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Résumé de l'article

Detecting and combating plagiarism from Web-based sources is a concern for administrators and instructors involved in online distance education. In this paper, we quantify copy-and-paste plagiarism among adult learners in an online geography course offered through Penn State's World Campus Geographic Information Systems (GIS) certificate program. We also evaluate the effectiveness of an "expectation management" strategy intended to discourage adult learners from unintentional violations. We found that while manual methods detected plagiarism in only about 3 percent of assignments, Turnitin.com revealed a 13 percent plagiarism rate among the same assignments. Our attempts to increase awareness and manage expectations decreased infractions measurably, but not significantly. In contrast, Turnitin.com substantially improved our ability to detect infractions. We conclude that raising awareness and managing expectations about plagiarism may be worthwhile, but is no substitute for systematic detection and vigilant enforcement, even among adult learners.

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Plagiarism by Adult Learners Online: A case study in detection and remediation

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Abstract

Detecting and combating plagiarism from Web-based sources is a concern for administrators and instructors involved in online distance education. In this paper, we quantify copy-and-paste plagiarism among adult learners in an online geography course offered through Penn State's World Campus Geographic Information Systems (GIS) certificate program. We also evaluate the effectiveness of an "expectation management" strategy intended to discourage adult learners from unintentional violations. We found that while manual methods detected plagiarism in only about 3 percent of assignments, Turnitin.com revealed a 13 percent plagiarism rate among the same assignments. Our attempts to increase awareness and manage expectations decreased infractions measurably, but not significantly. In contrast, Turnitin.com substantially improved our ability to detect infractions. We conclude that raising awareness and managing expectations about plagiarism may be worthwhile, but is no substitute for systematic detection and vigilant enforcement, even among adult learners.

Keywords: Plagiarism; academic integrity; cheating; online; e-learning; adult education

Introduction

Educators have always been concerned with upholding standards of academic integrity among individuals engaged in scholarly pursuit. For many institutions of higher learning, academic integrity is viewed "as a basic guiding principle for all academic activity" (Penn State University Faculty Senate, 2000). Members of intellectual communities, such as universities, are expected to value honesty, trustworthiness, and civility and to behave accordingly (McCabe and Pavela, *n.d.*; Princeton University, 2003; York University,

2005). These standards of behavior are meant to ensure "that work done is one's own and that the work of others is properly recognized" (College of Agricultural Sciences, 2005). As a basic tenet of scholarly activity, educators have a responsibility to foster and maintain standards of academic integrity, which requires engaging students in the development of moral reasoning (Kohlberg and Hersh, 1977). One approach to effective maintenance of standards and the advancement of students' moral development is the detection and remediation of specific violations.

Plagiarism is one type of violation of academic integrity. The Council of Writing Program Administrators states that "Plagiarism occurs when a writer deliberately uses someone else's language, ideas, or other original (not common-knowledge) materials without acknowledging its source" (as cited in Quinn, 2006). With the proliferation of digital source material on the Web, plagiarism has received renewed attention, particularly among administrators and instructors involved in online distance education (Groark, Oblinger, and Choa, 2001; Heberling, 2002; Hickman, 1998). Some observers believe that the Internet makes it easier for students to plagiarize (Harris, 2004; Saulnier, 2005). Underwood and Szabo (2003) find that students with more exposure to Internet use in assignment preparation self-reported greater willingness to engage in copy-and-paste plagiarism (i.e., copying word-for-word without citing the source). Hinman (1999) goes so far as to suggest that we soon will witness an increase in academic dishonesty as universities offer more courses through online distance education.

As instructors of an online distance education course, we share these concerns and chose to examine the extent of Internet plagiarism in five offerings of our online course between July 2003 and June 2004. Our course requires students to be active Internet users, including creating an online portfolio in which they post their assignments as webpages. This paper presents the results of our investigation of plagiarism prevalence, detection, and remediation among adult learners in an online course. We focus specifically on copy-and-paste plagiarism, the copying of another author's language word-for-word without proper citation.

