

OCMT

ONTARIO COLLEGES MATH TEST

UPDATE ON THE PROGRESS OF THE OCMT – MATH ASSESSMENT FOR STUDENT SUCCESS



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AGENDA

- OVERVIEW: OCMT
- BENEFITS: LEARNERS & FACULTY
- IMPLEMENTATION PROJECTS
- RESEARCH & ANALYSIS
- RENEWAL & EXPANSION
- INTEGRATION
- NEXT STEPS
- QUESTIONS

OVERVIEW

ONTARIO COLLEGES MATH TEST

TOPICS AND SUB-TOPICS

Whole Numbers

*Place value, reading and writing numbers
Equality/inequality
Rounding
Absolute value*

Arithmetic

*Addition
Subtraction
Multiplication
Division
Exponential notation*

*Order of operations
Prime numbers
Factors and multiples
Scientific notation*

Integers

*Adding and subtracting negatives
Multiplying and dividing negatives
Exponents with negatives*

Decimals

*Place value, reading and writing numbers
Arithmetic operations with decimals
Rounding*

Fractions

*Types of fractions, equivalent fractions,
conversion
Addition and subtraction
Multiplication
Division
Order of operations*

Ratios and Proportions

*Creating ratios
Ratios in simplest form
Calculations involving ratios
Rates
Proportions*

Percents

*Converting between percent, fraction and decimal
Calculate amount given base and percent
Calculate percent given amount and base
Calculate base given percent and amount
Calculate percent change*

Basic Algebra

*Variable expressions
Monomial operations
Binomial operations
Polynomial operations
Factoring
Solving equations*

Measurements

*Mass and length
Metric-imperial conversions
Area and volume (capacity)*

1 DIAGNOSTIC ASSESSMENT

IDENTIFY SKILLS THAT REQUIRE MASTERY

OCMT 642

Jessica withdrew \$700.00 in \$20 bills to spend on gifts for her family. She buys gifts that cost \$25.00, \$42.65, \$25.48, \$33.56, and \$39.65. How many \$20 bills does she have left?

bills

1 2 3 4 5 - < >
6 7 8 9 0 . C

Previous 2/36 Next

2 REMEDIAL MODULES

ACHIEVE MASTERY

Rate Section 2

: :

\$3000 \$4000 \$1000

What is the ratio of Jim's investment to Pam's investment to Michael's investment? Enter your answer in the boxes above.

1 2 3 4 5 - < >
6 7 8 9 0 . C

Vretta

3 SUMMATIVE ASSESSMENT

ASSESS LEVEL OF MASTERY

OCMT 642

Calculate.
Express the result as a mixed number in lowest terms.

$4\frac{1}{2} \times 5\frac{1}{2} =$ /

1 2 3 4 5 - < >
6 7 8 9 0 . Clear

Previous 2/36 Next



BENEFITS

LEARNERS

A group of students sitting outdoors on a grassy area, using laptops and tablets. The image is overlaid with teal semi-transparent bars at the top and bottom. The top bar contains the text "ENGAGING and RICH INTERACTIONS" and the bottom bar contains "IMMEDIATE FEEDBACK".

ENGAGING and RICH INTERACTIONS

IMMEDIATE FEEDBACK



BENEFITS

FACULTY

DIFFERENTIATED INSTRUCTION



ACTIONABLE DATA

IMPLEMENTATION

TORONTO CATHOLIC DISTRICT SCHOOL BOARD



ADDRESSING THE NUMERACY GAP

Grade 9 Applied Mathematics



Ontario Centres of
Excellence

Advancing Education Program

- ✓ Diagnostic, Remediation, and Post-Test
- ✓ Use in class and at home
- ✓ Correlation of OCMT to student achievement data
- ✓ Correlation of OCMT to EQAO data



HUMBER

OCMT
ONTARIO COLLEGES MATH TEST



Vretta

PROJECT PLAN

PHASE I

- Launch in 3 schools
- Winter 2016

PHASE II

- Expand to an additional 10 schools
- Fall 2017

PHASE III

- Implement OCMT in all (29) schools
- Winter 2018

PROJECT RESULTS



RESULTS

- ❑ Average score: 46.3%
- ❑ Least successful: Algebra, Integers and Ratios
- ❑ Most successful: Decimals and Measurement
- ❑ Success hinges on: Integration with Curriculum

