Creating an individualised, open-ended modelling worksheet through partially-automated assessment

Peter Rowlett[1], Chris Graham[2] and Christian Lawson-Perfect[2]

1. Sheffield Hallam University; 2. Newcastle University

29 June 2023

E-Assessment in Mathematical Sciences 2023

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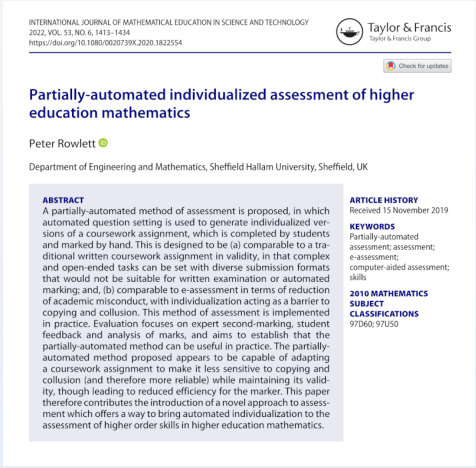

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Partially-automated individualized assessment of higher education mathematics

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ABSTRACT

A partially-automated method of assessment is proposed, in which automated question setting is used to generate individualized versions of a coursework assignment, which is completed by students and marked by hand. This is designed to be (a) comparable to a traditional written coursework assignment in validity, in that complex and open-ended tasks can be set with diverse submission formats that would not be suitable for written examination or automated marking; and, (b) comparable to e-assessment in terms of reduction of academic misconduct, with individualization acting as a barrier to copying and collusion. This method of assessment is implemented in practice. Evaluation focuses on expert second-marking, student feedback and analysis of marks, and aims to establish that the partially-automated method can be useful in practice. The partially-automated method proposed appears to be capable of adapting a coursework assignment to make it less sensitive to copying and collusion (and therefore more reliable) while maintaining its validity, though leading to reduced efficiency for the marker. This paper therefore contributes the introduction of a novel approach to assessment which offers a way to bring automated individualization to the assessment of higher order skills in higher education mathematics.

ARTICLE HISTORY
Received 15 November 2019

KEYWORDS
Partially-automated assessment; assessment; e-assessment; computer-aided assessment; skills

2010 MATHEMATICS SUBJECT CLASSIFICATIONS
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doi.org/gjj2kw

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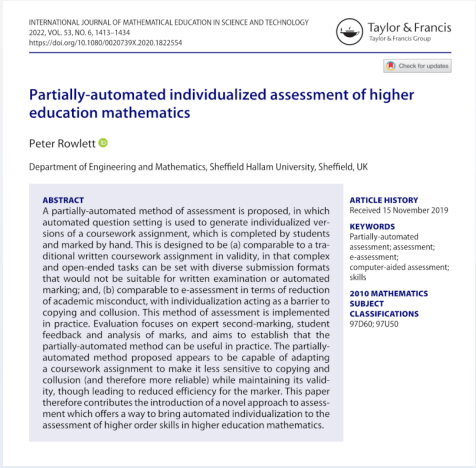

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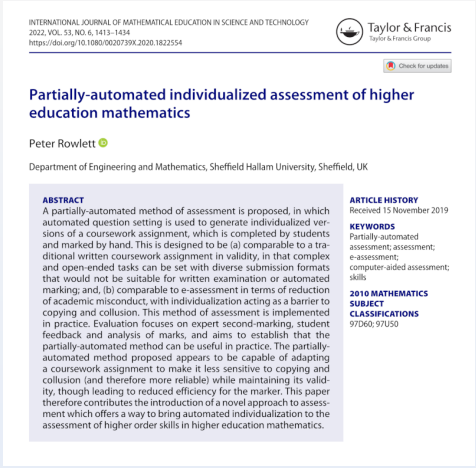
- Maintain validity while increasing reliability.



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- Students attempt and submit solutions in the usual way.
- Marking is similar to usual, except with reference to the individualised answers.
  - This definitely takes longer.
  - Though questions are still similar in structure.

Methods

- In data-driven contexts, give students the same questions and an individualised data set.
- In computational contexts, perhaps the students can write some parameter (student number?) into code as a random seed.
- There are lots of ways to achieve this in code, for example
  - in LaTeX;
  - using Lua in LuaLaTeX;
  - in another language, e.g. Python.
- Today's demo: Numbas 'printable worksheet' theme.

Other uses for Numbas printable worksheet theme

- In-class worksheets.
- Printing e-assessments (students with particular needs, quality assurance).
- 'Printable worksheets' can also be delivered via a VLE through the Numbas interface.
- Mixing written questions into an e-assessment – some questions auto-marked, some by hand).

Thanks for listening!

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