Teacher Experiences in CMSI University-based Math and Science Endorsement Programs, 2007-2008

End of Year Evaluation Report
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Prepared by the PRAIRIE Group, UIC College of Education
Megan Deiger, Mariam Mazboudi, Esther Mosak, Stacy Wenzel[1]

For further information, contact Stacy Wenzel (312)413-9221 or swenzel@uic.edu.

Executive Summary

External evaluators observed 17 CMSI university-based math and science courses and surveyed a sample of teachers in these courses. These teachers had varied backgrounds and experiences preparing them for the courses. Most but not all teachers (79%) were pursuing a math or science endorsement or a grade 8 algebra credential. Teachers found these university math and science courses to be engaging, relevant to their teaching, and as rigorous as college level courses.

- Nearly all (96%) indicated that they agreed or strongly agreed that their course was engaging.
- Most (over 80%) indicated that they agreed or strongly agreed with statements about the relevance of the course. For example:
  - Whether course included
    - Coverage of specific strategies to use with their students
    - Opportunities to practice specific strategies
    - Discussion on ways students learn
  - Whether teacher used content from the course in their classroom.
- Most (82%) teachers indicated that they agreed or strongly agreed that their course was at least as rigorous as other college level courses they have taken.

[1] Authors produced this report collaboratively and share responsibility for its contents. Conclusions drawn in this report reflect a systematic analysis of data by external evaluators. Our hope is that these findings facilitate improvement of this and related programs through open discussion and consideration of data-driven understandings.

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Introduction

The PRAIRIE Group at the University of Illinois at Chicago (UIC) serves as an external evaluator for the Chicago Public Schools (CPS) Chicago Math and Science Initiative (CMSI). PRAIRIE collaborates on the evaluation with the CPS Department of Program Evaluation. This report has been prepared with the goal of illuminating key contexts and issues pertaining to the use of university-based math and science programs supported by CPS with the aim of increasing the number of teachers with State middle grades math and science endorsements and with NCLB Highly Qualified status. The audience for this brief includes key stakeholders: the CPS Office of Math and Science (OMS), the CPS Chief Education Office, the universities participating in this initiative and those who fund university-based activities that are part of the CMSI (Chicago Community Trust, James McDougal Foundation, Illinois State Board of Education and others).

The CMSI design has included the provision that partial tuition be provided to support current CPS elementary teachers taking courses as part of specially designed math and science university programs.[2] The development of these courses began in 2000 with the start of the NSF funded Chicago Urban Systemic Program grant and had the support of a large contingent of university partners. These courses and programs aim to provide teachers with stronger math or science content knowledge, a better understanding of strong math and science pedagogical practices and allow them to apply for and receive their endorsement to teach middle grades math and/or science.

In 2000 only 5 - 6% of CPS elementary teachers of math and elementary teachers of science had State of Illinois middle grades endorsements which No Child Left Behind legislation now requires them to have if they are departmentalized (i.e., as opposed to self-contained classrooms) in their teaching of these subjects. Progress has been made in terms of increasing the numbers of endorsed teachers. In 2007-2008, 7% of elementary math and 8% of elementary science teachers were endorsed in their fields.[3] However, with many of these endorsed teachers teaching in non-departmentalized primary (K-5) grade levels, there remains a gap between the numbers endorsed and the optimum numbers of endorsed teachers needed to fully staff departmentalized middle grades math and science classrooms. This shortfall will become increasingly important with the anticipated (forthcoming September 2008) CPS policy of teacher specialization.[4]

In this report, we examine the CMSI university-based math and science endorsement programs from the point of view of teachers who participate in these programs. Previous external evaluation reports have relied more heavily on the perspectives of the CPS administrators and university faculty who have designed and taught these courses and on observations of courses

[2] As a stipulation of CPS tuition support for teachers taking these courses, most teachers sign a "participation contract" that they must pass the course and continue to teach at CPS. If they don't meet the contract, they must reimburse CPS for the cost of their tuition expenses. However, to date we do not have any evidence that the mechanisms for measuring compliance to the contract and for obtaining reimbursement are in place.

[3] See the CPS Department of Program Evaluation report: Characteristics of Chicago Public Schools' Elementary School Teachers in the 2007-2008 School Year, June 2008.

[4] See CPS Office of Math and Science presentation: University-based Programs Meeting, August 5, 2008.

made by evaluators.[5] Here we highlight the reasons teachers give for their participation in these programs and their assessment of the courses' engagement, relevance and rigor. We examine how teachers' variation in background and their current teaching assignment may relate to their assessment. We raise reflection questions related to the findings.

Methods

Data for this report were collected via both quantitative and qualitative methods--primarily, observations of university courses and surveys of teachers taking these university courses. In this report, all identifying characteristics (including gender of instructors) have been altered to protect anonymity.

Seventeen observations of math and science courses at five universities were conducted during 2007 - 2008: nine math and eight science courses. Interviews were conducted with all instructors whose classes were observed, for a total of 15 interviews (two instructors taught two different classes but were interviewed only once). The seventeen math and science courses were sampled from an estimated population of 33 CMSI-supported math and science courses offered between September 2007 – May 2008. The population was determined based on courses listed on the CMSI web site and follow-up phone calls to universities whose offerings on the web were not complete. Within a given CMSI-approved math or science program, between 25% and 50% of the September through May offered courses were observed. Copies of the observation and interview protocols are in Appendix A.

Evaluators administered an anonymous survey to teachers attending the subset of 11 courses that were observed during spring 2008. Completion of the survey was voluntary and participants were given time during classes to fill them out except in one course where they took the surveys home and returned them the next week. The survey included quantitative and open-ended questions pertaining to teachers' perceptions of/experiences in their university courses, questions about their current teaching (e.g., types of students taught, curricula used), questions about their level of preparation for the course, and their reasons for taking the course. A copy of the survey is in Appendix A. Teacher survey respondents represented:

- 4 universities (between 13 and 45 responses per university)
- 11 university courses (117 total teachers)
- 6 science courses (48 or 41% teachers surveyed)
- 5 math courses (70 or 59% teachers surveyed)

Descriptive and inferential statistical analyses were conducted on the quantitative survey data to examine patterns of responses across the whole sample and between/among subgroups of the sample. Qualitative (i.e., open-ended) survey responses and observation and interview data were analyzed and compared and contrasted with the quantitative data to provide a richer picture of the teachers' experiences and instructors' perceptions. More detailed analysis of qualitative findings were presented in the January 2008 report, in which observations and interviews were the main focus.

[5] See CMSI/CUSP University-based Teacher Professional Development Courses, August 29, 2003, CMSI/CUSP University-based Teacher Professional Development Courses, August 31, 2004, and CMSI University-Based Programs: Quality, Relevance, and Support Toward Endorsement Interim Report, January 16, 2008.

