Developmental Mathematics Placement Pilot

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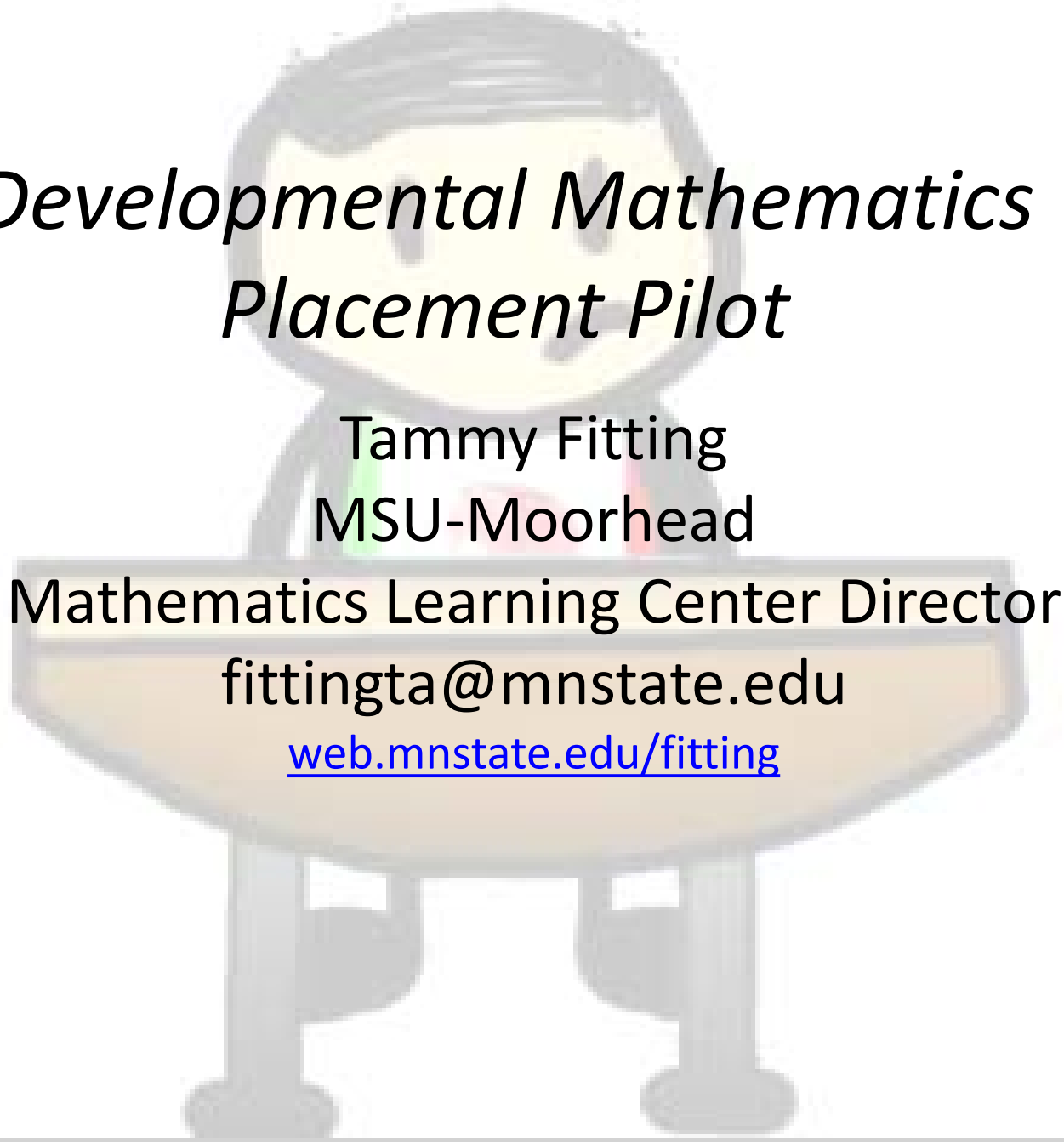

Image from Study.com

Why do a pilot?

- Concerned about features and viability of NGA QAS.
  - All multiple choice.
  - Trying to fit one test to many different types of courses.
  - Many topics covered in one question.
  - No helpful feedback on the topics the student does or doesn't understand (diagnostics).

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Why do a pilot?

- Investigate a multifaceted tool.
  - Placement as part of multiple measures
  - Diagnostic
  - Remediation/Bridging/College Readiness
  - Reliable
  - Flexible, editable features
  - Cost effective

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Why MyMathTest?

- Experience with Pearson products including MyMathLab, MyFoundationsLab, and MyMathTest.
- Multiple options and adaptable to many situations

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MMT satisfies more than one need.

- Placement
- Diagnostic
- Remediation
- Bridging
- College Readiness
- Adaptable

Free (or $12 for 16 weeks if institution does not use Pearson)

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What does a placement test tell us?

- Does it predict a student's success in a course?
- It's a tool to measure whether the student has the prerequisite knowledge required for a course.

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Options

- Adaptive Tests
  - Computer Adaptive Test (CAT)
- Fixed Tests

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The adaptive testing creates a personalized test experience by utilizing computerized adaptive testing (CAT) technology based on Item Response Theory.

