Designing Authentic Assessments for Learning

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Enhancing Assessment Practices

- Scoping review of literature on assessment in STEM
- Results in 5 categories:
  1. Quizzes/Tests
  2. Assignments/Projects
  3. In-Class Assessments
  4. Self-Learning/Mastery Grading
  5. Communication/Other
Scoping Review Process

- Research question:
  - What is known from existing literature about practices for educators to assess students in undergraduate STEM education?

- Search strategy and terms:
  - ERIC database, “Assessment” AND “STEM or Math”
  - Peer reviewed, higher ed, English only

- Screening process:
  - 766 abstracts read -> 103 papers fully read -> 45 included
Data Charted

- Article info: title, author(s), year of publication, journal of publication, source
- Instructional context: subject(s) or course, class size, number respondents, institution(s), country, course delivery modality
- Study details: purpose of the study, type(s) of assessment used, the goal behind the assessment(s), results
- Potential application: extra resources, best practices, limitations, instruments used
Paper Demographics

Articles Distributed by Year

Number of Articles

Year

Paper Demographics

Articles Distributed by Country

Country

United States
Spain
Oman
Ireland
Germany
Finland
Chile
Canada
Australia

Number of Articles
0 5 10 15 20 25 30 35 40
Paper Demographics

Articles Distributed by Subject

- Computer Science
- English for STEM
- Statistics
- Mathematics
- Business
- Science
- Engineering

Number of Articles

0 2 4 6 8 10 12 14 16 18 20
Paper Demographics

Articles Distributed by Class Size

<table>
<thead>
<tr>
<th>Class Size</th>
<th>Number of Articles</th>
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<tbody>
<tr>
<td>≤25</td>
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<tr>
<td>26 - 50</td>
<td>9</td>
</tr>
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<td>10</td>
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<tr>
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<td>10</td>
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<td>≥301</td>
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1. Quizzes/Tests

- No performance gap in computer vs paper delivery
  - Some benefits of computer (multiple attempts)

- Questions
  - Student-written questions
  - Longer sentences hinder understanding

- Preparation
  - Practice tests/questions
  - Reference sheet vs open book
2. Assignments/Projects

- Topic choices
  - Student interests
  - Agency increases engagement

- Scaffolding
  - Provide support and feedback
  - Several short projects more effective than one long one
  - Exemplars
3. In-Class Assessments

- In-class multiple choice quizzes
  - No difference if images are present
- Hands-on activities
  - Labs, worksheets, scenario discussions
- Rubrics
  - Students clarify learning goals
4. Self-Learning/Mastery Grading

- Optional test re-takes
  - Various grading options, less inflationary pressure
  - Grades improved, mixed effect on anxiety, increased time

- Mastery grading
  - Multiple attempts to achieve mastery of learning outcomes
  - Reduced anxiety, requires clear objectives

- Self-assessment
  - Correlation with instructor grades mixed
  - Guidance and feedback essential
5. Communication/Other

- Oral exams
  - Students can better articulate understanding
- Writing exercises
  - Short in-class activities improved exam performance
- Group video assignments
  - Developed effective digital communication skills
Key Takeaways

- Research supports the use of authentic assessments to enhance student learning

- Perceived efficacy and quality feedback are essential

- Try it and encourage your colleagues to do it too!
References – Quizzes/Tests


References – Assignments/Projects


References – In-Class Assessments


References – Self-Learning/Mastery Grading


Funding

- Faculty of Math Strategic Plan initiative
- Gov’t of Canada Student Work Placement Program