A Pilot Study of the Learning Curve Effect on Technological Safeguards Used in Online Courses

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The March 2020 COVID-19 pandemic caused many universities to move face-to-face and hybrid courses to completely online formats, resulting in increased challenges for using online safeguards to thwart cheating. Although academic misconduct and academic dishonesty among students is nothing new, the literature is inconclusive as to whether there is more cheating in online classes than in face-to-face classes. However, online education has made it much more difficult for instructors to detect instances of cheating even with more technological safeguards. The purpose of this study is to identify faculty use of safeguards in online courses and determine if more experienced online faculty use more safeguards and more technologically oriented safeguards. An Internet survey link was sent to all faculty at a southwestern university.

Keywords: Covid, online, safeguards, academic misconduct, academic dishonesty

INTRODUCTION

Online education has grown at a rapid pace in the last few years as more and more universities develop programs to reach the online community and to offset declines in on-campus attendance. In some cases, this has allowed universities to reach entirely new market segments. The movement to an online environment has also brought with it an increase in the possibility of safeguards such as Respondus Lockdown Browsers for monitoring quizzes/exams and plagiarism detectors such as SafeAssign and Turnitin. There has also been an increase in online websites offer "help" with homework, term papers and even taking courses for students. This research addresses these issues through a survey of faculty at a regional university in the southwest.

LITERATURE REVIEW

Academic integrity has received a great deal of interest in the educational literature, both for universities and K-12 schools, (e.g., Silver & Stafford, 2017). Incidents such as the Atlanta school cheating scandal (Blinder, 2015) raise awareness in the general public, but teachers, administrators, and students are aware that cheating is an everyday problem. According to McCabe, Butterfield, & Trevino (2012) over the 13-year period from 2002 to 2015, in a survey of 71,300 students, 68% of undergraduates admitted to cheating in some form as did 43% of graduate students. In the same survey, 95% of high school students reported they had either cheated on a test, plagiarized, or copied homework (McCabe, et al., 2012).

While there are numerous definitions of academic integrity (e.g., East & Donnelly, 2012; Turner & Beemsterboer, 2003), the International Center for Academic Integrity [ICAI] defines academic integrity as the ethical principles that guide academic practice. ICAI breaks down "academic integrity" into *academic misconduct*, and *academic dishonesty*. Academic misconduct is a violation of ethical conduct (e.g., intentional cheating or plagiarism) while academic dishonesty refers to behaviors that lead to the misrepresentation of scholarly work (ICAI, 2015). It is this definition of academic integrity, along with the concepts of misconduct and dishonesty we use in this paper.

Academic dishonesty involves a number of behaviors including unauthorized collaboration on homework, cheating during exams, plagiarism, and purchasing term papers. Collaboration on homework is a form of collusion where students work together or share information about an assignment and then present it as an individual effort. Plagiarism includes, at the low end, improperly citing another person's work and, at the high end, completely incorporating someone else's work into an assignment and presenting it as one's own work. Purchasing term papers is a form of "contract cheating," particular to online classes and is discussed below (Atkinson, Nau & Symons, 2016).

When asked why they cheat, students often say, in one form or another, "It depends." Richards (2012) in his work on K-12 cheating made the following observation:

> Perhaps the most alarming news is that students say their cheating is contextual: based on the teacher, the assignment, or their overall workload. Decisions appear to be based on the extent to which the student can rationalize cheating in a given circumstance. Essentially, the academic integrity scale is a sliding one given the situation at hand, rather than a matter of a person's sense of right or wrong (p. 97).

Two other factors may contribute to cheating: culture and English language proficiency. Many foreign students, when entering U. S. universities, experience culture shock and need to learn Western academic mores. Some time may need to be set aside for intercultural learning on the part of the student and the instructor.

Many universities in the U.S., Canada, Australia, and the U.K. require English language proficiency. Yet, students arrive at English speaking universities with a variety of English language skills. This lack of language skill may cause inadvertent plagiarism through misunderstanding or, if the language skills are sufficiently deficient, as the only way to pass the assignment. The solution is not to punish the students but for the institution to have sufficient language support services (Atkinson, et al., 2016).

The literature is inconsistent as to whether there is more cheating in online classes than in face-to-face classes (Lanier, 2006). While there may be no difference in cheating incidents in different delivery methods, online education has made it much more difficult for instructors to detect academic dishonesty (Malesky, Baley, & Crow, 2016). As of 2016, 6.3 million university students in the United States were taking an online course (Freidman, 2018).