SUMMER TRANSITION PROGRAM



Ontario Centres of
Excellence



HUMBER



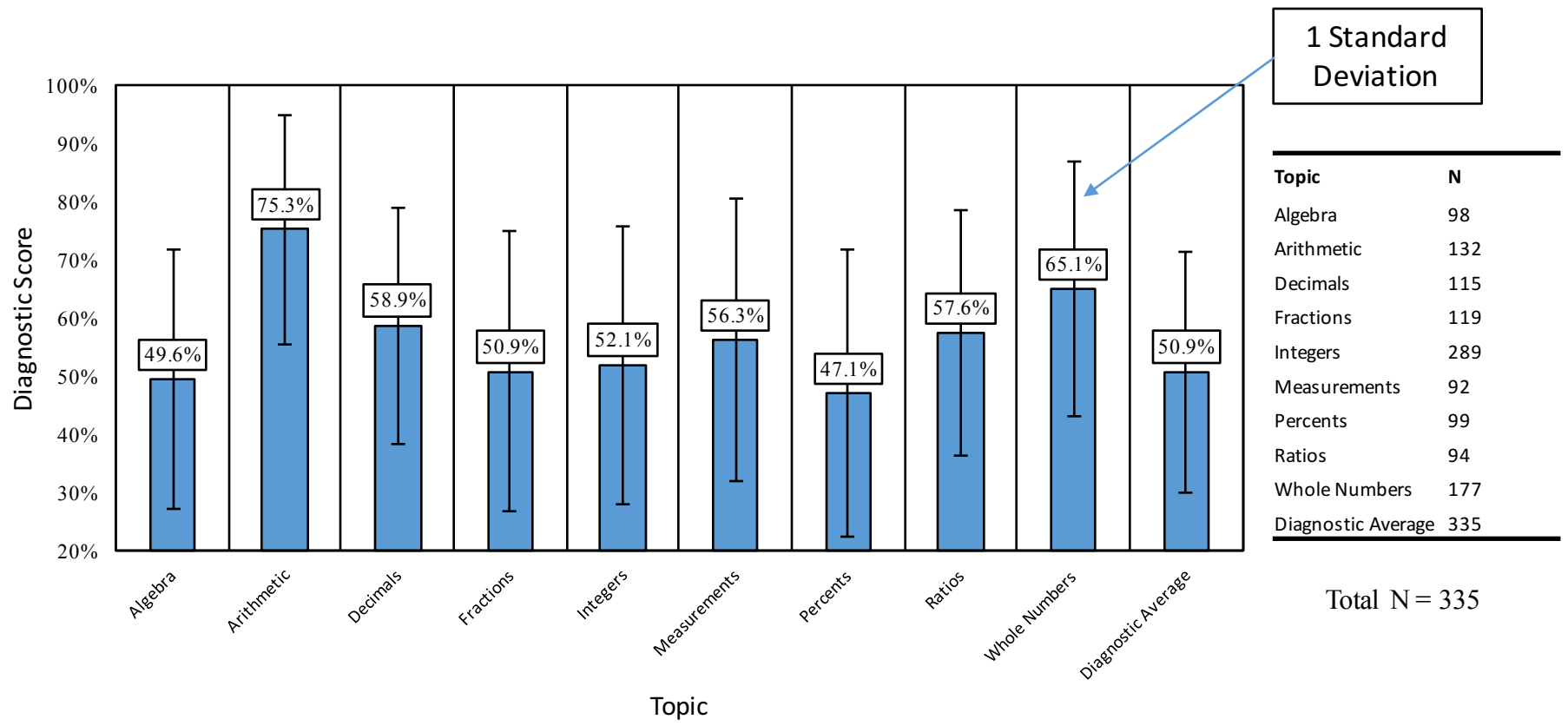
Vretta



SUMMER TRANSITION PROGRAM

- 5 schools, 7 teachers, 17 different classes and 427 user accounts created
- 335 completed a diagnostic (78.4%)
- Average score: 50.9% on diagnostic
- Biggest gaps noted in Algebra, Fractions and Percents
- Smallest gaps in Arithmetic and Whole Numbers
- Completion rates of remedial modules was significantly higher (47.2% - 154 students)
- Significant gains in Decimals, Integers, Measurement and Percents
- Response to “I like Math” and “It is important for me to develop strong math skills in high school” were predictive of diagnostic assessment score

