



Cheating at online formative tests: Does it pay off?

Ivo J.M. Arnold

Erasmus University, Rotterdam, The Netherlands



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ABSTRACT

Online testing has become a common way to organize formative assessment in higher education. When student participation is stimulated by grading formative tests that are held in an unproctored online environment, this raises the issue of academic dishonesty. In the literature, a debate is waged on the prevalence of cheating in unproctored online environments. The issue is whether online exams are invitations to cheat. We add to this literature by using the Harmon & Lambrinos (2008) and Jacob & Levitt (2003) approaches to detect cheating. Next, we go one step further by exploring whether cheating in online formative tests will do the suspected perpetrators any good. This is a non-trivial question, as students that cheat at formative tests forsake the opportunity to enhance their learning and may suffer the consequences in subsequent proctored summative tests. We investigate this using data from a large School of Economics in the Netherlands. We calculate a score that indicates the likelihood of cheating, based on unexpected grade patterns, and find that this score is negatively related to academic progress. Our evidence thus suggests that while cheating in online formative tests may happen, it does not seem to pay off.

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1. Introduction

Online learning in higher education has grown rapidly in recent years (Allen & Seaman, 2011). This development has raised the interest in the validity of online assessment. A large literature has emerged on online assessment, covering both formative and summative testing. The review by Gikandi, Morrow, and Davis (2011) concludes that online formative assessment improves learner engagement. Online formative assessment can be instrumental in providing timely feedback to the learner, which is shown to have positive effects on learning (Hattie & Timperly, 2007). The effectiveness of online assessment depends on a number of issues, including validity, reliability and dishonesty (Gikandi et al., 2011; Oosterhof, Conrad, & Ely, 2008). The latter issue is non-trivial, as Hard, Conway, and Moran (2006) report a widespread belief among educators that academic misconduct is on the rise. The absence of face-to-face contact fosters concerns that online assessment is particularly conducive to cheating (Fontaine, 2012; McNabb & Olmstead, 2009).

This paper focuses on dishonesty in online formative assessment. Formative assessment aims to improve learning by providing regular feedback during a course (Hargreaves, 2008). In contrast, summative assessment measures learning at the end of the course. Summative assessment makes use of grading to certify whether academic objectives have been reached. Grading is controversial in formative testing, as chasing grades may distract from deep learning (Wolsey, 2008). However, Smith (2007) and Duers and Brown (2009) find that grading formative assessment stimulates students to pay attention. In practice, the boundary between both types of assessment is not sharp, as formative assessment may serve summative objectives and vice versa (Gikandi et al., 2011). Formative assessment in an unproctored online environment

enables frequent testing in a cost-effective manner (Young, 2001). By stimulating learner engagement and providing quick feedback, it can be used to reduce academic procrastination.

Procrastination is widely prevalent in higher education. A majority of students report postponing academic tasks and engaging in distractions (Grunschel, Patrzek, & Fries, 2013; Schouwenburg, 1995). Survey evidence indicates that procrastination leads to stress and lower grades (Tice & Baumeister, 1997). Temporal Motivation Theory (TMT) (Steel & König, 2006) aims to integrate related motivational theories in order to understand procrastination. TMT stipulates that a person's motivation to perform a task is positively related to the expectancy of being able to complete the task and to the value of having completed the task. The motivation is negatively related to a person's impulsiveness and to the opportunities to delay working on the task. TMT shows how frequent online formative testing may reduce academic procrastination. It shrinks the time window between instruction and assessment and thus reduces delay. Through grades or other feedback, students will be rewarded for their participation (value) and may feel more confident about their ability to master the material (expectancy). However, stimulating student participation using grades raises the issue of dishonesty. Online assessment opens up a number of opportunities to cooperate, ranging from collaborative learning to outright cheating, whereby students use forbidden resources or engage a more competent outsider to take the test on his or her behalf.

The focus of the existing literature is on the identification of cheating and the proper design of online assessment to reduce cheating. We add to this by applying two different approaches. First, we try to detect cheating using the model of Harmon and Lambrinos (2008), which relates scores on (un)proctored tests to student characteristics. Second,

we apply Jacob and Levitt's (2003) algorithm for identifying suspected patterns in grade data. The latter approach enables us to calculate scores of the likelihood of cheating for individual students.

The main goal of this paper is to move the issue of cheating beyond identification. We aim to answer the question whether cheating pays off to the perpetrator. In the context of formative testing, an affirmative answer is not self-evident. By cheating at online formative tests, students forsake learning opportunities in exchange for a high score on a small component of the course grade. This is a short-sighted strategy, when the lack of learning is subsequently revealed at proctored summative exams. By cheating at unproctored online formative tests, a student risks falling behind students who take these tests seriously. In this case, one would expect cheating at online tests to be self-defeating. We test this hypothesis by relating the Jacob and Levitt (2003) score to academic survival using a logistic regression model. Our hypothesis is that a higher score leads to a lower chance of survival. We separately investigate the relationship between the Jacob and Levitt (2003) score and students' performance on courses which do not use formative testing. If a student's inclination to cheat signals a bad study attitude or motivation, high scores will be negatively related to the grades for these courses.

We recapture our research questions as follows:

- (1) Is cheating more prevalent in unproctored online formative testing than in proctored formative testing?
- (2) What is the effect of cheating at unproctored online formative testing on academic survival?
- (3) What is the effect of cheating at unproctored online formative testing on academic performance in other courses?

