



Integrity in Un-proctored Online Reading Tests: The Case of Iranian University Students

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Abstract

Online instruction has rapidly gained popularity owing to its flexibility, accessibility, and cost-effectiveness, however, challenges such as academic dishonesty remain significant concerns. Un-proctored online assessments, especially multiple-choice exams, are particularly vulnerable to cheating and plagiarism, threatening the integrity of student evaluation. While numerous strategies have been proposed to mitigate cheating, the effectiveness of specific measures in un-proctored settings remains underexplored. This study investigates the impact of several anti-cheating strategies on un-proctored online multiple-choice exams administered through Moodle. Strategies tested included fixed time limits, limited exam availability, restriction on backtracking, and auto-submit on time expiration. The TOEFL reading section was administered to 608 students to assess the effectiveness of these strategies. Results showed a Variance-Covariance Matrix value of +0.386 and a -2log likelihood of +37.913.919, indicating validity for the sample and effective mitigation of cheating. Item and person reliability analysis revealed that fewer than 4% of participants exceeded the outfit index of 1.2, suggesting minimal instances of random guessing or dishonesty. This research contributes to the growing body of literature by providing empirical evidence on the effectiveness of specific anti-cheating measures in un-proctored online assessments.

Key words: Academic Integrity, Mitigating Cheating, Un-proctored Tests, Reading, Moodle

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1. Introduction

Technological developments have enabled a shift from face-to-face classes to online instruction, providing learners with flexible and accessible educational opportunities. The rise of the Internet in the 1990s significantly boosted online education. The 2000s saw further growth with the introduction of Learning Management Systems and Massive Open Online Courses (Thompson, 2017). However, the COVID-19 pandemic in 2020 accelerated this shift dramatically, making online education more popular in many parts of the world. This transformation has been supported by practice and research reports and articles, highlighting the benefits and challenges of integrating technology into language learning and teaching (Haleem et al., 2022). For instance, the British Council has emphasized how digital technologies can enhance language learning by allowing learners to engage in meaningful interactions and practice language production (Motteram, 2013).

Research has shown that online learning can be highly effective when supported by appropriate strategies and tools, leading to positive educational outcomes (Tanaporn et al., 2022). However, challenges such as limited access to technology and digital literacy issues have been identified as barriers to effective integration of technology into instruction (Mayang Sari & Abrar, 2024). Despite these challenges, the potential benefits, including increased student motivation and personalized learning experiences, make the integration of technology a valuable pursuit (Mayang Sari & Abrar, 2024).

Online instruction has gained prominence due to its numerous benefits. Online learning eliminates geographical and time limitations, making education more manageable for different groups of learners. It allows individuals to engage themselves in online instruction regardless of their physical location or work schedules (Kamraju et al., 2024; Ma & Wang, 2024). Online education is often cost-effective for both students and educational institutions (Oz et al., 2015). It provides flexibility. Learners can access materials at their own pace, accommodating various learning styles and preferences. This adaptability is especially valuable for working professionals and non-traditional students (Ma & Wang, 2024).

Technology enables personalized learning experiences. Adaptive algorithms, interactive quizzes, and tailored content allow students to focus on areas where they need improvement, enhancing overall comprehension (Bernacki et al., 2021; Iqbal, 2023). Online platforms often incorporate multimedia elements, gamification, and discussion forums. These features engage learners and promote active participation, leading to better retention and understanding (Chukwu, 2024). Online courses facilitate collaboration among students worldwide. Virtual classrooms encourage cross-cultural interactions, fostering a global perspective and promoting cultural competence (Młodzianowska et al., 2024). Online education encourages continuous learning. Learners can acquire new skills, update their knowledge, and stay informed in their fields throughout their lives (Kasmas et al., 2023). In summary, online education is valuable because it can cater to various requirements and encourage lifelong learning.

Academic honesty is crucial for higher education. As more courses move online, it is important for those in charge to find ways to evaluate students fairly while ensuring they stay honest (Johnson, 2019). Maintaining academic integrity in online education requires a multifaceted approach that combines technology, communication, and thoughtful design (Verhoef & Coetser, 2021).

Online assessment has presented some challenges for students and authorities worldwide (Yeh & Tsai, 2022). A major trouble is the risk of cheating and plagiarism by some students who can exploit online resources or other forms of support. Such misconduct may badly affect education quality, particularly learning assessment (Surahman & Wang, 2022). In the context of online assessments, the capacity to adapt and restore an exam is paramount for upholding both its security and integrity. Additionally, this adaptability ensures equitable treatment for test-takers who encounter unexpected disruptions during the examination process (Holden et al., 2021; Winke & Isbell, 2017).

