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Article abstract

This essay discusses the technological arms race that has developed in response to academic cheating. The author highlights three technological advances that impact academic integrity, from oldest to newest: a) text-matching software, b) online exam proctoring software, and c) artificial intelligence and Large Language Models (LLMs). This essay argues that there is no "silver bullet" to preventing or investigating academic misconduct and that our ethical obligations for learning, teaching, and assessment must include a human focus to promote student success.

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The Academic Integrity Technological Arms Race and its Impact on Learning, Teaching, and Assessment

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Abstract

This essay discusses the technological arms race that has developed in response to academic cheating. The author highlights three technological advances that impact academic integrity, from oldest to newest: a) text-matching software, b) online exam proctoring software, and c) artificial intelligence and Large Language Models (LLMs). This essay argues that there is no "silver bullet" to preventing or investigating academic misconduct and that our ethical obligations for learning, teaching, and assessment must include a human focus to promote student success.

Keywords: Academic integrity; Academic misconduct; Technology; Text-matching software; Artificial intelligence; Online proctoring

Introduction

Academic cheating can be traced back to the sixth century when exams were first used on a large scale in China (Lang, 2013). Plagiarism began to emerge as a topic of concern in writing with the advent of the printing press in the fifteenth century (Eaton, 2021). The commercialization of the Internet provided an opportunity for traditional term paper mills to move online, creating a global industry for academic outsourcing, which is today known as 'contract cheating' (Clarke & Lancaster, 2006). Large-scale changes in technology and advances in education bring new ways for students to engage in learning – and academic misconduct.

In this article, I discuss some major advances in technology that have impacted education and academic integrity and point to topics that educators, administrators, and policy makers may need to pay more attention to in the coming years. The main argument I present is that the technological "arms race" (Mortati & Carmel, 2021; Thomas & Scott, 2016) does little to support students or to promote ethical approaches to teaching and learning. For decades, scholars have argued against a "Gotcha!" approach that focuses on catching student cheaters, instead advocating vehemently that we must prioritize student learning above catching cheaters

(Bertram Gallant, 2008; Howard, 2001; Morris, 2016). Academic misconduct is a complex and nuanced aspect of higher education that cannot be solved by technology; however, there are technologies that can help educators promote integrity and address its breaches, but humans are always part of the solution.

In the sections that follow I highlight three technological advances in the field of academic integrity, from oldest to newest: a) text-matching software, b) online exam proctoring software, and c) Artificial Intelligence and Large Language Models (LLMs). The first two are often used to prevent or detect cheating, whereas the third might result in students being found responsible for misconduct, possibly without cause. I argue that there is no "silver bullet" to preventing, investigating, or solving academic misconduct and that our ethical obligations for learning, teaching, and assessment must include a human focus to promote student success.

Text-Matching Software

Commonly known commercial text-matching software (TMS) products include Turnitin and iThenticate. This type of software is erroneously referred to as "plagiarism-detection software" or "anti-plagiarism software" because such technology cannot detect plagiarism *per se* (Bretag & Mahmud, 2009; Hayden et al., 2021; Weber-Wulff, 2016). Instead, TMS identifies exact textual matches between documents and produces a report that highlights textual matches or similarities for further analysis. The decision about whether such a match constitutes plagiarism must be determined by a human, preferably one who is trained and experienced using the software (Bretag & Mahmud, 2009; Hayden et al., 2021; Weber-Wulff, 2016).

An analogy (though an imperfect one) to help readers understand this subtle but important difference would be a comparison to radiology. An X-ray can reveal anomalies, but it is the radiologist, a medical doctor with extensive training, who ultimately interprets the X-ray and can detect and diagnose problems (American College of Radiology, n.d.). As Weber-Wulff (2016) points out, "it is generally not possible to construct a technological solution for the determination of plagiarism, since any definition is inevitably open for interpretation" (p. 626). In other words, it is the human who analyses the report, not the report itself, that diagnoses whether there is an issue that requires further investigation or treatment of a problem.

Online Exam Proctoring

During the COVID-19 pandemic, online exam proctoring services saw a surge in business, with the industry expected to reach a valuation of $325 Billion USD by 2025 (Talview, 2020). These are a suite of technologies clustered under the umbrella of "online proctoring" including lockdown browsers, identity authentication, and exam invigilation or monitoring (Dawson, 2020). Online exam invigilation can be performed synchronously during the exam or asynchronously by reviewing recordings of the exam after it has concluded.

Invigilation can be performed by a human or an artificial intelligence, with the former often being a more expensive option (Dawson, 2020).

The surge in online proctoring subscriptions during COVID-19 seemed to be another case of higher education institutions rushing towards technology to solve academic misconduct without fully considering its limitations and risks. Prior to the pandemic, researchers wrote about the importance of effective online course design to promote integrity, as well as the need to invest in training and professional development for online educators as ways to promote integrity (Berkey & Halfond, 2015). When schools flocked to online invigilation during COVID-19, students and scholars protested, citing privacy, data security, and accessibility as key factors (Chrysanthos, 2020; Dubiansky, 2020; Moro, 2020; Swauger, 2020). Equity is an additional consideration, as critics flagged the ways in which the algorithms embedded in the technology discriminate against students of darker skin tones (McKenzie, 2021; Rowland Williams, 2021; Parnther & Eaton, 2021). It is fair to say that online proctoring became one of the most polarizing educational technology debates of the COVID-19 pandemic. There remains, however, limited evidence about the effectiveness of online invigilation software to effectively detect academic cheating (Dawson, 2020; Eaton, 2020).

