

Summary of Online Assessments and Best Practices

Online student assessment is a widely debated and controversial subject that boils down to fundamental issues of trust.

- Some educators do not trust students, and assume they will cheat if given the opportunity. Online education represents an opportunity.
- Some educators do trust students, and assume most students will not cheat. And if they do cheat, they are only cheating themselves.
- Some disciplines and subjects require a more strict measure of student mastery than others, requiring concrete evidence and measures.
- Some technologies/vendors are not trustworthy. Proctoring and testing systems are intently focused on student surveillance and can be invasive to student privacy, data ethics, and FERPA.

This synopsis outlines commonly used strategies, tools, and issues related to online student assessment. The prevailing recommendation for digital education programs is to leverage project-based learning and portfolio-based assessment when possible, and defer to proctor based assessment only in the strictest of situations.

The first article cited below was authored around March 2020 by CU's own Shea Swauger and is particularly timely to this synopsis. Shea leads Research & Support Services in the Auraria Library, is a ThingStudio Fellow, and researches areas of data-ethics and social-justice. Shea is in active dialogue with the CU Office of Information Technology (OIT), CU Office of Digital Education (ODE), and the CU System Office on these matters.

Context

Swauger, S. (2020). [Our Bodies Encoded: Algorithmic Test Proctoring in Higher Education](#). Hybrid Pedagogy Journal.

Renzella, J., & Cain, A. (2017, December). [Supporting better formative feedback in task-oriented portfolio assessment](#). In *2017 IEEE 6th International Conference on Teaching, Assessment, and Learning for Engineering (TALE)* (pp. 360-367). IEEE.

Zahiruddin Fitri, A. H., Joharry, O., Cheng, S., Syamsul Nor Azlan, M., & Angela Rumina, L. (2018). [Portfolio-Based Assessment](#).

Oudkerk Pool, A., Govaerts, M.J.B., Jaarsma, D.A.D.C. *et al.* [From aggregation to interpretation: how assessors judge complex data in a competency-based portfolio](#). *Adv in Health Sci Educ* 23, 275–287 (2018).

Taylor, B., Harris, L. R., & Dargusch, J. (2017). [Portfolio Assessment in Engineering: Student Perspectives on Effective Implementation](#). *International Journal of Quality Assurance in Engineering and Technology Education (IJQAETE)*, 6(2), 1-21.

“Student portfolios can be used within higher education to assess complex professional skills (Flores, Veiga Simao, Barros & Pereira, 2015; Franco et al., 2017; Jaeger & Adair, 2015). Portfolios are said to be learner-centred, promote reflective practice, and help students better understand and achieve complex learning outcomes (Davis, Ponnampuruma & Jer, 2009; Flores et al., 2015; McDonald, 2012). Boud and Soler (2016) identify portfolios as a potentially sustainable approach to assessment as this genre can help students develop skills needed to meet their own future learning needs. It is for these reasons that a growing number of engineering programs are utilising this assessment genre to evaluate student competency in relation to complex graduate attributes, often in conjunction with project-based or problem-based learning (e.g., Jaeger & Adair, 2015; De los Ríos-Carmenado, Lopez, & Garcia, 2015). When implemented well, reports of first experiences with project- or problem-based learning are usually encouraging (Duda & Ross, 2012) and research suggests that such approaches can potentially reduce student attrition, increase student satisfaction, and improve students' success rate (Nedic, Nafalski & Machotka, 2010).” (Taylor, Harris & Dargusch, 2017)

In-Use at CU Denver

CU Denver has an array of computer applications that can facilitate online assessments. They include the following:

- [Jupyter Notebooks](#) - an online tool that can be used for executing code, equations and visualization. This online resource can be used as a textbook, workbook/primer, worksheet/drill set, notepaper/course packet or app. Used as a basecamp for student portfolios, it serves as an assessment platform.
- [Proctorio](#) is an online proctoring system for use within Canvas. It is licensed by CU Online and available to all faculty. [You can learn how to use Proctorio at CU here.](#)
- [Turnitin](#) is a plagiarism detection platform where student writing is submitted to a national database and cross-checked with other student works, identifying pattern matches and red-flagging potential plagiarism.
- Computer software
 - [Abaqus](#)
 - [Ansys](#)
 - [Autodesk](#)

