

CPMP Student Performance at Holland Christian High School

Background

Holland Christian has approximately 1,000 students in the high school in grades 9–12. After the 1994–1995 school year, the K–12 Mathematics Committee formally adopted the NCTM Standards as its guide for strengthening its mathematics programs. In doing so, it challenged the mathematics faculty at each level to improve its mathematics program.

Recognizing the responsibility to lead in this matter, the high school mathematics department rewrote its curriculum objectives to bring them in line with the more rigorous NCTM Standards and launched a search for the best new textbooks to carry these new challenges to our students.

After attending NCTM regional meetings, listening to presentations on reform curriculum, visiting schools that were currently using new textbooks, and piloting some of these textbooks in our classrooms our department decided that the Core-Plus Mathematics Project (CPMP) developed curriculum was the best option for meeting our curriculum objectives.

Implementation

After the proposal was passed by the school board, the school took aggressive action with our constituents and stakeholders to build the necessary support. Input from parents, business and industry leaders, and college/university personal was sought in order to build a solid foundation of support prior to implementing *Core-Plus Mathematics*, Course I in Fall, 1995. We had several parent meetings where many concerns were expressed about having only an integrated mathematics curriculum. To please a few constituents, Holland Christian offered a traditional track alongside *Core-Plus Mathematics*. The first year, 45 students signed up for Algebra I and approximately 200 students enrolled in *Core-Plus Mathematics*. After the first year, it was not feasible to teach Algebra I due to insufficient enrollment. The algebra-geometry-advanced algebra sequence of courses phased out as we continued to add *Core-Plus Mathematics* Courses II, III, and IV over the next three years.

Holland Christian High School was selected as one of the field-test sites for 2nd edition development. We are transitioning to the published texts as they become available.

To help assist with parent communication about the new *Core-Plus Mathematics* curriculum, one of our mathematics teachers was assigned to answer all questions concerning *Core-Plus Mathematics* during the first year. This was an important part of the implementation process, because it allowed for consistency in how questions were answered. This staff person was also in charge of setting up monthly meetings to keep parents informed about content that was being taught and about the teaching methods used. Initially the meetings were well attended by the parents, but over a short period of time, parents' confidence in the curriculum increased, the attendance dwindled, and the meetings were no longer necessary.

Course Placement

The majority of our students take Course I as freshman. Approximately 30 incoming freshman take Course I at the middle school during their eighth-grade year and go on to take Course II as freshman. These students may elect to take advanced placement calculus and/or statistics as upperclassmen.

Monitoring Implementation

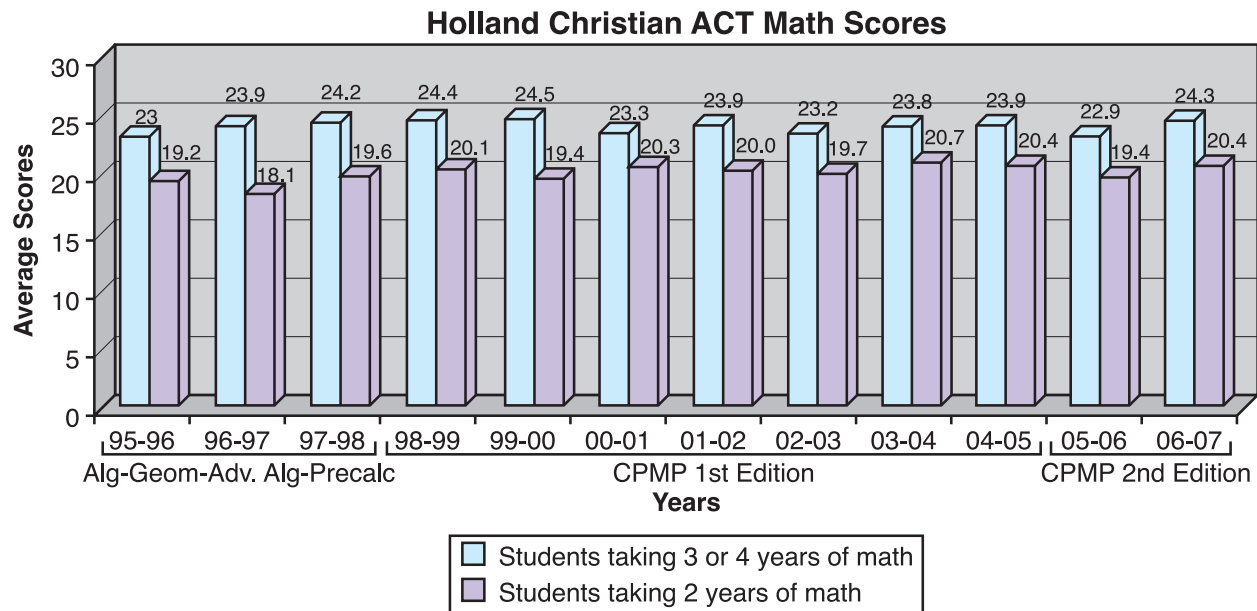
In order to gather information on student achievement, we decided to collect information annually on ACT results, the Michigan High School Proficiency Test, the *Ability to Do Quantitative Thinking* subtest of the *Iowa Tests of Educational Development (ITED-Q)*, and Advanced Placement course enrollments and test results. A summary of these results follows.

