Three Years' Experience with Mastery Testing in a Health Informatics Course

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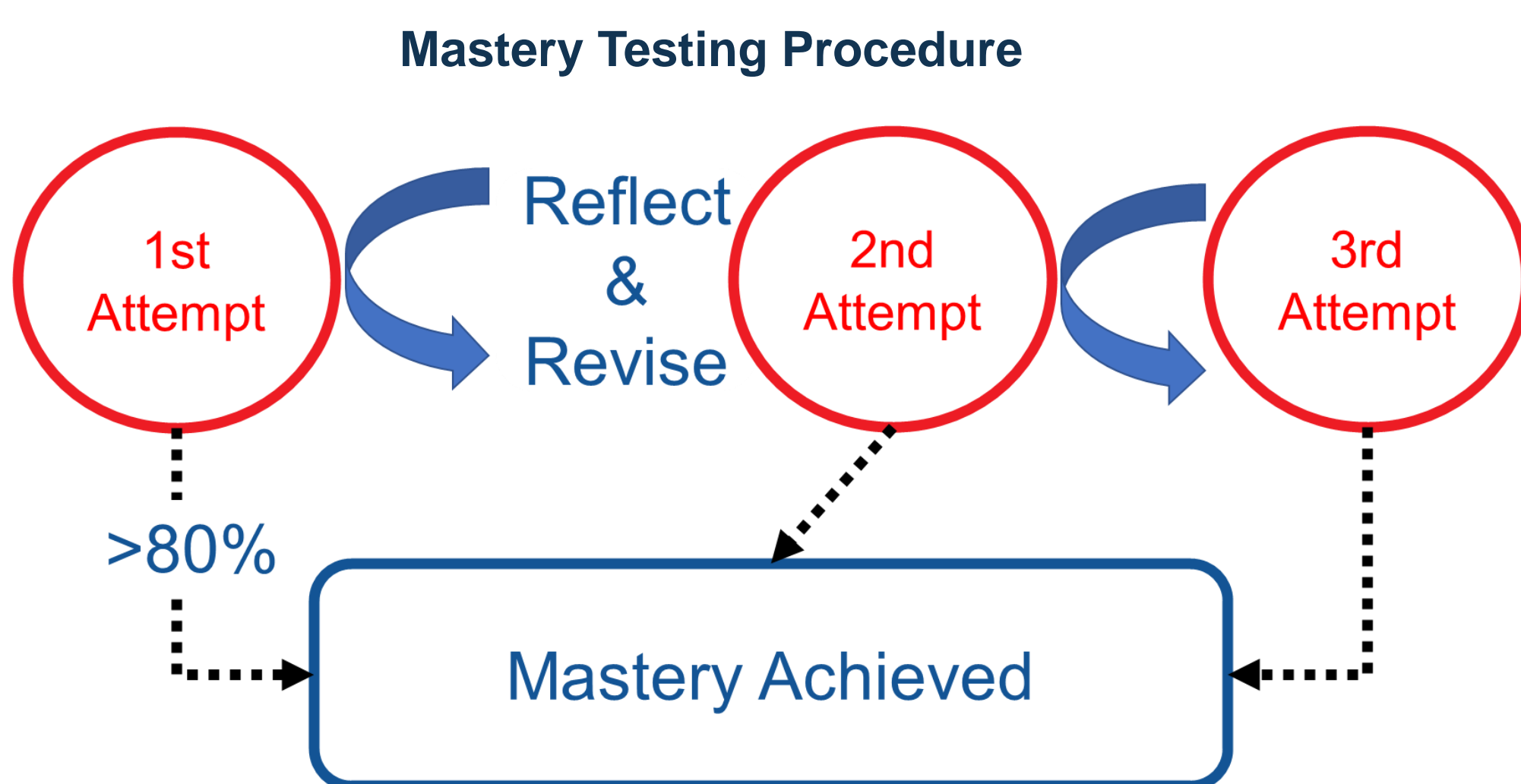UNIVERSITY OF MICHIGAN MEDICAL SCHOOL MICHIGAN MEDICINE — LEARNING HEALTH SCIENCES

Background

Mastery testing aims for each student to achieve a high level of performance throughout the course.