The paper is organized in the following way. First, we offer an interpretation of the definition of plagiarism and explain its impact on quantifying, detecting, and preventing infractions. Second, we describe our online course, convey our expectations regarding plagiarism among adult learners, and explain our focus on the copy-and-paste variety. Third, we discuss the methods used. Fourth, we present the results of our study which include quantifying the actual rates of plagiarism among assignments prepared by students, comparing plagiarism rates obtained using two different methods of detection, and evaluating the efficacy of explicit plagiarism instruction to reduce infraction rates. Finally, we discuss the implications of our results and recommendations for maintaining academic integrity standards.

Defining and Identifying Plagiarism

The Council of Writing Program Administrators' definition of plagiarism reveals several contingencies which complicate the enforcement of academic integrity in higher

education, particularly in regards to adult education. Intentionality is one contingency. Writers' uses of the works of others are not always deliberate. Infractions may result from mismatches between the ethical norms of the academy and the workplace (Martin, 1994), or simply from hasty and incomplete adaptation of passages copied and pasted from digital sources for reference purposes. Some might consider the latter an example of poor writing rather than plagiarism because it did not involve intentional cheating. Nonetheless, it is difficult to ascertain intentionality through detection except in extreme cases. (Extreme cases would include copying entire or large portions of papers written by someone else or papers purchased from term paper mills.) Lack of proof of intentionality may reduce the penalties for offenders, but detecting writing that gives the impression of being plagiarized remains important for offering instructive remedies. Unintentional violations of the rules do not mean that plagiarism has not occurred.

Regardless of the degree to which an infraction is intentional or substantial, plagiarism violates an original author's intellectual property rights. The "fair use" provision of US copyright law does allow quotations and paraphrasing of original works without authors' permission. When original authorship is not properly acknowledged, however, such uses constitute copyright infringement.

A second contingency is the degree of culpability. Researchers have identified different forms of plagiarism (Cabe, n.d.; Martin, 1994). Copying another writer's language (e.g., directly quoting word-for-word several sentences of common-knowledge materials) or poor paraphrasing (e.g., substituting a few synonyms for original text without significantly changing it) may be judged less substantive infractions than an attempt to pass off someone else's idea as one's own. Some educators suggest that concern with plagiarism should be more about teaching students to appreciate the development of knowledge, acknowledge intellectual contributions of other scholars, and represent the process of building on existing knowledge in academic writing and less about violating rules and copyright laws (Howard, 2003; Hunt, 2003; Martin, 1994).

Because academic integrity involves the development of behavior that reflects moral values, educators' responsibility for addressing plagiarism may go beyond shielding students from copyright infringement. Students whose use of other authors' works is constrained only by the perceived risk of detection and punishment may fail to recognize the relevance of the rights of others (Kohlberg and Hersh, 1977). By seeking more than mere compliance with what may seem to students to be arbitrary rules, therefore, educators enforce academic integrity in order to advance students moral development (Dark and Winstead, 2005). These considerations, which complicate the identification of plagiarism and enforcement of standards, affect instructors' ability to quantify, detect, and prevent incidences of plagiarism. The following sections review previous research on these three issues.

Quantifying Plagiarism Prevalence

Previous studies report widely varying percentages of cheating prevalence (Crown and Spiller, 1998; Ercegovac and Richardson, 2004; Lathrop and Foss, 2000; Whitley, 1998).