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Findings

We review findings addressing the following topics:

I. How do teachers view the qualities of CMSI university courses as: Engaging? Relevant to teachers' work? Rigorous?

II. How do the teachers taking these courses vary in terms of their pursuit of endorsement and backgrounds?

III. How does this variation relate to teachers' views of the courses?

I: Teachers' Engagement in Courses and Assessments of Course Relevance and Rigor

The support CPS provides for tuition of teachers enrolled in CMSI university-based math and science courses costs approximately $800,000 annually. The resources devoted by universities offering these courses are similarly large. On one hand, the "pay-off" for these investments is measured in terms of the State middle grades endorsements teachers taking these courses receive. However, given the number of courses required, obtaining these endorsements takes several years for most teachers. The following findings offer a more short-term assessment of how the courses may be beneficial to teachers. Teachers self-report their views of courses in terms of how engaging they are, how relevant they are to their teaching, and how rigorous they are in terms of content taught.

Engagement. As shown in Table 1.1, nearly all (96%) of the teachers surveyed indicated that they agree or strongly agree that the university math or science course they took in 2007 – 2008 was engaging.

Table 1.1
I find this course to be engaging – All respondents

Rating	Frequency	Percent
Strongly Disagree	1	.9
Disagree	4	3.5
Agree	56	48.7
Strongly Agree	54	47.0
Average Rating = 3.4		

Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

Relevance. Teachers commented on how the courses could be useful related to their teaching of math and science to their CPS students. On the survey, they answered four questions about their university course as it addressed teaching strategies and students. On all of these questions the vast majority of the teachers (78% or more) agreed or strongly agreed that the courses provided them with useful experiences. Table 1.2 summarizes these responses.

Table 1.2
Ratings of Course Relevance
All Respondents

	Frequency	Percent
My instructor provides me with specific strategies to use with my students		
Strongly Disagree	3	2.6
Disagree	8	7.0
Agree	61	53.0
Strongly Agree	43	37.4
Average Rating = 3.3		
My instructor gives me opportunities to practice specific strategies to use with my students		
Strongly Disagree	2	1.7
Disagree	13	11.3
Agree	61	53.0
Strongly Agree	39	33.9
Average Rating = 3.2		
We discuss the ways in which students learn in this class		
Strongly Disagree	3	2.6
Disagree	20	17.4
Agree	54	47.0
Strongly Agree	38	33.0
Average Rating = 3.1		
I use content and/or activities from this course in my classroom		
Strongly Disagree	3	2.7
Disagree	21	19.1
Agree	47	42.7
Strongly Agree	39	35.5
Average Rating = 3.1		

Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

While the teachers rated the courses highly overall in terms of relevance, it is important to examine the degree to which some teachers disagreed and strongly disagreed with these items.

- Instructor provides specific strategies to use with students – 7% disagree or strongly disagree
- There are opportunities to practice specific strategies to use with students – 11% disagree or strongly disagree
- Discuss ways in which students learn – 17% disagree or strongly disagree
- I use content and/or activities from this course in the classroom – 22% disagree or strongly disagree

Examination of the open-ended survey questions uncovered some clues as to why some teachers may not have been applying what they experienced in the course to their K-8 teaching. For example, when asked about what would make the course more valuable to them, teachers from six of the 11 courses noted that they would like more "grade-specific" information—understanding how activities and content might be used differently for students at different levels.

The open-ended survey questions also yielded more information regarding teacher perceptions of how courses were relevant. In reviewing results of these analyses, it is important to remember that many teachers chose not to respond to these items and therefore responses are not necessarily representative of the entire sample. However other teachers did provide examples of how they used the university course content that they learned in the K-12 classrooms in which they taught. N for open-ended questions for math ranged from 6-20 (6, 7, 14, 20, 20), whereas the N for science classes ranged from 4-22 (4, 5, 6, 6, 6, 22). Generally, they described how they used various activities, strategies and content. Though the teachers' open-ended survey responses were typically limited in detail and specificity, we offer the following examples.

How teachers responded on the survey about what activities they used in the classes they taught differed between teachers taking math versus science university courses. For those in math courses, activities included working on extended response, getting resources, and working with graphing calculators, working on problems/examples, geoboards, and adding machines. For teachers in science courses, activities included doing labs, getting resources, working with graphing calculators, working on problems/examples.

Types of strategies teachers mentioned using included, learning methodology and concepts, understanding misconceptions, learning how to create an activity, receiving explanations, getting strategies on teaching language learners, and obtaining lesson plans from other teachers.

Reported use of course subject content differed between teachers in math and science courses.

Of the five math classes, teachers in four classes did not report using course content in their classrooms, but rather reported using only strategies and activities. In only one math course did teachers describe how they took math content taught and specifically used it in their classrooms. Eleven teachers from across the math courses specifically wrote that the content taught in the course was not useful for use in the classes and/or grade level they taught. None of the teachers gave specific examples of how the content did not match their needs but one teachers gave a specific example on how the content covered in his university course did work with the specific math curriculum he used to teach his students.

Teachers in science courses were more likely than teachers taking the math courses to report using content from courses in their classrooms, with teachers in five of the six science classes reporting using subject content learned in their university course, in addition to strategies and activities. Nine of the teachers in science courses indicated the content taught in the university course was not useful. Some of these (N=5) teachers in university science courses who did not use the content in their classrooms complained about the science content being too difficult, with one explicitly saying that his students were behind schedule in the pacing of their science as it was. Another explained that she would have liked the university instructor to provide more examples of content that would be relevant to teach to an elementary science class.

In light of the teachers' perceptions of course relevance (above), we examined course university instructor interviews and course observation data to provide a fuller picture of this concept. All instructors interviewed, to varying degrees, referred to the way the concept or activity being

taught could transfer to participants' classrooms. Evaluator observation of courses also found examples in each course where explicit reference was made to at least one of the following topics related to K-8 teaching.

- Ways the concept being taught might be explored with children, and appropriate sequences for presenting ideas: "walking them through the steps"
- Materials and resources relevant to what participants were teaching
- Examples from instructors' own experience as classroom teachers (if they had been), particularly with designing "high interest" lessons
- Activities that could be used directly in classrooms
- Common student misconceptions and how to address them.

Across the board, instructors indicated their emphasis was on increasing participants' content knowledge: "We don't want them to be teaching at the frontier of their knowledge," said one. Several responded to questions about addressing pedagogy with answers like "I am a scientist [or mathematician] and not trained as an educator," "the teachers are the experts." All indicated their belief that greater content knowledge would make teachers more effective. A common theme among instructors, regardless of topic, was getting participants involved in "big ideas" beyond the immediate content or curriculum they worked with. Similarly, all expressed, in some form or another, the idea that "I'm not looking for the answer, but a strategy." [6]

Still it was clear from the observations that, with the exception of one math and one science instructor who spent a larger portion of the class time working out problems on the board, all were modeling an inquiry-based approach to teaching. In interviews faculty expressed a general expectation that participants would learn this approach by experiencing it as students; two math instructors were more specific, saying in their interviews: "I try to model teaching," and "my philosophy is that every course you teach, you're also teaching pedagogy." Observation bore out these instructors' approach to making the pedagogy explicit. The first instructor, discussing Sun Tzu's arithmetic of nine sections, asked teachers, "Do you have a method, a real question, who cares what the answer is, if I change numbers, will the method work each time?...so you were practicing multiplication with your class? This is a good way to con students into [figuring out a system]... tell them about Sun Tzu. If you can do this, you can do really advanced math." The second, explaining the benefit of using words rather than presenting formulas for memorization, told teachers: "I want to get across a way of thinking about integers... do this with kids and they will come up with answers as quickly as you do, without knowing what an integer or positive or negative number is, but they know the context. They can come up with a sophisticated idea." These examples came from classes that were part of master's degree programs. A program leading to endorsement included courses that were explicitly identified as "methods" courses in their titles. One that we observed had teachers carrying out activities designed to be used in their classrooms; they had to work in groups, use calculators, and graph results.