In much the same way, Holden et al. (2021) warn that distance learning may be more prone to academic misconduct. This vulnerability arises from the challenge of verifying the identity of individuals completing assessments in unsupervised environments, where they might resort to using external resources like cheat sheets and online materials. Additionally, the absence of direct interaction with instructors can facilitate collaborative efforts among students during tests. Online assessments are more prone to academic dishonesty due to the lack of control over the testing environment and the ease of accessing opportunities to cheat. The prevalence of cheating has prompted extensive research into the security of online assessments (Holden et al., 2021).

Reading comprehension is thought to be a crucial skill for academic success and lifelong learning (Kendeou et al., 2015; McBreen & Savage, 2021). It serves as the foundation for academic achievement across all subject areas. In certain EFL contexts, such as Iran, undergraduate students are required to take a general reading comprehension course. Therefore, it is the responsibility of authorities and teachers to ensure the quality of these programs, whether delivered face-to-face or online.

While online assessments provide several benefits, they also present significant challenges. Key issues include academic dishonesty, infrastructure limitations, ensuring comprehensive coverage of learning objectives, and requiring timely submission by students (Cantiello & Geschke, 2024; Kurniati et al., 2023; Sutherland-Smith 2016;). This study specifically focuses on addressing the issue of academic dishonesty.

In online courses, the absence of in-person interactions and monitoring makes them more vulnerable to forms of academic misconduct, such as contract cheating, collusion, and fabrication, compared to face-to-face assessments. Assessing reading comprehension, for instance, is especially challenging in online settings, where traditional paper-based tests may not be feasible or reliable.

The rationale for this study is to explore effective strategies for maintaining the integrity of un-proctored online tests. Online tests of reading comprehension in an EFL context present several quality assurance challenges, such as designing valid and reliable test items that accurately measure the intended construct and align with learning objectives, as well as preventing cheating by test-takers who may access online resources or other forms of assistance. Given the constraints of the institution and students, several measures were implemented to minimize academic dishonesty and ensure a fair testing environment.

Applying some of the strategies reviewed here—such as scheduling a single set time, limiting exam duration and availability, presenting questions one at a time, randomizing questions and answers, preventing backtracking, and setting auto-submit upon time expiration—seem to be effective in mitigating cheating in online assessments. This study aims to show how well these strategies work to keep un-proctored online reading comprehension tests fair. Therefore, this study focuses on the following research question:

RQ: Do cheating prevention strategies provide reliable and valid test scores?

The study was conducted using an online reading comprehension test to assess undergraduate students across various majors in a university in Tehran, Iran, aiming to evaluate the validity and

reliability of the test scores. The findings of the study provide useful insights and implications for improving the trustworthiness of un-proctored online reading comprehension tests, especially in Iran.

2. Review of Literature

2.1 *The Significance of Assessment*

Assessment means gathering information in an organized manner to evaluate the significance and worth of various elements in higher education, like how well students are doing (Wall et al., 2014). They note that assessment is important for universities and plays a complex role in higher education, including ensuring accountability and emphasizing value.

Assessment is central to what students experience in their education and is likely the main factor influencing how they learn (Winke & Isbell, 2017). Assessment is intricately linked to quality and the dynamic nature of quality assurance processes and accountability in education. Recent trends in higher education emphasize student assessment, particularly within online learning environments (Kayyali, M. 2023).

Online assessments offer some benefits for users. For example, teachers can design various types of assessments using digital platforms, making exams simpler to prepare, manage, and evaluate (Heil & Ifenthaler, 2023). Furthermore, online assessments can be taken from the student's home, reducing nervousness and saving time compared to traditional pen-and-paper exams (Serutla et al., 2024). Online assessments provide immediate results and feedback to the teachers and students. Students can view their results immediately after finishing the assessment, which helps them spot areas where they need to improve and change their study strategies as needed. (Dermo, 2009; Shraim, 2019). This provides the opportunity to use assessment *for* learning. Online assessments are more cost-effective because they preclude printing and make automatic grading possible (Donovan et al., 2007). Online proctors can monitor students via video, safeguarding testing standards (Heil & Ifenthaler, 2023). Online assessments can be adapted and personalized to fit individual student needs (Tetzlaff et al., 2021).

Along the same lines, the 2010 Joint Information Systems Committee (JISC) report points out many benefits of online assessments. These include offering different types of assessments and making sure they are genuine, engaging students with interactive assessments that give feedback, and allowing

flexibility in when and where assessments are taken. It also mentions assessing a wider range of skills through simulations, e-portfolios, and interactive games. Additionally, online assessments make it easier to submit, grade, and store data, ensure consistent and accurate results by using both human and computer evaluations, encourage students to use feedback to improve through e-portfolios, explore new methods with creative media and online peer/self-assessment, and gather precise and timely evidence to evaluate how well the curriculum works (p. 9).

According to Conrad and Openo (2018), some online platforms provide facilities for alternative assessment methods such as **E-Portfolios, Journals, Projects, Group Work and Self-Assessment**. Practitioners should remember that integrating a mix of assessment methods and ensuring authenticity can improve the overall learning experience in online education.