Crown and Spiller (1998) attribute this to variation in the measurement of cheating along three dimensions: actual observance versus self-reporting of instances, type of cheating behavior evaluated, and time period in which cheating occurred. First, most research quantifies cheating by means of self-reporting in student surveys (CAI research, 2005; Ercegovac and Richardson, 2004; Whitley, 1998). Actual observations of cheating produce different results, usually much lower estimates of prevalence (Crown and Spiller, 1998; Karlins, Michaels, and Podlogar, 1988). Second, Whitley's 1998 review of the literature on college cheating indicates that cheating behavior is most frequently defined as cheating on examinations followed by estimates of total cheating, cheating on homework, and plagiarism. Estimates of total cheating typically include a variety of types of cheating behavior (e.g., copying from another student's exam or quiz; using notes during an exam; turning in a paper written by someone else; falsifying citations; failing to cite source material; unauthorized collaboration on homework (McCabe and Trevino, 1996). The wide range of cheating rates reported in the literature (i.e., from 9 to 95 percent of students for total cheating and from 3 to 98 percent for plagiarism as reported in Whitley (1998) suggests that the type of cheating behavior explains some of the variation in incidence levels (Crown and Spiller, 1998). Third, the bounding time frame for incidence occurrence, either for observance or survey self-reporting of cheating behavior, affects prevalence rates. Incidence rates for cheating on homework assignments over the course of a semester will differ from rates of plagiarism on one assignment or self-reporting of any incident of cheating during a college career (Crown and Spiller, 1998).

Less common in the literature are studies that examine the prevalence of plagiarism separately from other forms of cheating (Whitley, 1998). Most assessments of the prevalence of plagiarism alone among students rely on self-reporting in surveys (CAI research, 2005; Ercegovac and Richardson, 2004; Scanlon and Newman, 2002). Such surveys are often conduced within individual universities (Ercegovac and Richardson, 2004), but a few studies sample from multiple universities (CAI research, 2005; Scanlon and Newman, 2002). A few studies measure actual rates of plagiarism detection among student assignments as a way to gage prevalence (Braumoeller and Gaines, 2001; Karlins, Michaels, and Podlogar, 1988; Soto, Anand, and McGee, 2004). Given the effort involved in systematic cheating detection, studies reporting observed rates assess fewer plagiarism types, shorter time frames, and smaller samples of students or assignments at a single university. This may reflect the finding that instructors are reluctant to report student cheating and therefore have no desire to set up systematic procedures for detecting it (CAI Research, 2005; Ercegovac and Richardson, 2004). Table 1 summarizes the research on actual plagiarism rates. Differences in the types of plagiarism detected may account for some of the variation in plagiarism rates obtained in the three studies.

Table 1. Summary of studies quantifying actual plagiarism rates

Study	Plagiarism rate*	Sample size (*n*) (students)	Type of plagiarism	Time frame (semesters)	Number of classes & assignments
Karlins et al. 1988	3%	666	Verbatim copying & poor paraphrasing from previously submitted student papers.	2	1 (1)
Braumoeller and Gaines 2001	13%	151	Verbatim copying & poor paraphrasing from Web sources.	1	2 (1)
Soto et al. 2004	21%	220	Verbatim copying & poor paraphrasing from all available sources.	1	3 (1)

' *Figures have been rounded to whole percentages.

Detecting Plagiarism

Instructors' ability to detect plagiarism has improved dramatically in the last decade. Prior to widespread use of the Internet, detection was limited to the manual efforts of instructors. For example, in the Karlins, Michaels, and Podlogar (1988) study, two people manually compared papers submitted during the current and preceding semester that contained citations of the same sources for verbatim copying or poor paraphrasing. Today, increased Internet use makes it both easier for students to copy-and-paste from online materials and for instructors to detect infractions (Braumoeller and Gaines, 2001; Tenbusch, 2002). Free online search engines such as Google allow instructors to track down copied phrases, while commercially available plagiarism detection software and online services (e.g., EVE; Turnitin.com) compare individual student papers to Web documents and/ or to essay databases to find and report instances of matching text. 1

The two recent studies discussed above used commercially available technology to quantify rates of plagiarism. Braumoeller and Gaines (2001) made use of EVE (Essay Verification Engine) software, while Soto, Anand, and McGee (2004) used Turnitin.com, an online detection service. (Rather than selling software, Turnitin.com sells

subscriptions to its search engine services.) Soto, Anand, and McGee (2004) used Turnitin.com to catch Web plagiarism and checked sources from students' bibliographies for plagiarism from articles not available on the Web, while Braumoeller and Gaines (2001) examined Web sources only.

