Curriculum Articulation Project
Mathematics Working Group
CESA #3

Final Report

March 11, 2001

Abstract: The Curriculum Articulation Project is represented by a collection of working groups from the core disciplines of English language arts, foreign language, social studies, mathematics, and science. The primary charge of each working group is to analyze the alignment between high school and college curricula in the respective field. This is the final report of the Mathematics Working Group of CESA #3, one of three mathematics working groups. In this report, we describe our process for analyzing this alignment. We also identify some areas of concerns and suggest some potential actions corresponding to these concerns. Throughout the report we pose new questions and suggest areas for continued analysis.

We begin our report with a list of the members of our committee. Next, we describe our meetings and our process for analyzing the alignment between the high school and college curricula. We then present the data we collected and suggest potential actions based on our interpretations of the data. We conclude our report with recommendations for other working groups that might build on our work.

Mathematics Working Group of CESA #3
Group Members

High School Faculty

Dave Conway	Southwestern Wisconsin High School
Bob McGuire	Belmont High School
David Wiemiller	Pecatonica Area Schools

UW System Faculty

Tim Deis	University of Wisconsin-Platteville
Kim Mueller	University of Wisconsin-Platteville
Marty Schuh	University of Wisconsin-Manitowoc
Karen Thomas	University of Wisconsin-Platteville
Jason Thrun	University of Wisconsin-Platteville
Rick Tufte	University of Wisconsin-Platteville
Sheryl Wills	University of Wisconsin-Platteville

Working Group Proceedings

Focus

While the general goal of each working group is to analyze the alignment of the high school and college curricula, the members of this committee envisioned a study that was student centered. That is, the members of the committee envisioned our goal in this project to analyze the transition that our students make between taking high school and college mathematics courses. To this end, we decided to focus on students' perception of their own transitions. As a result, our committee designed a questionnaire (see pages 17 & 18) that would be distributed to several students enrolled in beginning-level college courses, that is, courses at or below calculus. Based on this information, we determined some appropriate actions.

Process

Because the regular meetings were so important to our group, both in terms of meeting the objectives of this study and establishing a network of colleagues interested in mathematics education, we begin with a general description of our meetings. Following this, we present our process for analyzing the transition that students make between taking high school and college mathematics courses.

Regular Meetings

Perhaps the most beneficial aspect of the Curriculum Articulation Project, at least from the perspective of the members of this working group, was the opportunity to meet regularly with local high school and university faculty. We met almost monthly during the non-summer months from March 2000 to April 2001. While these meetings were very productive in terms of

meeting the goals of this project, these meetings were also very social. The social nature allowed the members of the group to openly discuss any issues related to the teaching of mathematics. Most importantly, the meeting opened necessary dialog between high school and university mathematics teachers.

At these regular meetings, we discussed issues both directly and indirectly related to the scope of this project. Issues related directly to this study are outlined in detail in this report; however, it may be useful to note some of the tangential issues discussed. Frequently the group discussed the merits and potential shortcomings of the reform curricula used locally in the state. In particular, much of the discussion focused on curricular materials designed by the Core-Plus Mathematics Project, a National Science Foundation funded project out of Michigan State University, published by Everyday Learning Corporation. While members of this committee found merit in the types of activities found in this curriculum, members of the group also found the materials lacking the computational rigor to prepare students for the standardized tests required for admission to and placement in college. We discussed similar issues regarding the University of Chicago School Mathematics Project curriculum published by Prentice Hall. In addition to the reform curricula, we also discussed the graduation tests and the impact these would have on both the high school and college mathematics curricula. We discussed these two issues at most of our meetings and we plan to continue discussing them at future meetings.

Each meeting had a loose agenda. Most agenda items were covered, but frequently issues not listed on the agenda were discussed. In fact, the unplanned discussions that surfaced were generally the most interesting. Copies of two typical meeting agendas are provided below.

Agenda for the Meeting of the Mathematics Working Group of the
Curriculum Articulation Committee
Representing CESA #3

October 2, 2000

1. Spring Meeting on Friday February 23, 9:30-3:30 at the Wintergreen Conference Center in Wisconsin Dells
2. Schedule classroom visits
3. Meetings with other working groups
4. Dissemination grants
5. Expanding the scope of events at the math contest
6. Finalize questionnaire
7. Select next meeting time

Agenda for the Meeting of the Mathematics Working Group of the
Curriculum Articulation Committee
Representing CESA #3

October 30, 2000

1. Discuss questionnaire from CESA #8 working group.
2. Discuss who is to receive our questionnaire.
3. Discuss possible action based on the results of our questionnaire.
4. Select next meeting date.

Students' Transitions between Taking High School and College Mathematics Courses
Looking through the syllabi for the high school and college mathematics courses, the members of this committee found obvious overlap in similar courses. Put in a slightly different way, we found that most of the mathematics taught in high school could be found in courses taught at the university. Not all of these courses offered college credit or satisfied general education requirements, however.

Looking at the syllabi, we had few alignment concerns in terms of content. However, from experience we knew that many students did have difficulty making transitions from high school to college. We decided to conduct a student-centered analysis to see what types of courses taken in high school prepared students for college mathematics and to analyze students' observations regarding their transitions between taking high school and college mathematics courses. To this end, we designed a survey to administer to several students at the University of Wisconsin—Platteville taking beginning-level mathematics courses.

In designing a questionnaire, we identified some core information that would help us analyze the students' transitions. For example, we identified courses taken in high school, hours spent studying mathematics, and perceived content weaknesses as some general topics that might be helpful in terms of monitoring and analyzing students' transitions. Most of the questions on this initial, pilot questionnaire were free-response questions. After giving this questionnaire to approximately 250 students in beginning-level mathematics courses, we redesigned the questionnaire. We reworded the questionnaire to minimize ambiguous responses and redesigned it to contain fewer free-response questions but more check-the-box type of questions. Members of the committee suggested the new format so that the data could be entered into a database and analyzed. Approximately 550 students in beginning-level courses at the University of Wisconsin—Platteville completed the final questionnaire.