Mastery Testing Procedure

1st Attempt → Reflect & Revise → 2nd Attempt → 3rd Attempt

>80% → Mastery Achieved

Lessons Learned

In a course focused on evaluation and research methodology, the mastery model ensures that **all students attain a specified level of achievement of course objectives by the end of the course**.

While the mastery model allows self-pacing, self-pacing becomes challenging in practice. **It requires incentives and penalties for not keeping pace**.

Methods: The Course

1. Enrolled 139 graduate students over three years (Schools of Public Health, Information, and the Department of Learning Health Sciences) in 'Evaluation and Research Methods for Health Informatics & Learning Systems.

2. Course included 7 asynchronous mastery modules. Mastery of all 7 required to complete the course.

3. Learning resources for the modules included: study guides, coaching support, textbook w. practice problems, recorded lectures, and feedback on test attempts.

4. Course included weekly case study discussions assuming steady progress through modules. The highest grade that a student can receive on a mastery test is determined by which date students take their first attempt (Fig. 1).

5. We adjusted the grading rubric each year to incentivize students to stay in sync between the module and case study topics.

Fig. 1. 2022 Grading rubric

	Mastery Achieved on First Attempt	Mastery Achieved on Second Attempt	Mastery Achieved on Third on Later Attempt
Make first attempt at mastery test **during "Bonus Period"**	A+	A if score on first attempt > 50% B otherwise	A if score on first attempt > 50% B otherwise
Make first attempt at mastery test during "On Time Period"	A	A if score on first attempt > 50%, B- otherwise	A- if score on first attempt > 50%, C otherwise
Make first attempt at mastery test during the "Late Period"	C	C	C

Acknowledgments

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Results

	2020	2021	2022
Success Rate on Mastery Tests (Average)	82%	75%	80%
Attempted first test by recommended date	29%	78%	98%

Performance on Mastery Tests
- Over three years, the average success rate on mastery tests was 79%.
- For all years, 76% of the students achieved success on their first attempts; an additional 20% of the students achieved success on their second attempts; 4% of the students required three or more attempts to achieve success.

Keeping Pace in the Course

2020: No incentive to complete module in a timely fashion
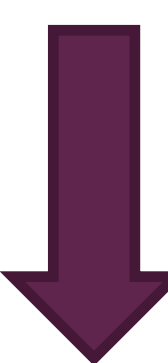
With no incentive to complete a module in a timely fashion once the bonus period ended, many students fell behind the pace that would keep them in synchronization with the case study sessions.

2021: "Late period" created, and penalty for attempting first test after recommended date (B grade)

Many students' critiques on the 2020 end of the course evaluation pointed to a need to "enforce deadlines for the modules because many people in the discussion groups were often not prepared." This resulted in the introduction, in 2021, of a second deadline for each module, which marked the beginning of the "late period". In 2021, the maximum attainable module grade was a B if a first test attempt occurred during the late period.

2022: More stringent grading policy (B grade changed to C for late period attempts)

In 2022, the grading policy was made more stringent, such that first attempts on a mastery test during the late period would lead to a maximum grade of C on the module. The result was that 2% of first tests were attempted in the late period.

Future Application and Next Steps

While mastery testing presents a novel experience to students, on the whole students like its flexibility for their schedules and are able to keep pace with completing their modules when a harsher disincentive is part of the grading.

For courses in health education with both quantitative and qualitative-type testing concepts, the mastery testing method can be applied with these experiences in mind.

The course will resume in Fall 2023, with feedback from students incorporated.

Feedback From Students

- "While the mastery tests were challenging, i**they pushed me to understand the material and apply it,** which I thought was helpful."
- "Many people in the discussion group were often not prepared, **especially with regards to the content from the modules/text**. As a result, the discussions were not as robust."
- "I had fallen behind on the modules really quickly. Having the mental barrier was tough, but pulling ahead of the pack around module 5 and **finally finishing the modules with time to spare felt great**."
- "I liked the flexibility of the modules. **It was nice to know I didn't have to have the test done if I didn't have time**. I also appreciated the willingness to adjust the course when we were struggling."

Fig. 2. Student feedback on mastery testing in 2020

I was comfortable with the mastery module format.

Strongly Agree | Agree | Neutral | Disagree | Strongly Disagree | N/A

0%   20%   40%   60%   80%   100%