Being Grade-less

There is a growing contingency of teaching philosophy and practice pointing to a theme of being *grade-less* as a high-impact practice. This does not mean there are no grades. This means a distinct strategy to do less grading and to grade unconventionally. This prioritizes rapid and frequent student feedback over fixed rubrics.

Andrew, B. (2020). [Scored out of 10: Experiences with Binary Grading Across the Curriculum.](#) In Proceedings of the 51st ACM Technical Symposium on Computer Science Education (SIGCSE '20). Association for Computing Machinery, New York, NY, USA, 1152–1157.

Blum, S. (2017) [The significant learning benefits of getting rid of grades \(essay\).](#) Insidehighered.com.

Elbow, P. (1993). [Ranking, evaluating, and liking: Sorting out three forms of judgment](#). College English, 55(2), 187-206.

FERGUSON, H. (2016). [CHAPTER FOURTEEN: Journey into Ungrading](#). Counterpoints, 492, 207-222. doi:10.2307/45157513

Sackstein, S. (2015). [Hacking assessment: 10 ways to go gradeless in a traditional grades school](#). Times 10 Publications.

Stommel, J. (2018) [Why I Don't Grade](#). Jesse Stommel.com

Stommel, J. (2018) [How to Ungrade](#). Jesse Stommel.com

Strategies used for online assessments

Without a doubt, assessment best practices in higher education is one of the most controversial topics discussed during this time. Therefore, looking objectively at what we are assessing and how we are assessing is of high priority. In a nutshell, assessments are best when students are given clear guidelines/rubric in which the criteria for performance are explicitly made (Wolf, et al, 2012). With this in mind, using different types of assessments would reflect a more accurate picture of student learning as they have different learning styles and perform at different levels depending upon the type of assessment.

Here are ten essential assessment practices that all faculty in higher education should be aware of.

- Learning Outcomes
- Performance Assessments
- Objective Tests
- Essays
- Portfolios
- Rubrics
- Formative Assessment
- Student Self-Assessment
- Grading
- Assessment Technologies

Wolf, K., Dunlap, J., & Stevens, E. (2012). Ten things every professor should know about assessment. *The Journal of Effective Teaching*, 12(2), 65-79. Retrieved from https://www1.ucdenver.edu/docs/librariesprovider8/default-document-library/ten-things-every-professor-should-know-about-assessment.pdf?sfvrsn=ab6fbbb8_2

[WCET](#) (2009) published an article entitled “Best Practice Strategies to Promote Academic Integrity in Online Education”, which lists 15 points about assessment and evaluation that still ring true today in all content areas of higher education, namely:

- Provide a rubric.
- Use a test bank.
- Randomize the order of test questions.
- Require forced completion on exams.
- Password protect exams.
- Change test items and assignment topics each semester.
- Use a variety of assessment strategies (quizzes, short and long papers, test questions that require the application of a theory or concept).

Brent et al (2011) explained that modern instructional technology can be used to significantly enhance the teaching and learning process in Engineering by using interactive multimedia-based tutorials, systems simulations, computer-aided design tools, course management software, personal response systems (clickers) and online communication tools.

[The Center for Teaching Innovation](#) at Cornell University created a list of online assessment tools supporting this finding.

- Classroom Polling ([iClickers](#))
- [Gradescope](#)
- In-Video Quizzes in [Panopto](#) & [Kaltura](#)
- Proctoring Services
- Survey Tools
- Turnitin

There are many strategies universities employ for online assessments during these unprecedented circumstances, one of which is the honor code instituted by Stanford and Princeton Universities. At these institutions exams are not proctored, instead, students are required to pledge on their honor to not cheat during exams. Additional strategies include:

- Make all exams open-book.
- Schedule multiple, short, low-stakes tests, rather than one or two lengthy, high-stakes exams.
- Turnitin
- Shuffle answers to questions.
- Randomize questions.