DIAGNOSTIC SCORES

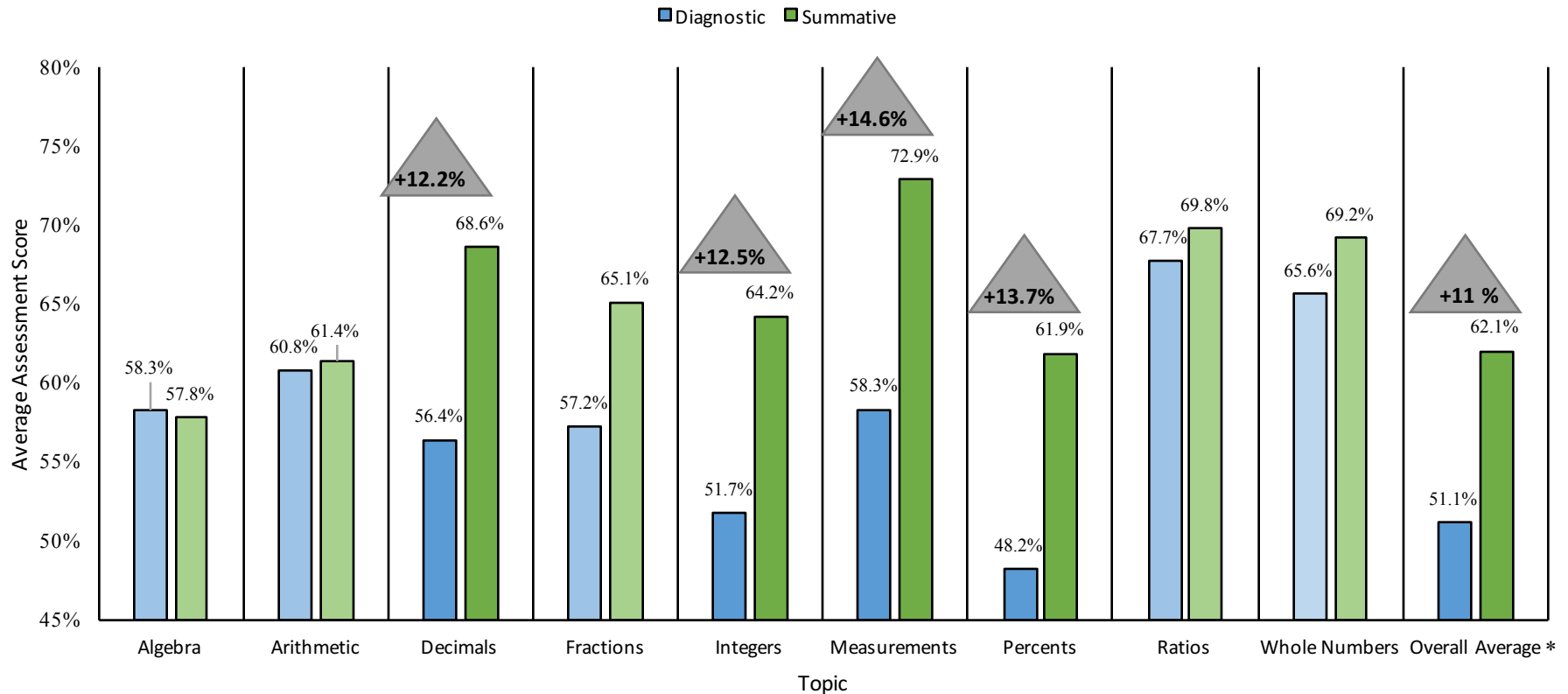


1 Standard Deviation

Topic	N
Algebra	98
Arithmetic	132
Decimals	115
Fractions	119
Integers	289
Measurements	92
Percents	99
Ratios	94
Whole Numbers	177
Diagnostic Average	335

Total N = 335

STUDENT ACHIEVEMENT GAINS



Bottom 3 from Diagnostic

Algebra: No improvement

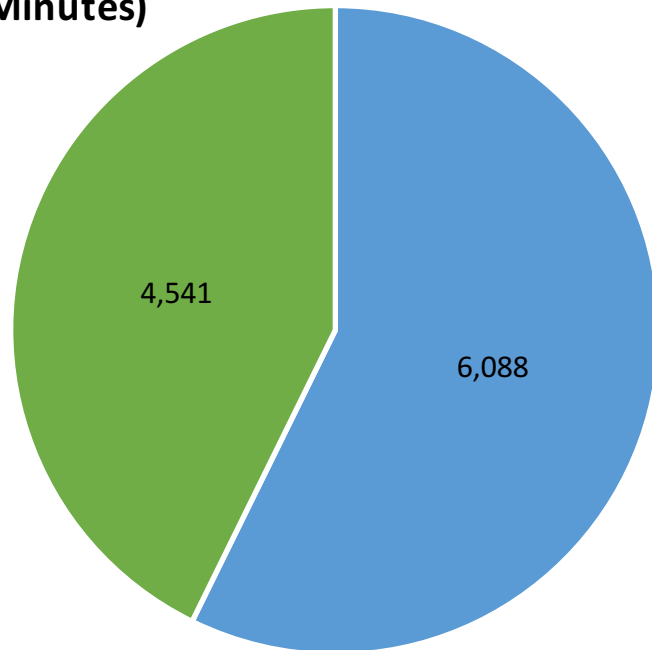
Fractions: Marginal improvement

Percents: Large improvement

*Diagnostic average of topics with summative scores

MORE TIME SPENT ON REMEDIAL MODULES AT SCHOOL

Away (Minutes)