Overall, classroom observation and instructor interviews indicate that courses focused on content rather than pedagogy. Our analyses suggest that there may be a disconnect between some teachers' and instructors' perception of course relevance. It appears that instructors may see relevance as an outgrowth of increased content knowledge, while some teachers may expect to see more specific examples and activities presented in order to consider a course as highly relevant (as measured by the survey questions).

[6] See CMSI University-Based Programs: Quality, Relevance, and Support Towards Endorsement Interim Report, January 16, 2008 for a more in-depth discussion of these perceptions.

Rigor. Of the teachers responding to the survey, most (82 %) indicated that they agreed or strongly agreed that their course was at least as rigorous as other college level courses they had taken.

Table 1.3

This course is at least as rigorous as other college level courses I have taken
All respondents

Rating	Frequency	Percent
Strongly Disagree	4	3.5
Disagree	16	14.0
Agree	30	26.3
Strongly Agree	64	56.1
Average Rating = 3.4		

Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

Some of these teachers confirmed their view of course rigor when they complained in open-ended survey responses that they were not ready for the course content. However in all five of the math courses surveyed, most of the teachers indicated that the rigor was as they had expected it to be. Teachers who did not feel prepared admitted that their background did not prepare them (either because they never took such a content course, they took such a course a long time ago, or the subject was not their area of expertise). This was seen in all five math courses. All those who felt prepared did not think the course was rigorous and these teachers either had a background in the content area or had taken a previous course.

Based on open-ended survey responses, teachers in science courses who felt unprepared had no background in the content area (either because they never took such a content course, they took such a course a long time ago, or this was not their background). In two of the six courses, some teachers felt that the graduate level rigor of the class was not what they felt they should be taking. Those who felt prepared either had a background in the content area or had taken a previous course.

Based on course observations and faculty interviews with evaluators, the ways that university faculty conceptualized the desired level of rigor in terms of the level of math or science content taught, and their expectations of teachers in their courses, was somewhat nuanced. For example, one faculty instructor was observed explaining to his science class that he required teachers' work to be graduate-level work. However, he later indicated in the interview with the evaluator that he did not consider the course content itself to be graduate level:

> When I talk about graduate level content, I'm talking about a very high level of content that would be appropriate for students who have had a lot of undergraduate courses [in the subject]. These are teachers... there's no way I could teach this course higher than I'm currently teaching it. I'm losing people now... and the content I'm presenting is charitably at the level of a freshman introductory class... It is college level content that's been made appropriate for this group of students... but the expectations, and the work quality, need to be at a graduate level.

This was a theme we heard repeatedly from many (but not all) university instructors across a range of classes; some did not consider the course content to be even college-level. Of instructors holding this view, some felt the content was appropriate to what teachers would be expected and able to do as a result of taking the course; while others felt they had to make downward adjustments in the content level based on the teachers' abilities.

Regarding the algebra classes, one instructor said, "The algebra they learn is the algebra they would teach in an 8th grade class," when asked if she would consider it equivalent to a university algebra course, she said, "Probably not... the topics are more geared... to how [they] would be taught in the elementary school, so everything is done from that perspective." The same instructor estimated about 60% of her class would find the content challenging. A second instructor said her course did not have challenging college-level content, but that it must be challenging to some students as not all pass the qualifying test. A third commented, "Certainly if a number of my colleagues in the math department looked at what I'm doing they would say this is 8th grade mathematics."

In university math classes for teachers working towards endorsement or a master's degree, one instructor did consider her course to be college level. Another said, "The content of most of what we do is not up to what I teach in my undergraduate courses, and yet the foundations are the same... I don't expect the teachers to walk out being able to do proofs. That's not necessarily the point."65

In science classes for teachers working towards endorsement or a master's, one faculty member said, "The content that we teach... is often way above the level of what teachers could teach their own students. We want to challenge them as adult learners." Another explained, "If you consider it college level, it's not that challenging. But considering their background it's very challenging... wherever they are, they have to move up." A third stated, "Most of these teachers never even took high school [content]... so why would I challenge them with a college level course? I am teaching them basic stuff that I would hope they would be able to transfer to their students."

II: Teachers Enrolled in Courses have Varied Goals, Prior Experiences and Teaching Assignments

The goals and backgrounds of the teachers enrolled in university courses have a great deal to do with how university faculty shape their courses and how teachers react to the courses. The variation in teachers' experiences that we describe below offers a glimpse into the challenge faced when designing courses of appropriate rigor and relevance.

Credentials sought. The teachers surveyed were most likely to be pursuing their State of Illinois middle grades math or science endorsement. Of the 110 teachers responding to the survey on these items, 77 or 70% were pursing at least one of these endorsements. Of the other 33 teachers, 9 or 8% were pursuing the 8th grade algebra certification but not the endorsement. The remaining 24 teachers indicated they were pursuing a master's degree in math or science but not the math or science endorsement. However of these 24, 5 indicated pursuing "another credential" and 19 marked pursuing only the master's degree.

Table 2.1
Frequencies of credentials being pursued by respondents

	Frequency	Percent
Middle Grades Math Endorsement	49	44.5
Middle Grades Science Endorsement	30	27.3
8th Grade Algebra Certification	19	17.3
Master's Degree	32	29.1

*Percent column does not sum to 100 because respondents could indicate pursuing more than one endorsement

Many (47 of 110) teachers were pursuing more than one of the credentials. Those combinations indicated by more than one respondent are:

