Using Multiple Measures for Placement in Mathematics

Assessment and placement in community colleges has depended heavily on placement exams administered shortly after admission. Research indicates that these placement exams frequently misplace students in the curriculum, and that students more often are placed in coursework that is *below* their potential than they are in coursework that is *above* their potential (Scott-Clayton, 2012; Willett, et al., 2015). The decisions by ACT to phase out the widely used Compass placement test (Fain, 2015) and Michigan's move from administering the SAT instead of the ACT have added a new sense of urgency to improving assessment and placement processes in community colleges. Colleges either must invest limited financial and administrative resources in identifying and implementing an alternative placement test or else rely on other types of information to place students in mathematics courses.

This brief summarizes the results of a study that examined the relationships between a student's grade in in his/her first college-level mathematics course and several sets of predictors, including Compass placement exam scores, scores on the Michigan Merit Exam (MME), scores on the ACT portion of the MME, and cumulative high school grade point average. To determine which may serve as substitutes for Compass, the study compared sets of predictors with respect to their capacity to predict student performance in mathematics.

> *High School GPA is the best <u>single</u> predictor of success in Intermediate Algebra and College Algebra.*

> *The best <u>combination</u> of predictors included high school GPA and ACT math score, as administered in the Michigan Merit Exam.*

> *Students with a high school GPA of 3.5 or above can be expected to achieve a B- in Intermediate Algebra, even in the face of fairly low Compass algebra scores.*

## How did students perform on common assessments?

This study used a sample of 2,012 students who enrolled in college for the first time between the Summer term of 2007 and the Fall term of 2011, who completed the Compass pre-algebra and algebra placement tests no later than the beginning of their first term of college and no earlier than six months prior to their first term of college, and who enrolled in Intermediate Algebra or College Algebra as their first math course. Table 1 displays student performance in the selected math courses and placement exams including Compass, MME, ACT, and high school GPA.

Table 1: Course Grade, Assessment Test Scores, and High School GPA		
	Intermediate Algebra	**College Algebra**
Number of Students	1839	173
Course Grade (measured in grade points)	1.9	2.4
Compass Pre-Algebra	63.3	77.1
Compass Algebra	36.5	61.2
MME Math	1101.7	1114.1
ACT Math (administered as part of the MME)	19.4	22.5
High School Grade Point Average		
4.0-3.5	12%	29%
3.4-3.0	34%	36%
2.5-2.9	33%	24%
2.0-2.4	15%	10%
1.5-1.9	4%	1%
0.0-1.5	1%	1%

What assessments best predicted performance in mathematics?

The *single* best predictor of performance in mathematics was high school GPA. Alone, it explained 13.3% and 13.1% of the variation in final grades in Intermediate Algebra and College Algebra, respectively, among students for whom one of these was their first math course. The best overall *combination* of predictors for Intermediate Algebra was high school GPA combined with Compass scores, and the best combination of predictors for College Algebra were high school GPA combined with ACT math scores, administered as part of the Michigan Merit Exam (MME). Figure 1 displays the predictive value (r^2) of each of the assessments.


Figure 1: Best Predictors of Performance in Mathematics
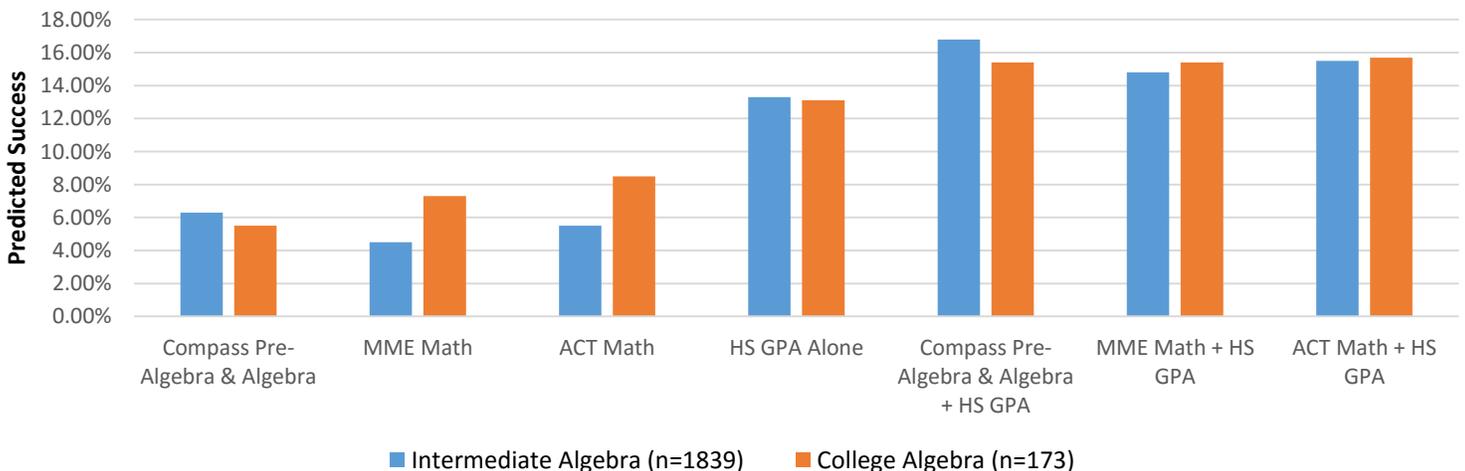
How did students with similar high school GPAs, but different Compass scores, perform in Intermediate Algebra?