Despite these advantages, assessment can raise sensitivity; students call it a process that arouses fear, anxiety, and stress (Putwain, 2016). It is reasonable to say that assessment is an area where both the consequences and student interest are particularly concentrated. Essentially, assessment makes a difference to students, and its impact is clearly understood (Campbell & Schwier, 2014). Assessment in technologically controlled environments increases another layer of complication to an already emotionally intense topic (Conrad & Openo, 2018). The emotional aspects underline the key role assessment plays in education.

2.2 The Consequences of Academic Dishonesty

Academic dishonesty leads to numerous undesirable outcomes that affect students, educational institutions, and society at large. Students engaging in academic dishonesty fail to develop critical thinking, problem-solving, and subject-specific skills. Whitley and Keith-Spiegel (2002) argue that cheating undermines the educational process, depriving students of the opportunity to acquire the knowledge and abilities necessary for future success. Students caught cheating may face academic penalties such as failing grades, suspension, or expulsion (McCabe et al., 2001). Beyond academia, the long-term effects include reduced career prospects, as employers may view degrees from institutions with widespread dishonesty as less credible (Gallant, 2017; Surahman, & Wang, 2022). Cheating can develop a pattern of unethical behavior that extends beyond the classroom. Murdock and Anderman

(2006) emphasize that students who engage in dishonesty may carry unethical practices into their professional lives. Furthermore, the internal guilt and loss of self-respect associated with cheating can lead to stress, anxiety, and reduced self-worth (Rettinger & Kramer, 2009).

Academic dishonesty damages an institution's credibility and the perceived value of its degrees (Bretag, 2013). This can reduce enrollment, affect rankings, and diminish partnerships with employers and other institutions. The prevalence of cheating can compromise the integrity of assessments, making it difficult to evaluate students' true capabilities (Jones, 2011). Institutions must invest significant resources in preventative measures such as proctoring systems and honor codes (Bretag, 2013). If dishonesty is systemic, accrediting bodies may question the institution's ability to uphold educational standards, potentially endangering its accreditation (Newton, 2018).

When academic dishonesty becomes widespread, the value of academic credentials diminishes. Employers and stakeholders may question whether graduates possess the competencies their qualifications suggest (Bretag, 2013). Cheating leads to graduates entering the workforce without the necessary knowledge and skills. In critical fields like medicine or engineering, this incompetence can result in significant harm (Simkin & McLeod, 2010). Dishonest practices in academia can perpetuate unethical behavior in other areas of life. Callahan (2004) highlights how academic dishonesty contributes to a broader "cheating culture" in society, eroding trust in professional and social systems.

Academic dishonesty directly compromises construct validity, which concerns whether a test truly measures what it purports to measure (Messick, 1995). If students cheat, the test results no longer reflect their true academic abilities or understanding of the content. For example, when students resort to cheating in a high-stakes exam, their performance does not accurately represent their learning or comprehension, undermining the test's validity in terms of accurately assessing their knowledge. This misrepresentation can lead to misguided decisions in educational or employment settings, further distorting the consequences of the assessment.

Consequential validity is also deeply connected to the ethical and behavioral consequences that arise from academic dishonesty. The normalization of cheating, particularly in high-stakes testing environments, can foster a culture of dishonesty that persists beyond the educational context (Callahan, 2004). As McCabe et al. (2001) note, widespread cheating in academic settings not only affects the integrity of individual assessments but also promotes unethical behavior in professional and personal life. This leads to negative consequences for societal trust and the broader educational mission.

When students involve in academic fraudulence, the ethical principles such as fairness, transparency, and equity are compromised (Alguacil, et al., 2023). The consequential validity of a test is therefore weakened because the behaviors encouraged by the testing system (i.e., cheating, dishonesty, or shortcutting learning) are in conflict with the values the test is intended to uphold. In a study by Whitley and Keith-Spiegel (2002), it was shown that academic dishonesty tends to reproduce itself, especially when students observe that cheating is not punished or discouraged, leading to a broader erosion of ethical standards in both educational and professional settings.

Academic dishonesty also has significant implications for educational goals and student motivation, both of which are key considerations in the consequential validity of assessments. According to Anderman and Murdock (2007), when students engage in cheating, the intrinsic motivation to learn is diminished, and students may instead focus on finding ways to "beat the system." This shift in motivation can lead to a scenario where students are more concerned with the test as a hurdle to overcome rather than an opportunity for genuine learning. As such, the test fails in its role to promote useful educational outcomes.

From a policy perspective, the widespread occurrence of academic dishonesty challenges the consequential validity of educational assessments and calls for re-evaluation of testing practices. For example, in online learning, where monitoring is often limited or non-existent, institutions are turning to more rigorous proctoring systems, adaptive testing, or even AI-driven plagiarism detection systems (Rodrigues et al., 2024). These tools aim to preserve the fairness and integrity of assessments, but they also raise questions about privacy, equity, and the potential for false accusations of dishonesty.