Several methods of detecting online cheating include remote proctoring of exams, requiring students to prove their identity, and submitting students' written work through such links as Turnitin or SafeAssign to detect plagiarism. Yet, these methods have their limitations. A new way to get around these limitations is to engage a company online to take the course for the student. This is known as "contract cheating" (Atkinson, et al., 2016). One particular problem with contract cheating is that the companies that offer these

services submit assignments of high-quality original content and are not detected ty Turnitin and SafeAssign (Malesky, et al., 2016).

In a recent study, Malesky, et al. (2016) established an online introduction to psychology course. Both the instructors, who were experienced online teachers, and the students knew the course was not for credit. The students were blind to the instructors just as in any online course. Students were instructed to cheat and there was a reward of $200 if the instructors did not catch them.

One student contacted an online company that, for $917, would take the course for him and guarantee him an "A." This included tests, papers, and discussion boards. One glitch was that the student was required to make a live presentation on Go-To-Meeting with PowerPoint slides. The company sent the slides to the student along with a script he was to read verbatim. The student received an "A" on the presentation.

Other methods of detecting cheating were used by the instructors. For the mid-term and final, the student took 46 minutes and 37 minutes to take an hour-long 50-question test, which was not considered unreasonably fast. His written work was run through Turnitin and instructors also did Google searches of his work. In the end, neither instructor had any reason to believe he had cheated (Malesky, et al., 2016).

Cheating doesn't begin in college. As noted above, in one study 95% of high school students admitted to some form of cheating. Emphasis on grades and high stakes testing for college admissions have contributed to this trend (Price-Mitchell, 2015). The solution to the problem of cheating is not an easy one and views differ on how to address it. There is even a difference in attitudes about whether academic integrity can be taught (Lofstrom, et al. 2015).

In a survey of university professors in New Zealand and Finland, Lofstrom, et al. (2015) found that while professors agreed that academic integrity was more than following rules, they disagreed on whose role it was to teach academic integrity or even whether the underlying values of academic integrity could be taught at all.

Potential employers are also concerned about the integrity of online courses. A study done in 2018 found that 41.6% of CPAs would let an online degree impact their decision to hire an employee (Richards, Stevens, Silver, Metts, 2018). As part of this study, the authors conducted interviews with CPAs and found that many CPA firms are now giving entrance exams to evaluate new hires. This concern has come from CPA firms' experience with hiring students with accounting degrees who have very limited knowledge of accounting. Also, in this study, the authors learned from CPAs that they viewed the CPA exam as a leveling tool for accounting degrees. The CPA exam is a nationwide exam given in a secure testing environment. With a CPA license, employers were not concerned with online learning due to the uniformity of the exam and the security and identification controls in place for testing.

Course Integrity Safeguards

College professors have struggled with student academic misconduct and dishonesty for many years, and technological changes have made actions such as cheating and plagiarism easier than ever. A study by Guyette, King, and Piotrowski (2008) noted that while faculty tend to hold strict views regarding what constitutes cheating, today's college students have relaxed attitudes regarding what constitutes unethical behavior in online courses.

One of the most common problems professors encounter is plagiarism. Oxford University defines plagiarism as "presenting someone else's work or ideas as your own, with or without their consent, by incorporating it into your work without full acknowledgment" (Oxford University, n.d.). Incidences of plagiarism appear to be increasing, especially in the online learning environment (Reyneke & Shuttleworth, 2018). A study by Thompson (2006) revealed that only 27% of college students believed that cutting and pasting from an Internet source was cheating. There are several software programs such as Grammarly, Safe Assign, Unicheck, and Turnitin, designed to detect plagiarism.

Internet sites are available that, for a fee, allow students to download papers, obtain answers to test bank questions, and assignments from specific professors. (Michael & Williams, 2013). Some of these sites also make test banks and instructor manuals available for purchase by students. Professors should monitor these sites for evidence of their materials, exams, and assignments and issue takedown notices of copyright infringement, requiring the materials to be removed or access disabled.

Contract cheating is a form of academic dishonesty in which students engage a third party to complete assignments for them (Eaton, Chibry, Toye, & Rossi (2019). Third parties include paid sources, friends, and family and the work can range from one assignment to an entire course. Detecting contract cheating can be difficult as many of these sites provide original material to the student. Turnitin has developed a service called Turnitin Originality that uses forensic linguistic analysis that will compare a student's submissions to their past submissions. Unicheck uses AI tools to detect contract cheating (Young, 2020). Professors are required to submit three examples of a student's writing to be compared with the suspect paper.