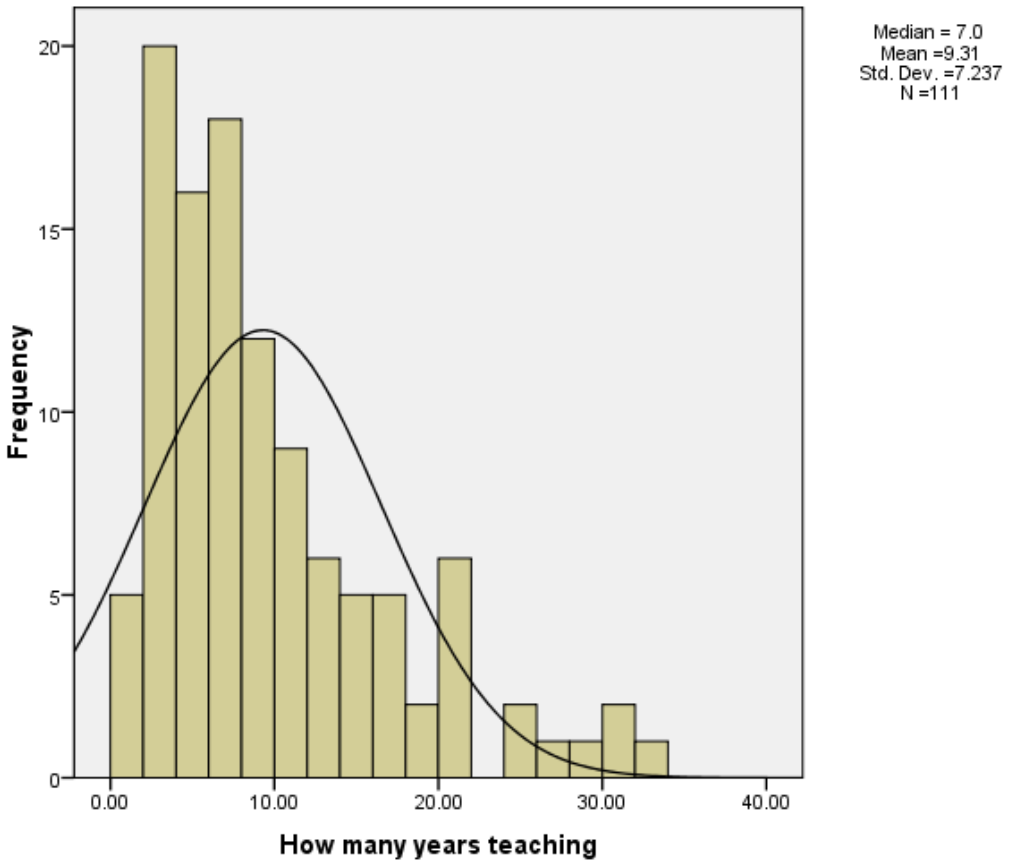
- Middle grades science endorsement and a Master's degree (9)
- Middle grades math endorsement and an 8th grade algebra certification (10)

In open-ended survey responses, teacher indicated that they took courses for reasons of: gaining endorsement or graduate credit, making themselves more marketable as teachers, enhancing their knowledge in the content area, and/or helping themselves to teach better. Some teachers also indicated that being able to take a course for free was a motivator.

Teacher preparation. The following tables and histograms offer a view of the variation in preparation across the teachers surveyed.

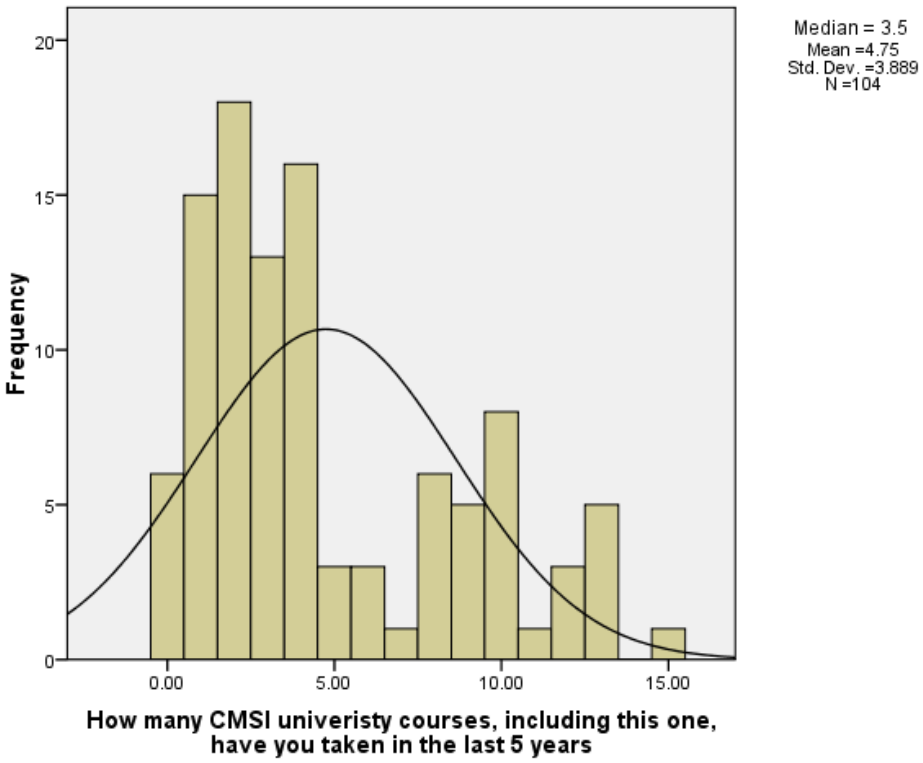
Table 2.2
Teacher preparation for courses
All respondents

	Number years teaching	Number of university courses taken in the last 5 years	Years since last college math course	Years since last college science course
1st Quartile	0 – 4	0 – 2	0 – 3	0 – 3
2nd Quartile	4.1 – 7.0	2.1 – 3.5	3.1 – 6.0	3.1 – 6.0
3rd Quartile	7.1 – 13.0	3.6 – 8.0	6.1 – 10	6.1 – 10
4th Quartile	13.1 +	8.1 +	10.1 +	10.1 +
	Average = 9.3	**Average = 4.8**	**Average = 8.0**	**Average 8.3**