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Items are dynamically selected one by one. The student's response to the first Item dictates the second Item which will be given and so on. Typically the flow is as follows:

https://www.learnosity.com/computerized-adaptive-testing/

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1. Item pool is searched for optimal item, based on the student's ability estimate
2. The Item is presented to the student.
3. Based on the student's response, correct or incorrect, the ability estimate is updated.

Steps 1-3 are repeated until a termination criterion is met.

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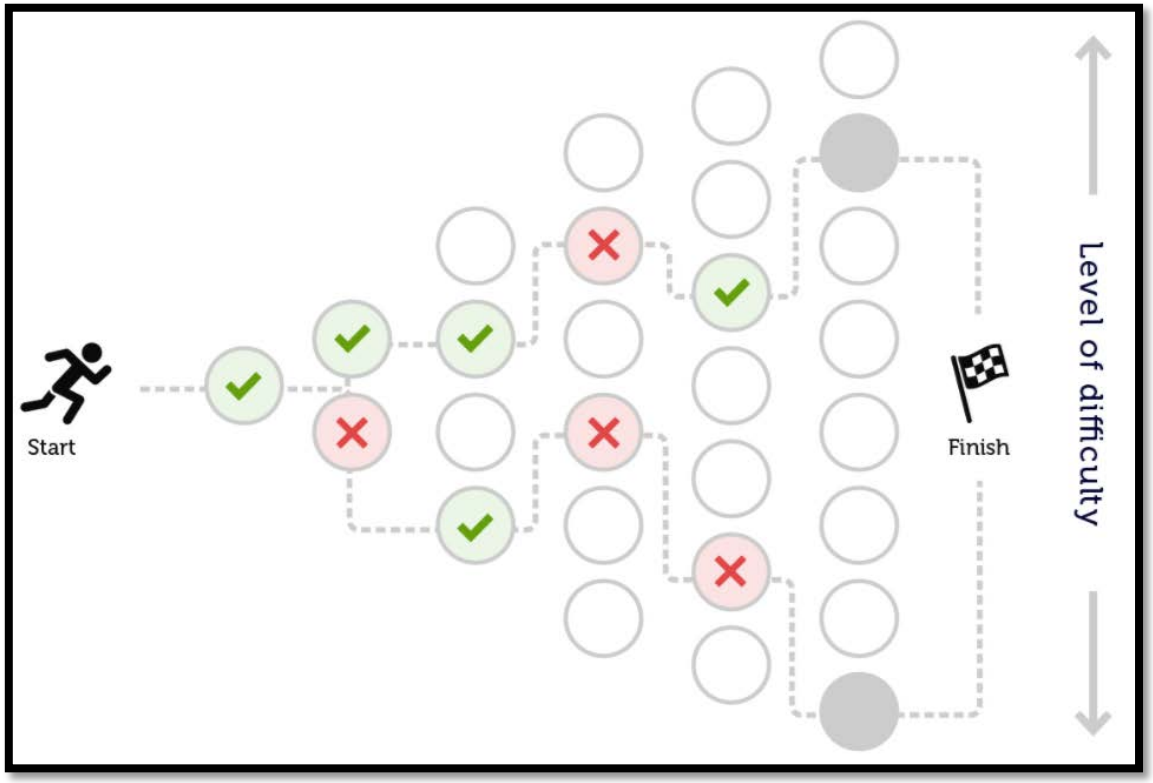

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…students generally have to complete a reduced number of questions, as they are only presented with questions considered appropriate for their knowledge level (“Computer-adaptive test”, 2013)

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- The adaptive test is a variable test length. In MyMathTest, the minimum number of questions per test is six, and the maximum is ten questions.

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The assessments draw from a large bank of questions, and because students receive different questions based on their responses, test questions are more secure and can be used for a longer period of time.

(Smarter Ballanced Assessment Consortium, 2018)

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The MyMathTest adaptive test uses a *readiness* score which is the expected proportion correct score. A readiness score of 60 means that if the whole set of questions from the prerequisite topics is given to the student then the student is expected to solve 60% of the questions correctly.

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Percent vs. Readiness in Adaptive Tests

Results of three Intermediate Algebra students. Completed parts 2 and 3 in the second week of the semester.

Percent			Readiness			
Part 1	Part 2	Part 3	Part 1	Part 2	Part 3	
1-4, 6	9-12, 15	10-14, 16	AR	EA	IA	
			65	70	70	
Score	Score	Score	Score	Score	Score	
	50	50		75	14	MSUM5
	44.44	50		42	19	MSUM7
	83.33	50		93	69	MSUM10

Part 1: Arithmetic
Part 2: Elementary Algebra
Part 3: Intermediate Algebra

MSUM5 Test
MSUM10 Test

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The conventional, or ‘fixed’ test is a fixed length, and all students complete items from the same set of selected objectives.