Maintaining testing integrity in online courses can is especially difficult since students are often located in different cities, states, or even countries. Proctoring of exams is a means to maintain control over the testing environment and can be used in a variety of ways. Examples include Respondus LockDown Browser and Monitor, and ProctorU. Students can be required to locate a testing center in their area, come to campus to take exams, or take exams on their personal computer using a camera and microphone (Michael & Williams, 2013). Testing sessions can be monitored in real-time and/or recorded, and professors notified of any testing issues.

Respondus LockDown Browser (https://web.respondus.com/he/lockdownbrowser/) integrates easily with a variety of learning management systems, including Blackboard, Canvas, and Moodle. Once a student has logged into the assessment through Respondus, the student cannot access other applications, including the Internet, messaging, screen-sharing, printing, and screen capture. They are also unable to copy and paste anything to or from the assessment. Respondus disables a number of functions such as right-click menu options, keyboard shortcuts, and function keys. Students cannot exit an assessment until the assessment has been submitted for grading.

Respondus Monitor can be used with the LockDown Browser. It is an automated proctoring solution that requires students to use a webcam to record themselves during the test. Advantages of Respondus Monitor are that students do not have to pre-schedule taking a test and potentially can take a test at any time and still be proctored. Analytics are used to detect exam violations, which are flagged for the instructor.

LockDown Browser is an annually renewed campus-wide license. The cost is based on total student FTE as reported by the Integrated Postsecondary Education Data System (IPEDS). Table 1 shows the cost breakdown. Institutions that purchase licenses for the LockDown Browser receive a free 200-seat license for Respondus Monitor. Institutions can also take advantage of a free 2-month pilot to try out Respondus Monitor. This allows universities to gauge interest in this feature before making a purchase decision. The initial cost is a flat rate of $3950, regardless of institutional size.

TABLE 1
PRICING TIERS FOR RESPONDUS LOCKDOWN BROWSER

LMS Seat License	Annual Fee
1 to 2,000 Students	$2795
2,001 to 2,500 Students	$3195
2,501 to 5,000 Students	$3745
5,001 to 10,000 Students	$4595
10,001 to 15,000 Students	$5045
15,001 to 20,000 Students	$5343
20,001 to 25,000 Students	$5695
25,001 to 30,000 Students	$5995
30,001 to 35,000 Students	$6395
35,001 to 40,000 Students	$6795
Over 40,000 Students	Ask for a Quote

ProctorU is another tool for monitoring online students. ProctorU (proctor.com) offers three levels of proctoring, Record+, Review+, and Live+, depending on the importance of the assessment. Similar to Blackboard, it integrates with online learning platforms such as Blackboard, Canvas, and Moodle. Record+ is used for low-stakes assessments. It is a fully automated system that verifies student identity and records the session. There is no live proctor, but the AI platform monitors and flags suspicious behaviors for instructors to review. Instructors have the option of viewing the video after the exam is submitted or they can watch sessions in real-time.

Review+ is recommended for lower-to-mid-stakes quizzes and exams. Like Record+, it has automated ID verification and AI behavior monitoring. Suspicious activity is reviewed by professional proctors and reported to the instructor if confirmed. If an instructor wants to take action, they are provided with all necessary evidence of a breach of integrity.

For high-stakes assessments, ProctorU recommends Live+. It provides professionally trained live proctors who monitor every session. If cheating behaviors are suspected, live interventions are taken. Instructors are notified within 24 hours and can also choose to receive real-time incident notifications. Instructors typically need to review less than one percent of all exams when using Live+. For all three options, students have access to full tech support with live chat. The cost for exams proctored through ProctorU is based on the time length of the assessment and are shown in Table 2.

TABLE 2
COST FOR PROCTORU

Time	Cost
30 Minutes	$8.75
1 Hour	$14.75
90 Minutes - 2 Hours	$21.50
3 Hours	$30.25

Online platforms such as Blackboard have other features that help prevent cheating, particularly if students are working together when taking tests (Eaton, et al., 2019). The order of test questions can be randomized, and for objective questions, the order of the answers can be scrambled as well. Professors can also set limits on how much time students have to take a test, thereby limiting the time they have to look up answers.

Plagiarism Checker Websites

There are websites available to universities, businesses, students, and individuals. They differ in cost and other restrictions and there are, of course, differences in the depth to which a plagiarism check is done. The two best known are Turnitin and SafeAssign. Turnitin, an entrepreneurial venture based in Oakland, CA is now owned by Advanced Publications, the owner of *Condè Nast* magazine. Normally the university pays for the service and the cost is $2 per student, per year. SafeAssign is included in the Blackboard learning management system at no additional cost.

There are a number of other websites that check for grammar and plagiarism and will, in some cases, offer to paraphrase parts of a paper that fail a plagiarism check. Tale 3 is a partial list of plagiarism checking websites developed from a Google search for such sites.