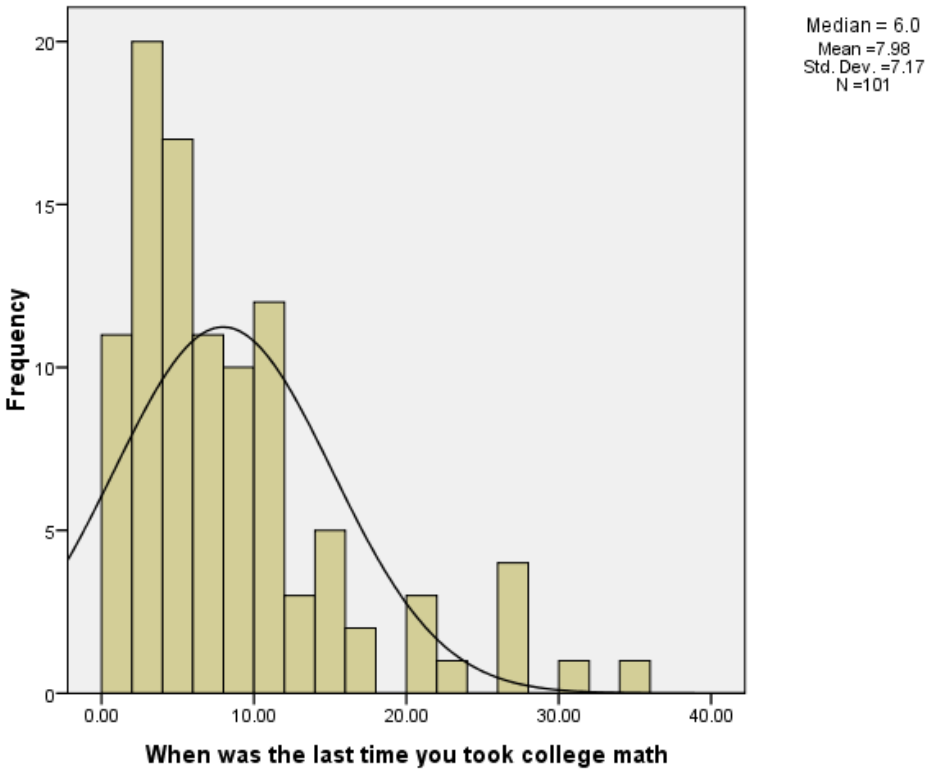


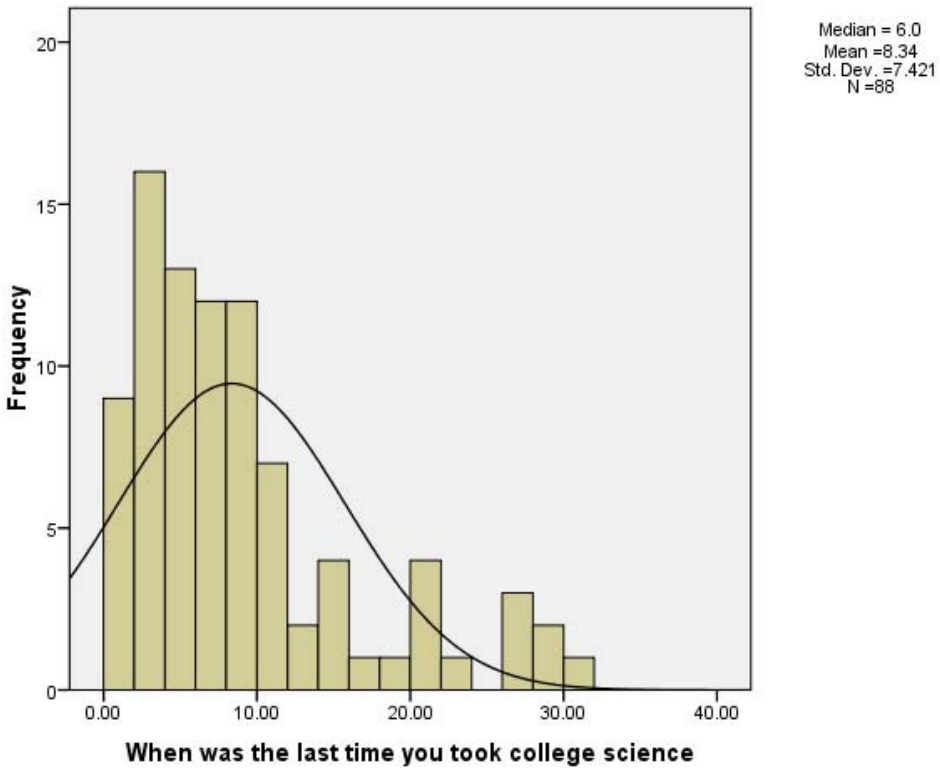
On average, the number of years teachers reported teaching was about nine. Also:

- 53% of teachers reported having taught between one and seven years
- An additional 30% of teachers reported having taught between eight and 15 years
- The most commonly reported number of years teaching was three years (23%)



On average, teachers indicated that they have taken approximately five university courses in the past five years, and that it has been about eight years since their last college math and/or science course. The most common response, however, was two classes. Fifty percent of teachers had taken between zero and three courses. An additional 30% of teachers had taken between four and eight courses during the last five years.


Median = 6.0
Mean =7.98
Std. Dev. =7.17
N =101
Frequency
0
5
10
15
20
0.00
10.00
20.00
30.00
40.00
When was the last time you took college math


Median = 6.0
Mean =8.34
Std. Dev. =7.421
N =88
Frequency
0
5
10
15
20
0.00
10.00
20.00
30.00
40.00
When was the last time you took college science

On average, it had been about eight years since most teachers had taken a college level math or science class prior to a CMSI university course.

In terms of taking college math,

- For 50% of teachers, it had been between zero and six years
- For an additional 30% of teachers, it had been between seven and 10 years.

In terms of taking college science

- For 50% of teachers, it had been between 0 and 6 years
- For an additional 30% of teachers it had been between seven and 13 years.

Based on informal discussion with participants during observations and interviews with instructors over both semesters, we found a very broad range of teacher preparation. One science course, for example, spanned teachers nearing retirement who had not had a science course since high school (and that might have been "general science") to a recent graduate who majored in science and was teaching AP classes at a selective enrollment high school. Similarly, a math course had both older teachers who had not gone beyond high school algebra and a young teacher who had been a math and engineering major and was now pursuing a master's degree.

This range of teacher preparation posed a challenge to instructors in the design and delivery of courses, and to some participants who had difficulty grasping concepts, or projecting ways course content could be transferred to their own instructional practices. In nearly every course observed we found very different levels of how participants engaged with the instructor and materials; how quickly they grasped a new concept or strategy; and the degree to which they completed tasks (homework, labs, take-home exams, online research, etc.)

Two math instructors spoke of being "discouraged" or "depressed" by participants' content knowledge. One science instructor said she found them "shockingly unprepared," while another felt "extremely limited" in what she could do given the content level at which she had to teach.

Teachers' current teaching assignments. Teachers were enrolled and thus participating in their university courses at the same time they were teaching their K-8 CPS students. The characteristics of their schools and student population offer a context from which they view the relevance of their university courses. We describe selected characteristics of their teaching assignments in Table 2.3.

Table 2.3
Selected characteristics of teachers current teaching assignments

	Percent
Teaching classes with more than 20% English language learners	46
Teaching classes with more than 20% special education	17
Using at least one CMSI curriculum	49*

*Note that this item asked teachers to report which curricula they use and not all respondents answered the question. Thus, this is only a rough estimate of the number of university course participants using CMSI curricula in their classrooms.

The majority of respondents teaching classes with more than 20% ELL are teaching in grades six (39%), seven (36%) and eight (39%) with the remaining distributed across all other grades (K-12)[7]. Those indicating teaching classes with more than 20% SPED are also primarily teaching grades six (29%), seven (35%), and eight (47%).

Teachers who reported having special populations of students in their classrooms were specifically asked if their university courses helped them in teaching such students. Some teachers in both math and science courses indicated that the content was too difficult for regular students, let alone English language learners or students with disabilities, so they did not even consider their special students when thinking about teaching the subject matter from their university course. However, among others there was also a general inference that regular students would likely understand the concepts because of the hands-on activities, and that the English language learners and students with disabilities would also benefit from these activities.

III: Relationships between Teachers' Interests and Experiences and How They Viewed their University Courses

Given the variation in teachers' interests and backgrounds, we report on whether different groups of teachers may be experiencing the university courses in distinct ways.

Teacher preparation and perceptions of relevance/rigor. Correlations between measures of teacher preparation (number of years teaching, number of university courses taken in last 5 years, years since last college math, years since last college science) and measures of course relevance and course rigor were examined. The only statistically significant correlation that emerged was that of the association between the number of years teaching and the degree to which the teacher found the course to be as rigorous as other college level courses. The correlation suggests that the longer teachers have been teaching, the less rigorous they find their university course to be.

	Course is at least as rigorous as other college level courses
Number of years teaching	-.25*

This correlation is statistically significant ($p < .05$)

Instructors interviewed tended to identify participants who were "struggling" with those most distant from a high-level math or science course—even though the statistical analyses of the survey data do not support that. Some faculty indicated that even those coming in with higher levels of content knowledge, acquired at whatever point in their careers, might find these courses challenging because of the focus on inquiry. One instructor said, "The content they might understand, but the strategies and alternative ways of doing things might be new. So many of them have learned it by a formula, and now they're seeing how you uncover the formula, and break it down in a way that's accessible to students."

