, he faced severe cheating problems and 'massive complaints from those who did not cheat'. Thus, he adopted SEB to stop students from searching and sharing answers and also removed the open-book

option to make the monitoring practice simpler. Thus, in the reactive process of addressing cheating issues and increasing exam fairness, his social constructivist belief of the purpose of teaching and learning has been lost. Ultimately, his course has further moved away from real-life science where 'scientists have to mingle with other people', and his students (both cheaters and the cheated) have been deprived of their subjectivity as future scientists and freedom to mingle.

Online proctoring technologies and disciplinary governmentality

In the Fall 2020 semester, most faculty members used SEB, with many adding their own tactics to effectively monitor student behaviours during online exams. Since the technologies (SEB with Zoom) were implemented, none of the teacher participants in this case study has noted any cheating incidents or faced student complaints about the exam unfairness. Our student participants, too, believe the proctoring technologies have worked well, and cheating cases have been dramatically decreased to the best of their knowledge. Both teachers and students seem to be satisfied with the effectiveness of the proctoring technologies. The major function of the adopted technologies was to put students under the enhanced surveillance capacity of human examiners. That is, although SEB directly forbids exam takers' misconduct by blocking access to other websites and messaging software, it does not provide AI-based case detection features—it was ultimately the teachers' task to monitor and discern the cheaters and cheating behaviours on Zoom.

Firmly grounded in the discourse of fairness, placing student bodies under the increased teacher surveillance has been fully justified and even welcomed by both parties involved in online exams. However, interestingly, all faculty members in this study admitted that they did not necessarily 'put my eyes on the Zoom screen all the time' but recorded the Zoom meeting 'to use the recording as evidence for any suspicious cases' (Teacher 4). This exam proctoring mechanism reminds us of the surveillance mechanism of the Panopticon (Foucault, 1995). Just like the prison inmates put under the 'perceived' surveillance conditions in which they cannot *know* but must *assume* that guards are constantly watching them, students had to believe that they were being watched by their teachers (or TAs). Students were also aware of the Zoom meeting being recorded, suggesting that they were under surveillance not only 'here and now' but 'there and then'—possibly, permanently. Worse than prisoners who were at least free from each other's eyes, students in the case study were also 'feeling watched by my classmates because I know, last semester, there was someone who reported the cheating cases to the professor' (Student A). That is, such an extended 'sense' and 'perceptions' of being surveilled have made students stop cheating.

To Foucault (1990), the disciplinary technology includes not only technical tools and machines but also tacit techniques exercised through institutional policies and regulations, controlling people's minds and creating docile bodies. For instance, the relative grading system, making students compete against each other, is a powerful disciplinary technology. The system effectively formulates (or degrades) the principle of academic dishonesty as an interpersonal dispute between offenders and victims of online cheating, and subsequently, students willingly take the responsibility to surveil and report each other's malpractice to minimalise potential harm on themselves. Teacher 5 actually mentioned: 'I am pretty sure if there were any cheating cases, students must have brought them up. But I haven't heard anything this year, so guess it was okay'. It can be argued that the online exam proctoring technologies, in a broad sense, have re-formed (or de-formed) pedagogical relationships between students and teachers and amongst students.

According to Foucault (1988), the most advanced form of disciplinary technology is utilised by individuals themselves. That is, the most dangerous outcome of disciplinary governmentality