Additionally, [University of Michigan's Engineering department](#) posits that instructors should move away from closed book, high-stakes, timed exams, but rather lean towards untimed, open book assessment strategies. They also point to Canvas quizzes that can be used in conjunction with the [LockDown Browser](#) feature. It is a custom browser that locks down the testing environment in Canvas in order to deter cheating.

Stanford University gave their faculty a list of options for final exams online:

- Distribute Exam PDF electronically and ask students to scan with their phones.
- Use Canvas to offer exams online.

You can read more about the best practices of these universities below.

[Berkeley Center for Teaching & Learning: Best Practices - Remote Examinations](#)

[Stanford:Teach Anywhere - Best Practices](#)

The following types of assessments, as mentioned in the reference below, is considered the best suited to be given asynchronously and synchronously:

- Data processing and analytics
- Problem resolution
- Programming (coding)

However, online quizzes are best suited to be given synchronously.

It is recommended that conventional plagiarism detection methods (for example, Turnitin), can be used for highly selective testing. In a synchronous or asynchronous format, assignments can be combined with quizzes. One can also enhance the quality of assessments by combining different types. Assessments, when given synchronously or asynchronously, should be time-limited with random questions and random order of questions and answers to make collaboration more difficult between students. Additionally, when structuring questions, avoid googleable ones.

Sylvestre, E., Van de Poël, J., Carbonel, H. & Jullien, J. (2020). [Vademecum for Remote Assessment](#). University of Lausanne

Effective Practices in Engineering, Computing and Design

Recent research suggests that engineering education falls short in teaching students the basic principles of sustainable development. Clevenger et al., (2018) conducted a longitudinal research over a 2 year period using Autodesk's Building Performance Analysis (BPA) online module to promote learning of sustainability principles in construction education. They found that the online training materials enhanced sustainable competencies in both systems thinking and change-agents skills. MIT commissioned a report in 2016 to find out the worldwide trends in the changing landscape of engineering education, identify the current leaders in the field, and describe some of its future directions. This research promoted the birth of the New Engineering Education Transformation (NEET) initiative. [NEET](#) is a student-directed, project-based, outward facing, socially-relevant approach to engineering. In support of this revolutionary approach to engineering, Stiller and LeBlanc (2002) pointed out that software engineering students will not be convinced of the benefits of using software engineering techniques until they experience the benefits themselves. Therefore, completing a semester-long project is the most effective way of convincing students of the importance of their professional development as well as the development of reliable, robust, easily-maintained software.

In general, there are online software that can be used for online assessment such as CodePen and Coderunner. CodePen is an engaging web design interface, while Coderunner is a plug-in that can run program codes written in many different languages and submitted by students. Hand grading students' codes is a tedious task; therefore, Coderunner came up with a way to mix traditional style questions with coding questions that can be used in the laboratory and on examinations. Instructors are able to directly assess skills taught, providing instant feedback to

students. Additionally, grading is automatically done within the program (Lobb and Harlow, 2016).

Brent, R., Felder, R., and Prince, M. (2011). Engineering instructional development: programs, best practices and recommendations. *Journal of Engineering*, 100(1), 89-122. Retrieved from [https://www.engr.ncsu.edu/wp-content/uploads/drive/1hs3fEP3OhpNJ-jSiwxbahhyf-QqASs-Z/2011-Instruct_Dev\(JEEv100-online\).pdf](https://www.engr.ncsu.edu/wp-content/uploads/drive/1hs3fEP3OhpNJ-jSiwxbahhyf-QqASs-Z/2011-Instruct_Dev(JEEv100-online).pdf)