We compared our ability to detect Internet plagiarism within our students' assignments using two different methods. This allowed us to evaluate and compare the effectiveness of automated and manual methods of plagiarism detection.

Preventing Plagiarism

While recognizing the importance of plagiarism detection, we are also interested in prevention. Our own experience with student infractions supports the conclusion of Center for Academic Integrity (CAI) researchers that many students have yet to develop a clear sense of appropriate Internet use in written assignments (CAI research, 2005). Other researchers found actual observed infractions to be associated with a lack of knowledge about plagiarism (Soto, Anand, and McGee, 2004). Many educators view explicit plagiarism instruction as the best means of prevention (Conradson and Hernandez-Ramos, 2004; Harris, 2004; Vernon, Bigna, and Smith, 2001). Recent case study research provides support for the effectiveness of incorporating plagiarism instruction into individual courses. Soto, Anand, and McGee (2004) found that students who received no explicit plagiarism instruction plagiarized twice as often as those who participated in active instructional activities such as class discussions of definitions of plagiarism, review of Turnitin.com plagiarism reports, and exercises requiring students to identify instances of plagiarism in example essays. We also tested the impact on infraction rates of providing explicit plagiarism instruction in the form of an expectation management strategy introduced prior to students' preparation of assignments.

Case Study

We analyzed 429 assignments prepared by students[2] enrolled in five sections of Geography 482: The Nature of Geographic Information between July 2003 and June 2004 for signs of plagiarism.[3] Geography 482 is a required first course in both the Post-baccalaureate Certificate and Master of Geographic Information Systems (GIS) degree programs offered by Penn State's Department of Geography and delivered through the University's World Campus. The course has been offered four times a year since 1999, attracting 40 to 100 students per offering. The purpose of the course is to introduce students to the field of GIS and to orient them to online learning. Students meet the latter objective by creating and maintaining a webpage portfolio (e-portfolio) of their course assignments.

Enrollees tend to study part-time while maintaining full-time employment.[4] Ages of students enrolled during the study period ranged from 25 to 87; the median age was 41

years. Students were located throughout the US and to a lesser extent the world. Sixty-six percent were male. Most had undergraduate degrees obtained through previous higher education.[5] Many were practicing GIS professionals seeking formal education in geography and GIS in support of career advancement. Others pursue the certificate in hopes of entering the field.

Plagiarism Among Adult Learners

Our course is populated primarily by part-time returning adult students. Our initial assumption was that the adult learners in our course would be less likely to plagiarize and more likely to have received instruction about academic integrity through previous education. Studies of the demographic characteristics of students support this assumption with evidence that age is associated with lower levels of cheating (Whitley, 1998). A closer look at the specific definitions of cheating used in studies, however, suggests this association is not true for plagiarism, which was defined as having "intentionally used someone else's ideas or words as your own" (Roberts, Anderson, and Yanish, 1997). Even though cheating is less acceptable to older, post-baccalaureate students, there is other evidence that graduate students still engage in cheating (Brown, 1995; Love and Simmons, 1998). These studies indicate that graduate students cheat for the same reason that undergraduates do: to get good grades when they do not study enough to earn them on their own. We found in our course that students experienced an additional financial pressure to attain grades of at least a B, as many of their employers reimburse them for the cost of the course only under that condition. While older students may be less likely to engage in cheating, this may not apply to plagiarism specifically and there are additional situational factors that may counter the demographic trends.

Copy-and-Paste Plagiarism

Even though evidence to date provides mixed support for the idea that levels of college student plagiarism, and cheating generally, are rampant and increasing (Crown and Spiller, 1998; Lathrop and Foss, 2000; McCabe and Trevino, 1996; Whitley, 1998); nonetheless, student responses to survey questions about Internet plagiarism are cause for concern. The Center for Academic Integrity (CAI) reports results from their survey of approximately 50,000 students at more than 60 universities that students believe:

> *'cut & paste' plagiarism – using a sentence or two (or more) from different sources on the Internet and weaving this information together into a paper without appropriate citation – is not a serious issue. While 10 percent of students admitted to engaging in such behavior in 1999, almost 40 percent admit to doing so in the Assessment Project surveys [2002-5]. A majority of students (77%) believe such cheating is not a very serious issue* (CAI research, 2005).