We now outline the general categories of questions used on our final questionnaire. For each category, we provide a brief description and justification for including this type of question. The specific questions used on the final questionnaire are provided also.

Background Information Questions. The first few questions were designed to provide general background on the student. Since the goal of the project is to gauge the alignment between high schools and universities in Wisconsin, we asked if students attended a Wisconsin high school. We also decided to have students identify their intended major. Initially, the committee decided to send the questionnaire to other universities in the state, so we also asked students what university they presently attend.

1. Please answer the following general questions.
   - What university or college do you presently attend?
   - Did you attend a Wisconsin high school?
     □ Yes □ No
   - What is your major?

Mathematics Background Questions. These questions were included in the questionnaire to identify the fit between the courses taken in high school and the courses taken in college. Members of the committee wanted to know how many students took courses that repeated the

content available in their high school courses. In particular, we were interested in knowing students' highest mathematics course taken in high school and their first college mathematics course.

2. What mathematics courses did you take in high school?

3. Which of the following best describes the mathematics course that you are presently taking?
   - □ Intermediate Algebra
   - □ College Algebra
   - □ Precalculus
   - □ Trigonometry
   - □ Statistics
   - □ Business Calculus
   - □ Finite Mathematics
   - □ Mathematics of Finance
   - □ Calculus and Analytic Geometry I
   - □ Other _____

4. What was your first college mathematics course?
   - □ Intermediate Algebra
   - □ College Algebra
   - □ Precalculus
   - □ Trigonometry
   - □ Statistics
   - □ Business Calculus
   - □ Finite Mathematics
   - □ Mathematics of Finance
   - □ Calculus and Analytic Geometry I
   - □ Other _____

5. What other college mathematics courses have you taken?
   - □ Intermediate Algebra
   - □ College Algebra
   - □ Precalculus
   - □ Trigonometry
   - □ Statistics
   - □ Business Calculus
   - □ Finite Mathematics
   - □ Mathematics of Finance
   - □ Calculus and Analytic Geometry I
   - □ Other _____

Study Habits. This type of question was added to provide insight into students' study habits in high school and college. While this question does not directly address alignment, it does provide some insight into the difficulties that students may experience when they make the transition from high school to college mathematics courses.

6. In high school, how much time did you spend studying mathematics each week?
   - □ 0-3 hours
   - □ 3-6 hours
   - □ 6-9 hours
   - □ More than 9 hours

7. How much time do you presently spend studying mathematics each week?
   - □ 0-3 hours
   - □ 3-6 hours
   - □ 6-9 hours
   - □ More than 9 hours

Instructional Activities Experienced/Preferred. These questions were designed to identify the types of instruction that students received in their high school and college mathematics courses. They last question in this category was included to identify instructional styles that students prefer. Like the previous category of questions, this category does not directly address the alignment of the high school and college curricula, but it does provide some insight into the transitions that students make between taking high school and college mathematics courses. The

committee was particularly interested in the fit between the types of instruction experienced in high schools and the types of instruction experienced in college.

8. Consider the following types of activities.
   a. Teacher-directed lecture
   b. Group work
   c. Student independent reading of textbook
   d. Writing about mathematics
   e. Other type of instruction (please explain)

   - Which of the above types of instruction did you experience in your high school mathematics courses?
   - Which of the above types of instruction have you experienced in your college mathematics courses?
   - Which of the above types of instruction do you feel help you learn the best?

Perceived Content Weaknesses. This question was designed to see if students were aware of their own weaknesses. This question directly addresses the alignment of high school and college curricula. Furthermore, members of the committee thought that the information might indicate a gap that might make the transition between high school and college mathematics difficult. The reader may notice that the topics included in this question are found in beginning-level college courses. Specifically, they are topics included in courses below the calculus level.

9. The following are either topics covered in mathematics courses or issues related to mathematics courses. Coming out of high school, in which of the following areas did you feel your skills were **weak**? (Please check all that apply.)

- ☐ Order of Operations
- ☐ Equation Solving (Linear)
- ☐ Inequalities
- ☐ Absolute Values
- ☐ Properties of Exponents
- ☐ Function Notation
- ☐ Composition of Functions
- ☐ Graphing
- ☐ Interpreting a Graph
- ☐ Equation Solving (Systems)
- ☐ Factoring
- ☐ Equation Solving (Quadratic)
- ☐ Properties of Radicals
- ☐ Equation Solving (Radical)
- ☐ Conic Sections
- ☐ Exponential Functions
- ☐ Logarithms
- ☐ Trig Functions
- ☐ Trig Identities
- ☐ Trig Equations
- ☐ Probability
- ☐ Problem Solving
- ☐ Use of a Calculator
- ☐ Mathematical Terminology
- ☐ Reading a Mathematics Text
- ☐ Study Skills
- ☐ Other (Specify) _____

Alignment between High School and College Curricula. Like the previous category of questions, this category of questions directly addresses the alignment of the curricula. In addition, these free response questions were designed to identify students' observations regarding their transition between taking high school and college mathematics courses. The committee hoped to identify common responses and develop some general themes that would indicate some potential action.

10. Do you think the mathematics courses you took in high school prepared you for your first college mathematics course?

    If you answered yes, specifically, how did your high school mathematics courses help prepare you for your first college mathematics course?

    If you answered no, describe what was lacking in your high school mathematics preparation.

11. What advice would you give your high school mathematics teachers concerning the preparation of future students for college mathematics courses?

