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Assessment as a Learning Opportunity: Feedforward with Multiple Attempts

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Assessment as a Learning Opportunity

Feedforward with Multiple Attempts

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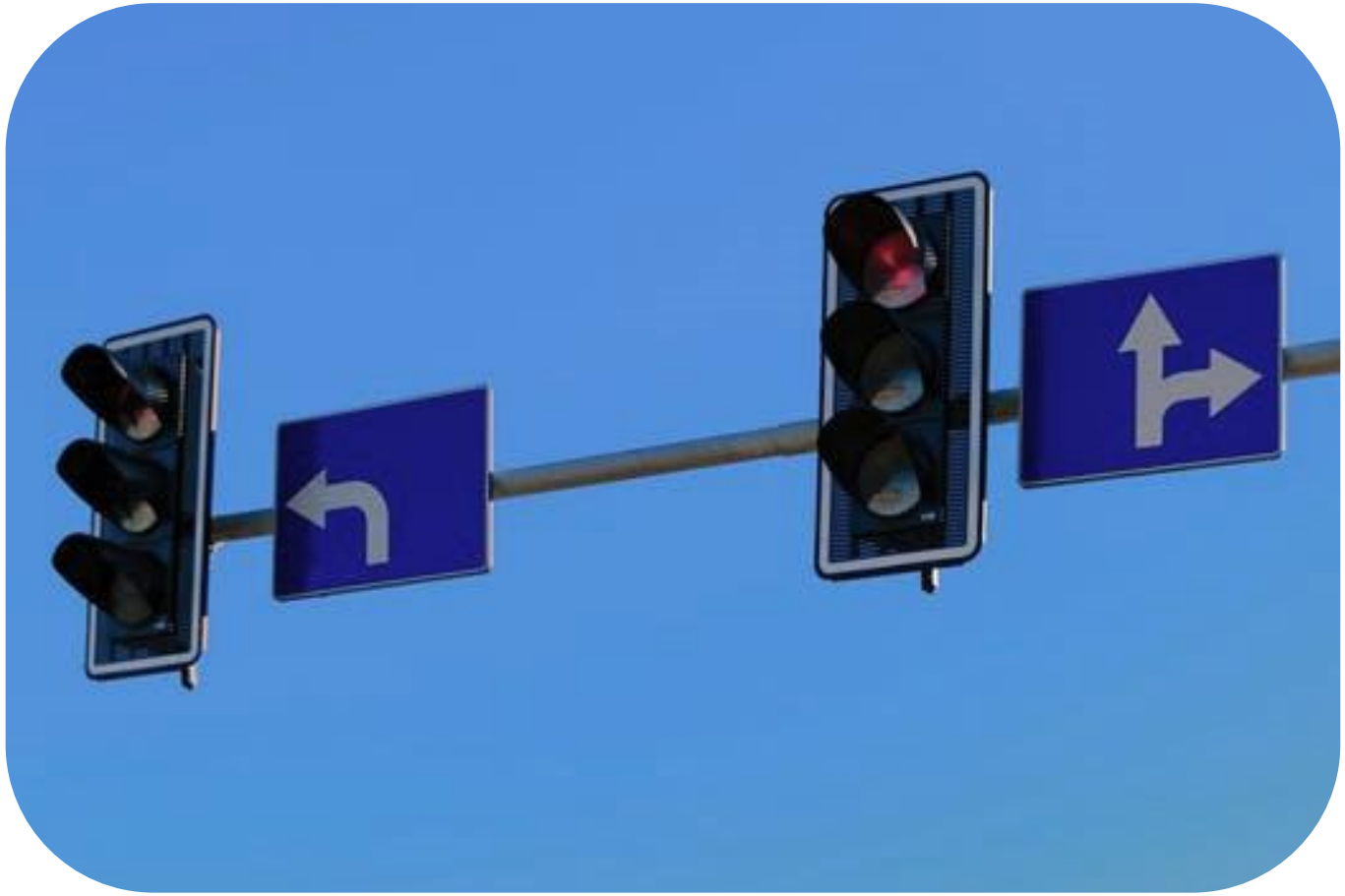
Exemplary assessments guide students in the learning process.

✓	Valid
✓	Coherent
✓	Rigorous
✓	Respectful
✓	Responsive
✓	Engaging

Learning management systems offer flexibility for assessments.

✓	Question Pools
✓	Multiple Attempts
✓	Scoring Options
✓	Automatic Grading
✓	Immediate Feedback



Effective feedback has specific characteristics.

✓	Timely
✓	Tangible & Actionable
✓	Goal-referenced
✓	Careful & Respectful
✓	Personal
✓	Ongoing
✓	Positive & Growth Focus

Using multiple attempts alone does not always improve learner performance.

- Presence of feedback
- Use of question pools
- Scoring of attempts

Combining high-quality immediate feedback with multiple attempts is a potentially powerful tool.

✓	Valid – Objective alignment
✓	Coherent – Transparent purpose
✓	Rigorous
✓	Respectful – Learner-centered and self-reflective
✓	Responsive – Provide information
✓	Engaging - Autonomy

Combining immediate feedback with multiple attempts an underexplored tool.