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Select Topics for an Adaptive Test

13. Factoring and Applications	☐
Section 13.1: Factors: The Greatest Common Factor	☑
Section 13.2: Factoring Trinomials	☑
Section 13.3: Factoring Trinomials by Grouping	☑
Section 13.6: Solving Quadratic Equations by Factoring	☑
14. Rational Expressions and Applications	☐
Section 14.2: Multiplying and Dividing Rational Expressions	☑
Section 14.3: Least Common Denominator	☑
Section 14.4: Adding and Subtracting Rational Expressions	☑
Section 14.5: Complex Fractions	☑
Section 14.6: Solving Equations with Rational Expressions	☑
15. Systems of Linear Equations and Inequalities	☐
Section 15.1: Solving Systems of Linear Equations by Graphing	☑
Section 15.2: Solving Systems of Linear Equations by Substitution	☑
Section 15.3: Solving Systems of Linear Equations by Elimination	☑
16. Roots, Radicals, and Complex Numbers	☐
Section 16.3: Adding and Subtracting Radicals	☑
Section 16.4: Rationalizing the Denominator	☑

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When creating a fixed test, you and select specific questions specific objectives from the topics. You can preview the questions before deciding whether to include them on your test. After you have chosen the questions, you can view the test as it will appear to students.

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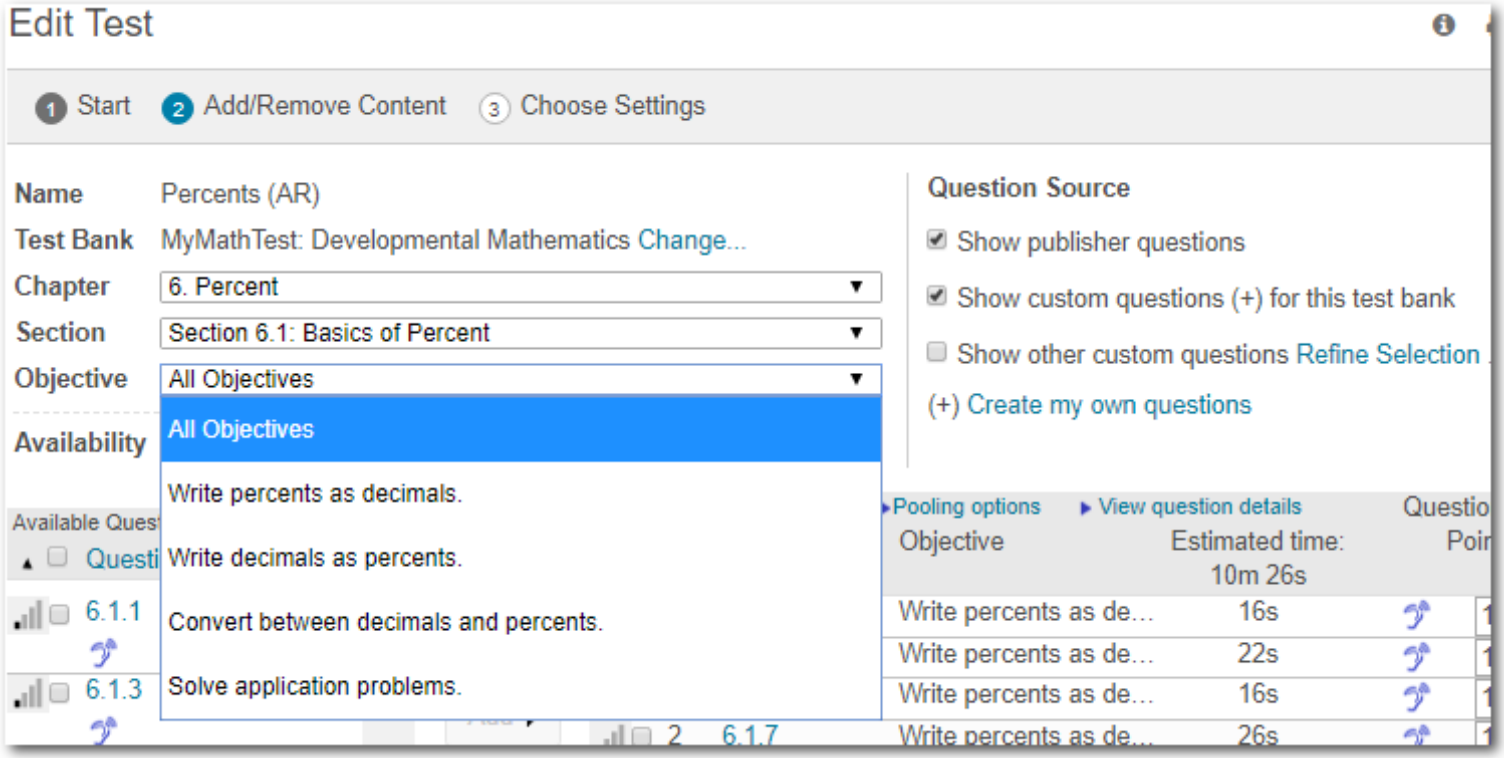
Fixed Test

Specific question(s) from a specific objective.