The predictions provided in Figure 2 pertain to two groups of students. The first group includes students enrolled in Intermediate Algebra and achieved a score on the Compass algebra test that put them in the 10th percentile of students in Intermediate Algebra. In other words, this group of students had placement test scores that nearly resulted in them being placed in developmental mathematics. The second group is like the first except that they scored in the 90th percentile of the Compass algebra test. These figures suggest that students who achieves a high school GPA of 3.5 or above, who enter college immediately after high school, and who enroll in Intermediate Algebra in their first term can be expected to achieve a B- in the course, even when their Compass algebra scores are fairly low.

Figure 2: Intermediate Algebra Grade, by HS GPA and Compass Algebra
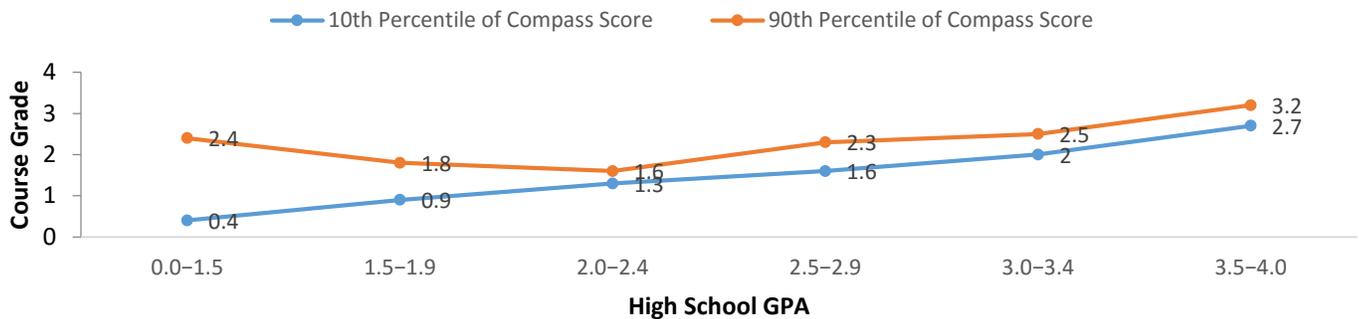
Conclusions and Policy Considerations

If colleges were confined to using a single data element to place students in mathematics, high school GPA reasonably could serve as the single predictor. In the absence of high school GPA, the ACT math test (as administered in the MME) is a superior alternative to the Compass pre-algebra and algebra tests for predicting performance in College Algebra. Only with Intermediate Algebra do we find some ambiguity, with the Compass pre-algebra and algebra tests having a slight advantage over the ACT math test in explaining variation in course grade, but being equal to the ACT math test in predicting strong success. Still, high school GPA is the superior choice, predicting course grade and strong success in both Intermediate Algebra and College Algebra as well or better than any test. As colleges consider options for replacing the Compass placement test and adopt a new approach, we suggest that colleges consider the following policy changes.

✓ **Confirm results at your community college**
Michigan community colleges use a variety of measures to assess and place students. Examine the best predictors of success in mathematics at your institution by examining your own administrative data. Leverage CEPI's Student Pathways files for missing information about students' MME, ACT/SAT, or high school GPA.

✓ **Collect high school grade point average on the student admissions application**
Michigan community colleges historically have not collected high school GPA on the admissions application, although colleges increasingly are requesting this information from students. Consider requesting self-reported high school GPA, in addition to collecting GPA from submitted high school transcripts.

✓ **Use high school grade point average as a factor in placement**
Since Compass is no longer a resource and as Michigan moves away from statewide administration of the ACT to the SAT, Michigan community colleges need better predictors for placement. This study indicated that high school GPA is a powerful predictor of success in mathematics. Even if high school GPA is not the only factor used in assessment and placement, consider using it as the primary placement indicator, supplemented by other measures (ACT/SAT, MME, Accuplacer) for students "on the bubble" between developmental and college-level courses.

Further Research

This study suggests that, when compared to placement and standardized tests, high school GPA is as good or better at predicting performance and success in math courses that often are deemed college-level. However, this study did not examine how well high school GPA or any of the test scores (Compass, MME, ACT) predicts success in developmental math courses. Future research should seek to fill this gap in our knowledge. Furthermore, this study examined success among students who enrolled in college within a few years after high school. Future research should explore how well high school GPA predicts success for students who delay college for longer periods of time. Additionally, as Michigan moves from the ACT to the SAT, further research should examine the predictability of the SAT on placement. Finally, further research should explore the reasons why high school GPA is a strong predictor of success.

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References

Bahr, P.R. (2016). *Replacing placement tests in Michigan's community colleges*. Ann Arbor, Michigan: Center for the Study of Higher and Postsecondary Education, University of Michigan.

Fain, P. (2015, June 18). Finding a new compass. *Inside Higher Ed*. Retrieved from https://www.insidehighered.com/news/2015/06/18/act-drops-popular-compass-placement-test-acknowledging-its-predictive-limits

Scott-Clayton, J. (2012). *Do high-stakes placement exams predict college success?* New York, New York: Community College Research Center, Teachers College, Columbia University.

Willett, T., Hayward, C., Nguyen, A., Newell, M., Bahr, P., Hetts, J., Lamoree, D., Sorey, K., & Duran, D. (2015). *Multiple measures assessment project (MMAP): Spring 2015 technical report.* Sacramento, California: Research and Planning Group for California Community Colleges.

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