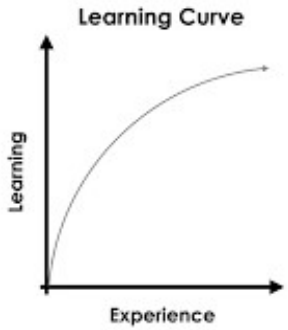
TABLE 3
SAMPLE PLAGIARISM CHECKERS AND COSTS

Plagiarism Checker Website	Costs/Restrictions
Safeassign	Included with the Blackboard learning management system
Turnitin	$2 per student per year (paid by university)
Grammarly	$11.66 per month, billed annually (individual account)
The Plagiarism Checker	$8 per month (individual account)
Plag Tracker	$7.49 per month (individual account)
Chegg Writing	$9.95 per month (individual account)
Quetext	$9.95 per month (individual account)
Duplichecker.com	Free with ads (1000 word limit)
Smallseotools.com	Free with ads (1000 word limit)

Learning Curve Effect

Individuals and organizations learn through experience. The learning curve is a graphical description of this process (Musaji, Schulze, & De Castro, 2020). A learning curve graph illustrates how an increase in learning (vertical axis) results from greater experience (horizontal axis). Thus, the more someone performs a task, they, theoretically, will get better at it. The learning curve can result from repeating the same task a number of times or by learning a body of knowledge over time (Musaji, et al., 2020). Normally learning increases at a quicker rate in the early stages of experience and diminishes as ore experience is gained. Figure 1 illustrates this phenomenon.

FIGURE 1
LEARNING CURVE



In this exploratory study, we propose that more experienced online instructors will have learned more effective methods to detect and prevent cheating than less experienced online instructors. They will use more types of safeguards and also make use of more technologically oriented safeguards.

Methodology

To collect data for this study, an Internet survey link was sent to all faculty at a southwestern university. The list included 123 full time faculty and 91 adjuncts. The survey had been approved by the Institutional Review Board (IRB) and the Vice President of Academic Affairs prior to sending it out. Respondents were informed of the nature of the survey and given a definition of academic integrity to assure cognizance of the survey intent. Seventy faculty responded, yielding a 32.7% response rate. The survey instrument used in this study was adapted from a questionnaire developed at the University of Central Florida.

Respondent characteristics were as follows: (1) had an average of 15.3 years of teaching experience with and an average of 11.1 years here at This University; (2) having taught an average of 2.96 online courses in their career and at This University before the spring, 2020, semester – None – 15 respondents;

1-3 courses – 19 respondents; 4-6 courses – 4 respondents and 7 or more courses – 31 respondents; (3) 61 % were in the School of Arts and Sciences, 20% were from the School of Business, and 19% were from the School of Education. Respondents included 35% full professors, 9% associate professors, 15% assistant professors, 16% instructors, and 25% were adjuncts.

For purposes of this study, academic integrity was defined as follows: Academic integrity is the moral code or ethical policy of academia. This includes values such as avoidance of cheating or plagiarism; maintenance of academic standards; honesty and rigor in research and academic publishing.

RESEARCH OBJECTIVES

The research objectives for this study are stated as follows:

1. To determine if those that have taught more online course use more technology-related safeguards (Respondus, Safeassign, etc.) compared to those who have taught fewer online courses.
2. To determine if those that have taught more online course use more total safeguards (Respondus, Safeassign, statements in the syllabus, etc.) compared to those who have taught fewer online courses

SPSS software was used to analyze the resulting data. The analysis produced means, medians, and percentages where appropriate with the results show in the tables below. Chi-square analysis was used to compare differences in respondents who had taught fewer/more online courses and the use of fewer/more technology-related safeguards in their courses. Data were also analyzed to determine if those who had taught fewer/more online courses and the use of fewer/more total safeguards in their courses.

FINDINGS

In the middle of March 2020, the COVID-19 pandemic resulted in most campuses across the US to close for face-to-face and hybrid/blended courses. This is reflected in Table 4 below, as it shows that 19% of the respondents in this survey had never taught an online course before the current semester. This means that these instructors had no experience in online education and the challenges to academic integrity that ensue with such courses. Some of the University's programs were already 100% online and therefore, unaffected by the changes involved in an online format.

