

Novel Cost-Effective Internal Live Online Proctoring Solution

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Abstract: Live, in-person proctoring is the industry standard for high-stakes exams in nursing education. The COVID-19 pandemic resulted in an abrupt mandatory shutdown of the on-campus testing center. The contracted vendor that provided a live online proctoring option was unable to meet the increased demand of pandemic-related requests for service. The vendor was unable to accommodate simultaneous exams in a limited window to maintain test integrity. University staff were not performing regular on-site duties and were available to be redeployed as proctors. Using existing university licenses for the learning management system, web conferencing program, and exam security software, an internal live online proctoring protocol was developed for prelicensure graduate nursing course exams. Job aids for both proctors and students were developed. Course faculty provided professional development, including role-play, for proctors. Proctors and students participated in pilot testing of the protocol using a mock exam prior to full implementation. Using this proctoring protocol, 879 exams were successfully administered between April and August 2020. This novel internal live online proctoring protocol maintains industry standards, ensures test integrity, optimizes existing human resources, and anecdotally promotes proctor and nursing student satisfaction.

Introduction

The National League for Nursing (NLN) recommends fair testing policies and consistent practices within nursing programs (Furby, 2020b; NLN, 2012). Live in-person proctoring is recommended for exams that are considered high-stakes (Furby, 2020a). The nursing licensure exam (NCLEX) is administered at commercial testing centers that use live in-person proctors with simultaneous video recording. To reflect this process, the university prelicensure graduate nursing program used live in-person proctoring for all exams in high-stakes courses (final grade of B or better to pass). The context of the COVID-19 pandemic required rapid conversion of exam procedures to remote delivery.

There is sparse literature regarding remote proctoring. Many institutions are using third party vendor proctoring software or services; a recent EDUCAUSE survey reported that

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63% of colleges and universities in the United States and Canada are using some type of proctoring software (Kimmons & Veletsianos, 2021). There is evidence to suggest that using webcam technology to proctor deters from misconduct while taking online exams (Dendir & Maxwell, 2020; Hylton, Levy, & Dringus, 2016). However, third party live online proctoring can create barriers such as excessive technical requirements and additional student costs (Milone, 2017). The feeling of being watched, the use of artificial intelligence, and being recorded by a third party are concerning and can be perceived as invasions of privacy by students (Young, 2020).

Available vendor online proctoring options did not meet faculty needs, and a new protocol was developed using an iterative process. The purpose of this paper is to describe the process of developing and implementing an internal live online proctoring protocol using available university resources. The goal was to align the protocol with NLN recommendations, maintain exam integrity, and promote student satisfaction.

Methods

Setting and Participants

The setting was an urban academic medical center and healthcare university in the Midwestern United States with a prelicensure graduate nursing program. The university had an active contract with a live online proctoring vendor. Existing university software licenses included a learning management system (LMS; Blackboard Inc., 2020), web conferencing (Zoom Video Communications, 2020), and exam security software (Respondus Inc., 2020).

This protocol was implemented with two cohorts of prelicensure graduate nursing students enrolled in their beginning (n=78) and advanced (n=76) clinical management didactic courses, and a pool of nursing faculty and university staff proctors (n=15).

Proctoring Intervention

When the university abruptly transitioned to remote instruction and testing due to the COVID-19 pandemic, exam proctoring alternatives were considered ([Table 1](#)).

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Table 1. Options considered for remote exam proctoring

Strategy	Description	Advantages	Disadvantages
No proctoring/honor system	Individual commitment by students to access only authorized resources during the exam.	<p>Reflects university code of conduct.</p> <p>Establishes expectation of individual professional integrity.</p> <p>No live proctor or technology required.</p> <p>No financial cost.</p>	Risk of use of unauthorized resources and exam piracy, particularly for high-stakes exams.
Locked browser	Plugin or application “locks” the web browser tab used for the exam and prohibits other actions (e.g. copy/paste, printing). Some also restrict use of unauthorized programs/applications.	<p>Reflects university code of conduct.</p> <p>No live proctor required.</p> <p>Prevents access to web-based unauthorized resources or exam piracy.</p> <p>Faculty can control authorized online resources and/or applications (e.g. calculator, electronic textbook).</p>	<p>Different levels of “locking” may allow access to unauthorized resources or exam piracy (e.g. screen share or background recording applications).</p> <p>Does not prevent use of unauthorized resources or exam piracy via a second electronic device, second monitor, or non-electronic sources.</p> <p>May require cost associated with licensing agreement.</p>
Automated proctoring	Program that records student audio, video, and/or screen. May	Reflects university code of conduct.	False positive/false