One useful outcome of the surge of online proctoring services is that guidance has emerged about how to implement this type of technology which include using online proctoring only as a last resort when no other options are available, ensuring high quality examination design, using only minimal restrictions, offering students an alternative (e.g., a different assessment task), ensuring that concerns related to equity, diversity, and inclusion are considered, offering the software is fully piloted before deployment, ensuring a "whole institution" approach is taken, and ensuring that privacy and data security laws are respected (Dawson, 2020). In other words, investing in online exam proctoring software requires not only paying a licensing fee, but also ensuring that educators, staff, and the institution itself are prepared to invest in training and assessment adaptation, including ensuring that assessments are high quality and appropriate. Online exam proctoring technologies are likely not going away; however, there is more work to be done to ensure they can be used appropriately, equitably, and fairly.

Artificial Intelligence and Large Language Models

The final technology discussed is artificial intelligence (AI) and specifically, LLMs such as GPT-3, or Generative Pre-trained Transformer 3, a technology that can produce human-like text based on a prompt. LLMs have existed for some time and their use among major mainstream media companies has become almost commonplace (Dans, 2019; Seabrook, 2019). Of note is the rate at which LLMs are developing and becoming more sophisticated means, and GPT-3 is more powerful and arguably useful than its predecessor, GPT-2. Since 2020, several free apps have emerged that will write poetry in the style of any poet (Rich, 2022) and those

that claim to write literature reviews and help with research project design (see, for example: https://elicit.org/). Other AI apps not based on language, such as DALLE*E Mini, can generate an image based on any text prompt (Dayma & Cuenca, 2022).

It seems clear that artificial intelligence apps are developing quickly and there are exciting implications for teaching and learning; however, there is still a lot to think through. Educators have already been urging us to pay attention to how assessment practices might need to change as AI becomes more ubiquitous (Sharples, 2022). In the academic integrity research community, scholars are forecasting that contract cheating, or the outsourcing of academic work to a third party such as term paper mills, may evolve into students simply having an AI do the work on their behalf (Eaton et al., 2021; Lancaster, 2022).

If this happens, artificial intelligence writing apps could eliminate human ghostwriters entirely. It is possible to envision a future in which students might not have to engage in much academic writing at all, providing that they can prompt an AI app effectively. As it stands, many academic misconduct policies (at least in Canada) have some provisions to address outsourcing of academic work as a form of misconduct, either explicitly or subsumed under another category such as plagiarism (Eaton, 2021; Eaton et al., 2022; Stoesz & Eaton, 2020; Stoesz et al., 2019). There is currently limited guidance about how to address misuse of artificial intelligence as a breach of academic integrity. This is likely due, at least in part, to some fundamental questions that remain unanswered: Is it ethical to use AI for teaching, learning, and assessment? If so, how do we ensure the use of AI in educational context is, in fact, ethical? Who gets to decide what counts as ethical use of AI in education? Who decides what may or may not constitute academic misconduct when artificial intelligence is involved?

I have anecdotally heard comparisons between the use of AI today being analogous to the introduction of the calculator into classrooms a few decades ago. I would argue that this analogy is flawed for a couple of reasons. Parents or students had to buy calculators, which presented a financial barrier for some, but many AI apps are currently free, so there is no financial barrier to their use. Furthermore, calculators were a physical instrument, you held them and input numbers manually to generate a result. Artificial intelligence is not only an entirely digital tool; it is increasingly becoming embedded into existing technologies such as Word and Google docs. Recent advancements in predictive text generation, grammar checking, and so on, means that the boundaries between human and machine are becoming blurred. There is no longer a physical tool one has to buy, carry around, or enter input into. (Even as I write this, Word has suggested that I change the words “has to” to “must” in the previous sentence.)

As a scholar of academic integrity, I am not yet convinced that using AI apps would automatically constitute academic misconduct. I am worried about idiosyncratic responses to these apps in which individual educators become entrenched in polarized views that artificial intelligence is either good and must be adopted universally, or that it is evil and should be banned immediately. The potential for caustic and entrenched opinions that perpetuate philosophical and pedagogical divides worries me deeply. Of course, the debate is complex and

more nuanced than I have time or space to address here, but I would say that artificial intelligence is "the next big thing", not only for academic integrity, but for education in general, and it merits our attention, as well as further inquiry.

Conclusions

As Lisa Vogt commented during the Academic Integrity Inter-Institutional Meeting (AIIIM), hosted online by the University of Manitoba in May 2022, when it comes to academic misconduct, "If you're looking for a silver bullet, I suggest you purchase a smoothie maker" (Vogt & Mercer, 2022). The context for this statement is that there is no "magic bullet" that will prevent academic cheating and educators would be better off focusing on student learning, rather than preventing cheating; a sentiment that has been espoused by academic integrity advocates worldwide (Bertram Gallant, 2008; Bretag & Mahmud, 2009; Morris, 2016).

The technological "arms race" (Mortati & Carmel, 2021; Thomas & Scott, 2016) does not promote academic integrity, and nor is the use of technology inherently (un)ethical. Technology comes, goes, and evolves. The question of how to use it effectively and ethically for teaching and learning persists. What is clear is that the message that educational technology scholars (Anderson et al., 2001; Garrison & Cleveland-Innes, 2005; Vaughan et al., 2013) have been saying for years about technology and teaching applies just as well to academic integrity: technology does not replace humanity. Understanding the benefits, as well as the limitations, costs, and impact of using technology to uphold academic integrity is foundational to making informed decisions about how, when, and if to use it.

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