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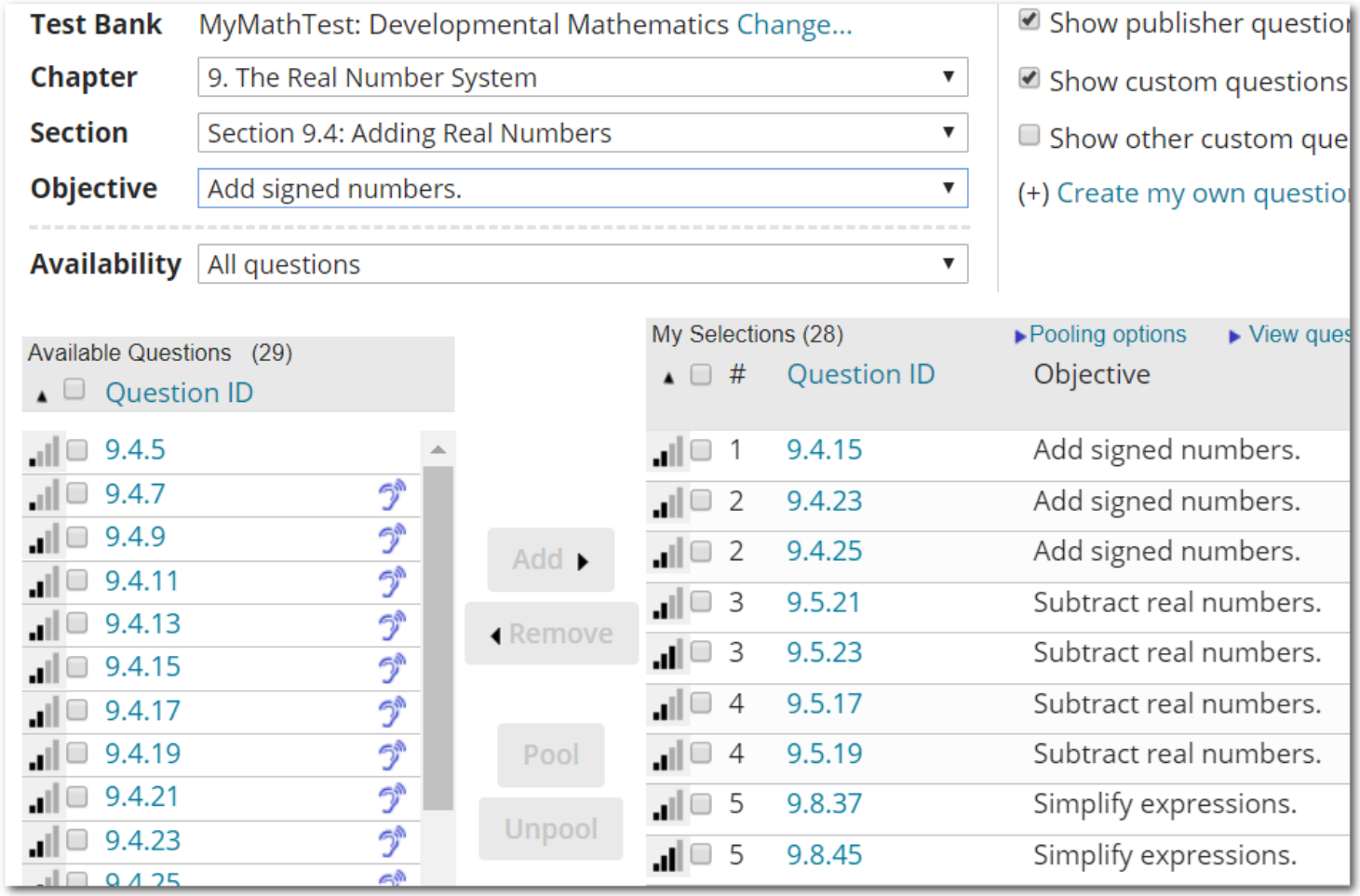
In a fixed test, questions can be pooled so not the same question is given each time but they are still be from the same objective.



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You can set password access, prerequisites, partial credit on multi-part questions, points per question and many other options. Fixed tests can be prerequisites to other tests you create in MyMathTest.

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Therefore, you can require a minimum score on a particular fixed test as a prerequisite to another test. This is helpful when developing placement tests for multiple courses; you can create a “group” of tests, with minimum required scores to progress to the following level.

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SIS

The results of fixed tests can be integrated with a student information system.

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Comparison of Fixed versus Adaptive

See handout.

Which would you think is a better placement tool? Why?

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Early 2018

- Investigated MyMathTest features and availability.

2018

- Pilot approved. Developed one test for each: Arithmetic, Elementary Algebra and Intermediate Algebra and ran trial tests at end of Spring semester.

Early Fall 2018

- Reviewed testing process.
- Four institutions tested at beginning of Fall semester.
- Accumulated statistics and comments to compile and analyze for guidance in revision and implementation.

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- Created a coordinator ‘program’ after much experimenting and sample testing.
- Three other institutions copied it; member courses.
- Any changes in the coordinator ‘program’ are reflected in the members’. Members can view results and adjust individual enrollments.
- Each institution had their own ID and access code.
- 300 enrollments are allowed in each section.

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- Students were asked to complete two assessments.
- They completed the part that included what was considered the prerequisite for the course in which they were enrolled.
- They then completed the part that included topics from the course they were in.

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Order	Ch.	Assignment Name	Group	Assigned
1	O	Orientation - How to Enter Answers		✔
2	1-4, 6	Part 1		✔
3	9-12, 15	Part 2		✔
4	10-14, 16	Part 3		✔
5	1, 2	Whole numbers, Multiplying and Dividing Fractions (AR)		
6	3, 4	Adding and Subtracting Fractions, Decimals (AR)		
7	6	Percents (AR)		
8	9	The Real Number System (EA)		
9	10	Equations, Inequalities, and Applications (EA)		
10	11	Graphs of Equations and Inequalities (EA)		
11	12, 13	Exponents, Polynomials, Factoring (EA)		
12	15	Systems of Linear Equations and Inequalities (EA)		
13	10-12	Absolute Value, Lines, Functions (IA)		
14	14	Rational Expressions and Equations (IA)		
15	16	Roots and Radicals (IA)		

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Statistics

Elementary Algebra students took Part 1, the Arithmetic test (no calculator) and Part 2, Elementary Algebra test (with basic calculator) at the beginning of the semester.