12. What advice would you give to your college instructors to help ease the transition between taking high school mathematics courses and taking college mathematics courses?

Confidence Levels. The final category of questions was included to identify students' confidence levels regarding their abilities in mathematics. While this does not directly impact the analysis of alignment of the high school and college curricula, members of the committee thought it would provide insight that might help the university faculty identify special considerations necessary when teaching developmental courses. Member of the committee also thought that the question could, to some extent, provide some insight into the transition that students make between taking high school and college mathematics courses.

13. How would you rate your confidence level in mathematics?
    - □ Very Low
    - □ Low
    - □ High
    - □ Very High

Findings and Results

In the following sections we outline our findings and results. Specifically, we provide a summary of the data from most of the items on the questionnaire. However, we refrain from making any generalizations concerning these data. Rather, we provide the information and hope the careful reader will draw some reasonable conclusions. After we present all the data, we do provide some reflections and potential actions based specifically on our data.

Data from Questionnaire

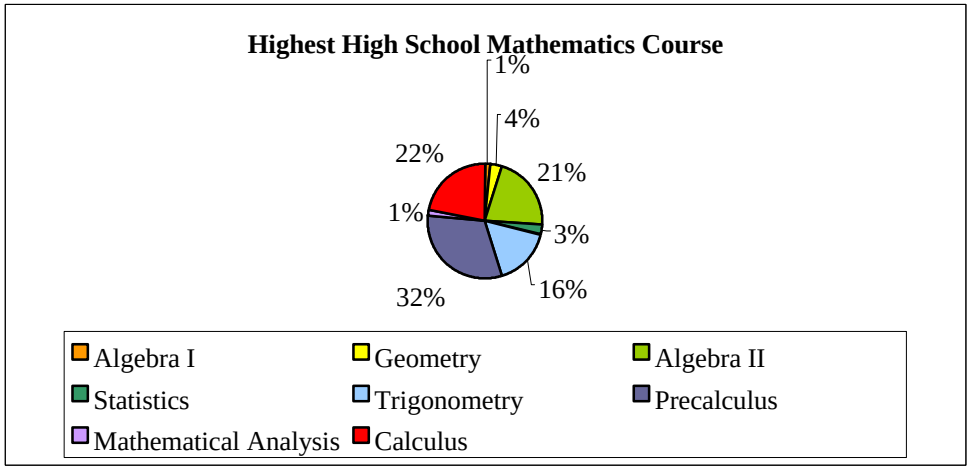
Most of the data that we present here are based on the entire sample of students responding to the questionnaire. As such, when we refer to students' confidence levels, we are referring to the confidence level of every student who answered this question. The members of this committee realize that it would be more helpful to try to correlate the data in some useful way. For example, it might be useful to examine the confidence levels of the students whose first course is intermediate algebra or calculus. Or, it might be useful identify the specific mathematics weaknesses identified by students whose first course is college algebra. However, since we have not looked for any specific useful correlations to this point, our comments might be categorized as general, qualitative observations. The members of the committee plan to analyze this data more rigorously at a later date.

Mathematics Background Questions. The most striking realization made by the members of this committee is that large numbers of students are taking mathematics courses at or below the level

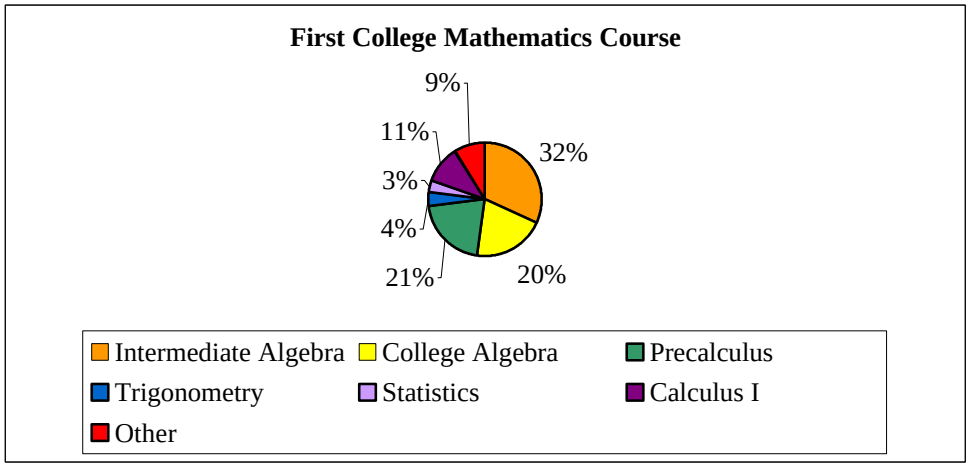
taken in high school. For example, 90% of the students indicating that their first course in college was intermediate algebra indicated they had an intermediate algebra or higher course in high school. Similarly, 90% of the students indicating that their first course in college was precalculus indicated they had a precalculus or higher course in high school.

While this is very surprising, this is not an immediate concern because we did not analyze placement scores. It might be the case that students are placing into higher courses than the students are selecting. However, the members of this committee feel that if students are placing into courses below the levels of courses they took in high school, then this is a concern that must be analyzed more fully.

The following chart illustrates the percent of students indicating a particular course as their highest high school mathematics course.