Another survey of college student attitudes towards Internet plagiarism reveal that nearly 90 percent (of 698 students at nine universities) agree that copying and pasting text from Internet or traditional sources without proper citation is wrong, but close to 25 percent admit having used Internet sources in this manner anyway (Scanlon and Neumann, 2002). This same study found that students perceived their peers to be guilty of copying and pasting text from Internet sources at a much higher rate (almost 88 percent). In a 2005 survey of undergraduate students at Penn State, 28 percent of respondents reported their belief that plagiarism occurs in many courses, while 14 percent said they knew at least one person who had plagiarized a paper (Penn State Information Technology Services, 2005).[6] No data are available for the thousands of adult professionals who participate in certificate and degree programs online through the University's World Campus.

In our course, copying and pasting text from Internet websites was the form of plagiarism that students were most likely to engage in, given the requirements for the assignments. We selected two of three project assignments to examine for signs of plagiarism. Students post project reports in their e-portfolios. Project 1 required students to compare three geospatial coordinate systems (i.e., grids that enable the specification of particular locations on the earth's surface) and to describe a map they create using an online mapping tool. Project 3 involved investigating a method or technology used to collect and analyze geographic information. We eliminated the second assignment from our study because it did not require students to review literature extensively. We were concerned with copy-and-paste plagiarism in this introductory course because assignments did not ask students to make evaluative or critical arguments, nor were they required to make original research contributions.

Methods

This study investigated three aspects of plagiarism. The first objective was to quantify actual rates of copy-and-paste plagiarism in student assignments. The second objective was to compare our ability to detect plagiarism manually with automated methods provided by plagiarism detection software. Manual methods were used during the process of grading the assignments during each of the course offerings. After the completion of the courses, the assignments were reevaluated for plagiarism using an automated detection service. The third objective was to contrast assignments prepared by students who were given minimal plagiarism instruction to assignments completed by those receiving explicit instruction. This before-and-after comparison revealed the extent to which explicit instruction reduced occurrences of plagiarism.
Quantifying plagiarism using manual detection

In instructions for the course assignments, plagiarism was defined generally as the unacknowledged use of ideas, words, or illustrations produced by other authors. Students were given a link to the definition of plagiarism used by Penn State's College of Earth and Mineral Sciences (College of EMS, 2002):

> *The fabrication of information and citations; submitting other's work from*
> *professional journals, books, articles, and papers; submission of other*

> *student's papers, lab results or project reports and representing the work*
> *as one's own; fabricating in part or total submissions and citing them*
> *falsely; purchasing or copying papers from Web; etc.*

During the process of grading, each assignment was evaluated for upholding principles of academic integrity using manual methods for plagiarism detection. The grader looked for common signs of copy-and-paste plagiarized work: inconsistent citation styles, lack of citations in long passages, awkward formatting, use of dated language, use of difficult vocabulary and terminology, and irregularities of diction and style (Harris, 2004). Suspect text was checked against work cited in bibliographies and through Google searches for copied phrases and sentences. We employed a strict standard for classifying text as plagiarized. An assignment was considered to contain plagiarism if it included: 1) at least one sentence copied verbatim from an online source without the inclusion of quotation marks and a citation or; 2) two or more poorly paraphrased sentences that also lack citations. In the second case, poor paraphrasing was identified as sentences including too many of the author's actual words or phrases and/ or the author's original sentence structure.

We did not check printed materials as sources of plagiarism for several reasons. First, students were encouraged to use Web resources because one objective of this orientation course is Internet literacy. Second, students did not have required readings from printed materials as all of the course lecture material was online and served as the textbook for the course. Third, we recommended specific webpages from reputable organizations – pages which did a good job of citing sources – for their use in assignments. In addition, Braumoeller and Gaines (2001) found that printed sources may be detected indirectly through direct quotations included on webpages and in online articles. Nonetheless, there is a small chance that by excluding printed materials our analysis underestimates the amount of plagiarism.