What results would you expect on Part 1 and Part 2 for an Elementary Algebra student who is properly placed?

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MATH095 Elementary and Intermediate Algebra						
		Readiness Scores				
ID	COU_NBR	MMT_AR	MMT_EA	MMT_IA	Exam 1	
msum6	095	87.00	22.00		79.90	
msum8	095	73.00	34.00		81.96	
msum12	095	84.00	37.00		87.63	
msum18	095	77.00	26.00		91.24	
msum26	095	93.00	19.00		86.08	
msum39	095	79.00	42.00		82.47	
msum42	095	89.00	39.00		84.54	
msum50	095	87.00	17.00		77.32	
msum54	095	11.00	42.00		45.36	
msum56	095	66.00	57.00		93.30	
msum62	095	88.00	37.00		80.41	
msum63	095	93.00	55.00		94.85	
msum67	095	29.00	29.00		84.54	
msum71	095	61.00	44.00		79.90	
msum74	095	51.00	28.00		72.68	
msum78	095	73.00	42.00		77.84	
msum85	095	9.00	22.00		65.46	
msum87	095	46.00	42.00		59.79	
msum66	095	73.00	77.00	46		to IA
msum89	095	46.00	81.00	27		to IA

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Elementry Algebra (MATH090)				
	Pilot Test			Course
ID	MMT_AR	MMT_EA	MMT_IA	Exam 1
msum1	29	57		88.04
msum14	66	52		88.59
msum15	71	42		71.74
msum22	43	26		52.17
msum43	73	39		84.78
msum46	69	39		88.04
msum47	93	40		88.59
msum70	95	71		86.41
msum77	95	71		79.35
msum84	46	40		69.57
msum91	66	57		53.26
msum94	93	40		96.2
msum102	73	32		89.13
msum113	97	6		99.46
msum118	88	30		81.52

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Elementary Algebra Students (090 and 095)

6% of the students had a readiness score below 60 on Part 1 and did C or better on the first course exam.

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Intermediate Algebra Students

24% of the students who received a readiness score below 60 on Part 2, received a C or better on the first course exam.

Placement chart

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http://insidestl.com/...

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What are the prerequisites needed?

Topics on handout are based on the shared learner outcomes.

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Late Fall 2018

- The four institutions will retest those tested at beginning of semester. Utilize fixed tests and revised adaptive test (?)

During 2018

- Draft a process of integrating MyMathTest as a measurement tool.

2019

- Repeat testing with Spring 2019 students maybe including 100-level classes.
- Pilot implementation of process with new and current students needing placement information.

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Next…

- Create fixed tests for use at end of 2018 Fall with part of test group. Adjust cutoff scores in adaptive test and review student results to identify possible revisions.
- Use for new Spring 2019 students as an element of multiple measures.
- Continue to gather statistics and revise to implement for Fall 2019 students.

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and more.

- Develop fixed tests to utilize as a diagnostic tool.

- Offer to all students as a remediation/review option for developmental and 100-level.

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Diagnostic Tool

The results of the fixed test is reflected in the study plan indicating the objectives which were mastered and those which need to be reviewed.