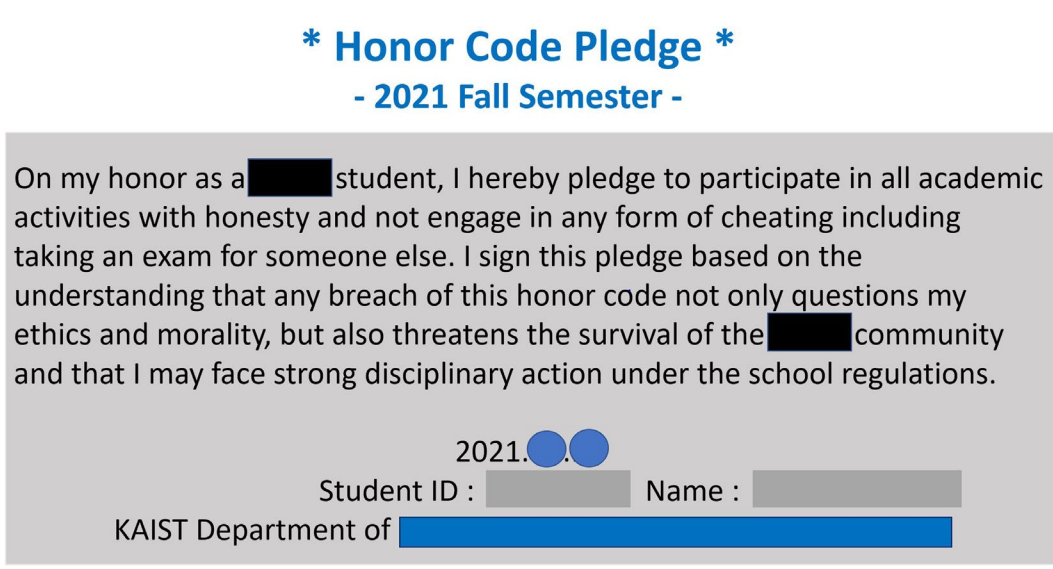

FIGURE 1 The pop-up message of student honour code pledge

is that those under institutional control willingly accept the rules without questioning and accordingly govern their own thoughts and behaviours. The 'student honour code pledge' (Figure 1) effectively exemplifies how such technology works. At the beginning of each semester, the pledge appears on the main screen of the university LMS as a pop-up message, and students are asked to 'agree and sign the content' by entering their name and student ID and clicking the 'Agree' button. The pledge repeatedly appears until students do so. Despite its brief nature, the pop-up message strongly suggests that 'any form of cheating' is subject to 'strong disciplinary action' under the university's regulations. It also urges students to become responsible for their own 'ethics and morality' and the 'survival of [the university] community'. Whilst the statement itself may appear unproblematic, the pledge ultimately reinforces the problematic assumption that educational fairness is an individual or interpersonal matter of responsibility and morality. By clicking the button, therefore, students do not simply agree to keep the rules of honour but uncritically accept other social and institutional conditions (eg, teacher-centred knowledge delivery, relative grading system, unequal learning environments) fundamentally make their learning experiences unfair and challenging.

CONCLUSION

There has been a fast-growing excitement toward the educational innovation enabled by 'game-changing' technologies such as AI and machine learning in the field of educational technology and general society. Despite the optimistic premise offered by futuristic educational technologists, any changes the new technologies bring about in a specific educational setting at a given historical point require comprehensive examination. As demonstrated by the case study, online proctoring technologies, which may appear as a natural solution to student misconduct in online exams, are not neutral but disposed to the teacher-centred educational paradigm focusing on teacher knowledge transmission and knowledge retention assessment. The simple adoption of such technologies has unexpectedly reinforced the teacher-centred pedagogy within the university and deprived its faculty members of a critical opportunity to transform and innovate their teaching and evaluation practice. Furthermore, the exclusive focus on cheating and evaluation

unfairness has also neglected more fundamental societal and structural inequalities that make online course experiences genuinely unequal and unfair during the Covid-19 pandemic (a broader discussion on inequalities in online higher education can be found in Lee, 2017, 2020a, 2021).

There have also been undesired educational ramifications of adopting online proctoring technologies, negatively impacting student subjectivities, pedagogical relationships and educational outcomes at the university. In particular, the binary subjectification of students as cheaters and the cheated has degraded the value of student engagement in university education whilst creating more competitive and distrusting relationships amongst students and between students and teachers. Nevertheless, students willingly accept the institutionalised mechanism to monitor, control and correct their behaviours and actively participate in (and contribute to) the surveillance and examination processes. In this context, university education may ultimately produce docile bodies—disciplined and governed not by others or external forces but by themselves. This group of diligent knowledge recipients and honest exam-takers are likely to adapt to and maintain the status quo of society rather than questioning and challenging unequal social structures and unfair educational practices. If so, it may be right to question how such students will develop as critical thinkers, collaborative problem-solvers and future leaders in their chosen fields.

Therefore, it is safe to conclude that the online exam proctoring technologies adopted by many universities during the Covid-19 pandemic, despite their advanced technical features and useful functions, have unintentionally, but severally, deteriorated educational approaches in higher education practice rather than innovating them. The negative consequences of implementing online exams (and subsequently, online proctoring technologies) and damages on pedagogical subjects and relationships in higher education need to be carefully reflected and addressed to imagine and develop a more positive and democratic future of online higher education in the post-Covid-19 era. For a more positive and practical closing remark, we want to direct our attention back to Teacher 3, a science professor with a social constructivist pedagogical belief who had implemented open book exams and project-based assessments before the pandemic. The field of educational technology should not miss an opportunity to closely work with these teachers to help them continue standing on their pedagogical ground and performing authentic and meaningful assessment practices regardless of their teaching contexts (online or face-to-face). Rather than providing them with advanced online exam proctoring technologies, the field (and universities) should support them in 'creatively' navigating challenging situations like the Covid-19 pandemic and developing 'radically' innovative evaluation practices that can nurture a trusting pedagogical relationship and culture of formative assessment.

CONFLICT OF INTEREST

There is no conflict of interest to report.

ETHICS APPROVAL STATEMENT

The ethics approval has been received from the FASS-LUMS Research Ethics Committee at Lancaster University.

DATA AVAILABILITY STATEMENT

Our qualitative data is not available due to the strong possibility to identify the institution and participants.

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