Moreover, the consequences of academic dishonesty extend beyond individual assessments, affecting institutional credibility and societal trust. Institutions facing high levels of dishonesty must invest in strategies like proctoring systems or adaptive testing to mitigate its impact, but these efforts often raise ethical and logistical concerns (Rodrigues et al., 2024). Conversely, fostering academic honesty strengthens consequential validity by ensuring that assessments not only measure true student capabilities but also promote fairness, ethical development, and alignment with broader educational values. Thus, addressing academic dishonesty is crucial for maintaining the validity and integrity of assessments.

Academic dishonesty significantly impacts the reliability of test scores. If some students engage in cheating while others do not, the resulting scores will fail to accurately represent their actual abilities, making it challenging to depend on these scores for evaluating performance consistently over time (Pettyjohn et al., 2020). Over time, academic dishonesty can result in students being unprepared for future academic or professional challenges, as those who cheat do not genuinely learn the material (He, et al., 2024).

2.3 Challenges in Maintaining Academic Integrity

Academic dishonesty is a global issue that has been extensively studied in various countries. It generally refers to acts of cheating during exams or copying others' research to gain unfair advantages (Thomas, 2017). Violations of academic integrity can take many forms, including bribery, misrepresentation, plagiarism, cheating, collusion, submitting the same work multiple times, conspiracy, fabrication, academic misconduct, improper use of computers or calculators, misuse of online and blended courses, and disruptive behavior (Moten et al., 2013). Social networks provide a platform for students to share assignments and solutions, consider answers, and engage in group cheating during exams (Noorbehbahani et al., 2022).

E-dishonesty, a term made popular by McCabe (2005), refers to cheating in online academic work. This prompts new issues for educators to consider. For example, cheating in online tests often involves “electronic warfare,” as McCabe (2005) calls it, which means using computers to interfere with the test system. Other types of cheating include imposture, sharing test questions, using unauthorized resources like internet searches, working with others through messaging, getting answers from others, accessing files on their computer, or using books or notes directly (e.g., Moten et al., 2013; Wahid et al., 2015). All these actions are also known as “academic dishonesty” (Akbulut et al., 2008; Namlu & Odabasi, 2007).

Cheating and fraudulent behaviors are influenced by three conditions, as described by Jalilzadeh et al. (2024). The fraud triangle concept categorizes these conditions into opportunity, incentive/pressure (also known as need), and rationalization/attitude. The lack of supervision and the easy access to the Internet are often seen by students as opportunities to cheat, allowing them to find direct answers or hints through online resources like Google and ChatGPT (Mungai & Huang, 2017).

In educational environments, maintaining academic integrity means upholding values like honesty, trust, fairness, and responsibility. Recognizing and adhering to these values provides a common foundation for professional conduct, highlighting the importance of mastering knowledge, skills, and abilities (Holden et al., 2021). While it is often believed that cheating and plagiarism are more prevalent in online settings, the challenge of upholding academic integrity is present in both online and traditional classrooms. However, due to the inherent nature of online education, it may be more susceptible to violations of academic integrity (Verhoef & Coetser, 2021).

2.4 Strategies for Mitigating Cheating in Online Assessments

The Academic Dishonesty Mitigation Plan (ADMP) outlines some plans to prevent and detect cheating behaviors such as impersonation (Mungai & Huang, 2017), collusion (Crook & Nixon, 2019), plagiarism (Awasthi, 2019) and unauthorized aids (Hylton et al., 2016). Online assessment integrity is challenged by the ease of finding answers on the Internet. Solutions include using secure browsers, though they can be hacked (Holden et al., 2021) and paraphrasing questions, which advanced search algorithms can still undermine (Golden & Kohlbeck, 2020). Integrity policies are also suggested but often suffer from poor implementation and lenient penalties (Nguyen et al., 2020).

While proctoring multiple-choice exams online can be beneficial, instructors must consider the inconvenience to students and the costs of administering a proctoring system. According to U.S. Department of Education, Office of Postsecondary Education (2006) online courses often target underserved populations, such as working students balancing various commitments. For these students, inflexible exam times and inconvenient locations may negate the benefits of online courses. Additionally, the costs of administering proctored exams, including developing guidelines, setting exam dates and locations, reserving computer labs, communicating requirements, approving locations, hiring and training proctors, and verifying student participation, can be substantial and discourage the use of proctored exams.

To minimize cheating in online multiple-choice exams without proctoring, several strategies can be employed. Scheduling a single set time for the assessment and making the link available within a narrow window ensures all students start and finish simultaneously, reducing collaboration opportunities. Limiting the exam duration to allow thoughtful answers but not research time, and setting auto-submit

upon time expiration, are effective timing strategies, with adjustments for students with disabilities (Mate & Weidenhofer, 2021). Following Bloom's taxonomy to focus on higher-order cognitive skills (analysis, application, synthesis, and evaluation) rather than lower-order skills (knowledge and comprehension) can enhance academic integrity (Mate & Weidenhofer, 2021). Presenting questions one at a time, randomizing questions and answers, preventing backtracking, changing the order of questions, offering different versions of the test, and letting students take the test only once and incorporating images in questions further reduce cheating opportunities (Sabrina et al., 2022; Serwatka, 2003; Shuey, 2002; Taşkın, 2024; Vachris, 1999).