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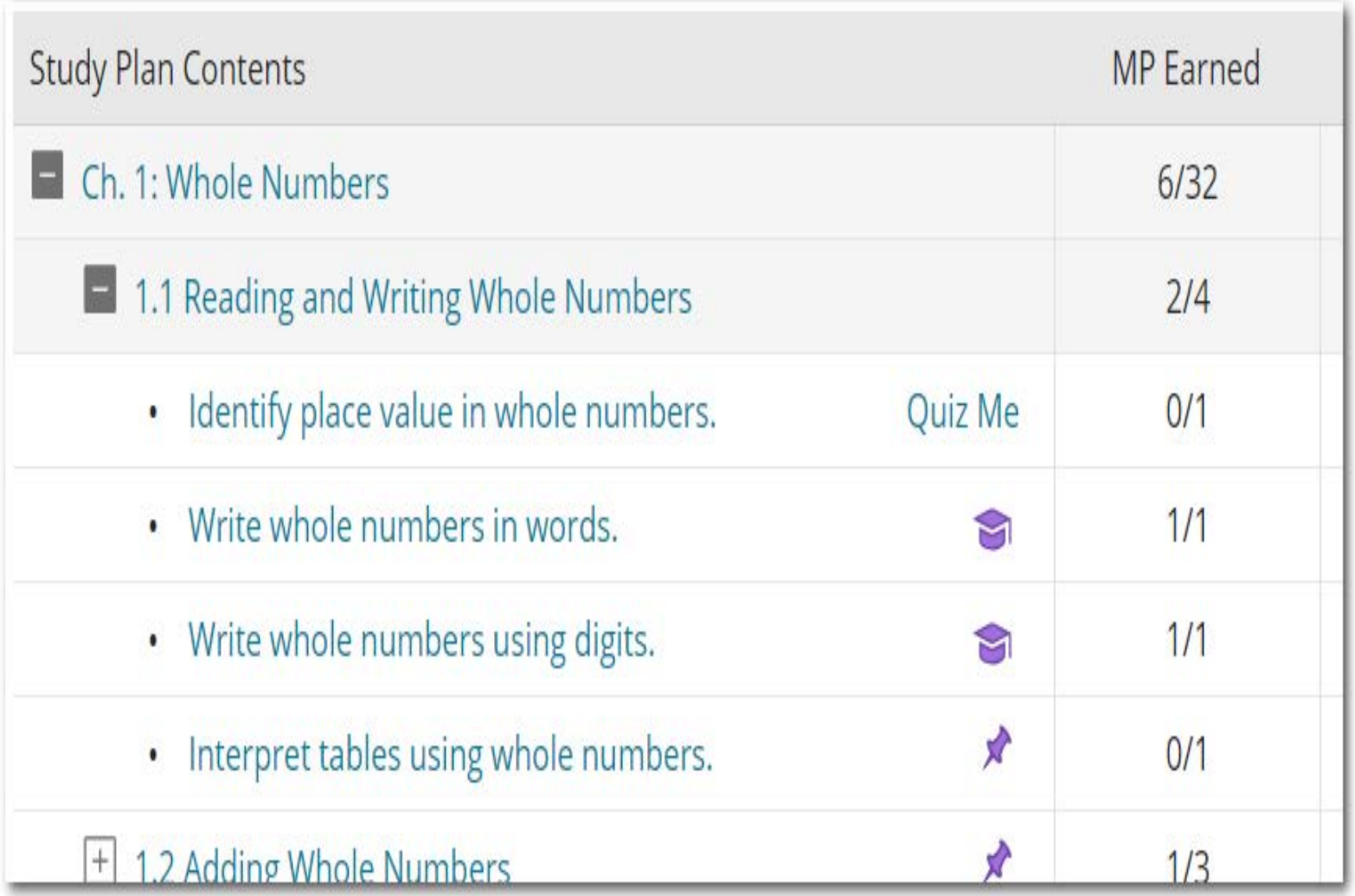

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Cost

- $12/account for 16 week access
- Free if institution is using Pearson products for some classes.

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Admission Accepted:
Take Placement Test(s)

MMT placement < cutoff

MMT placement ≥ cutoff

Incorporate multiple measures

Complete MMT diagnostic (fixed tests) and review.

Enroll

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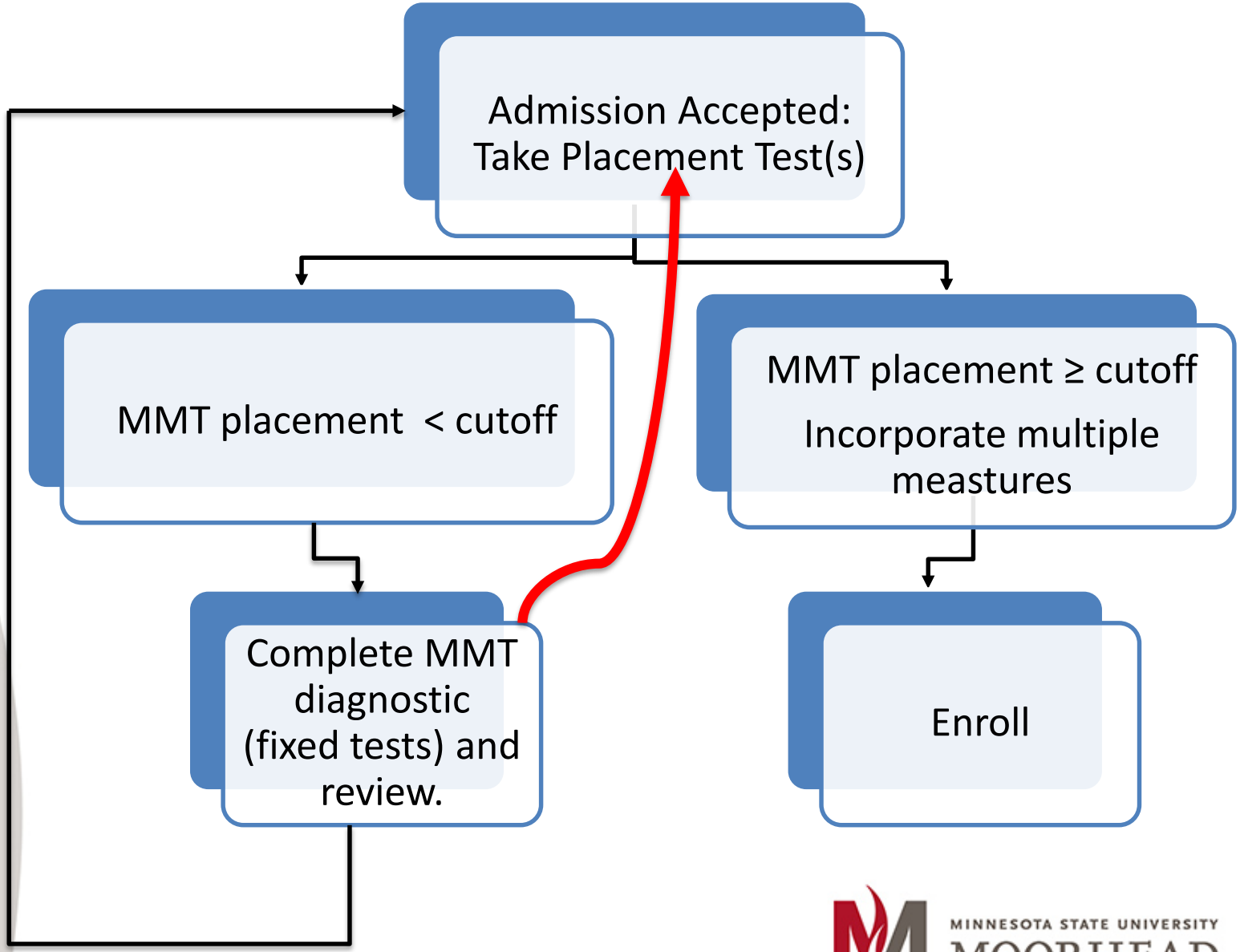