Teacher preparation and credentials sought. Correlations between teacher preparation and pursuit of credentials were also explored. Not surprisingly, the pursuit of a Master's degree is associated with more courses having been taken over the past five years. Also not surprisingly, it is associated with fewer years since last taking a college science course, as the majority of teachers pursuing Master's degrees are doing so in science subjects:

[7] Note that respondents could indicate teaching multiple grades, so overall percentages are over 100%

	Number of university courses taken in last 5 years	Years since last college science course
Pursuing a Master's Degree	.36*	-.22*

These correlations are statistically significant ($p < .05$)

The pursuit of an 8th grade algebra certification was also associated with more years since the last college math and science course taken:

	Years since last college math course	Years since last college science course
Pursuing an 8th grade algebra certification	.28*	.32*

These correlations are statistically significant ($p < .05$)

Patterns of ratings on most items shown in Tables 1.1 to 2.3 were consistent across subsets of teachers, including:

- Teachers who report having students who are English language learners
- Teachers who report having no ELL students
- Teachers who report having special education students
- Teachers who have no SPED students
- Teachers who report using a CMSI curriculum
- Teachers who do not use a CMSI curriculum

However, in investigating differences among subgroups, statistically significant differences in ratings of engagement emerged between Cluster 4 Middle Grades Project (Cluster 4) respondents and all other respondents, as well as between teachers in math courses and teachers in science courses for some items.

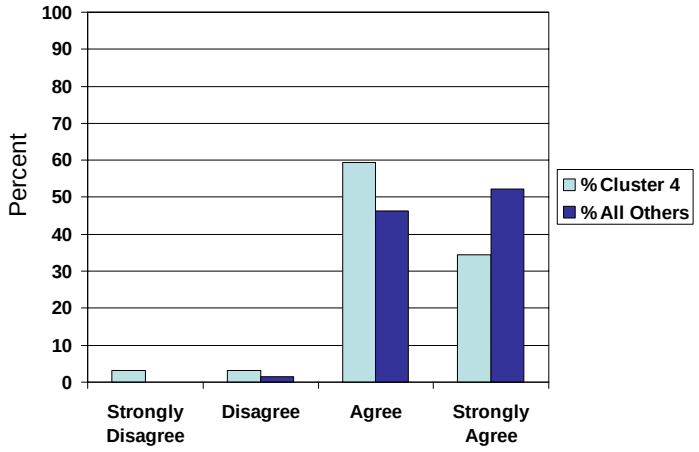
Cluster 4 Middle Grades Project respondents vs. all other respondents. The following table and graphs display differences found on indexes of relevance between Cluster 4 respondents and all other respondents.

Table 4.1
I find this course to be engaging – Cluster 4 respondents versus all other respondents

		Frequency	Percent
Cluster 4 (32)	Strongly Disagree	1	3.1
	Disagree	1	3.1
	Agree	19	59.4
	Strongly Agree	11	34.4
Average Rating = 3.3*			
Non-Cluster 4 (67)[8]	Strongly Disagree	0	0.0
	Disagree	1	1.5
	Agree	31	46.3
	Strongly Agree	35	52.2
Average Rating = 3.5*			

*These mean ratings differ significantly ($p < .05$)
Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

I Find this Course to be Engaging – Cluster 4 Respondents Versus all other Respondents



As shown in Table 4.1 and the accompanying graph, Cluster 4 respondents indicated lower levels of engagement in their courses. Examination of the distribution of the ratings on this item shows

[8] All numbers in parentheses in the tables are the number of respondents within each subcategory for the particular item.

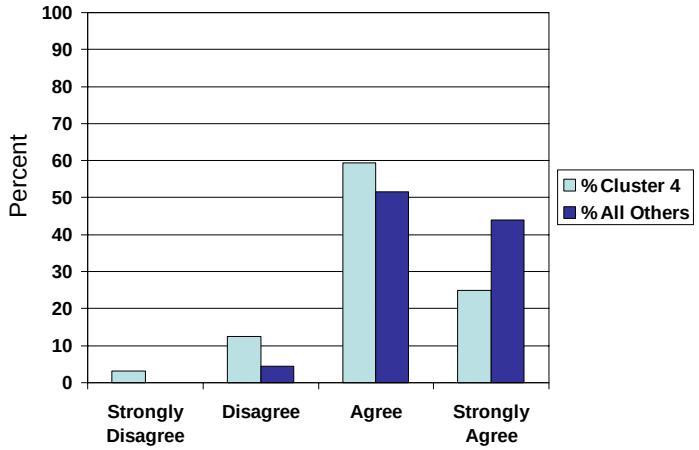
that Cluster 4 respondents were less likely to strongly agree that the class was engaging than were all other respondents.

Table 4.2
My instructor provides me with specific strategies to use with my students – Cluster 4 respondents versus all other respondents

		Frequency	Percent
Cluster 4 (32)	Strongly Disagree	1	3.1
	Disagree	4	12.5
	Agree	19	59.4
	Strongly Agree	8	25.0
Average Rating = 3.1*			
Non-Cluster 4[i] (66)	Strongly Disagree	0	0.0
	Disagree	3	4.5
	Agree	34	51.5
	Strongly Agree	29	43.9
Average Rating = 3.4*			

*These mean ratings differ significantly ($p < .05$)
Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

My Instructor Provides me with Specific Strategies to use with my Students – Cluster 4 Respondents Versus all other Respondents



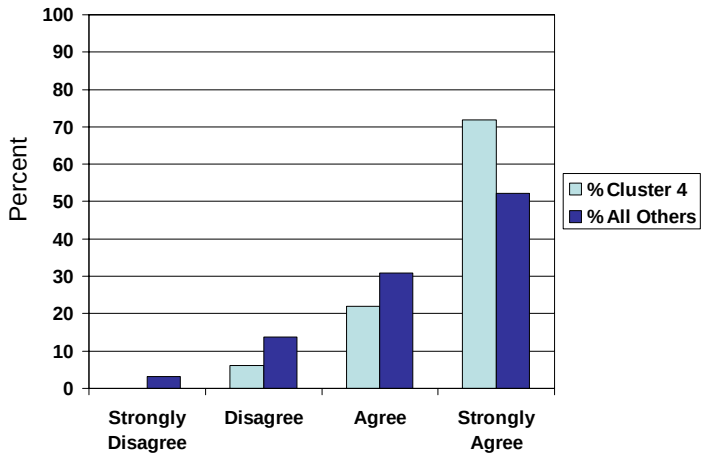
As shown in Table 4.2 and the accompanying graph, Cluster 4 teachers disagreed more often with the statement that they were given specific strategies to use with their students. Fifteen percent of Cluster 4 teachers (vs. 5% of non-Cluster 4 teachers) disagreed or strongly disagreed with this item.