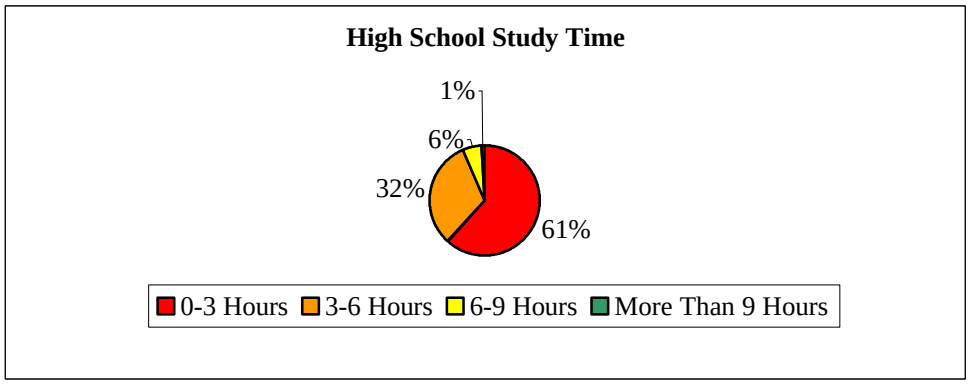


The following chart illustrates the percent of students indicating a particular course as their first college mathematics course.

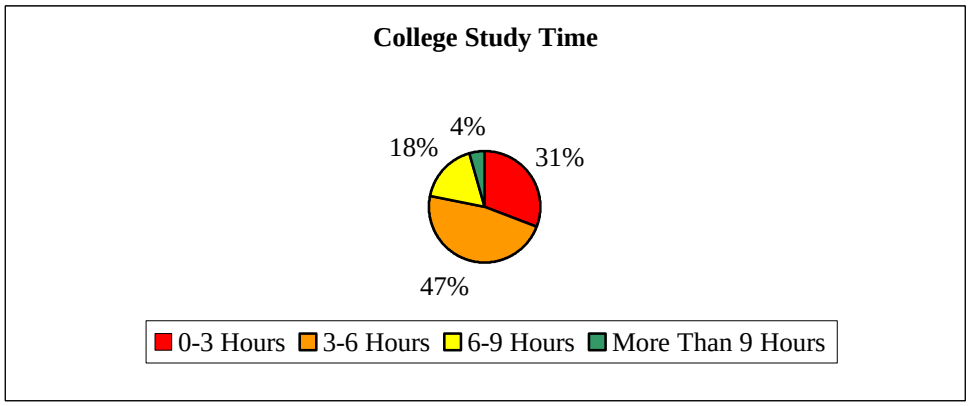


Study Habits. Members of this committee, while not surprised, were discouraged to see that the number of hours that students spend studying mathematics in high school and college is strikingly low. For example, 65% of the students taking intermediate algebra or precalculus courses at the time of the survey indicated they studied 3 hours or less per week in high school and 95% spent 6 hours or less per week in high school. While these numbers improved in college, they were still lower than expected. For example, between 70% and 75% of the students taking intermediate algebra or precalculus at the time of the survey indicated they spent 6 hours or less per week studying mathematics. This does not really help measure the alignment of the high school and college curricula, but it does raise a valid concern for the members of the committee.

The chart below indicates the total number of hours studying mathematics in high school as indicated by the students completing our questionnaire. Again, it should be emphasized that data from the entire population of students completing the questionnaire are included in the following two charts.

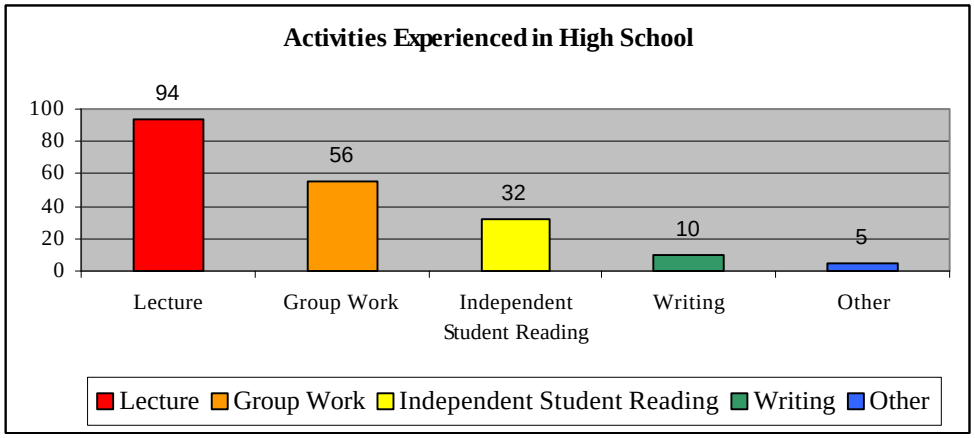


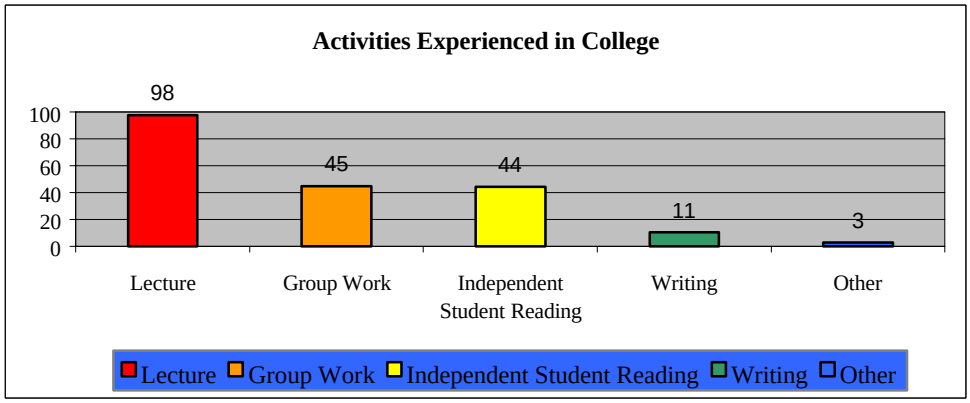
The chart below indicates the total number of hours studying mathematics in college as indicated by the students completing our questionnaire.

