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Alternative to Proctoring in Introductory Statistics Community College Courses

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Problem

The credibility of **unsupervised online exams**, which is an ongoing concern in higher education, has been mainly maintained by physical and remote proctoring (Malesky et al., 2016; Shute & Rahimi, 2017). However, both forms of proctoring are expensive and inconvenient (Ladyshewsky, 2015; Lee-Post & Hapke, 2017). The disconnect between high demand in online testing and the inability to maintain credibility of unsupervised web-based exams without inconvenient and expensive proctoring constitutes a problem.

Purpose

The purpose of this quasi-experimental study was to examine whether systematically selected non-biometric security mechanisms can be an effective alternative to proctoring.

Significance

The results of the study:
- Empirically confirm adequacy of the used theoretical framework
- Add to the body of best practices of secured online assessment
- Can be used by researchers, educators, and administrators for web-based exam implementation.

The use of the selected security mechanisms may allow for:
- Assessing student knowledge in a credible, inexpensive, and convenient way
- Not spending valuable in-class time on testing
- Enhancing viability of online courses.

Social Change Implications

With the combination of security mechanisms utilized in the study, credibility of web-based exams will be maintained with needed convenience. More students with full-time jobs and family commitments will be able to get degrees. The society will gain more college graduates with a high potential of becoming valuable professionals in their fields.

Theoretical Framework

The taxonomy of cheating reduction techniques (Varble, 2014) rooted in the **fraud triangle theory** (Cressey, 1950) explains which security mechanisms can substitute for proctoring and why.

The categories of the taxonomy aim to neutralize *need*, *rationalization*, and *opportunity* needed for cheating to occur.

Relevant Scholarship

Results of Previous Studies:
- With the use of **no or a few** security mechanisms students performed **better on unproctored exams** (Arnold, 2016; Fask et al., 2015).
- With the use of **several selected** mechanisms **mixed results** were obtained: Students performed better on unproctored exams (Varble, 2014), not significantly different (Beck, 2014; Stack, 2015), or better on proctored exams (Ladyshewsky, 2015).

Gaps in the Literature

Previous researchers:
- Administered proctored exam in pencil-and-paper form and unproctored in web-based form.
- Studied the course delivery mode effect with small sample size.
- Did not examine the order or instructor effects
- Did not study the combination of the mechanisms utilized in the given investigation.

Research Questions

When equivalent automatically scored web-based exams with the same security mechanisms are used,
- **RQ1**: What is a relationship between the format, proctored vs. unproctored, and student scores?
- **RQ2:** What is a relationship between the order in which proctored and unproctored exams are administered and student score?
- **RQ3:** What is a relationship between the course delivery mode and student scores?
- **RQ4:** What is a relationship between the instructor and student scores?

Participants

Census sample: all students in web-based introductory statistics courses offered in a suburban community college between Fall 2015-Summer 2017.

850 students who took at least one study's exam:
- Mean age = 22 (ranged from 14 to 50 years)
- Mean GPA = 3.19
- 704 face-to-face, 91 hybrid, and 55 online students

Procedures

One group sequential design
- Each student took two sets of proctored and unproctored exams in a certain sequence. In Set1, proctored exam was followed by unproctored. In Set 2, the order was reversed.

Security Mechanisms
- Synchronous testing, time restriction, randomization, blocked backtracking, one question per page, and cheating warning statement.

Data Collection

All exams were part of regular educational practice and had 23 automatically graded items and 70-minute time limit. Six questions were identical across all four exams. The exams were:
- Alternative within each set
- Equivalent between the sets

The content validity and equivalency of the exams were established by experts; reliability and construct validity were tested.

Analysis

Repeated measures ANOVA was used for RQ1 and RQ2. Mixed factorial ANOVA was used for RQ3 and RQ4

Findings

Statistically significant ($p < .05$) findings include:
- In all subgroups, scores were **lower** on **unproctored exam** in Set 2.
- The **order effect** was **significant** in all subgroups, except Ex. time group.
- The **instructor effect** in Set 1
- In UP group, the scores on asynchronous unproctored exam were significantly higher than on synchronous unproctored exam.

Interpretation

Findings suggest that the **used security mechanisms were effective**.

Forgetting and end of the semester fatigue syndrome may explain lower scores on the unproctored exam.

The instructor effect could occur due to differences in instructors' experiences with web-based testing.

Synchronous testing may be important as a security mechanism.

Limitations

Possible limitations include:
- Nonrandom assignment into groups with respect to the modes and instructors
- The use of archived data
- Small sample size in Ex. time group.

Recommendations

Future Research
- Replicate the study in different institutions and with larger Ex. time group
- Study the order effect with smaller retest interval between the sets ruling out forgetting and end of the semester fatigue effect.
- Study a relationship between instructor experience in web-testing and scores.
- Study a relationship between synchronous and asynchronous unproctored exams and students scores.

Practical Recommendations
- Incorporate the study's combination of the security mechanisms to improve credibility of web-based exams.

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