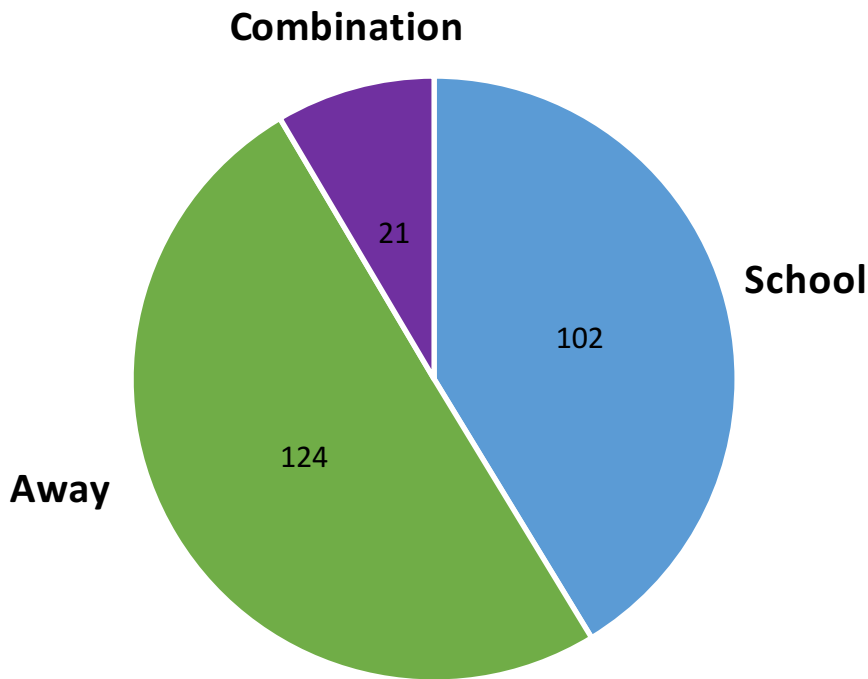
School (Minutes)

	Minutes	Hours	Proportion
School	6088	101.5	57.3%
Away	4541	75.7	42.7%

- School: Weekdays between 8:30 and 3:30
- Away: Everything else

*Shift from pilot phase (71% away, 29% school)

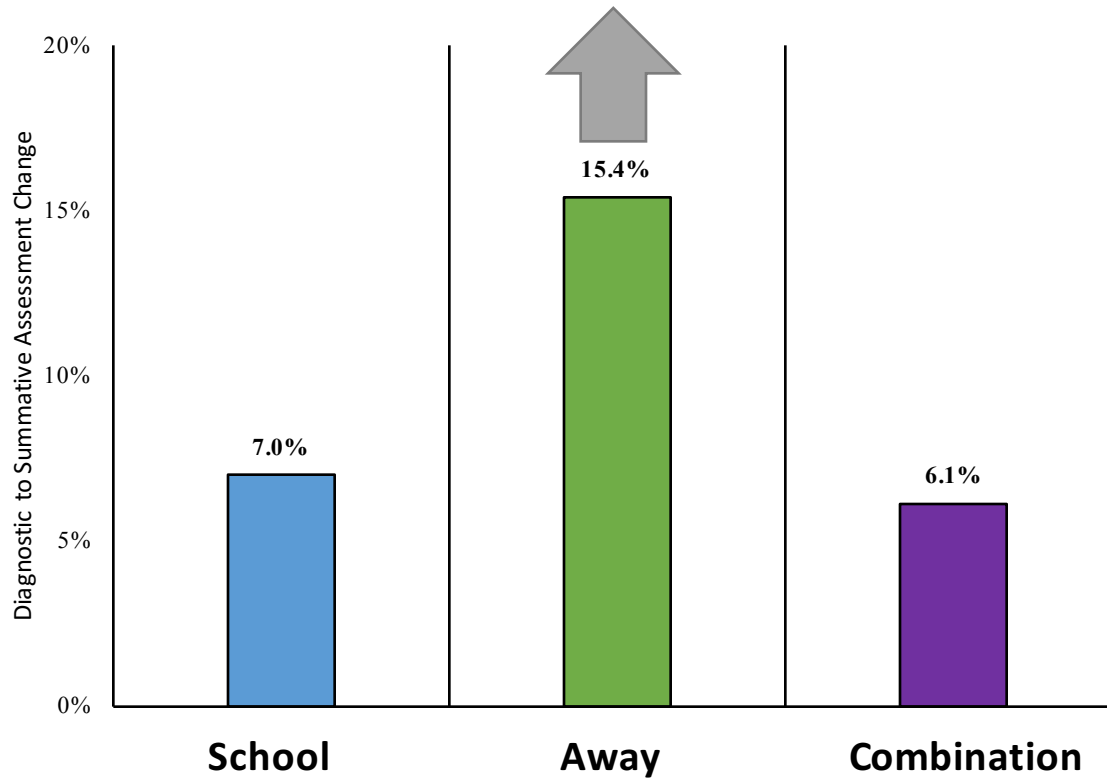
MORE STUDENTS USE REMEDIAL MODULES OUTSIDE OF CLASS



	Students	Proportion
All away	124	50.2%
All at school	102	41.3%
Combination	21	8.5%

*Similar pattern to pilot phase
(All Away: 52.7%, All School: 42.9%, Combination: 4.4%)

ASSESSMENT IMPROVEMENT BY REMEDIAL LOCATION



Location	N
All at school	74
All away	64
Combination	16
Total	154

IMPLEMENTATION

ONTARIO COLLEGES

UPGRADING

Post-admission

- Students complete the test in a proctored environment.
- Results are then used to determine which remedial modules students should complete to support their continued success in mathematics.
- Test takes ~ 60 minutes.