Table 4.3
This course is at least as rigorous as other college courses I have taken
Cluster 4 respondents versus all other respondents

		Frequency	Percent
Cluster 4 (32)	Strongly Disagree	0	0.0
	Disagree	2	6.2
	Agree	7	21.9
	Strongly Agree	23	71.9
Average Rating = 3.7 *			
Non-Cluster 4 (65)	Strongly Disagree	2	3.1
	Disagree	9	13.8
	Agree	20	30.8
	Strongly Agree	34	52.3
Average Rating = 3.3 *			

*These mean ratings differ significantly ($p < .05$)
Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

My Course is at Least as Rigorous as other College Courses I have Taken – Cluster 4 Respondents Versus all other Respondents



As shown in Table 4.3 and the accompanying graph, Cluster 4 teachers also indicated a higher level of agreement with the statement that their course was at least as rigorous as other college courses they have taken. Ninety-three percent of Cluster 4 teachers (vs. 83% of non-Cluster 4 teachers) agreed or strongly agreed with this item.

There is little in the interview and observation data to explain the difference in ratings of engagement between Cluster 4 participants and all others. However, two math instructors commented that participants seemed to have expected a "methods" course. We do not know whether the participants they were referring to were in Cluster 4, or if so, how many of them had this expectation. A science instructor suggested a possible problem in expectations, saying of his course "this isn't a professional development short course."

The survey found a 10% difference in the number of Cluster 4 respondents vs. other respondents who agreed with the statement that the course was at least as rigorous as other college courses the have taken. While some instructors indicated they were not aware of which students had "self-selected" and which were in their course because of Cluster 4, others commented that as a group the Cluster 4 teachers were less prepared than other participants for the level at which they were expected to perform.

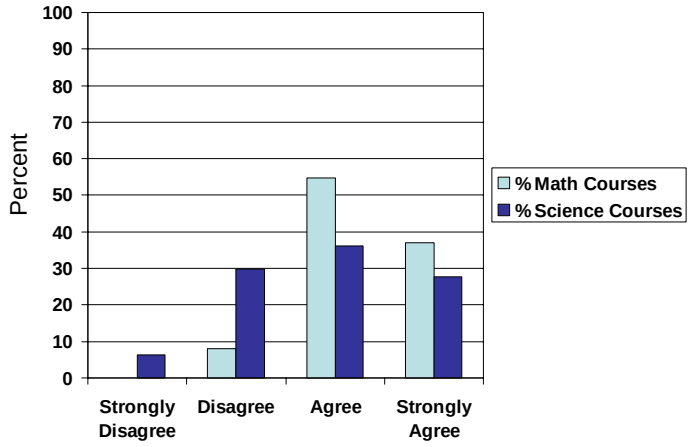
Math course respondents vs. science course respondents Statistically significant differences in how teachers assessed the course emerged when math courses were compared to science course.

Table 4.4
We discuss the ways in which students learn in this course – Teachers in math courses versus teachers in science courses

		Frequency	Percent
Math (62)	Strongly Disagree	0	0.0
	Disagree	5	8.1
	Agree	34	54.8
	Strongly Agree	23	37.1
Average Rating = 3.3*			
Science (47)	Strongly Disagree	3	6.4
	Disagree	14	29.8
	Agree	17	36.2
	Strongly Agree	13	27.7
Average Rating = 2.9*			

*These mean ratings differ significantly ($p < .05$)
Ratings are on a scale from 1 (strongly disagree) to 4 (strongly agree)

We Discuss the ways in which Students Learn in this Course – Teachers in Math Courses Versus Teachers in Science Courses



Teachers in math courses rated the degree to which they discuss how students learn in their courses more highly than did teachers in science courses; 36% of teachers in science courses (vs. 8% of teachers in math courses) disagreed or strongly disagreed with this item.

Based on course observations, all but one of the math courses observed addressed ways students learn and how participants could apply what they were learning to their own classrooms. This underscores participants' survey responses indicating that "how students learn" was addressed more in math than science classes.

Reflection Questions

A. Most teachers reported that the university course they took offered them information about content, students and teaching strategies—some of which they were applying in their K-8 classrooms. However, a subset of teachers did not find courses to be relevant in these ways. Does OMS have expectations for specific ways that courses should be relevant and can these expectations be elaborated and shared? Do universities have specific learning goals related to students' understanding of how to apply in their classroom what they learn from each specific course?

B. Likewise, what are OMS expectations for what content knowledge is conveyed in university courses? How do university faculty instructors determine what content knowledge to cover? How do these expectations of content knowledge map onto the content that middle grades math and science teachers are expected to cover with their students—specified by State standards?

C. Of the teachers enrolled in these courses, most but not all are seeking middle grades math or science endorsements or algebra credentials and thus are eligible for CMSI tuition support. How is tuition support distributed across teachers in these courses who vary in terms of what credentials they are pursuing? Within the roughly 20% of teachers surveyed who indicate that they are not pursuing endorsement or certification, are any receiving tuition support?

D. With the range of teachers' math and science background and variation on how they view the rigor of the courses, do (and how do) university instructors adapt their course goals and differentiate instruction? How are pre- and/or post-tests of teachers' content knowledge used in these courses? Can the analysis of content tests offer information that can be used by universities and OMS to further inform how to best serve teachers of varying backgrounds?

Appendix A

FILE CODE –

PRAIRIE Evaluation Team

IL-MSP Observation Template 2007-2008

Evaluation project:

Location of visit:

Program/Activity:

Date/time/duration of visit:

Observer recording notes:

Date notes written:

****

Individuals present:

Description of site:

List of materials collected:

Description of activities with time intervals:
(This section should include detailed description of interactions and dialogue during observation, with time indicated at key activity intervals (for instance, as move to next point on agenda).

Analytic themes:
(This section should include evidence about activities, interactions, comments that will contribute to evaluating the program. The following prompts will help you relate your observations back program goals and evaluative questions.)

1. *Evidence of quality of the learning environment, for instance:*

- *time for reflection on practice --alone and together; written and verbal*

- time for applying/using new ideas during the seminar/workshop

- *active participation through attendance, discussion, writing, activities*

- Ideas have relevance to participants' work

- Participants move from new ideas to constructing original solutions to problems

- Participants communicate their understanding and engagement (to each other)

- Participants' prior ideas/assumptions are reflected upon in light of new challenging ideas

- Participants are engaged as sources of knowledge and experience

- Participants receive constructive feedback on their work

2. Evidence of acquisition of new knowledge:

- Participants acquire a deeper understanding of the aspects of good instruction in mathematics and science

- Participants acquire new knowledge/understanding of the processes by which good instruction in math/science can be promoted in Chicago Public Schools

- Participants reflect upon/reconsider their roles as teacher leaders and/or as classroom teachers

- Participants acquire new knowledge/understanding about their ability as teacher leaders to support math and science inquiry in schools and classroom

- Participants acquire a better understanding of CMSI-supported curricula and materials

- Participants indicate a need to modify and/or supplement CMSI-supported curricula and materials

- Participants acquire new knowledge/understanding to support students with special needs with appropriate instruction in math and science

- Participants acquire new knowledge/understanding to support English language learners with appropriate instruction in math and science

- Other gains participants indicate they have made

3. Other analytic comments:

- Instructor challenges participants to increase their content and pedagogical knowledge

- Instructor actively monitors participants' understanding of new content and instructional practices

Interpretive comments:
(i.e. additional thoughts in which you relate your observations to broader issues and contexts beyond the immediate scope of the program objectives)

Self-reflective observations:
(i.e. ways in which the event or activity observed affected you, how you responded to aspects of the activity that might influence your observations, etc.)

