Maintaining Academic Integrity on Spreadsheet-Based Assessments

Thomas A. Mays
Miami University
maysta@miamioh.edu

Abstract. Maintaining academic integrity on spreadsheet-based assignments can pose a challenge as students often work with duplicate starting files and datasets, resulting in similar or identical submitted work. The literature presents several approaches to address academic dishonesty, including reviewing file metadata, tagging files, incorporating tracking logs, using unique files and datasets, and proctoring assessments. These methods vary in their implementation complexity, and in this paper, guidance is provided for instructors seeking strategies to ensure academic integrity and a streamlined path for implementation. In addition to employing detection mechanisms, academic integrity education can be a critical part of maintaining integrity. Specific areas including clearly communicating policies and penalties, providing examples of activities and actions considered integrity violations, and emphasizing the importance of the coursework in professional skill development.

Introduction

Maintaining academic integrity is a critical part of teaching. Based on survey data collected from 2002 to 2010, McCabe et al. (2012) found that 65% of student respondents self-reported at least one of nine forms of academic dishonesty. Further fueling concerns is the rise of internet-related cheating (McCabe et al., 2012), specifically the readily available tools and technologies to enable dishonest behavior. Additionally, institutions may not be providing needed training to faculty to aid in how to recognize academically dishonest behavior (El-Nakla et al., 2019), or the institution lacks an academic integrity support system (Zharikova & Sherstjuk, 2017). Detecting academic dishonesty can be even more difficult for instructors who rely on spreadsheet-based assessments, where often students are assigned work that produces identical or highly similar work that may not be the result of dishonest behavior.

Academic dishonesty in college has been linked to ethically questionable post-graduate behavior (Graves, 2008; Harding et al., 2006; Lawson, 2004; Nonis & Swift, 2001). Furthermore, developing competent spreadsheet skills is critical in several disciplines, and failure to develop these skills may lead to negative consequences for new graduates. Therefore, educating students on the importance of maintaining integrity and improving the prevention and detection of dishonest behavior is essential for instructors. This paper presents research on the methods and approaches that can mitigate cheating in courses that use spreadsheet-based assignments and enhance the probability of detecting cheating. Additionally, the author presents supporting practices, including academic integrity education's role in a multipronged approach to addressing academic dishonesty on spreadsheet-based assignments.

Integrity issues with spreadsheet-based assignments

There are numerous types of spreadsheet-based assignments. In beginning and intermediate level spreadsheet courses, curricula are often delivered using a step-by-step approach using textbook publisher or instructor-provided "starter" files and datasets. A

concern is that for many spreadsheet assignments where students start with the same files or datasets, it is possible, if not probable, that students submit very similar or identical work that may not result from cheating, thus presenting a challenge in detecting dishonest behavior. The problem may be further exacerbated in asynchronous online courses where in-person assessments may not be possible, especially if an online proctoring solution is unavailable or inappropriate for the circumstances.

Examples of cheating used in McCabe et al.'s (2012) study include plagiarizing, copying a peer's work, providing completed work to peers, and unauthorized collaboration, among others. On spreadsheet-based assessments, file sharing and unauthorized collaboration appear to be the primary ways students cheat. Ball et al. (2016) and Lux et al. (2021) observed similar ways in how students cheat on spreadsheet assignments. Ball et al. (2016) described students collaborating simultaneously, one student completing then sharing with others who copy the assignment either partially or in its entirety, and providing credentials to someone in order for that individual to complete the assignment for the student. Lux et al. (2021) described how copying could occur, including copying and pasting commands in the spreadsheet application and manually retyping the solutions. Other considerations include sharing files within academic terms, across academic terms, and through online file-sharing websites.

The reviewed literature does not discuss the role of file-sharing sites in helping to facilitate cheating, which is suspected to be a growing problem. However, Singh (2013) noted that the nature of digital files made cheating easier. While these fast-growing sites are often promoted as legitimate study aids, they appear to be an effective mechanism for students to share assignment files. Some of the solutions presented here may be effective against this new way students can cheat on spreadsheet-based assignments.