*Supporting students in
programs ranging from
University to
Apprenticeship*



PLACEMENT

Post-admission

- Students complete the test in a proctored environment, both face-to-face and online.
- Results determine which first semester math course they will be required to take.
- Test takes no longer than 60 minutes and includes questions from all 9 foundational topics.



RESEARCH & ANALYSIS

BUSINESS

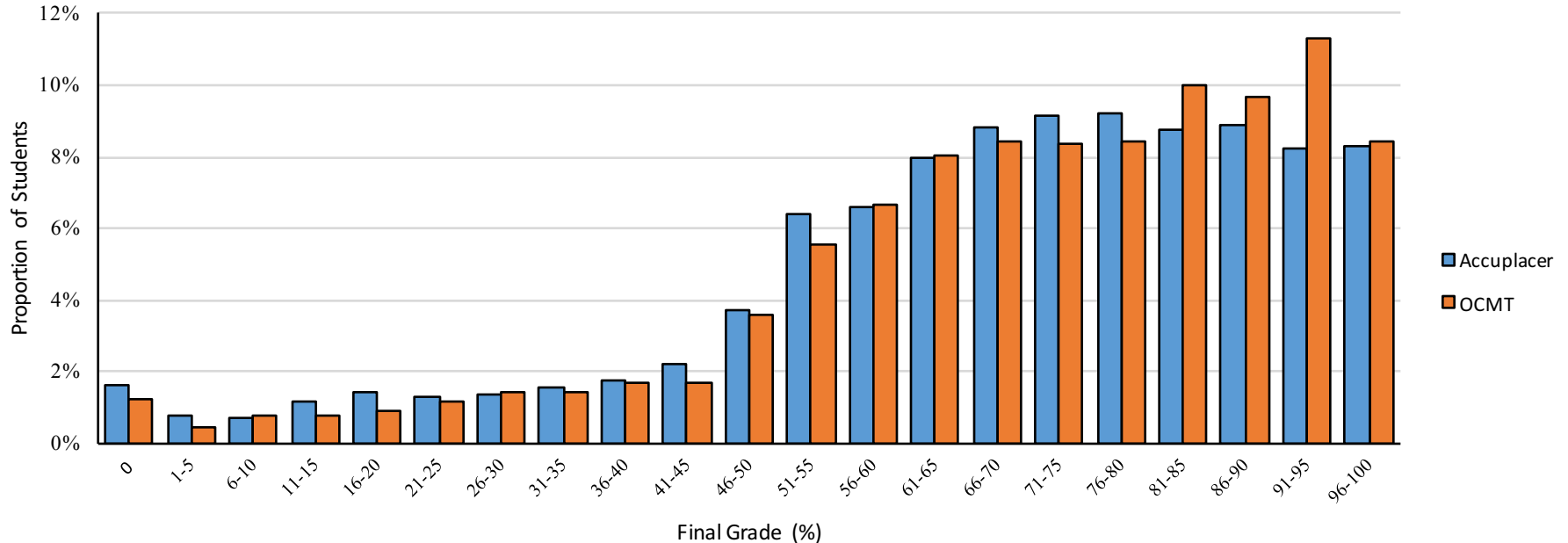
$$\begin{aligned} 21 &\leq \text{SCORE} \\ 16 &\leq \text{SCORE} < 21 \\ &\text{SCORE} < 16 \end{aligned}$$

TECHNOLOGY

$$\begin{aligned} 22 &\leq \text{SCORE} \\ 16 &\leq \text{SCORE} < 22 \\ &\text{SCORE} < 16 \end{aligned}$$