Sancho-Vinuesa & Viladoms (2012)

- Math: Learning gains on subsequent summative quizzes

Marden et al (2013)

- Physiology: Learning gains on subsequent exams

Sancho-Vinuesa et al (2018)

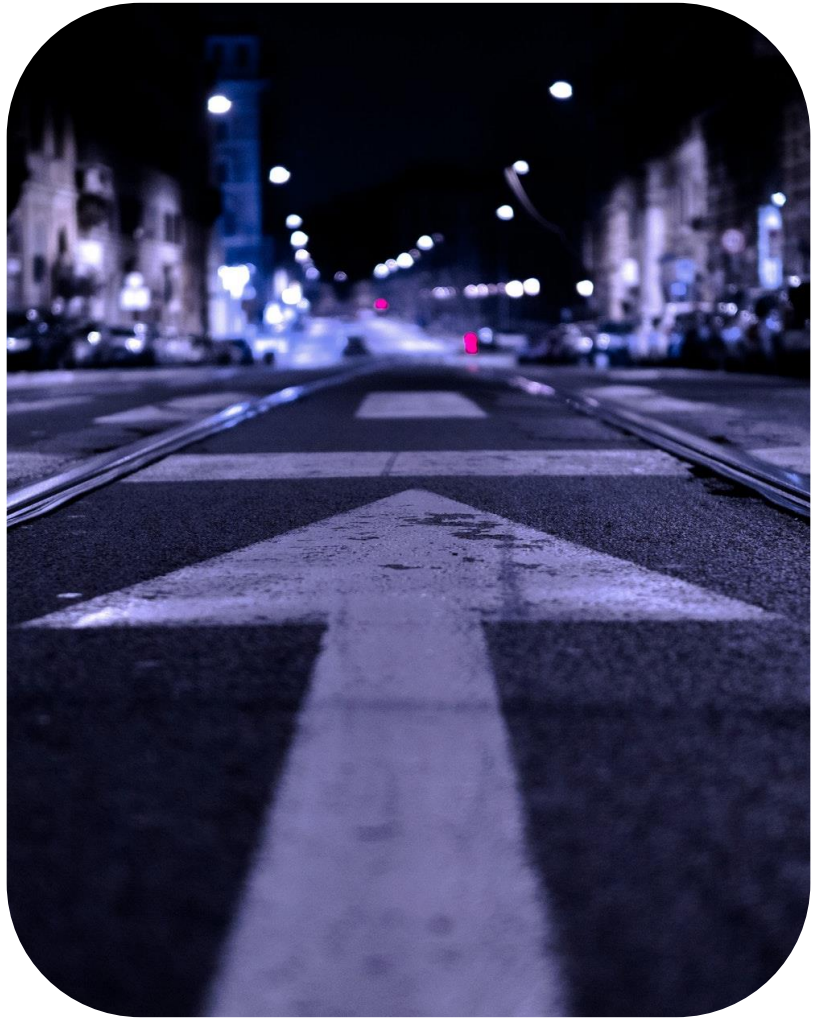
- Calculus: No learning gains

Faulconer et al (2019)

- Chemistry: Learning gains

We put the LMS to work to combine multiple attempts and feedforward.

✓	No penalty for using only 1 attempt
✓	Closed questions from pools
✓	Questions one-at-a-time
✓	Save and resume options
✓	Timed – 1 hour
✓	Keep highest score
✓	Auto-graded by LMS
✓	Feedback immediate, once



We embedded automatic feedback designed according to best practices.

Topic	Question	Feedback
Significant Figures	Which number below contains 3 significant figures?	Zeroes to the left of the nonzero digits are never significant. Zeroes in between nonzero numbers are always significant. Zeroes to the right of nonzero numbers are significant if there is a decimal present.
Subatomic Particles and Atomic Models	How should this diagram be changed to properly represent the Lithium – 8 isotope?	Isotopes have the same atomic number but different atomic masses. Which subatomic particle varies in isotopes?

Students take advantage of multiple attempts across several science disciplines.

Chemistry (151 students)
Environmental Science (141 students)
Science of Flight (119 students)

46%	Overall use of multiple attempts
53%	<A tried again
60%	<D tried again

Multiple attempts with feedforward led to higher scores, justifying the increased time investment.

- ✓Average 10% gain
- ✓Outperformed students who completed 1 attempt

Student behavior with multiple attempts introduces potential moderating variables.

Throw away attempt

- Would *falsely* ***strengthen*** relationship between multiple attempts-immediate feedback and content mastery

Abandoned attempt

- Would *falsely* ***weaken*** relationship between multiple attempts-immediate feedback and content mastery

Students found the feedback useful and reported using the feedback to prepare for future attempts.

Chemistry (n = 33)
Environmental Science (n = 46)
Science of Flight (n = 31)

84%	Feedback **useful**

84%	**Used** feedback

In Review

- ✓ **Students tend to use feedback** and report it is useful.
- ✓ **Students tend to use multiple attempts,** particularly if they did not pass.
- ✓ **Students improve content mastery through multiple attempts** compared to their prior performance *and* compared to peers who use one attempt

Questions?

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