Solutions found in the literature

Without taking more advanced action to reduce cheating or improve detection, an instructor may only have the file metadata to review (generally either "author" or "last modified by" names, and "created" and "last modified" dates), which a student can easily change. Thus, focusing on metadata to detect cheating may not be a consistently reliable strategy. While the product Turnitin is known for plagiarism detection in papers, it can also detect plagiarism in Microsoft Excel spreadsheets. However, its effectiveness is diminished or nullified if students are expected to submit legitimately identical or near-identical work. More effective approaches should be sought.

There is a body of literature that focuses on approaches for addressing dishonest behavior in spreadsheet-based assignments. The discussed strategies include reviewing file metadata (Coakley & Tyran, 2001; Singh et al., 2011), file tagging (Ball et al., 2016; Blayney & Freeman, 2004; Coakley & Tyran, 2001; Singh et al., 2011), logging file changes (Ball et al., 2016; Lux et al., 2021; Singh, 2013), providing unique data files for each student (Ball et al., 2016; Blayney & Freeman, 2004; Coakley & Tyran, 2001; Frost et al., 2018), and in-person proctoring (Coakley & Tyran, 2001). These strategies involve a range of implementation challenges, and instructors can layer strategies to increase effectiveness.

File Metadata

File metadata in Microsoft Excel spreadsheets include information about the file author, the last user to modify the file, and dates and times of when the file was created and last modified, among a host of other metadata about the file. Coakley and Tyran (2001) incorporate the use of a Microsoft Word document with a spreadsheet assignment. The document is linked to the spreadsheet, and its metadata is checked to ensure the file was created during the specified exam period and by the correct student. On its own, using file metadata for academic integrity purposes is not reliable as the metadata can easily be changed. However, it still may be helpful as a part of a comprehensive strategy.

File tagging

Much of the reviewed literature discusses file tagging in some way. Of the solutions presented in this paper, file tagging may be the easiest to implement, depending on several factors. File tagging involves adding information, often hidden, that links a file to a specific student or course section. This information can then be checked to ensure that the student submitting the file has submitted the one that was explicitly distributed to them or their specific course section.

Blayney and Freeman (2004) recommended tagging files by adding a student's name to each assignment file. The name tag is visible to the student. However, the student's identification number is hidden in the file. Singh et al. (2011) suggested adding the students' names to a cell and then changing the font to white to match the background. In the Ball et al. (2016) study, researchers used the content management system *MyEducator* to tag and manage student files. Adding another layer to file tagging, Coakley and Tyran's (2001) approach uses VBA code to embed a student-specific tag within the assignment dataset. After a file is submitted, the file is checked for that unique identifier. As a less complex solution, file tags can also be simple and apply to course sections instead of individual students. For example, an instructor can tag files with a code that incorporates the semester, year, and course section code (e.g., "FA2021 – Section 1").

An important consideration is whether to tag all files or only specific files. Some spreadsheets courses, specifically those that focus on application skill development, could include a large number of files. Using Visual Basic for Applications (VBA), scripts can be written to automate the tagging process. However, without a background in VBA coding, instructors may need to complete the tagging process manually. A simpler method for courses with high numbers of files is only to tag higher-stakes assessments.

Tracking logs

A tracking log can range from simply recording that a change has occurred to a file (e.g., modifying the contents of a cell) to a detailed log including username, time/date of the change, name of the file, number of files open, and more. Singh (2013) described a process requiring students to enter their names in a specific cell and append their names to the filename. Then, a hidden formula records the student's name and the date, time, and filename. The formula result is updated when the name changes. Lux et al. (2021) used a VBA script to record the username, date, and time a file change occurs. The script also records the number of Excel files open and their filenames. Ball et al.'s (2016)

approach used the *MyEducator* system to manage assessments. The system records the time and date of file changes as well as details of those changes.

Unique student assignment files/data

Some approaches use unique assignment files for students, providing a way to identify plagiarism among students. Ball et al. (2016), Blayney and Freeman (2004), Coakley and Tyran (2001), and Frost et al. (2018) described methods and tools for generating files customized to the student. However, providing customized files to students may require resources or knowledge accessible to instructors, specifically the use of VBA to facilitate the creation and review of student files. Another approach described by Singh (2013) requires students to use personal data such as birthdate in the spreadsheet assignments. This approach can be expanded to require students to identify data independently and then engage in a particular sequence of instructions to complete an assignment.