VALIDITY AS A PLACEMENT TEST: GRADE DISTRIBUTION

Grade Distributions by Placement Method



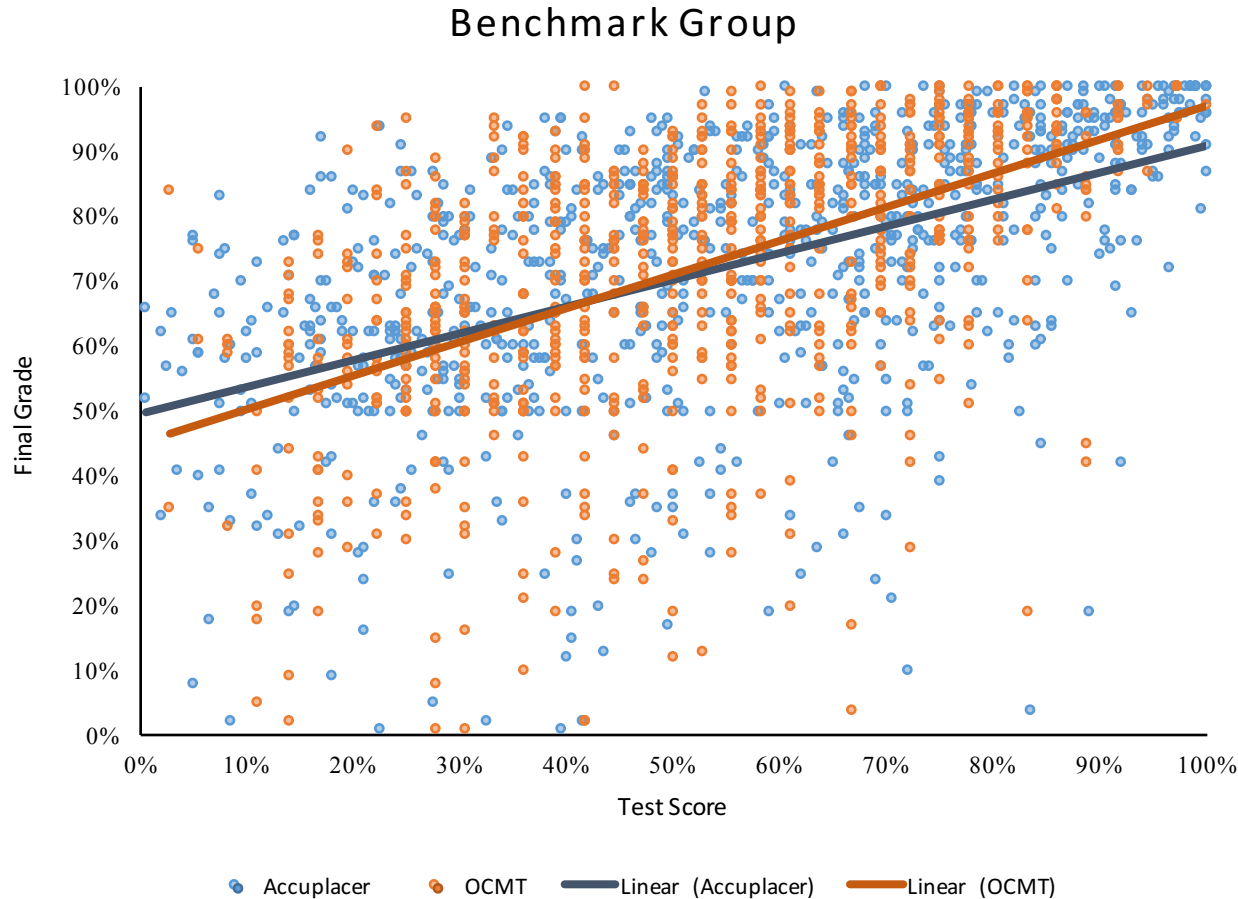
Placement Used	N	Mean	SD
Accuplacer	6675	69.37	21.53
OCMT	2249	71.47	20.68

Statistical Comparisons

- Final Grade (parametric): $t=4.031, p<0.001$
- Final Grade (non-parametric): $U=7275472, p<0.001$
- Variance: $F=2.543, \text{not significant}$
- Distribution: $K-S Z=2.139, p<0.001$
- Success: $\chi^2=11.49, p=0.001$

- Students placed by the OCMT had a higher average final grade.
- They also achieved success as defined by 60% or higher more often (75.3% of the time, compared to 71.6%)
- Other factors could be at play (placement cut scores, curriculum, teachers, etc.)

