

# REshaping Assessment Excellence: COVID-19 and the New Now at the University of Bath

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# Context and Scope

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Many businesses are not going back to “five days a week”, with some research [Bin22] suggesting that “two days is optimal”.

There are many changes in Higher Education as well, which are not going to be reversed [Cri21]: we look at one area: assessment, and in particular the written examination.

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Indeed, the final examination is a university institution that would appear to be off-limits as far as innovation is concerned. To put this into context, while faculty and students alike will not stray too far from a computer as they go about their daily business, it is still the norm for examinations to be conducted using pen and paper. Does this imply, therefore, that some element of modern learning theory might be sacrificed if it were abandoned in favour of some alternative instrument? Or, given it is still the most commonly administered summative assessment instrument in universities today, is there some other special intrinsic value attached to a closed-book, invigilated exam that justifies its continued use? [WW09]

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- May 2022** Following very substantial pressure by the academics, the university allowed some **Trad-C** examinations in first-year subjects.
- Future** Some Trad-C, mostly Electronic-O, experiment with Electronic-O in an invigilated setting.

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*Certain exams are more relevant in open-book, online format, but not all. [CS]*

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[Wil22] also reports a worrying rise, but data come from an online proctoring company.

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- “I have an online Statistics Examination from 08:30 to 11:30 next Friday. Is anyone familiar with “Definition of continuous random variables (RVs), cumulative distribution functions (CDFs) and probability density functions (PDFs). ... [a screenshot of what was obviously a 1st/2nd-year syllabus]” please bid to help me.  
[<https://www.freelancer.com/jobs/statistics/>].

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- **Definition** of proper/improper online resources. We haven’t seen a good definition that will allow Wikipedia searches but not tools that write programs [FADB<sup>+</sup>22], say. JHD says “non-interactive Internet resources”: this hasn’t met a lawyer.

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- A5 How to measure? But see [JMW<sup>+</sup>14] “The assessment level incorporated into the course had a significant impact on students' conceptual understanding and final achievement scores” .



## Alpha Academic Appeals.

Press release on prevalence of cheating in online assessment,  
July 2022.

<http://www.academicappeals.co.uk/news/05072022201747-press-release-on-prevalence-of-cheating-2022>.



Jack Betteridge, James H. Davenport, Melina Freitag, Willem Heijltjes, Stef Kynaston, Gregory Sankaran, and Gunnar Traustason.

Teaching of computing to mathematics students:  
Programming and discrete mathematics.

In Steven Bradley and Alexandra Cristea, editors, *CEP '19: Proceedings of the 3rd Conference on Computing Education Practice*, pages 12:1–12:4, New York, NY, USA, 2019. ACM.



K. Bindley.

What if the Optimal Workweek Is Two Days in the Office, Not Three?

<https://www.wsj.com/articles/the-optimal-workweek-is-two-days-in-the-office-not-three-2022>.



T. Crick.

Covid-19 and Digital Education: a Catalyst For Change?

*ITNOW Issue 1*, 63:16–17, 2021.



J. Dickinson.

Did 1 in 6 students cheat in online assessments this year?

<https://wonkhe.com/blogs/did-1-in-6-students-cheat-in-online-assessments-this-year-2022>.





Finnie-Ansley.J., P. Denny, B.A. Becker, A. Luxton-Reilly, and J. Prather.

The Robots Are Coming: Exploring the Implications of OpenAI Codex on Introductory Programming.

*ACE '22: Australasian Computing Education Conference*, pages 10–19, 2022.



J.L. Jensen, M.A. McDaniel, S.M. Woodard, , and T.A. Kummer.

Teaching to the test ... or testing to teach: Exams requiring higher order thinking skills encourage greater conceptual understanding.

*Educational Psychology Review*, 26:307–329, 2014.



New York Times (Kashmir Hill).

Accused of Cheating by an Algorithm, and a Professor She Had Never Met.

<https://www.nytimes.com/2022/05/27/technology/college-students-cheating-software-honorlock.html>, 2022.



Joint Information Services Committee (Uniwis).

Online proctoring: panacea or problem?

<https://www.jisc.ac.uk/membership/stories/online-proctoring-panacea-or-problem>, 2022.



T. Williams.

Levels of cheating in online exams soaring, say invigilators.

<https://www.timeshighereducation.com/news/levels-cheating-online-exams-soaring-say-invigilators>, 2022.



B.J. Williams and A. Wong.

The efficacy of final examination: A comparative study of closed-book, invigilated exams and open-book, open-web exams.

*Br. J. Educ. Technol.*, 40:227–236, 2009.