If using publisher-developed assignments, then adding customized assessment elements may help detect cheating. For example, instructors can ask students to create a chart that incorporates what the student decides is most appropriate, including selecting the data and chart design elements. This builds off of one form of the unique file/data approach, where students customize the file or dataset in some way. Not only can this improve detection, but there is also a learning component as students are asked to make decisions based on the spreadsheets they modify or create. Additionally, adding short answer questions or analysis essays to assignments adds another customized component where duplicate answers from students would not make sense.

In-person and proctored assessments

Coakley and Tyran (2001) suggested verifying student identification before administrating in-person spreadsheet or database-oriented exams. Another approach discussed by Weinthal et al. (2019) involves detecting unauthorized use of cell phones and Bluetooth devices. For distance courses, proctoring can be replicated using an online proctoring tool. These tools often involve checking student identification as well as recording audio and video of the student during the assessment. However, concerns exist with online proctoring systems regarding their effectiveness (Bergmans et al., 2021) and issues of exacerbating student test anxiety (Woldeab & Brothen, 2019).

Education

While there are many strategies an instructor may employ to detect academically dishonest behavior, a more effective approach is to adopt a multipronged strategy that includes an academic integrity education component. For example, educating students on why integrity is important, helping students understand how the course materials apply to their professional goals, and establishing multiple prevention and detection mechanisms can create a comprehensive strategy. Gallant (2008) recommended improving instruction and student support and the organizational environment to combat dishonesty, while McCabe et al. (2012) discussed the importance of a "culture of integrity" as being critical (p. 167).

Ball et al. (2016) provided three key considerations for maintaining academic integrity. In addition to detection, the components outlined include clearly

communicating the course policy on what constitutes cheating, and having administrative support that includes enforcement of sanctions. Academic integrity education can also be supportive. Bain (2015) recommends communicating the purpose and importance of academic integrity. Examples of what constitutes academic dishonesty in the course should also be incorporated, and to reinforce this importance, assessments such as a syllabus quiz can be utilized. Additionally, Sotiriadou et al., (2019) suggest providing information on how particular assignments can help with a student's professional development.

Comprehensive strategies

If an instructor has a background in VBA, then the more advanced techniques presented in this paper can be employed, including tagging all course files, generating a change-log, and creating unique datasets for each student. However, not all instructors will have a background in VBA programming or access to resources to administer some of these approaches. Lower-tech approaches can be integrated with integrity education to address dishonesty in spreadsheet-based assignments. The following outlines this approach:

- Communicate the course policy on what is considered cheating
- Communicate the potential sanctions or penalties for cheating
- Add customizable components (e.g., charts)
- Add written short-answer or essay components
- Have students provide their own data, at least in part, for each assignment
- Add course and term tags to high stakes assignments
- Have a plan for documenting evidence in suspected cases
- Know the institution's policy and procedures for reporting suspected integrity cases

Conclusion

Not every approach will be practical or effective in each situation, particularly if an approach is implemented as a singular solution. Thus, a multipronged approach can be of more significant help in addressing academic dishonesty in spreadsheet-based assessments. There are several considerations for those seeking to reduce cheating in their spreadsheet-based assessments, including understanding and following department and institutional policies and procedures, communicating policies and their purpose to students, collecting evidence of dishonesty when it occurs, and following through with action in accordance with the communicated policies. It is also essential to be aware of changes in technologies, practices, and norms that may impact student behavior.

References

Bain, L. Z. (2015). How students use technology to cheat and what faculty can do about it. *Information Systems Education Journal*, 13(5) pp 92-99. http://isedj.org/2015-13/ ISSN: 1545-679X.

Ball, N. L., Wood, R. E., & Allen, G. (2016). Using technology to detect and deter electronic cheating at a large public university. *Issues in Information Systems, 17*, 82–90. https://doi.org/10.48009/4_iis_2016_82-90

Bergmans, L., Bouali, N., Luttikhuis, M., & Rensink, A. (2021). On the efficacy of online proctoring using Proctorio. *Proceedings Of the 13th International Conference on Computer*

Supported Education (CSEDU 2021), *1*(Csedu), 279–290. https://doi.org/10.5220/0010399602790290

Blayney, P., & Freeman, M. (2004). View of automated formative feedback and summative assessment using individualised spreadsheet assignments. *Australasian Journal of Educational Technology*, *20*(2), 209–231. https://ajet.org.au/index.php/AJET/article/view/1360/730