Another effective strategy to reduce cheating is to design and deliver quizzes using item banks, which lowers the stakes by allowing multiple attempts (Sullivan, 2016). Additional methods include continuously developing new questions, creating multiple versions of exams, offering open-book options, using time stamps, and varying question sequences, types, formats and frequencies.

Some other strategies to mitigate cheating include open-book exams, password-protected exams (Rovai, 2001), and emphasizing essays and discussions over exams (Liefert, 2000; Taylor, 2002). Limiting exam availability (Liefert, 2000), random phone calls during exams, webcam monitoring (Carnevale, 1999), and voice and retinal scans (Rovai, 2001) are also effective. Plowman (2000) emphasizes using technology to boost student motivation and engagement to combat cheating.

Having a strict time limit and not allowing students to go back to previous questions can make some students more anxious (Trifoni & Shahini, 2011). This anxiety can lead to lower grades in school and when learning a second language and make the test scores less accurate. (Teimouri, et al., 2019). However, Theobald et al., (2022) suggest that test anxiety does not interfere with recalling learned information during the exam.

Gernsbacher et al. (2020) argue that untimed power tests are preferable to time-limited tests in educational settings for several reasons. First, time-limited tests do not accurately measure students' knowledge and mastery, as the speed of test-taking is not a valid indicator of these attributes. Second, the reliability of time-limited tests is falsely high due to consistent test-taking speeds rather than genuine consistency in knowledge levels. Third, time-limited tests disadvantage students with disabilities who require additional time, often leading to their exclusion from test-taking environments. Finally, these

tests can disadvantage students learning English, those from underrepresented backgrounds, older students, and those with disabilities who face barriers in obtaining necessary accommodations. These points highlight the importance of considering untimed power tests to ensure a fairer and more accurate assessment of students' abilities.

3. Method

3.1 Participants

The study included an available sample of 608 university students, aged 19 to 23, who had registered in a compulsory general reading comprehension course at a university in Tehran. It was assumed that these participants would represent the broader student population involved in language learning at the institution.

3.2 Instrument

The test used to evaluate students' reading comprehension was the reading section of the TOEFL. The choice of the TOEFL reading section was based on its established validity in assessing English language proficiency and its relevance to academic reading skills required in the university setting. This section assesses various micro-skills crucial for effective reading comprehension, such as:

- Remembering word meanings
- Understanding words in context
- Interpreting textual and external sources
- Making inferences from the text

Locating synonyms

- Searching for and retrieving specific information
- Understanding references and grammatical relationships
- Skimming and scanning for key information
- Recognizing the author's style and tone

3.3 Procedures

To assess the learning outcomes of students in the general English course, the reading section of the TOEFL was administered via the university's online education platform, Moodle. This platform was selected for its ease of use and accessibility, ensuring effective participation from all students. The test was designed to be completed within a 40-minute period. Several measures were implemented to ensure the integrity and fairness of the test:

- The test was available at a single, predetermined time.
- The exam duration was strictly limited to 40 minutes.
- Test items were presented one at a time to prevent students from skipping ahead.
- Questions were randomly presented to each student.
- Answer options were shuffled to minimize the chances of cheating.
- Backtracking was disabled, preventing students from changing their answers once submitted.
- The test was set to auto-submit when the allotted time expired.

These strategies helped to control testing environment, thereby enhancing the reliability and validity of the assessment results.

3.4 Data Analysis

The normality of the data was examined through descriptive analysis using SPSS. Subscribing to Item Response Theory (IRT) with JAMOV, the reliability index for both items and persons was calculated, providing a clear indication of the measurement's dependability. Fit indexes for items and participants were also derived, highlighting the appropriateness of the measurement model. These indexes are crucial for validating the inferences drawn from the data, ensuring that the conclusions are accurate and meaningful. The CONSTRUCT MAP 4 was used to assess the construct validity of the online test used in this study.

4. Results

The study aimed to explore the effectiveness of cheating prevention scores in ensuring the validity and reliability of the scores in un-proctored online reading comprehension tests. Table 1 displays the distribution of participants' scores, with the lowest observed score being 9 (within a range of 0 to 40) and the highest score reaching 39.