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	<p>include a form of artificial intelligence (AI) such as eye tracking.</p>	<p>Can be combined with a locked browser.</p> <p>No live proctor required.</p> <p>Faculty can control authorized online resources and/or applications (e.g. calculator, electronic textbook, white board).</p> <p>Faculty can also select which security parameters should be monitored/flagged.</p>	<p>negative AI flags.</p> <p>Privacy concerns related to recordings.</p> <p>Faculty must review each video after an exam. Some vendors offer video review at additional cost. Each programmed parameter will increase the complexity of the review.</p> <p>No ability to terminate the exam or address concerning behaviors in real-time.</p> <p>Cost associated with licensing agreement.</p>
<p>Live online proctoring vendor</p>	<p>Trained remote proctors who monitor students via web conferencing and screen share. Proctor completes standardized identity check and environmental scan before initiating exam.</p>	<p>Reflects university code of conduct.</p> <p>Live online proctor.</p> <p>Proctor retains ability to terminate the exam or address concerning behaviors in real-time.</p> <p>Flexible scheduling for students, up to 24 hours a day.</p> <p>Formalized vendor proctoring protocol standardizes testing experience.</p>	<p>Vendor may not be able to accommodate faculty requests (test window or student volume).</p> <p>Privacy concerns with recordings.</p> <p>Per student/per exam cost.</p> <p>Long wait for proctor availability, even with</p>

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Faculty can control authorized online resources and/or applications (e.g. calculator, electronic textbook, white board).	scheduled appointments, at peak demand times. Proctors are unable to address non-technical exam issues.
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Initially, the vendor’s live online option was used to reflect the in-person exam environment most closely. However, the vendor could not accommodate administering exams to all students in a course at the same time, which resulted in test integrity concerns from faculty. The vendor subsequently abruptly suspended all live online proctoring services due to a local shelter-in-place order affecting the vendor’s testing center. Unfortunately, this abrupt closure occurred during a scheduled testing window for a course exam. Faculty accommodated by individually proctoring the remaining students’ exams using web conferencing and requiring the students to screen share.

Because this individual proctoring model was not practical or sustainable, a more efficient protocol was needed for all subsequent course exams. Key objectives included using existing university resources, maintaining test integrity, promoting proctor and student satisfaction, and aligning with nursing education testing recommendations (Furby, 2020a, 2020b; NLN, 2012; Oermann & Gaberson, 2017). [Table 2](#) provides a summary of these recommendations and how they apply to live online proctoring.

Table 2. Nursing education test administration standards and recommendations and live online proctoring strategies

Standard/Recommendation	Source	Strategy
“[Use] live online proctoring for high-stakes exams.”	Furby, (2020a)	Use web conferencing system for live online proctoring of high-stakes exams.
“Follow established procedures for administering tests in a standardized manner.”	Oermann & Gaberson (2017)	Use National League for Nursing (NLN)’s guidelines and recommendations (NLN, 2012) as well as other related nursing education testing standards and recommendations.
“Provide and document appropriate procedures for test takers...”	Oermann & Gaberson (2017)	Create and provide documentation regarding live online proctoring protocol for both students and proctors.

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“Provide test takers with an opportunity to become familiar with ... equipment that may be used during testing.”	Oermann & Gaberson (2017)	Provide orientation to live online proctoring protocol for both students and proctors.
“Protect the security of test materials ...”	Oermann & Gaberson (2017)	Simultaneously use test security software (i.e., a locked browser), web conferencing, and other related online test security methods for live online proctoring.

A team of faculty and instructional designers developed an internal live online proctoring protocol using a mobile device, locked browser, web conferencing, and exam security measures (audio/video feed, environmental scan, scripted sign in/sign out process).

Resources: Faculty, other personnel, equipment

Faculty recruited university staff whose duties were modified due to the pandemic. Sufficient proctors were recruited to accommodate groups of 6-10 students. Students needed access to two electronic devices: one to take the exam on (computer), and one to use for the web conferencing (mobile device). The university offered funding and equipment loans to students who needed resources for the unexpected transition to remote learning.

Implementation strategy

The protocol team created and provided job aids for both proctors ([online supplement A](#)) and students ([online supplement B](#)).

The protocol team provided proctors with a professional development session to describe the proctoring protocol and answer questions. Proctors worked together to practice, using role play, as both students and proctors. Course faculty were on-call during the practice session, as they would be during an actual exam, to assist with troubleshooting.

Faculty provided students information about the proctoring process verbally and in writing. A live online mock exam was administered using the LMS and students were assigned a proctor. The mock exam allowed both the proctors and students to experience the testing and proctoring experience in a low-stakes setting.