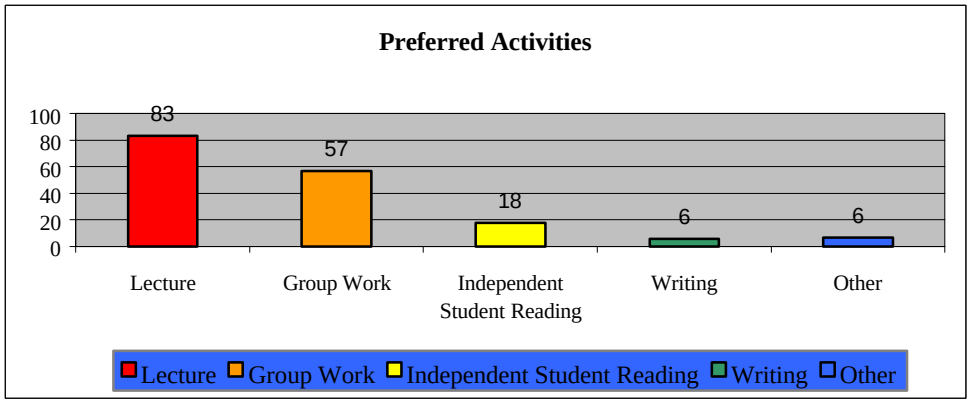


Instructional Activities Experienced/Preferred. Members of this committee anticipated that differences in instructional activities could potentially make the transition between high school and college difficult for students. However, from the data we collected, it seems that the types of

instructional activities experienced in high school and college are quite similar. The following three charts illustrate the percent of students who indicated that they either have experienced or prefer a particular type of instruction.







Perceived Content Weaknesses. The members of this committee hoped to identify particular weaknesses that students had coming out of high school. While students identified many areas of weakness, many of these areas are not an immediate concern. We concluded that many students might indicate an area of weakness because they have never been exposed to that topic.

We naturally expect a student who has not had trigonometry to have a weakness in solving trigonometric equations. However, if a student has had this material in high school, then this percentage could indicate a trouble area. The members of this committee realize, however, that for this information to be useful, we must cross-reference the weaknesses with the mathematics courses taken in high school. Once this is done, this list may also prove helpful in identifying content that is not covered adequately in either high school or college.

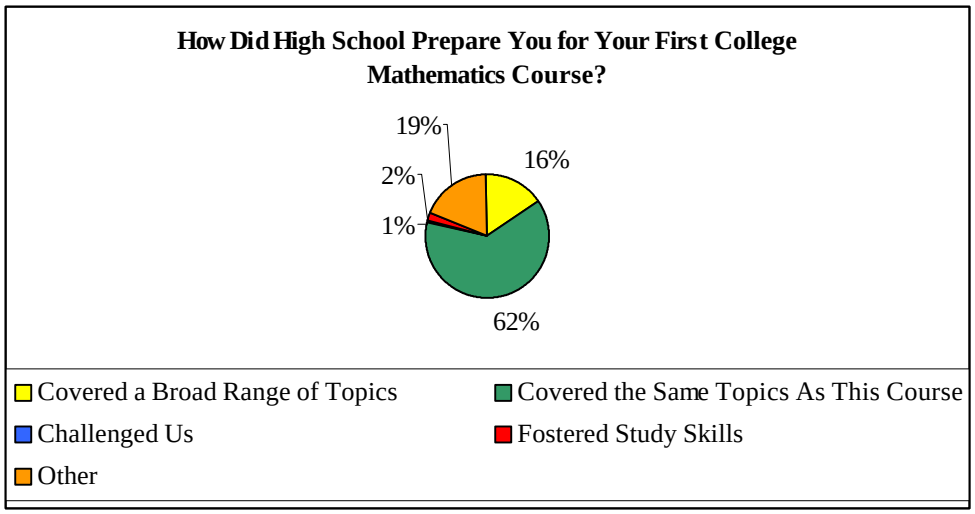
	Number of Students Reporting This Weakness (n = 548)	Percent
Order of Operations	16	2.9
Equation Solving (Linear)	32	5.8
Inequalities	47	8.6
Absolute Values	45	8.2
Properties of Exponents	57	10.4
Function Notation	85	15.5
Composition of Functions	104	19.0
Graphing	101	18.4
Interpreting a Graph	97	17.7
Equation Solving (Systems)	51	9.3
Factoring	95	17.3
Equation Solving (Quadratic)	75	13.7
Properties of Radicals	150	27.4
Equation Solving (Radical)	123	22.4
Conic Sections	296	54.0
Exponential Functions	83	15.1
Logarithms	276	50.4
Trig Functions	251	45.8
Trig Identities	299	54.6
Trig Equations	254	46.4
Probability	137	25.0
Problem Solving	109	19.9
Use of a Calculator	47	8.6
Mathematical Terminology	113	20.6
Reading a Mathematics Text	106	19.3
Study Skills	159	29.0
Other (Specify)	23	4.2

Alignment between High School and College Curricula. From the data we collected, it seems as though students think their high school prepared them for their first college mathematics course. When asked how their high school prepared them, many students responded that their high school mathematics courses prepared them for their first college mathematics courses by teaching the same material in their first mathematics course. Initially, this response seemed quite peculiar. Members of the committee thought that students who felt prepared take courses that covered new material. After more thought, this response seemed quite reasonable. After all, the question simply asked if students' high school mathematics courses prepared them for their first mathematics course. Hence, if students are taking courses at or below the level of courses taken in high school, then it stands to reason that students will feel prepared. The students who did not feel high school prepared them claimed that their high school mathematics courses lacked some specific content. Others claimed that high school was not challenging enough.