VALIDITY AS A PLACEMENT TEST: PREDICTIVE VALIDITY



Test	n	r	R ²
Accuplacer	810	0.515***	0.266
OCMT	810	0.537***	0.290

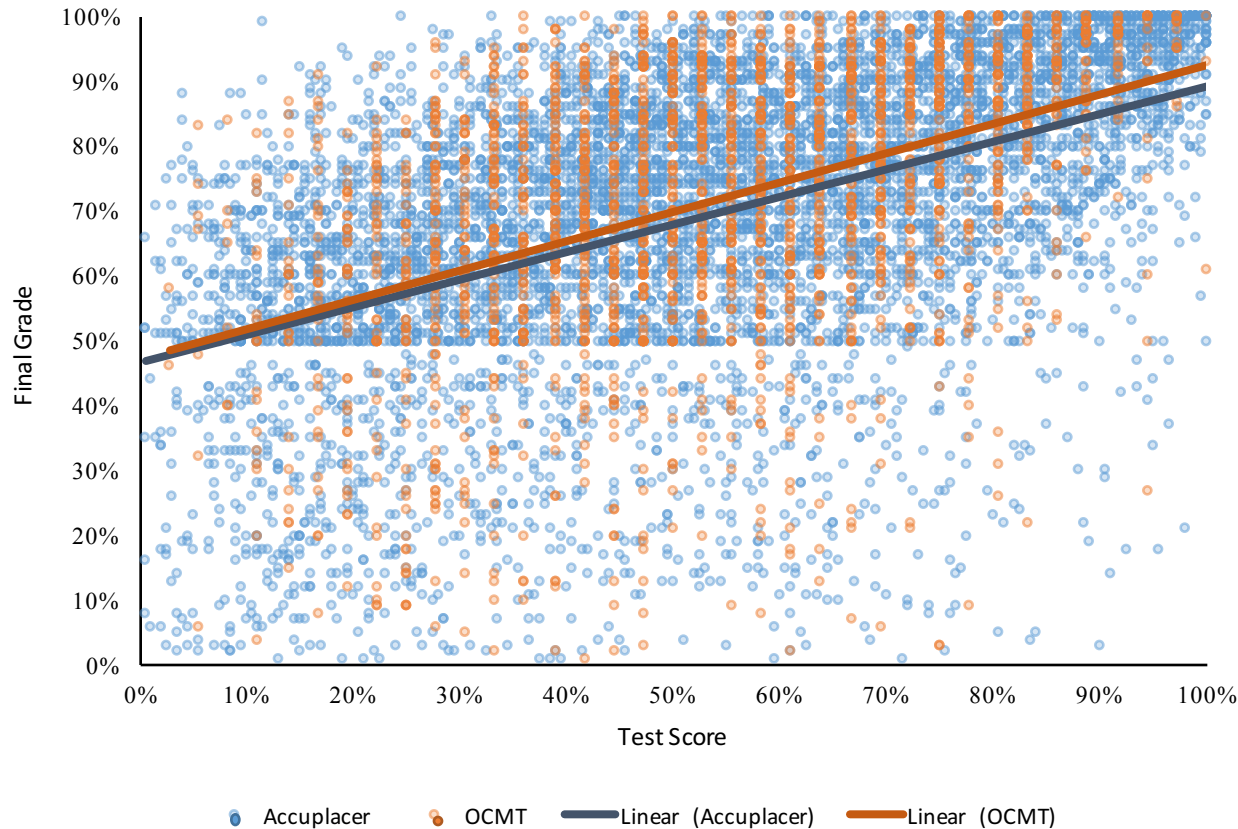
➤ OCMT and Accuplacer paired $r=0.809$.

Correlation coefficients not statistically different when comparing with Z-test.

When selecting only BMTH 010 students ($n=104$), OCMT does correlate stronger ($r=0.464$) than Accuplacer ($r=0.243$) but this goes away when correcting for range restriction.

VALIDITY AS A PLACEMENT TEST: PREDICTIVE VALIDITY

Overall Data



Test	n	r	R ²
Accuplacer	6679	0.499***	0.249
OCMT	2245	0.451***	0.203

Note: OCMT score not counted for Benchmark students

Accuplacer correlates stronger than OCMT
($z=2.54$, $p=0.006$).

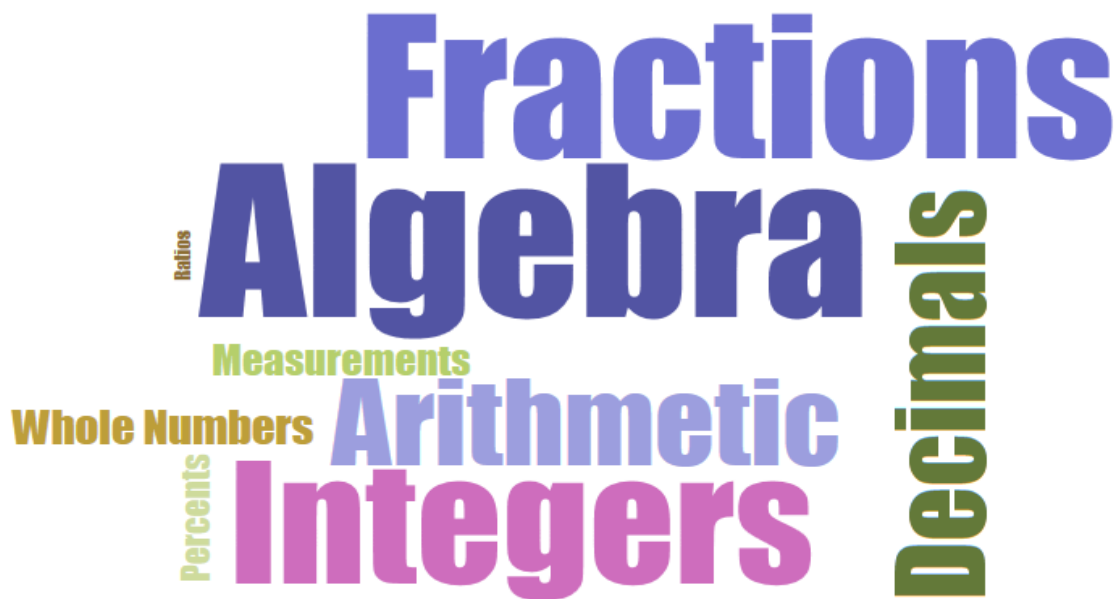
When selecting for TMTH 110, 120, and 125 students, OCMT ($n=197$, $r=0.485$) correlates stronger than Accuplacer ($n=817$, $r=0.279$). This remains when correcting for range restriction.