Evaluation Methods

Proctors and students provided anecdotal feedback. Students provided additional feedback on the formal university course evaluations.

Results

From April to August 2020, 879 exams were administered using the protocol with no resulting exam security concerns. The most common technical difficulty was short-lived internet connection issues. One student experienced a lengthy internet outage and required a separate make-up proctoring session with course faculty. Four students tested using the protocol at separate dates/times due to extenuating personal circumstances. Overall anecdotal feedback from both proctors and students were positive. The proctors, many of whom held non-teaching positions, expressed appreciation for the opportunity to contribute to the students' educational experiences in a tangible and ongoing way. Students appreciated that the remote exam time matched the time the exam would have been offered in-person, and that there were fewer delays than what was previously experienced with the vendor proctoring service.

Discussion

This internal live online exam proctoring protocol was designed specifically for use in two prelicensure nursing courses; however, it was offered as an alternative in other courses when lengthy delays were experienced using the vendor live proctoring service. Because the protocol was not universally adopted among all courses, this created minimal initial resistance from some students, but the previous in-person exam processes had not been consistent across courses either. As a college, there is a need to work towards fair and consistent exam practices (Furby, 2020b; NLN, 2012) regardless of delivery mode across all courses. However, this scripted protocol minimized variability within and between two courses.

The protocol incorporated use of webcam technology via a student's mobile device to deter exam misconduct (Hylton, Levy, & Dringus 2016). The use of a locked browser and a mobile device camera limited student access to unauthorized resources and provided the proctor a continuous view of the student and the testing space similar to that experienced in-person. Unlike vendor proctoring services, this protocol did not require picture identification matching. Consistent proctor-student matching allowed for informal/relationship-based identity verification prior to each exam. However, identity verification could add an additional layer of exam security especially with large student cohorts or inconsistent proctor-student matching. There were no witnessed events or accusations of exam misconduct with use of this protocol.

This protocol eases the online proctoring technology and cost barriers identified by Milone (2017) by using programs already available and familiar to students. Although this protocol used licensed commercial products, there are open-source resources available to implement a similar in-house live online proctoring protocol. These include open-source LMS (Moodle, 2020), web conferencing (BigBlueButton, 2020), and exam locked browser (ETH Zurich & Educational Development and Technology, 2020).

This protocol does not utilize artificial intelligence and does not include video recording. Students completed the environmental scan and sign in/sign out process with the proctor

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in a private breakout room. While the student's testing space was in view of the proctor during the exam, the lack of video recording and using university staff as consistent proctors potentially reduced concerns about student privacy that were described by Young (2020). Students did not report any privacy concerns with this protocol.

Use of live online proctoring may influence a student's decision to take a specific course (Milone, 2017). The circumstances of the two nursing courses that used this protocol did not allow for students to choose among different exam proctoring options. Students had to agree to the in-house proctoring protocol to remain enrolled in the class. No students withdrew from either course due to the proctoring protocol.

One unresolved concern with in-person vs online proctoring strategies is how exam scores may be influenced by differences in the student testing experience. There is some evidence that there is no significant difference in exam scores between live proctoring and online proctoring (Lee, 2020). For the courses that used this proctoring protocol, the exam averages and student pass rates were similar to previous terms when the course was in-person (face-to-face) and used live in-person exam proctoring.

Strengths and limitations of work

This live online proctoring protocol offers flexibility, potential cost savings, and reduced privacy concerns if offered as an alternative to vendor proctoring services. The protocol maintains exam integrity using a process similar to nursing licensure and certification exams. This protocol capitalizes on existing human and programmatic resources and engages redeployed or potentially furloughed diverse university staff. Most notably, this protocol creates a space of collaboration between faculty and staff, and between staff and students, which is particularly valuable given the ongoing challenges and isolation of a remote work/learning environment and social distancing requirements.

The limitations of this protocol include the need for adequate equipment and internet bandwidth for both the proctors and students. Resolution of technical problems during exams requires faculty, proctor, and student flexibility during a stressful time; however, this is the case with any exam experience. While a goal of this protocol was to intentionally limit the length of exam availability, this protocol may not be conducive for learning environments where a longer testing window is preferable, which would require extended proctor availability.

Future directions

The protocol will continue to be used for upcoming academic terms. Formal evaluation is planned for future work.

Conclusion

This internal live online exam proctoring protocol is a sustainable process for remote exams that aligns with industry standards, maintains exams security, capitalizes on existing resources, offers potential cost savings, addresses privacy concerns, and provides a source of contribution, engagement, and community for faculty, staff, and students.

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