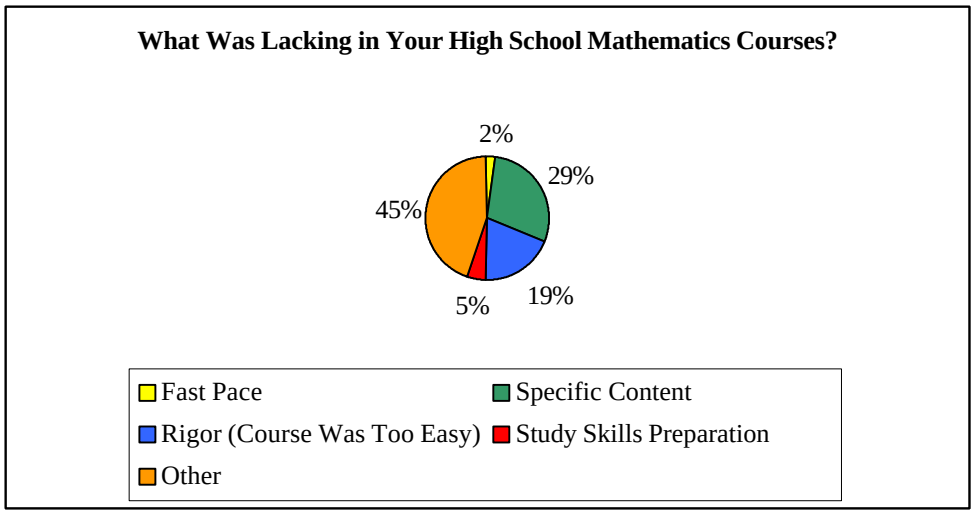
The following chart shows the number of students indicating that their high school prepared them for their first mathematics course.

Did Your High School Prepare You for Your First Mathematics Course	Number of Students Indicating This Response (n = 534)	Percent
Yes	410	76.8
No	124	23.2

The following chart shows the comments made by those students who felt their high school prepared them for their first mathematics course.



The following chart shows the comments made by students who did not feel their high school prepared them for their first mathematics course.



The members of the committee were also interested in specific advice that students could give to high school teachers and college teachers. Unfortunately, this free-response question was such

that many of the responses could not be categorized. Consequently, high numbers of responses were categorized as "other" types of advice. The committee did make some general observations. Regarding students' advice to high school teachers, we noticed that many students either did not respond or felt their high school teacher did a good job. This was quite encouraging. One suggestion that seems to stand out is that students would like their high school teacher to provide more depth. Regarding students' advice to college teachers, again we noticed that many students either did not respond or indicated that their teacher did a good job. The comments that we did observe is that students would like college instructors to slow down and review more.

The following chart identifies the advice that students offered to high school mathematics teachers.

Advice to High School Teachers	Number of Students Suggesting This Advice (n = 542)	Percent
Go Faster	12	2.2
Assign/Collect More Homework	29	5.4
Provide More Problem Solving	6	1.1
Foster Independence	23	4.2
Make Course More Like College	20	3.7
Go Into More Depth	47	8.7
Teach All Students	38	7.0
Other	183	33.8
Great Job	36	6.6
None	115	21.2
Go Slower	10	1.8
Provide More Examples	14	2.6
Work in Groups	9	1.7

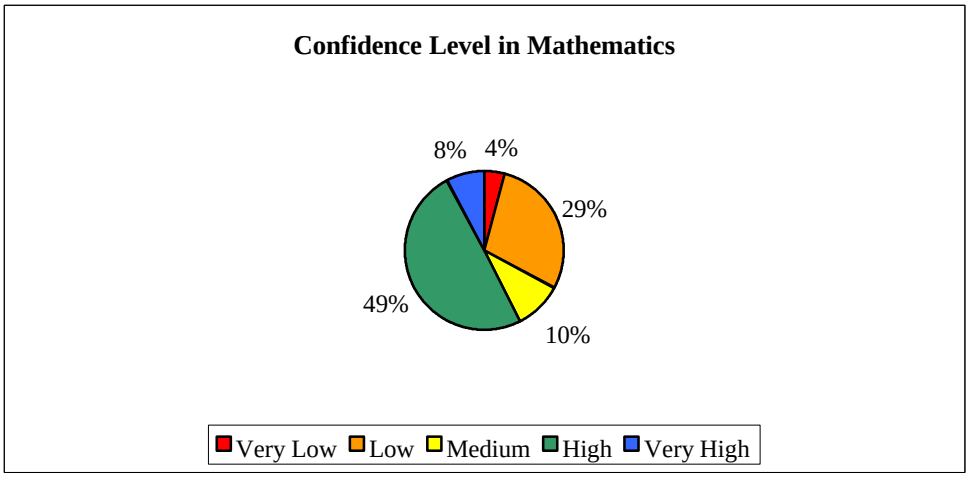
The following chart identifies the advice that students offered to college mathematics teachers.

Advice to High College Teachers	Number of Students Suggesting This Advice (n = 542)	Percent
Go Slower	88	16.2
Review More	45	8.3
Collect Homework	16	3.0
Help Students More	20	3.7
Get to Know Students	6	1.1
Give More Examples	23	4.2
Make Exams Easier	8	1.5
Other	108	19.9
Great Job	24	4.4
None	170	31.4
Cover Material Better	25	4.6
Work in Groups	9	1.7

Confidence Levels. The members of this committee were interested in students' levels of confidence. This was not directly related to the goal of this project, but it does provide insight for teachers of mathematics. It is interesting to note, while the committee decided to list only

four confidence levels on the questionnaire, very low, low, high, and very high, students felt so strongly about their medium level of confidence that the committee incorporated this into the analysis.

The following chart shows students' confidence levels.