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- If the access to MyMathTest is provided before taking the placement test, the student will
  - be familiar with the format
  - be able to review
  - better understand the implications of the test results.

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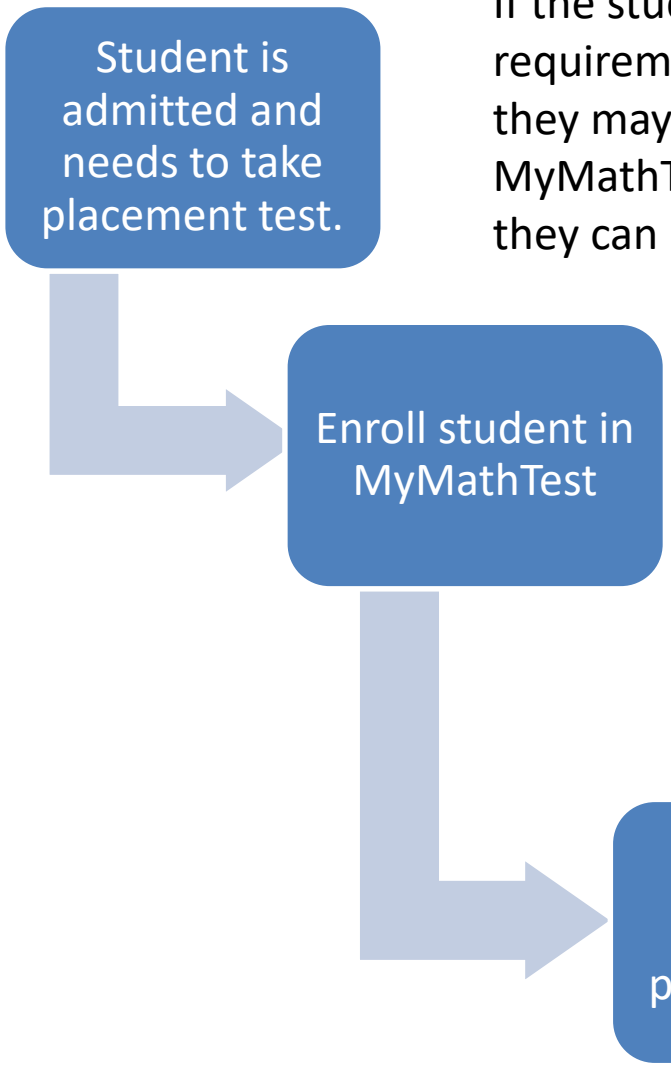

If the student meets placement requirements through other measures, they may still request access to MyMathTest to review and test to see if they can place higher.

The student will be sent information on how to access MyMathTest with an assigned username and password, along with an explanation of the purpose of the review process and testing.

The student may complete the diagnostic tests and work on the study plan before taking the placement test.

Because the access information was sent out before testing, the student should be familiar with the format and better understand the ramifications of the test results.

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Success?

- Being placed in the course for which the student has the prerequisite knowledge is one part of success.
- How do we measure preparation for college?
- How do we improve the students ability to deal with anxiety, change, depression, failure…?
- How do you help them create a growth mindset?