TABLE 4
NUMBER OF ONLINE COURSE TAUGHT BEFORE THE CURRENT SEMESTER

None	13	19%
1-3	14	20%
4-6	6	9%
7 or more	37	53%

However, they were all aware of the need for academic integrity and had specific actions that they would take if they were convinced that a student had cheated on a major test or assignment in their course. Respondents were then asked if they felt like the increased availability of technology threatened academic integrity and 84% responded yes. They were also asked about what types of safeguards they used in their courses to prevent cheating. Their responses are shown in Table 5 below. As noted in the findings, the most frequently used safeguard is information placed in the syllabus about cheating and plagiarism. The majority (56%) also felt that an honor code would be an effective tool in maintaining academic integrity.

TABLE 5
SAFEGUARDS USED TO MAINTAIN ACADEMIC INTEGRITY OF COURSES

None. I do not use any special safeguards in my courses	3%
Use Internet tools like Safe-Assign and Turnitin to confirm plagiarism	61%
Provide information in syllabus about cheating/plagiarism	96%
Change exams regularly	55%
Use different versions of each exam	59%
Discuss your views on the importance of honest and academic integrity with your students	68%
Remind students periodically about their obligations under your school's academic integrity policy	65%
Tell students about methods you will use to detect and deter cheating in your course	58%
Utilize Lockdown Browser Software or other monitoring programs during online tests/exams	26%
Set times for online tests/exams	64%
Other (please specify)	23%

Chi-square analysis was used to analyze the resulting data using the independence of principles of classification and a .05 level of significance. In this test, if the use of more technologically oriented safeguards is not related to the number of online courses taught, then the chi-square value with not be significant at the specified level of significance, (it will be greater than .05.) If the number of online courses taught is related to the use of more technologically oriented safeguards, then the chi-square value will be less than .05. The same test was used for the total number of safeguards used compared to the number of online courses taught.

As is shown in the tables below, there was a significant difference at the .05 level of significance for the use of more technologically oriented safeguards but not in the number of total safeguards used. These results indicate that those who have taught more online courses are more likely to use more technologically oriented safeguards but not more total safeguards.

TABLE 6
CHI-SQUARE ANALYSIS OF THE RELATIONSHIP BETWEEN NUMBER OF ONLINE COURSES TAUGHT AND USE OF SAFEGUARDS

Online courses taught in career by group * Safeguards used - Total grouped Crosstabulation
Count

		Safeguards used - Total grouped		
		4 or less	More than 4	Total
Online courses taught in career by group	Less than 7	9	24	33
	7 or more	7	30	37
Total		16	54	70

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.690a	1	.406		
Continuity Correctionb	.298	1	.585		
Likelihood Ratio	.690	1	.406		
Fisher's Exact Test				.570	.292
Linear-by-Linear Association	.680	1	.409		
N of Valid Cases	70				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 7.54.
b. Computed only for a 2x2 table

TABLE 7
CHI-SQUARE ANALYSIS OF THE RELATIONSHIP BETWEEN NUMBER OF ONLINE COURSES TAUGHT AND USE OF MORE TECHNOLOGICALLY ORIENTED SAFEGUARDS

Online courses taught in career by group * Safeguards used - Use Internet tools like Safe-Assign or Turnitin to confirm plagiarism Crosstabulation Count				
		Safeguards used - Use Internet tools like Safe-Assign or Turnitin to confirm plagiarism		
		No	Yes	Total
Online courses taught in career by group	Less than 7	18	15	33
	7 or more	10	27	37
Total		28	42	70

Chi-Square Tests					
	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.504a	1	.019		
Continuity Correction	4.417	1	.036		
Likelihood Ratio	5.566	1	.018		
Fisher's Exact Test				.028	.018
Linear-by-Linear Association	5.425	1	.020		
N of Valid Cases	70				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.20.
b. Computed only for a 2x2 table

DISCUSSION AND CONCLUSIONS

One interesting observation on the findings of this research is that while most respondents indicated that they felt that the increased availability of technology threatened the academic integrity of courses, the most common safeguard to thwart cheating was a statement in the syllabus about cheating. In other words, the increased availability of technology was seen as a threat to course integrity and yet available technology used to identify cheating was not the most frequently mentioned tool used to maintain academic integrity.

This would lead to the conclusion that the respondents were not aware/trained in the use of technology to enhance course integrity-an issue of the availability of training or, given the availably of training, respondents were unwilling to use the available technology, which would indicate a resistance to change. Since the University maintains a department charged with training and support in technology to help maintain course integrity, the latter, resistance to change, would be the most likely reason for not taking advantage of training and technology.

However, another possibility for the inconsistency is the belief on the part of some faculty that the technological tools are ineffective or require too much effort to use. This could also explain why more of the available tools are not more frequently used. As referred to in the literature review, the experiment by Malesky, Baley, and Crow, resulted in the instructors being unable to detect the company that took the course for the student and the student received an A on the presentation required for the course.

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