Having reported our data, we feel it is necessary to indicate some potential limitations of our study. The most obvious limitation is that the information was self-reported. While looking through the questionnaires, we found some inconsistencies. For example, some students would indicate their first mathematics course in college was intermediate algebra and that they were presently taking calculus, but they failed to mark the courses taken between these two courses. This is only one example, but the committee noticed other inconsistencies in other questions also. We make this point only to emphasize that well-intending students might not take the time necessary to accurately respond to the questionnaire. Also, the student's mathematics instructor administered the questionnaire. It might be the case that students felt uncomfortable completing the survey completely and honestly.

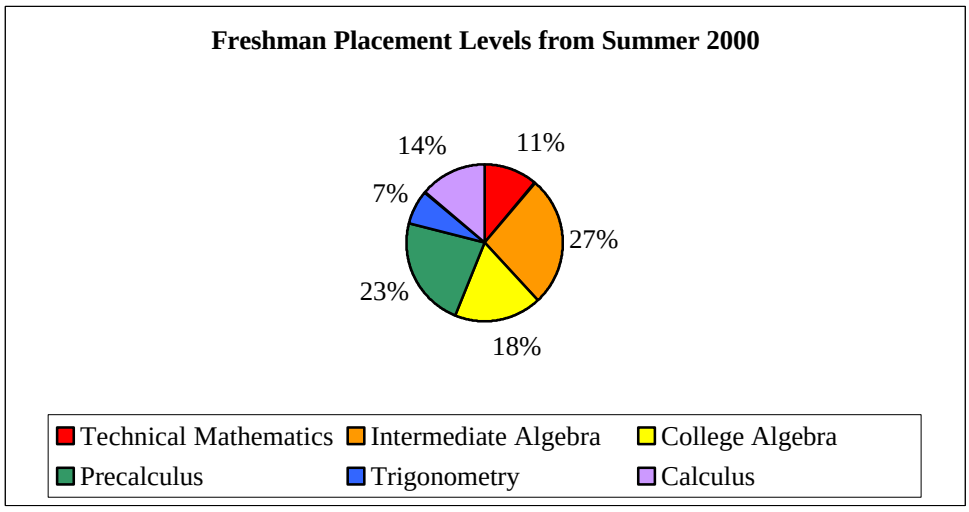
Reflections on the Data

After examining the syllabi for high school and college mathematics courses, we found that the curricula are in line in the sense that the majority of students place into mathematics courses carrying college credit at the University of Wisconsin—Platteville after high school graduation. However, we found that many students repeat courses that they have already taken in high school. As previously mentioned, this may not be a large concern. Students may simply prefer to take a mathematics course their first semester of college that they view as less challenging. However, if students are placing in courses below the level they took in high school, then we should ask why this is the case? Some members of the committee suggested that the reason might be related to the fact that all students are required to take more mathematics courses in high school. At first this might sound like a paradox, so here is our reasoning. Although students are required to take more mathematics courses in high school, some of these mathematics courses are not always the most appropriate course for these students. However, smaller school districts do not always have the flexibility to generate the most appropriate course, so these students take existing courses. We speculate that some of these students will

have limited success in these courses and need to repeat them when they enter college. This would have a tendency to widen the gap between courses taken in high school and the first course taken in college. Of course, this raises the question of what to do for these students.

We know students are repeating courses that they took in high school. Suppose that these students are not merely taking a less challenging course but instead placing into courses below the level of courses taken in high school. Is this necessarily a concern? Some may say no, arguing that this is indicative of the spiraling learning process. Indeed we acknowledge the power of a spiraling curriculum. However, is this a justification for larger numbers of students taking a course a second time? There is a finer point that we would like to emphasize. Our high school and college mathematics curricula are designed in such a way that each course contains elements of review. That is, spiraling is built into each course. The members of this committee feel that if students are placing into courses below the level of courses taken in high school, then this is an issue that we must continue to analyze.

The chart below indicates the placement results for the summer 2000 freshmen taking the exam. While these students are not necessarily the same students that completed our questionnaire, the members of this committee are confident that these data suggest that large numbers of students are placing in courses that are lower than the courses they took in high school. Of course, this raises more questions. Are the questions on the placement exam comparable in terms of difficulty and type to those encountered in a high school course? Are the questions on the placement exam consistent with the goals and objectives of the Wisconsin Model Academic Standards? That is, if students meet the goals of the Wisconsin Model Academic Standards, does this imply they will score well on their placement exam? These questions are beyond the scope of this committee, but we feel these are important questions that must be addressed.



We find the difficult transition that students face is not merely a content issue but also one related to the culture of college. The cultural difference is very apparent. College teachers expect that students spend significant time outside of class working on homework and reviewing notes. This committee found that students study less than what is expected of them in college. Similarly, college courses move more quickly than high school courses. Again, this is not a

misalignment of the curricula, but it is a factor in terms of making a transition to college-level mathematics. Of course, this raises more questions about what can be done to help students make these transitions more easily.

The high confidence levels of students surprised the members of our committee. While we are pleased that our students are confident, we are skeptical of their confidence. The college-level members of the committee expressed concerns that many students in courses below the calculus level expressed high confidence levels despite having significant conceptual weaknesses. Certainly we want our students to be confident, but we want them to recognize their weaknesses.

Action

The reader may get the impression that we have raised more questions than we have answered. We would like to compliment the wise reader—we have raised more questions than we have answered! To conduct a study of this nature and hope to answer all the questions posed would not be realistic. Moreover, the real value of the report is the extent to which we have been able to uncover issues of concern. As such, our committee plans to continue to meet and continue to answer the questions posed by this report and other challenging questions that arise. In fact, we hope to expand the core of individuals interested in meeting.