ADDITIONAL PREDICTIVE POTENTIAL

Stepwise linear regression using individual topic scores instead of a single overall score improves predictive power. Algebra, Fractions, Integers, Arithmetic, and Decimals are retained in this analysis.

- Total score only model $R^2 = 0.203$
- Multiple regression model $R^2 = 0.226$

This is a preliminary analysis, not an optimized prediction model.



Included in Model	
Topic	Beta
Algebra	0.214
Fractions	0.176
Integers	0.111
Arithmetic	0.050
Decimals	0.048

➤ Entry criteria: $p < 0.05$

Excluded from Model	
Topic	Beta In
Measurements	0.015
Percents	0.014
Ratios	0.010
Whole Numbers	0.016

RENEWAL & EXPANSION

SUMMER 2017

- Recruited 9 teachers.
- From 6 Ontario colleges:
 - Humber College
 - Durham College
 - Seneca College
 - Mohawk College
 - Georgian College
 - Sheridan College
- Developed a bank of **512** assessment items.



Programs: Business, Mineral Exploration Techniques,
Electrical Engineering Technology,
Welding Electrical Engineering,
Motive Power Technician,
Heavy Equipment Techniques, Mechanical Techniques,
General Arts & Sciences, Police Foundations, & Nursing



**St. Lawrence
College**

Program: Marketing



Program: Bachelor of Commerce

FALL 2017 & WINTER 2018

- Volunteer team from TCDSB
 - 4 secondary school teachers
 - 1 math consultant from the board
- Used the Non-Proctored OCMT items and developed a bank of **108** assessment items.



Grade 9 Applied Mathematics

BUSINESS

- Using the original OCMT developed as part of the College Student Achievement Project.
- Contains a bank of **307** assessment items.

FACULTY OF APPLIED SCIENCE AND ENGINEERING TECHNOLOGY (FASET)

- Volunteer team from the Faculty of Applied Science and Engineering Technology (FASET) at Seneca.
- Used the original OCMT items and developed a bank of **416** assessment items.

Arts and Science University Transfer (ASU)

- Volunteer team from the Arts and Science - University Transfer (ASU) at Seneca.
- Used the original OCMT items and developed a bank of **258** assessment items.

TOPICS

1. Whole Numbers
2. Arithmetic
3. Integers
4. Decimals
5. Fractions
6. Ratios & Proportions
7. Percent
8. Basic Algebra
9. Measurements

TOPICS

1. Arithmetic
2. Percent, Ratios & Proportion
3. Basic Algebra
4. Linear Correlation
5. Graphs & Systems of Linear Equations
6. Measurement

TOPICS

1. Equations & Inequalities
2. Functions
3. Linear Functions
4. Polynomial & Rational Functions
5. Exponential & Logarithmic Functions
6. Sine & Cosine Functions
7. Periodic Functions

SUMMARY

ORIGINAL TOPICS	ADDITIONAL TOPICS
1. Whole Numbers	10. Linear Correlation
2. Arithmetic	11. Graphs & Systems of Linear Equations
3. Integers	12. Equations & Inequalities
4. Decimals	13. Functions
5. Fractions	14. Linear Functions
6. Ratios & Proportions	15. Polynomial & Rational Functions
7. Percent	16. Exponential & Logarithmic Functions
8. Basic Algebra	17. Sine & Cosine Functions
9. Measurements	18. Periodic Functions

OCMT	NUMBER OF ITEMS
OCMT – Original	307
OCMT – Non-Proctored	512
OCMT – High School	108
OCMT – CAT Programs (FASET)	416
OCMT – CAT Programs (ASU)	258
TOTAL	1601

INTEGRATION

- STUDENT INFORMATION SYSTEM
- ONLINE PROCTORING



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B | VIRTUAL

NEXT STEPS



**EXPANSION OF
ITEMS &
MODULES**



**PSYCHOMETRIC
ANALYSIS**



**TRANSLATION
TO FRENCH**

QUESTIONS?



Website

ocmt.mathsuccess.ca



Quarterly Newsletter

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Demo and Training

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THANK YOU