1. ACT Scores—Mathematics Portion

The ACT assessment results below show our students' performance over the last twelve years. The majority of our students plan to attend college and thereby take three or more years of math. When we made the curriculum switch, we were concerned about how students would perform on the ACT. Even though the mathematics portion of the ACT stresses symbol manipulation, the scores for our students taking three or more years of math have remained fairly consistent. We were even pleased to observe that there seems to be some improvement in ACT math scores for our students that take only two math courses. In addition, our students have learned statistics, probability, and discrete mathematics not tested by the ACT.

Table 1

Year	Type of Data Year	Average ACT score for 3 or 4 years of Math	Average ACT score for 2 years of Math
95-96	Baseline	23.0 ($n = 146$)	19.2 ($n = 43$)
96-97	Baseline	23.9 ($n = 127$)	18.1 ($n = 47$)
97-98	Baseline	24.2 ($n = 148$)	19.6 ($n = 43$)
98-99	Core-Plus	24.4 ($n = 152$)	20.1 ($n = 56$)
99-00	Core-Plus	24.5 ($n = 128$)	19.4 ($n = 60$)
00-01	Core-Plus	23.3 ($n = 138$)	20.3 ($n = 50$)
01-02	Core-Plus	23.9 ($n = 138$)	20.0 ($n = 45$)
02-03	Core-Plus	23.2 ($n = 169$)	19.7 ($n = 33$)
03-04	Core-Plus	23.8 ($n = 170$)	20.7 ($n = 46$)
04-05	Core-Plus	23.9 ($n = 175$)	20.4 ($n = 41$)
05-06	Core-Plus 2nd Edition	22.9 ($n = 165$)	19.4 ($n = 24$)
06-07	Core-Plus 2nd Edition	24.3 ($n = 143$)	20.4 ($n = 40$)



Prior to implementing *Core-Plus Mathematics*, on average 81% of the junior class took the ACT test. Since 1999, the average percent of the junior class taking the test is about 85%. We believe that the *Core-Plus Mathematics* curriculum helped give our students confidence to attempt unfamiliar problems instead of guessing or skipping them. They are not as intimidated by problems that might look different. We believe this is because they work on new types of problems throughout the year.

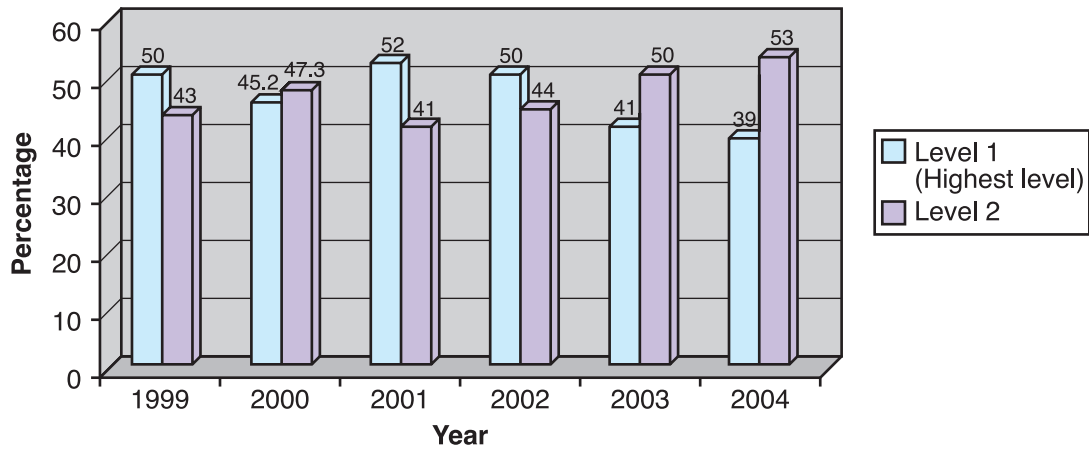
2. 11th-Grade MEAP Scores

In Michigan, a major measure of success of a program is the Michigan Educational Assessment Program High School Test (MEAP). The test is taken in the spring of students' junior year. If students perform at Level 1 or Level 2 rather than Level 3 or Level 4, they have passed the mathematics portion of the test. Students performing at Level 1 or Level 2 (in all content areas including mathematics) receive scholarship money from the state of Michigan for college attendance. We have no baseline data for the MEAP test because we only began administering the test in 1999, to our first graduating class taking all four years of *Core-Plus Mathematics*. Since we are a private school, we are not required to administer the MEAP. We believe that by teaching our students to apply mathematical models to real-life situations, we are also focusing on the types of problem solving skills that the Michigan Department of Education deems important. Despite a greater percentage of our students taking the test, the percent of qualifiers remains above 90%.