Table 1: *Descriptive Statistics*

N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis
608	9.00	39.00	27.41	5.61	-.83	.78

On average, participants scored 27.41, indicating that they achieved 68% of the maximum possible score. The standard deviation for reading comprehension was 5.61, and the coefficient of variation was 0.20, indicating that the data is normally distributed as this index is well below 1. Additionally, the table includes crucial statistical measures such as skewness and kurtosis. The skewness value of -0.83 suggests a slight leftward skew, meaning that there are more high scores than low scores. However, this value is within the acceptable range of -1 to 1, indicating that the distribution is not significantly skewed. The kurtosis value of 0.78 falls within the range of -2 to +2, suggesting that the distribution is neither too peaked nor too flat, further supporting the normality of the data. These statistical indicators collectively suggest that the sample data is normally distributed, providing a solid foundation for further analysis and interpretation.

The researchers analyzed the students' responses using CONSTRUCT MAP 4. The results showed consistency (Variance-Covariance Matrix: +0.386 and -2 log likelihood=+37.913.919). Based on Wilson's 2011 guidelines, one may conclude that the reading section of the TOEFL is valid for the students in this study.

Table 2 highlights the test's quality, showing item reliability at .96 and person reliability at .73. According to Duncan et al. (2003), reliability scores between .90 and .99 are excellent, .80 to .89 are good, and .70 to .79 are satisfactory. Thus, our test demonstrates excellent item reliability and acceptable person reliability. The separation index for items and persons were 5.52 and 1.64, respectively, indicating the test's satisfactory quality and its ability to differentiate between varying difficulty and ability levels.

Overall, the high reliability values for both items and persons suggest that the measurement is consistent. The separation indices and number of strata indicate that the items and persons can be well-differentiated based on their scores.

Table 2: *Reliability and separation Index for Items and Persons*

Criteria	Reliability	Separation	Number of strata
Item	0.96	5.52	7.7
Person	0.73	1.64	2.52

To evaluate the fit of our test within the Rasch model, we looked at the infit and outfit indexes for the test items. Table 3 shows that the infit indexes were between 0.96 and 1.07, and the outfit indexes were between 0.91 and 1.09. According to Wright et al. (1994), the acceptable range for these indexes is 0.8-1.2 for high-stakes tests and 0.7-1.3 for ordinary tests. Therefore, all items in our test fit the Rasch model.

The infit index measures the degree to which the data fit the model for items that are targeted at the ability level of the respondents, while the outfit index is sensitive to unexpected responses, particularly those far from the respondent's ability level. The values obtained for both indexes in our study fall within the recommended ranges, indicating that the test items are performing as expected and are well-suited to the Rasch model. This fit suggests that the test items are functioning consistently across different levels of respondent ability, providing reliable and valid measurements. Consequently, the alignment of our test items with the Rasch model supports the overall validity of our assessment tool.

Table 3: *Descriptive Statistics for item-fit*

	N	Range	Minimum	Maximum	Mean
Infit	40	.11	.96	1.07	.99
Outfit	40	.17	.91	1.09	.99

To assess the “appropriateness measurement” (Levine & Drasgow, 1983) of our test, we utilized person-fit statistics in JAMOWI to identify unusual response patterns that might indicate cheating or other random guessing. Person-fit statistics are crucial in identifying anomalies in response patterns, which can compromise the validity of test results.

Table 4: *Descriptive Statistics for person-fit*

	N	Range	Minimum	Maximum	Mean
Infit	608	.37	.83	1.20	.99
Outfit	608	.95	.69	1.64	.99

Table 4 shows infit indexes ranging from 0.83 to 1.20 and outfit indexes from 0.69 to 1.64. Infit indexes measure the consistency of responses for items that match the ability level of the respondents, while outfit indexes are more sensitive to unexpected responses, particularly those that are far from the respondents’ ability range.

According to Bond et al. (2020), person-fit indexes outside the 0.7 to 1.2 range suggest inappropriate measurement. In our sample, there is no case of infit, while, 21 students of 608 (less than 4 percent) had outfit indexes above 1.2, which could indicate random guessing or cheating. This minor anomaly suggests that the majority of the test-takers responded consistently and appropriately indicating that online tests, as described in this study, can be reliable and produce valid results.

3 . Discussion

Ensuring the security and fairness of online assessments remains a critical issue in modern education. With the increasing adoption of online learning, particularly following the COVID-19 pandemic, the issue of academic dishonesty has become more pronounced, especially in un-proctored online exams. The lack of physical oversight, coupled with the accessibility of online resources, presents a unique challenge in maintaining academic integrity (Sutherland-Smith 2016; Cantiello & Geschke, 2024).

This study explored several strategies to mitigate cheating during un-proctored online assessments, with the goal of creating a secure testing environment while preserving fairness. One of the strategies explored in this study was the use of a single, fixed assessment time. By scheduling the exam during a narrow, predetermined window, we can reduce the opportunities for collaboration and information-sharing among students. This approach aligns with findings from several studies that suggest synchronized testing times can effectively minimize cheating risks in online settings (Reddy et al., 2022; Sutherland-Smith, 2016; Noorbehbahani et al., 2022). For instance, Noorbehbahani et al. (2022) conducted a systematic review that found the restriction of exam availability to a fixed period significantly decreased opportunities for students to share answers. The synchronized timing also limits the ability of students to consult peers who may have already completed the test, further preserving the integrity of the exam.