Clevenger, C., Abdallah, M., Wu, W., & Barrows, B. (2018). Assessing an online tool to promote sustainability competencies in construction engineering education. *Journal of Professional Issues in Engineering Education and Practice*, 145(1), [https://doi.org/10.1061/\(ASCE\)EI.1943-5541.0000397](https://doi.org/10.1061/(ASCE)EI.1943-5541.0000397)

Lobb, R., & Harlow, J. (2016). Coderunner: a tool for assessing computer programming skills. *ACM Inroads*, 7(1), <https://doi.org/10.1145/2810041>

Stiller, E., & LeBlanc, C. (2002). Effective software engineering pedagogy. *Journal of Computing Sciences in College*, 17(6), 124–134. <https://dl.acm.org/doi/abs/10.5555/775742.775766>

Labs are important in the College of Engineering and Computer Science. Stanford University gave a few ideas on how to adapt teaching to in online environment.

- Take part of the lab online.
- Provide raw data for analysis.
- Increase interaction using Zoom, Google Drive, Slack and [Softphone:Jabber](#).

[The University of Washington](#) uses Canvas for quizzes and exams. In particular, they use SimChek, a plagiarism detection tool. It is said to have a modern and improved interface and a better repository of documents against which assignments are checked.

Policy: Best Practice for Higher Education

The changing higher education landscape has forced us to rethink traditional measures of learning outcomes and student performance. There is a need for assessment to be focused on quality of learning rather than on the adequacy of the assessment process (Powell 2013). With regards to accreditation, there is an ongoing argument about how to address concerns about how to apply accreditation standards to the new online, off-campus environment.

Here are the seven best practices developed by regional accreditation commissions to assist institutions planning distance education activities and to provide a self-assessment framework for those already involved:

- Education is best experienced within a community of learning where competent professionals are actively and cooperatively involved with creating, providing, and improving the instructional program;

- Learning is dynamic and interactive, regardless of the setting in which it occurs;
- Instructional programs leading to degrees have integrity and are organized around substantive and coherent curricula which define expected learning outcomes;
- Institutions accept the obligation to address student needs related to, and to provide the resources necessary for, their academic success;
- Institutions are responsible for the education provided in their name;
- Institutions undertake the assessment and improvement of their quality, giving particular emphasis to student learning;
- Institutions voluntarily subject themselves to peer review.

These best practices can be further subdivided into five categories each of which deals with a particular area of institutional activity specific to distance education.

1. Institutional Context and Commitment
2. Curriculum and Instruction
3. Faculty Support
4. Student Support
5. Evaluation and Assessment

Best Practices For Electronically Offered Degree and Certificate Programs. Retrieved from <https://www.aaup.org/NR/rdonlyres/BBA85B72-20E9-4F62-B8B5-CDFF03CD8A53/0/WICHEDOC.PDF>

Powell, C. (2013). Accreditation, assessment, and compliance: Addressing the cyclical challenges of public confidence in American education. *Journal of Assessment and Institutional Effectiveness*, 3(1), 54-74. Project MUSE muse.jhu.edu/article/517685.

Appendices

Computer/Engineering Programs online	Links
CodePen	https://codepen.io/education
Coderunner	https://coderunner.org.nz/
Autodesk	https://www.autodesk.com/

Proctoring tools available

Assessment tools	Cost	How accessible	Invasive?
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ProctorU	\$14.75 (1-hr. exam)	Tests can be taken anywhere in the world.	They tap into students' cameras, microphones and computer screens when they take their tests (very invasive)
Proctorio	\$20 per course or \$100 lifetime membership	Remote test taking	Only authorized officials at the testing institutions are able to access data collected. Customizable software based on assessment type, which means all recording options are chosen by the instructor or testing institution when Proctorio is enabled on an exam. Because Proctorio does not require any personally identifiable information on any user, there is no personal data to be given to third parties. (less invasive)
Prometric	\$100 administrative fee plus course enrollment fee	Test centers	A full range of test delivery solutions. They provide convenient locations and flexible delivery models every day of the week. (least invasive)