Table 2

MEAP Test Results

Year	% of Merit Qualifiers (Level 1 or Level 2)	Number of Students Tested	Class Size	% of Students Tested
1999	93	168	237	71
2000	93	188	222	85
2001	93	207	235	88
2002	94	204	236	86
2003	91	214	245	87
2004	92	230	251	92
2005	91	207	226	92

**Holland Christian 11th-Grade
Merit Qualifiers****3. Ability to Do Quantitative Thinking Test**

Another measurement of student achievement used was the *Ability to Do Quantitative Thinking* test. As the name suggests, this nationally normed test assesses quantitative thinking in problem-solving contexts. In the spring of each year (1998–2000), we randomly select 50 seniors to complete the test. Table 3 shows that our students have consistently performed at the 95th–97th percentile in the area of skills.

Table 3

ITED Ability to Do Quantitative Thinking

Test Time: The Spring of	School Mean Score (Points Possible = 40)	National Percentile
1998	27.00	96th
1999	26.57	95th
2000	27.40	97th

4. Advanced Placement Courses

One of the benefits of the *Core-Plus Mathematics* program is that it gives to students several mathematics course options in high school. The school has offered AP Calculus AB since 1995. The *Core-Plus Mathematics* curriculum now allows us to also offer AP Statistics. AP Calculus is open to all students who complete Course IV and AP Statistics is an option to students who have completed Course III or Course IV. The table below shows our results for the last twelve years. A few students each year choose to take both AP Calculus and AP Statistics.

Table 4

Year	Type of Data Year	Advanced Placement Calculus Scores (1 to 5)					Total Tests Taken	Advanced Placement Statistics Scores (1 to 5)					Total Tests Taken
		1	2	3	4	5		1	2	3	4	5	
95-96	Baseline	0	2	2	2	1	7	Not taught					
96-97	Baseline	0	2	3	4	1	10						
97-98	Baseline	0	0	2	10	7	19						
98-99	Baseline	0	0	4	5	15	24	0	1	0	0	2	3
99-00	Core-Plus	0	0	4	8	10	22	1	9	12	16	1	39
00-01	Core-Plus	0	0	4	6	11	21	1	5	14	8	4	32
01-02	Core-Plus	0	1	3	12	12	28	0	6	8	15	8	37
02-03	Core-Plus	0	0	3	7	7	17	3	8	20	19	10	60
03-04	Core-Plus	0	0	1	7	18	26	3	13	26	21	5	68
04-05	Core-Plus	0	0	3	5	13	21	3	14	27	14	9	67
05-06	Core-Plus	0	0	4	9	7	20	2	6	15	20	15	58
06-07	Core-Plus	0	1	2	12	9	24	5	6	19	23	12	65

Professional Development

Our mathematics teachers agree that the *Core-Plus Mathematics* program is a worthwhile mathematics program for our students. We believe that part of the reason for the success that our department and students have experienced is because our staff has attended one-week implementation workshops for each of the four course levels. As a district, we are committed to new hires attending workshops based on Courses I and II before they begin their first year of teaching. New teachers then attend Course III and IV workshops within two years of employment. We believe it is very important that the teachers have an understanding of the whole curriculum and eventually teach every course at least once to develop a full understanding of the curriculum.

Professional development based-on the *Core-Plus Mathematics* curriculum has been beneficial for teachers and indirectly for students for a several reasons. As teachers we began to learn how the curriculum was developed and fit together. This gave us the big picture before we began breaking it apart into individual courses and lessons. We also had a chance to experience what a *Core-Plus Mathematics* classroom looks like before the teaching began. Another benefit was the time we spent talking about mathematics and teaching with colleagues from other districts. It has given us opportunities to share ideas and learn from each other.

Summary Remarks

Teachers at our school really appreciate how the contexts in the *Core-Plus Mathematics* curriculum help students develop important mathematical concepts. One teacher stated that: “Retention is much higher because [most] everything is done in context. The curriculum [revisits many of the] same concepts ... at a deeper level each year.”

Our entire department enjoys teaching this curriculum. Our teaching methods may vary to some degree, but we are in agreement that students learn better when they are learning in the context of solving problems.