Quantifying Plagiarism Using Automated Detection

To obtain a second measure of plagiarism, we re-analyzed the same set of assignments using Turnitin.com, an online detection service. We evaluated several plagiarism detection software packages and services before deciding on Turnitin.com. Most of these providers offer free demonstrations.[7] Turnitin.com met several of our needs: it is easy to use, it accepts papers in HTML format, and it allows for selected websites to be excluded from searches, a feature we needed so that the search did not simply match our students' papers to their own postings of their papers in their e-portfolios, which were publicly available webpages.

We used the same criteria described above for classifying text as plagiarized for both manual and automated methods of detection. We are reasonably confident that manual and automated methods detected copy-and-paste plagiarism in a similar fashion because all of the papers identified as containing plagiarism using manual methods also were detected using Turnitin.com. The automated reports generated by Turnitin.com calculate

a percentage of copied text, but we did not use these measures in our determination of plagiarism.[8] Instead, we looked at each report and the text from original sources in side-by-side comparisons. This is because Turnitin.com cannot distinguish automatically between plagiarized text and properly cited direct quotations. Instructors must interpret the results documented in the reports, which can still be quite time-consuming. Nonetheless, Turnitin.com speeds up the process of finding copied text and finds it through more systematic searching than can be undertaken using manual methods. Evaluating the impact of expectation management on plagiarism prevention

We consider communicating the principles of academic integrity to be one component of establishing high expectations in the classroom, a quality Chickering and Gamson (1987) associate with excellence in teaching. From the time our course was first offered, we directed students to properly cite source materials in their written assignments and provided a link to the College's website on academic integrity. After several offerings of our course, during which we employed manual methods for detecting plagiarism, we noticed that a small percentage of our returning adult students sometimes violated standards of academic integrity in their written assignments, an issue we had not anticipated given their age and education levels. Students who plagiarized on the first assignment were given an explanation of their violation, including links to the sources from which they copied text without attribution. They were given a chance to revise and resubmit their papers for a new grade. They were not penalized because all students (who earned lower than an A) were given the opportunity to revise and resubmit Project 1 for re-grading, a standard practice for the course. For Project 3, students were not permitted to revise and resubmit, so students who plagiarized on the third assignment were penalized at least one letter grade depending on the number of instances of plagiarism within the assignment. In working with students to address the infractions on Project 1, we discovered that many were unfamiliar with standards for paraphrasing, quoting, and citing sources, and moreover, did not expect us to insist on these standards, despite our reference to university policies. We did not find any instances where students had clearly intended to cheat by handing in an assignment prepared by another student in a previous offering of the course. Therefore, our penalties were not as severe as those authorized by Penn State (College of EMS, 2002).

Because the reference to university policies alone did not prevent violations of academic integrity, we developed an expectation management strategy to better communicate our expectations with regard to plagiarism. We developed guidelines, customized to our course, for proper citation of text and graphic source material in student assignments.[9] In addition, we ensured that students adhere to those guidelines by requiring them to pass an academic integrity quiz to unlock instructions for project assignments.[10] The guidelines and quiz together constitute our expectation management strategy. Research linking carefully designed instruction about plagiarism to fewer infractions (Soto, Anand, and McGee, 2004) and to increased student recognition of the seriousness of infractions (Brown and Howell, 2001) supports the effectiveness of including such preventative strategies. We choose to test the effectiveness of the strategy by comparing plagiarism rates before and after its implementation.

Results

The use of an automated plagiarism detection service noticeably improved our ability to find and document instances of copy-and-paste plagiarism. The rate of plagiarism obtained using each method of detection is summarized in Table 2. Manual detection missed nearly 4 in 5 cases of plagiarism.