Carnaghan, C., Edmonds, T. P., Lechner, T. A., & Olds, P. R. (2011). Using student response systems in the accounting classroom: Strengths, strategies and limitations. *Journal of Accounting Education*, *29*(4), 265–283. https://doi.org/10.1016/j.jaccedu.2012.05.002

Coakley, J., & Tyran, C. (2001). Can e-cheating be prevented? An approach to detect plagiarism in computer skills courses. In *Americas Conference on Information Systems* (1239–1243). http://aisel.aisnet.org/amcis2001/241

El-Nakla, D., McNally, B., & El-Nakla, S. (2019). The importance of institutional support in maintaining academic rigor in e-learning assessment. 2nd International Conference on new Trends in Computing Sciences (ICTCS). 1-5. https://doi.org/10.1109/ICTCS.2019.892311

Frost, R., Matta, V., & Kenyo, L. (2018). Plagiarism prevention in Excel assignments. *Proceedings of the 2018 Pre-PICIS SIGDSA Symposium.* https://aisel.aisnet.org/cgi/viewcontent.cgi?article=1021&context=sigdsa2018

Gallant, T. (2008). *Academic integrity in the twenty-first century*. Jossey-Bass.

Graves, S. (2008). Student cheating habits: A predictor of workplace deviance. *Journal of Diversity Management. 3*(1), 15-22. http://dx.doi.org/10.19030/jdm.v3i1.4977

Harding, T., Finelli, C., and Carpenter, D. (2006). Cheating in college and its influence on ethical behavior in professional engineering practice. Proceedings of the 2006 ASEE Annual Conference and Exposition, Chicago, IL. American Society for Engineering Education. https://deepblue.lib.umich.edu/handle/2027.42/55273

Lawson, R. (2004). Is classroom cheating related to business students' propensity to cheat in the "real world"? *Journal of Business Ethics*, *49*(2), 189-199. https://doi.org/10.1023/B:BUSI.0000015784.34148.cb

Lux, D., & Knight, M. E. (2021). Fighting fire with fire: Using Excel macros to combat academic dishonesty in excel projects. *Issues in Accounting Education*, *36*(1), 23–34. https://doi.org/10.2308/ISSUES-19-119

McCabe, D., Butterfield, K., & Treviño, L. (2012). *Cheating in college: Why students do it and what educators can do about it*. Johns Hopkins University Press.

Nonis, S., & Swift, C. O. (2001). An examination of the relationship between academic dishonesty and workplace dishonesty: A multicampus investigation. *Journal of Education for Business*, *77*(2), 69. https://doi.org/10.1080/08832320109599052

Singh, A. (2013). Teaching tip detecting plagiarism in MS Access assignments. *Journal of Information Systems Education*, *24*(3), 177–180. http://jise.org/Volume24/n3/JISEv24n3p177.pdf

Singh, A., Mangalaraj, G., & Taneja, A. (2011). An approach to detecting plagiarism in spreadsheet assignments: A digital answer to digital cheating. *Journal of Accounting Education*, *29*(2–3), 142–152. https://doi.org/10.1016/j.jaccedu.2012.02.002

Sotiriadou, P., Logan, D., Daly, A., & Guest, R. (2019). The role of authentic assessment to preserve academic integrity and promote skill development and employability. *Studies in Higher Education*, *45*(11), 1-17. https://doi.org/10.1080/03075079.2019.1582015

Weinthal, C. P., Larrondo-Petrie, M. M., & Zapata-Rivera, L. F. (2019). Academic integrity assurance methods and tools for laboratory settings. IEEE Frontiers in Education Conference (FIE). 1-6. https://doi.org/10.1109/FIE43999.2019.9028482

Woldeab, D, & Brothen, T. (2019). Online proctoring, test anxiety, and student performance. *International Journal of E-Learning & Distance Education*, *34*(1), 1–10. https://files.eric.ed.gov/fulltext/EJ1227595.pdf

Zharikova, M. & Sherstjuk, V. (2017). Academic integrity support system for educational institution. Kherson National Technical University Kherson, Ukraine, 2017 IEEE First Ukraine Conference on Electrical and Computer Engineering (UKRCON). https://doi.org/10.1109/UKRCON.2017.8100445