We investigate our research questions using a cohort of over 400 first-year students from a large research university in The Netherlands. Our findings suggest that while cheating in online formative tests may happen, it does not seem to pay off. The next section provides a brief overview of the relevant literature. Section 3 describes the setting, the data and the methodology. Section 4 reports the empirical results. Section 5 concludes.

2. Literature review

The recent literature on dishonesty in online assessment is small and has not produced a consensus on the scale of the problem. In the older literature on cheating in general, estimates of the prevalence of academic dishonesty range from 9% to 95% (Whitley, 1998). A number of studies report on the determinants of cheating (Passow, Mayhew, Finelli, Harding, & Carpenter, 2006; Nowell and Laufer (1997). Other studies investigate the effectiveness of measures to reduce cheating, such as proctoring and the use of multiple test versions (Kerkvliet & Sigmund, 1999).

A widespread belief holds that online cheating will more prevalent than traditional forms of cheating, due to the lack of face-to-face contact between student and teacher (Kennedy, Nowak, Raghuraman, Thomas, & Davis, 2000; McNabb & Olmstead, 2009; Fontaine, 2012). In an unproctored online test environment, identification of the student is not feasible. It is also impossible to verify the extent of collaboration and the use of learning resources (Harmon & Lambrinos, 2008; Khare & Lam, 2008). The circumstance that an unproctored online test offers easier opportunities to cheat does not necessarily imply that students take advantage of these opportunities. Oosterhof et al. (2008) argue that academic dishonesty is not a big issue in online formative assessment, especially when instructors clearly explain the purpose of the test (Gaytan & McEwen, 2007). Moreover, the authenticity of the formative assessment will improve students' commitment and reduce the likelihood of cheating (Duers & Brown, 2009; Oosterhof et al., 2008). Khare and Lam (2008) suggest a relationship between maturity and

cheating. Postgraduate students will be more intrinsically motivated to master a specialization and thus be less tempted to cheat than undergraduates.

A number of studies find that faculty concerns about academic dishonesty are related to familiarity with online instruction. Kennedy et al. (2000) report that instructors' experience in teaching online courses reduces their concerns about online cheating. This is in line with Yates and Beaudrie (2009), who find that most objections to online assessment come from teachers without online teaching experience. Evidence from student surveys is mixed. Charlesworth, Charlesworth, and Vivican (2006) find that 40% of students think that cheating will be more prevalent with online assessment, while 42% think that there will be no difference with traditional assessment. Harmon, Lambrinos, and Buffolino (2010) find that 59% of respondents think that there is no difference between cheating in online and face-to-face assessment. As with instructors, having participated in an online course reduces the belief that online teaching is more conducive to cheating (Kennedy et al., 2000). Grijalva, Nowell, and Kerkvliet (2006) report a similar level of cheating in online and face-to-face assessment using a survey of 796 students. Based on self-reported behavior, Stuber-McEwen, Wisely, and Hoggatt (2009) find that online students are less likely to cheat. In contrast, Watson and Sottile (2010) report that during online tests, more students obtain their answers from fellow-students. Yet they conclude that "cheating in online classes is no more rampant than cheating in live classes". Finally, Stephens, Young, and Calabrese (2007) report evidence that students participating in unproctored online tests are more likely to use unpermitted notes during the exam. These mixed findings thus do not yield firm conclusions.

A number of studies investigate cheating using statistical models. Hollister and Berenson (2009) examine the effect of moving from a proctored to an unproctored test environment and find no evidence of cheating. Harmon and Lambrinos (2008) employ a model that was previously used in Anderson, Benjamin, and Fuss (1994), Brown and Liedholm (2002) and Coates, Humphreys, Kane, and Vachris (2004). They compare the explanatory power of variables measuring students' human capital for the test results of two online courses. One course uses an unproctored test, the other a proctored test. Absent cheating the explanatory power of these variables should be similar across the courses. Cheating would sever the link between the human capital variables and the test results and reduce the explanatory power. They report substantially lower *R*-squared statistics for the unproctored test, suggesting the presence of cheating. In contrast, Yates and Beaudrie (2009) fail to detect a significant difference between grades on proctored and unproctored exams. Englander, Fask, and Wang (2011) provide a critique of their methodology. Beck (2014) uses a model similar to Harmon and Lambrinos (2008) but reaches an opposite conclusion. According to Beck (2014), the conflicting evidence may be due to the selection of control variables and the design of online testing. Both Beck (2014) and Harmon and Lambrinos (2008) use small samples. The number of observations varies between 19 and 80 students per test.

The current study takes the Harmon and Lambrinos (2008) model as a starting point. In contrast to earlier research, we employ a much larger dataset with over 500 observations per test. We apply the model in two ways. First, similar to Beck (2014) and Harmon and Lambrinos (2008), we compare the results for proctored and unproctored tests using a model that includes human capital variables. Second, we relate the result for the summative test to the result for the (un)proctored formative test. Our hypothesis is that in the presence of cheating, the formative test scores are more loosely connected to students' performance on the summative test. We next aim to detect cheating at the level of individual students by adapting the Jacob and Levitt (2003) algorithm to spot unexpected grade patterns. This yields a score which is suggestive of cheating at the student level. We finally use a logistic regression model to relate this score to academic survival.

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