Table 2. Comparison of plagiarism rates

Detection method	Plagiarized assignments	Percent of total assignments plagiarized ($n = 429$)
Manual	12	2.8%
Automated	55	12.8%

Manual methods enabled detection of papers containing high levels of plagiarism, such as a paragraph copied word-for-word. Detection using Turnitin.com was more exact, uncovering instances where students copied just one sentence or several long phrases word-for-word. Compared with manual methods, the Turnitin.com search engine proved to be more systematic in searching the Web and precise in matching assignment text to its original source.

While Turnitin.com increased our plagiarism detection abilities appreciably, the expectation management strategy only marginally reduced rates of plagiarism. We observed a 3.5 percent decrease after its implementation, but this improvement was not statistically significant ($?2[1] = 1.148$, $p > 0.05$) (Table 3). We did not find any difference in the number of pre-quiz and post-quiz repeat offenders (students who plagiarized on both assignments) using Turnitin.com for detection. We did find, however, that of the five students caught (using manual detection methods) and penalized for using plagiarized material on the first assignment, none repeated the violation on the third assignment.

Table 3. Results of Chi-square test*

	Plagiarized	Non-plagiarized	Total	% of total plagiarized
Before quiz	27	155	182	14.8%
After quiz	28	219	247	11.3%
Total	55	374	429	12.8%

* The distribution is not significant $\chi^2[1] = 1.148$, $p > 0.05$.

Discussion

Plagiarism prevalence

Our finding of a 13 percent rate of plagiarism is in line with rates obtained from other studies that measured actual infractions (see Table 1 above). Given that previous studies quantified plagiarism among traditional undergraduate students, we also conclude that plagiarism rates among adult learners may not be lower than those for younger students. Additionally, our finding of a relatively low rate of plagiarism supports the notion that self-reported rates from survey questionnaires are likely to be higher than those obtained through actual detection of plagiarism (Crown and Spiller, 1998; Karlins, Michaels, and Podlogar, 1988). Instructors and researchers should heed the warnings of Crown and Spiller (1998) and make sure to account for the important bounding conditions of prevalence studies in their interpretation of rates.

Detection method

The use of Turnitin.com improved our ability to detect cut-and-paste plagiarism measurably. While the automated process of checking papers was not necessarily faster than manual checking, it was certainly more thorough, enabling us to adhere and enforce to a stricter definition of plagiarism. We did not use Turnitin.com during the initial grading of these assignments, but we have incorporated its use into recent offerings of the course by making it part of the grading criteria presented to students. Braumoeller and Gaines (2001) found a benefit to informing students of the use of Turnitin.com prior to student submission of assignments. They suggest that actual checking for plagiarism using Turnitin.com followed by grade penalties for infractions serve as a deterrent to would-be plagiarizers in a way that verbal and written warnings do not.

While our findings lead us to conclude that plagiarism search engines are effective assessment tools, some questions remain about their robustness. Braumoeller and Gaines (2001) specifically tested the detection accuracy of EVE software with a test paper known to contain plagiarism by running the paper through the system three times. They found substantial variation in the rates of copied text reported with each search and documented instances where known plagiarized material was not detected. We did not test the robustness of Turnitin.com, but based on our experiences with false positives (see note 8), we agree with Braumoeller and Gaines's conclusion that the search engine should be used to facilitate further inspection of suspect papers. Nonetheless, we believe the automated methods to be superior to manual ones, at least for copy-and-paste forms of plagiarism.

Plagiarism prevention

We did not see a significant reduction in plagiarism with the use of our expectation management strategy. Nonetheless, there was a small improvement in accordance with previous research that documents significant improvement (Soto, Anand, and McGee,

2004). We view expectation management as generally good practice, especially considering evidence that associates a lack of knowledge about plagiarism with higher rates of incidence (Soto, Anand, and McGee, 2004) and with student anxiety about committing offenses unintentionally (Ashworth, Bannister, and Thorne, 1997). By using an academic integrity quiz to assess student understanding, we go beyond basic written (or verbal) instruction, which by itself produces marginal, if any, deterrence to plagiarizing (Braumoeller and Gaines, 2001) and is not likely to provide the kind of instruction that furthers students' moral development.