Limiting the duration of the exam was another key strategy employed in this study. A time limit can serve to prevent students from seeking external help or conducting online research during the exam. Previous research supports this approach, indicating that time constraints are effective in encouraging students to rely on their preparation rather than searching for answers online (Jalilzadeh et al., 2024; Reddy et al., 2022). For example, Reddy et al. (2022) found that time-limited exams encouraged students to focus on their existing knowledge, rather than extending their time for research or collaborative cheating. However, the trade-off is that time-limited exams may not always accurately reflect a student's depth of understanding, particularly in subjects requiring complex analysis or creative problem-solving (Gernsbacher et al., 2020). Thus, while time constraints are valuable for limiting cheating, they must be carefully calibrated to avoid penalizing students who may need additional time to fully demonstrate their understanding.

The auto-submit feature, implemented in this study, ensures that all answers are submitted at the end of the allotted time, further reducing the potential for cheating. This feature is particularly useful in preventing students from exploiting system loopholes to gain extra time to complete the exam. Similar strategies have been discussed in the literature, with researchers like Mate & Weidenhofer, (2021) suggesting that auto-submit features help maintain the integrity of online exams by eliminating the possibility of time manipulation. Moreover, studies by Sabrina et al. (2022) emphasize that the uniform application of time limits across all students prevents any unfair advantage, ensuring equal conditions

for every test-taker. The auto-submit feature helps maintain these conditions, ensuring that no student can extend their testing time beyond the allocated duration.

Disabling backtracking and randomizing questions were additional strategies examined in this study. These measures prevent students from revisiting previous questions based on answers they may later encounter. The randomized presentation of questions is particularly effective in reducing the likelihood of answer-sharing, as it ensures that each student faces a unique sequence of questions. Previous studies have found that backtracking and question randomization are effective deterrents to cheating, particularly in multiple-choice and true/false tests (Taşkın, 2024; Sabrina et al., 2022). Taşkın (2024) demonstrated that randomizing both questions and answer choices significantly reduced the likelihood of students sharing answers during online exams, highlighting its importance as a strategy for protecting academic integrity.

Despite the effectiveness of these strategies, there are limitations and potential drawbacks that must be acknowledged. As discussed by Gernsbacher et al. (2020), the use of time-limited tests can be problematic, as they may not fully assess students' cognitive abilities. Time-limited assessments prioritize speed over depth, which may not be ideal for measuring higher-order thinking or comprehensive understanding, particularly in disciplines like literature or critical theory. In addition, while these time constraints help reduce cheating, they can also induce stress and anxiety in students, potentially affecting their performance negatively (Taşkın, 2024). This psychological impact of time pressure is well-documented, with several studies highlighting its role in increasing test-related anxiety and lowering overall performance (Mate & Weidenhofer, 2021).

Another issue that needs consideration is the potential technical difficulties that could arise when exams are scheduled at a fixed time. Internet connectivity issues, device malfunctions, or other technological barriers could disadvantage students, leading to unequal testing conditions. The issue of technical failure in online assessments has been highlighted in the literature as a significant concern (Sullivan, 2016). As suggested by Sabrina et al. (2022), it is essential for institutions to offer contingency plans, such as flexible exam rescheduling or alternative testing platforms, to mitigate these risks and ensure fairness for all students.

While this study focused on traditional strategies for mitigating cheating, there is potential for future research to explore innovative approaches, such as adaptive testing and AI-based proctoring systems. Adaptive testing, which tailors the difficulty of questions based on a student's performance, has gained attention as a way to both reduce cheating and improve the assessment of student knowledge (Iqbal, 2023). Additionally, AI-based proctoring systems, which use facial recognition and behavioral analysis to monitor students during online exams, are increasingly being adopted as a means of preventing cheating in un-proctored settings (Rodrigues et al., 2024). While these technologies offer promise, their ethical implications, including concerns about privacy and accessibility, must be carefully considered (Sullivan, 2016).

Academic dishonesty undermines consequential validity by distorting assessment outcomes, leading to misrepresentation of students' knowledge and abilities (Whitley & Keith-Spiegel, 2002). When cheating occurs, test results lose their reliability as accurate indicators of learning, which can result in flawed educational and policy decisions. Additionally, dishonesty shifts students' focus from learning to finding ways to manipulate the system, reducing intrinsic motivation and fostering unethical behaviors (Anderman & Murdock, 2007). Consequently, the intended positive outcomes of assessments, such as promoting genuine learning and fair evaluation, are compromised.