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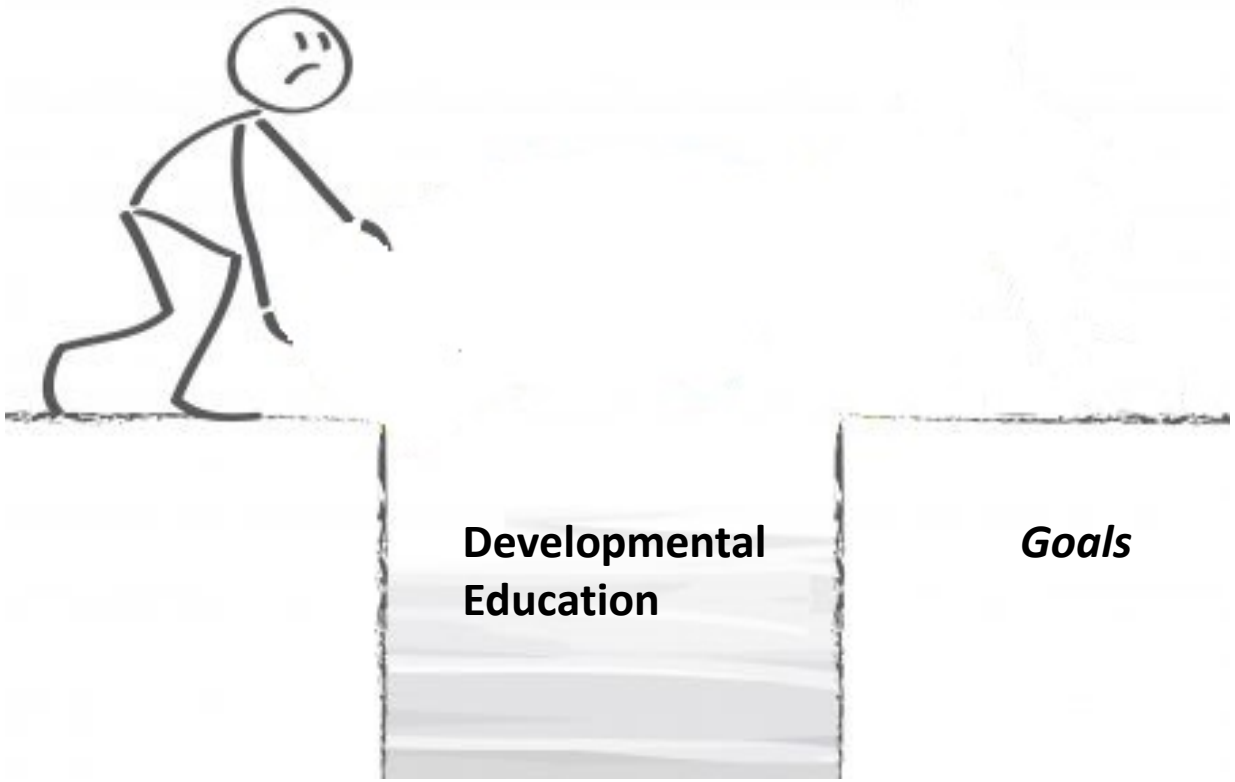

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Goals

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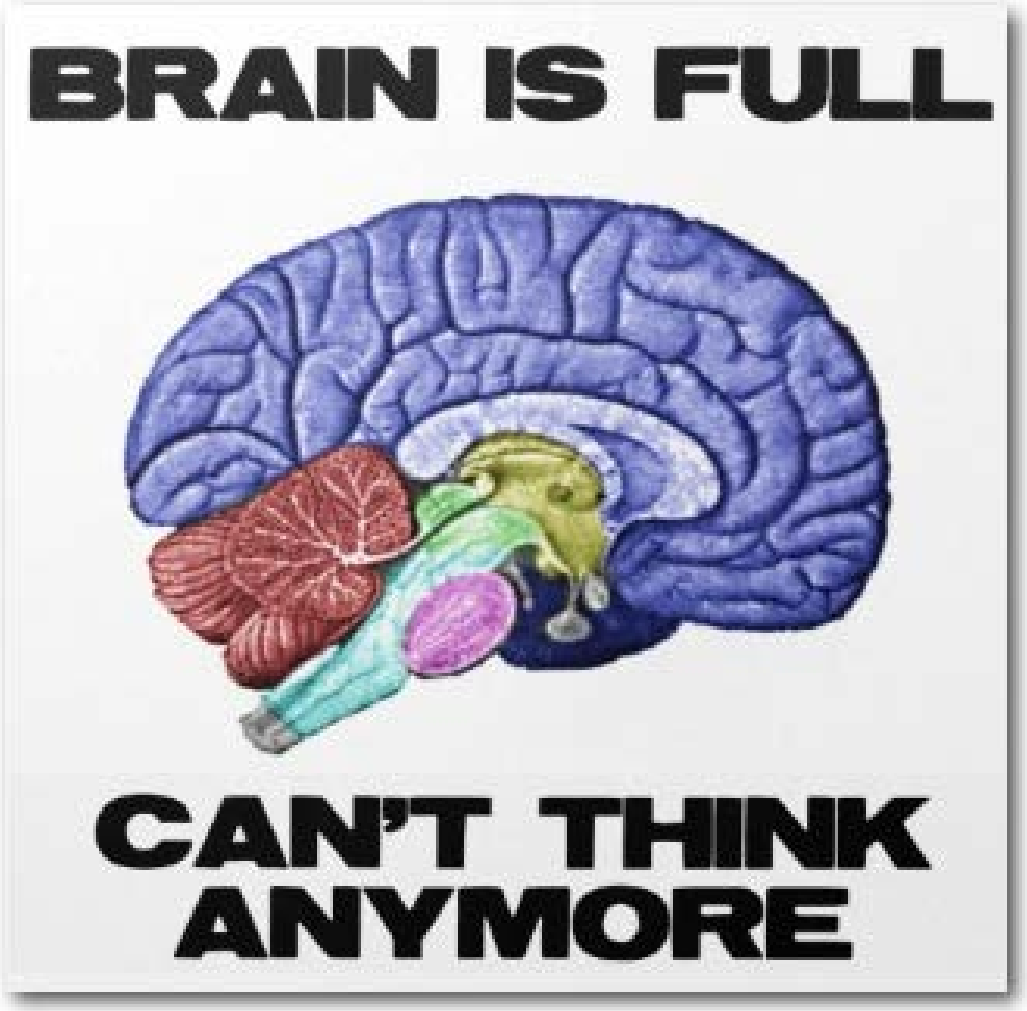

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