We concede that our expectation management strategy does not provide students with a complete understanding of the dimensions of plagiarism nor a full appreciation of the role of proper citation in the development of knowledge and intellectual pursuit. Nonetheless, we do believe that the expectation management strategy combined with detection and enforcement using Turnitin.com emphasizes to students the importance of academic integrity and reinforces the values of institutions of higher education.

Conclusion

Educators are keenly interested in ways to assure the academic integrity of their students' work. This fact was highlighted for us while working with colleagues at Leeds University and the University of Southampton on a project concerned with developing e-learning resources for geographic education. Through the first three years of the project, the resource most eagerly shared among the project partners was the academic integrity guidelines and quiz described above. Revised versions of these resources are now provided to all students enrolled in the Schools of Geography at Leeds and Southampton. (The resources are freely available to other institutions on request.) Despite the limited impact of the guidelines and quiz on plagiarism rates revealed in this study, all three institutions plan to continue this effort to communicate our expectations about the proper use of reference materials published online. Like Braumoeller and Gaines (2001), however, we conclude that expectation management alone is no substitute for rigorous enforcement of academic integrity standards. Based on the research reported here and in previous studies, we are convinced that even the most vigilant grader is likely to overlook many, if not most, infractions. Consequently, we have revised our procedure for evaluating student projects in Geography 482 so that every project assignment is first checked for originality using Turnitin.com (using the University's recently acquired site license). Assignments include warnings that Turnitin.com will be used to ensure that original sources are properly quoted, paraphrased, cited, and referenced. Originality reports are shared with students whose assignments contain academic integrity violations. As before, such students are invited to revise and resubmit the first two, but not the final, project. We expect that effective detection and enforcement will lead to a higher level of compliance with academic integrity standards in this introductory class, as well as in the classes that follow in our certificate and master's programs.

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Endnotes

1. Scholars are debating the implications for intellectual-property rights of Turnitin.com's practice of keeping previously submitted student papers in its database (Foster, 2002).

2. Assignments were prepared by 261 students, several of whom did not complete both assignments.

3. Each course lasts 10 weeks.

4. For example, of the 73 students who introduced themselves (via threaded discussion) in the Fall 2003 offering of GEOG 482, 60 (82 percent) identified an employer. In Winter 2005 (when students were first surveyed formally about employment), 85 percent of students indicated that they worked more than 30 hours per week.

5. An analysis of program graduates through Summer 2002 indicated that 81 percent possessed baccalaureate degrees. The certificate program began to require baccalaureate degrees in 2004.

6. The specific definition of plagiarism used in the survey was not reported.

7. In summer 2004, we evaluated EVE2, Mydropbox.com, Plagiarism Finder, Scriptum, and Turnitin.com. All but Turnitin.com provided easily accessible, free examination

versions or subscription trials of their products/services. Ironically, Turnitin.com discontinued offering free plagiarism detection for up to five papers from their website because of unethical behavior on the part of instructors! The company found that some instructors were abusing the system by registering multiple email addresses in order to evaluate papers for entire classes, five at a time. Turnitin.com will arrange for testing of their services on demand, which is what we did.

8. Our experience was similar to that of Braumoeller and Gaines (2001) who found that using the rates reported by detection software alone can be misleading. We checked all the assignments, not just those flagged with high percentages of matching text and interpreted the side-by-side comparisons of the student's submission and the flagged source material. Another reason that we checked each paper and not just flagged assignments was specific to the way we structured course assignments. For at least one of the two assignments checked, we provided a sample project online with example headings and citations and told the students that they could use this sample as a template for creating their webpages. Turnitin.com flagged text from the template and the assignment instructions as copied text so we needed to eliminate these webpages from the system's searching procedures, which fortunately can be done using the "exclude and reanalyze" feature.

9. The guidelines can be retrieved from https://www.e-education.psu.edu/courses/geog482/policies.shtml#integrity

10. The academic integrity quiz can be retrieved from http://www.dialogplus.soton.ac.uk/aig/index.html