The presence of cheating in online or in-person assessments also challenges the criterion-related validity of tests. For instance, if students use unauthorized resources or collaborate illicitly, the assessment fails to predict their actual academic capabilities or future success in related fields. As noted by McCabe et al. (2001), if the results of a test are influenced by dishonesty, the test can no longer serve as a valid predictor of student learning or future performance in professional environments, such as in job settings that require the knowledge assessed.

To sum up, the relationship between academic dishonesty and consequential validity is complex and multifaceted. Academic dishonesty undermines the very purpose of assessments, distorting their ability to measure true learning and negatively impacting students' ethical development, motivation, and future success. The presence of dishonesty can diminish the fairness and integrity of the testing process, leading to biased results that fail to align with the educational goals of promoting genuine learning. To maintain the consequential validity of assessments, educational institutions must take proactive measures

to reduce academic dishonesty, implement fairer testing environments, and ensure that assessments align with broader educational values such as honesty, fairness, and equity.

4 Conclusion

This study demonstrates the effectiveness of several strategies designed to maintain the integrity of un-proctored online tests, particularly in assessing students' reading comprehension in an EFL context. By incorporating a combination of time-limited assessments, randomized questions, and other anti-cheating measures, the researchers have shown that it is possible to reduce opportunities for academic dishonesty while preserving the fairness of the testing process. Specifically, the following strategies were implemented:

- A single, predetermined exam time.
- A strict 40-minute time limit for the exam.
- Presentation of test items one at a time.
- Randomization of questions and answer options.
- Disabling of backtracking, preventing students from revisiting questions after submitting answers.
- Auto-submit upon time expiration to ensure timely submission.

The results of this study confirm that these strategies are effective in mitigating cheating during un-proctored online assessments. By controlling the testing environment through these measures, educators can create a more secure and equitable space for assessing students' knowledge. The alignment of the findings of this study with previous research (e.g., Noorbehbahani et al., 2022; Jalilzadeh et al., 2024) strengthens the argument that these strategies can be widely applicable in various online testing contexts.

The findings of this study offer several practical implications for educational institutions seeking to improve the security and fairness of online assessments. First, the adoption of time-limited tests with fixed assessment windows can help reduce the likelihood of students collaborating or engaging in dishonest practices. Additionally, strategies such as disabling backtracking, randomizing questions, and presenting one question at a time can further minimize the risk of cheating. These approaches are not

only cost-effective but can be implemented easily within most learning management systems (e.g., Moodle), making them accessible for a wide range of institutions.

Moreover, the study highlights the importance of balancing exam security with students' well-being. While the strategies tested here are effective in preventing cheating, time limitations and strict exam conditions can induce test-related stress, which may negatively impact performance, particularly for students with test anxiety or those facing technical difficulties. Educational institutions should therefore be mindful of these factors and consider offering accommodations or flexible testing conditions for students who may face challenges during online assessments. This could include providing alternative test-taking windows, offering extra time for students with documented learning differences, or offering a variety of assessment methods to cater to different learning needs (e.g., essay-based assessments or oral exams).

The present sample included university students from only one country. As such, the findings may not be generalizable to the population of EFL students, such as those from different educational backgrounds, age groups, or regions. Future research should include a more diverse sample to increase the external validity of these findings and explore how these strategies work in various educational settings, including high schools, vocational training institutions, and online degree programs.

Another limitation is that the study focused solely on reading comprehension assessments within an EFL context. While the strategies tested here were effective for this specific type of assessment, further research is needed to determine their applicability to other subject areas, especially those that involve higher-order cognitive skills such as critical thinking, problem-solving, or creativity. For instance, in subjects like mathematics, engineering, or the humanities, different assessment strategies may be required to evaluate deeper levels of understanding. It would be valuable to examine how these strategies work across different disciplines and assessment formats to develop a more comprehensive understanding of online testing integrity.

In addition, the use of technology to monitor and control online assessments is rapidly evolving. The potential integration of adaptive testing, which tailors question difficulty to a student's ability level, and AI-based proctoring systems, which can detect suspicious behavior during exams, could significantly enhance online test security. Future studies should explore these emerging technologies to understand

their effectiveness in preventing cheating while also considering ethical implications, such as privacy concerns and fairness in AI-based systems (Rodrigues et al., 2024). Moreover, exploring the potential for AI-driven plagiarism detection and behavioral analysis tools could further boost the security of online assessments.

While quantitative methods of cheating deterrence are important, interviewing the test takers to assess their perceptions of fairness, stress, and the impact of test conditions on their performance can offer valuable insights into the broader implications of these strategies. This could lead to a more holistic approach to designing online assessments that are both secure and supportive of diverse student needs.

Human Ethics and Consent to Participate

The data used in this study consists of students' final exam scores obtained from the English Department. These scores were collected in compliance with ethical research guidelines, safeguarding that participants' privacy and confidentiality. No personally identifiable information was included, and the data was used exclusively for research purposes to maintain ethical integrity. The data collection was done under the supervision of the Internal Review Board of English Department.

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