While the results of our study are not particularly surprising, the process of conducting the study was invaluable. Through the process of conducting this study, the members of this committee held regular meetings and opened a rich and healthy dialog that we plan to continue. We feel that the working groups of this project have a story to tell and we plan to tell it. Some preliminary results of the committee were presented at a tri-state mathematics gathering last month at the University of Wisconsin—Platteville. Members of the committee also plan to present more results at the Wisconsin Mathematics Council Meeting in Green Lake in May of this year. We also plan to hold a special meeting of the Tri-State Mathematics Teachers Consortium in October of this year.

To this point, we have not found significant misalignment between high school and college curricula in terms of content covered. However, we realize the high school curriculum is undergoing change. We will continue to monitor the changing high school curriculum and observe the impacts at the college level. As we have previously mentioned, some high school students may be taking courses that are not appropriate. When members of the committee reflected on our results, we speculated that some students at the college level might be taking courses that are equally inappropriate. Consequently, we suggested some potential changes at the college level. Perhaps there are new courses that could be introduced that would not simply repeat the content in high school. Perhaps new courses could be introduced that would serve as a general education requirement.

Many of the issues related to the transition from high school to college are related to the college culture and the expectations of college faculty. To this end, members of this committee think it would be beneficial to expose high school students to this culture. Members of this committee suggested expanding the scope of the mathematics contest at the University of Wisconsin—Platteville to include activities that expose this college culture to the high school students. Members suggested bringing many students to campus and having college students talk to them

about the expectations. Perhaps this can be expanded further so that students can experience the college culture first hand.

Advice and Recommendations

The members of this committee have enjoyed this curriculum articulation project. We found the process to be rewarding and helpful. We encourage other working groups to meet regularly in an informal manner. In fact, we found our evening meetings with dinner and snacks to be quite productive. The regularity of the meetings enabled us to remain focused. It also meant that we would have time to discuss other important issues that surfaced. We also suggest other working groups of this project or working groups of similar projects take their show on the road and share it with other professionals in the field. As we have tried to stress over and over, the specific results of this study may not be particularly surprising, but the dialog created benefited the members of our working group and will continue to benefit the members of an expanded working group.

Questionnaire for the Curriculum Articulation Project

This questionnaire is part of a curriculum articulation project. In part, this project hopes to analyze the transition that students make between taking high school and college mathematics courses. Your opinions are very important in helping the members of this project analyze the present situation and make recommendations for improvement.

1. Please answer the following general questions.

What university or college do you presently attend?	Did you attend a Wisconsin high school?	What is your major?
	□ Yes □ No	

2. What mathematics courses did you take in high school?

3. Which of the following best describes the mathematics course that you are presently taking?

□ Intermediate Algebra	□ College Algebra	□ Precalculus
□ Trigonometry	□ Statistics	□ Calculus and Analytic Geometry I
□ Business Calculus	□ Finite Mathematics	□ Mathematics of Finance

□ Other _____

4. What was your first college mathematics course?

□ Intermediate Algebra	□ College Algebra	□ Precalculus
□ Trigonometry	□ Statistics	□ Calculus and Analytic Geometry I
□ Business Calculus	□ Finite Mathematics	□ Mathematics of Finance

□ Other _____

5. What other college mathematics courses have you taken?

□ Intermediate Algebra	□ College Algebra	□ Precalculus
□ Trigonometry	□ Statistics	□ Calculus and Analytic Geometry I
□ Business Calculus	□ Finite Mathematics	□ Mathematics of Finance

□ Other _____

6. In high school, how much time did you spend studying mathematics each week?

□ 0-3 hours □ 3-6 hours □ 6-9 hours □ More than 9 hours

7. How much time do you presently spend studying mathematics each week?

□ 0-3 hours □ 3-6 hours □ 6-9 hours □ More than 9 hours

8. Consider the following types of activities.
   a. Teacher-directed lecture
   b. Group work
   c. Student independent reading of textbook
   d. Writing about mathematics
   e. Other type of instruction (please explain) _____

Which of the above types of instruction did you experience in your high school mathematics courses?	Which of the above types of instruction have you experienced in your college mathematics courses?	Which of the above types of instruction do you feel help you learn the best?
□ a	□ a	□ a
□ b	□ b	□ b
□ c	□ c	□ c
□ d	□ d	□ d
□ e	□ e	□ e

9. The following are either topics covered in mathematics courses or issues related to mathematics courses. Coming out of high school, in which of the following areas did you feel your skills were **weak**? (Please check all that apply.)

□ Order of Operations	□ Equation Solving (Systems)	□ Trig Identities
□ Equation Solving (Linear)	□ Factoring	□ Trig Equations
□ Inequalities	□ Equation Solving (Quadratic)	□ Probability
□ Absolute Values	□ Properties of Radicals	□ Problem Solving
□ Properties of Exponents	□ Equation Solving (Radical)	□ Use of a Calculator
□ Function Notation	□ Conic Sections	□ Mathematical Terminology
□ Composition of Functions	□ Exponential Functions	□ Reading a Mathematics Text
□ Graphing	□ Logarithms	□ Study Skills
□ Interpreting a Graph	□ Trig Functions	□ Other (Specify) _____

10. Do you think the mathematics courses you took in high school prepared you for your first college mathematics course?

    If you answered yes, specifically, how did your high school mathematics courses help prepare you for your first college mathematics course?

    If you answered no, describe what was lacking in your high school mathematics preparation.

11. What advice would you give your high school mathematics teachers concerning the preparation of future students for college mathematics courses?

12. What advice would you give to your college instructors to help ease the transition between taking high school mathematics courses and taking college mathematics courses?

13. How would you rate your confidence level in mathematics?

    □ Very Low □ Low □ High □ Very High