Follow-up needed:
(In this section identify any additional information that needs to be gathered, gaps filled, etc.)

Interview of University Course Instructor, Fall 2007 FILE CODE: _____

Name of Interviewee:
Name of Course:
Dates of Course:
Location of Course:
Name of Researcher:
Date and Location of Interview:

Researcher first discusses informed consent with interviewee(s): If consent is reaffirmed, the researcher then asks the following questions. The interviewee is encouraged to elaborate on answers.

1) How did you come to teach this course?

Where did you first learn about the opportunity to teach it? When? Explain.
How did you learn about what the course should include? Was there a syllabus?
Do you or others vary how you teach this course year-to-year?

2) What does this course cover? Can I have a copy of the syllabus?

a) In brief, how would you describe it?

b) Based on what the CPS Office of Math and Science has shared with us, this type of course may have the characteristics of:

- Offering challenging college-level content
- Highlighting pedagogy
- Including content on how students learn
- Relating to CMSI-supported curricula
- Connecting relevantly to teachers K-8 teaching.

Can you talk to us about the course related to some of these expectations?

IF teaching in the ALGEBRA INITIATIVE – Add this question also

c) What are the characteristics of teaching high quality algebra in grade 8?
How are these characteristics conveyed and experienced by teachers in your course?

Background to interviewer:

Challenging college-level content --Instructors have varied in terms of how they describe overall course and/or math/science content as "college" or "graduate" level. See August 2004 report. Here we want additional views on this.

Pedagogy –Instructors have varied in how they deal with pedagogy (presenting information, modeling practices, having teachers address their own practices) and what practices they focus on. See August 2004 report. Here we want additional views on this.

Student learning --As you are instructing teachers, are you requiring them to look at/ study their students' work? If so, how is this study of student work conceived/structured?

CMSI-supported curriculum -- Do you (and how) use specific K-8 curricular materials to shape your course? Give examples. If math course: Math Trailblazers, Everyday Math, Math Thematics, Connected Math. If algebra course: What texts. If science course: SEPUP, IES, FOSS.

3) Get a sample of a challenging assignment / activity from the instructor

a) Tell us about this assignment and why you think it is particularly challenging for participants in your course/workshop.

b) How will they benefit in their teaching/other work from doing this assignment/activity?

c) Tell us about how they completed this assignment/activity.

4) Benefits for and characteristics of participants

a) What are the intended benefits of this course/workshop for participants? How do you know/determine whether they are benefiting?

b) How do teachers in your course vary in terms of their needs and backgrounds?

Let them answer broadly but then probe on following:

- teachers working with bilingual students
- teacher working with students with disabilities
- teachers who self-select endorsement programs vs. those who enter them with a mandate by the Cluster 4 Initiative or by their principals' strong recommendation

c) How do you assess the participants' work?

d) Do you think there will be any benefits to the participants' students? What might they be?

5) The course you teach [_____] is part of your university's [_____] program that can lead CPS teachers to [state endorsement in _____ or CPS certificate or passing CPS algebra test].

a) What are your thoughts about this program and where it can lead teachers?

Let them answer broadly but then probe on following:

- Teachers who gain/pass the [__] vs. those who do not
- Related to teachers instructional practices
- Related to teachers status influence them and their schools? For example, in terms of teacher leadership, mobility, etc.?

b) What supports are most helpful to teachers who succeed in completing the program?

c) Based on your experience teaching this course, do you have thoughts about why some teachers do not complete endorsements or pass the (Algebra Initiative) test? What additional supports are needed?

6) What did you get out of this experience personally?

7) What does your university/ college/ department get out of offering the course?
How do you know this?

a) What do you think about the sustainability of this course?
How it is funded? Why do courses cost what they do for teachers?
How do you recruit participants?

b) Do you reflect on participants' course/program completion rates?
Other data provided by OMS? If so, how?

Background of Professional Development Course/Workshop Instructors

Name:

Name of Professional Development Course/Workshop:

Location of Professional Development Course/Workshop:

1. **What courses are you currently teaching that are for practicing CPS teachers of math and science? For each of these, how often have you taught them in the past and when?**
   _____
   _____
   _____
   _____
   _____
   _____

2. **Have you taught other courses for practicing CPS teachers in the past? What and when?**
   _____
   _____
   _____

3. **What is your current position,**

   If at a higher education institution?

   Title _____ Department _____ College/University _____

   Check all that apply:

   Tenured ___ Non-tenured, Tenure-track ___ Non-tenure-track ___Full-time ___ Part-time ___

   If in a CPS school?

   Title _____ Grade level _____ School _____ Area _____

   If at a different organization?

   Title _____ Organization _____

4. Do you currently or have you in the past worked in any the following positions? If so, how many years had you:

a. Been an elementary school teacher?
__Never __< 1yr __2-3yrs __4-5yrs __6-10 yrs __11-15 yrs __15 +

b. Been a high school teacher?
__Never __< 1yr __2-3yrs __4-5yrs __6-10 yrs __11-15 yrs __15 +

c. Been an administrator at the school level
__Never __< 1yr __2-3yrs __4-5yrs __6-10 yrs __11-15 yrs __15 +

What type of position(s)?

d. Been an administrator at the system level?
__Never __< 1yr __2-3yrs __4-5yrs __6-10 yrs __11-15 yrs __15 +

What type of position(s)?

e. Been a university instructor?
__Never __< 1yr __2-3yrs __4-5yrs __6-10 yrs __11-15 yrs __15 +

5. Are you a graduate of a CPS high school?

__ Yes __No

6. Are you:

__ African-American
__ Asian-American
__ Hispanic
__ White, Non-Hispanic
__ Native American
__ Biracial/Multiethnic
__ Other

7. Are you:

__ Male __Female

8. What is the highest level of formal education you have completed?

__ Bachelor's degree
__ Master's degree
__ Master's +15
__ Master's +30
__ Master's +45
__ Doctorate

9. What degrees do you have?

Degree ____ Department _____ College or University _____

Degree ____ Department _____ College or University _____

Degree ____ Department _____ College or University _____

Degree ____ Department _____ College or University _____

University Courses: Written Reflections for Teachers

Reflections on This Course

Please indicate the extent to which you agree or disagree with the following statements (circle one):

1. I find this course to be engaging

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

2. This course provides me with specific strategies I can use with my students

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

3. This course gives me opportunities to practice specific strategies with my students

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

4. In this course, we discuss the ways in which students learn math or science

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

5. This course is at least as rigorous as other college level courses I have taken

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

6. I use content and/or activities from this course in my classroom

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

7. What content/and or activities do you use in your classroom?
   (Please be specific and give examples where possible)

8. In what ways did you feel prepared and/or unprepared for the rigor of this course's content?

9. What do you find to be most valuable about this course?

10. What would make this course more valuable to you?

About University Math and Science Courses

1. How many CMSI university math or sciences courses, including this one, have you taken in the last five years? _____

2. Apart from the university courses referenced above, when was the last time you took a math or science course at the college level?
   a. Math_____years ago
   b. Science_____years ago

About Your Students

1. Approximately what percentage of your math and/or science students are English language learners? _____%

a. If you are teaching at least some English language learners, to what extent do you agree that this course supports you in this teaching? (circle one)

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

Please explain your answer:

2. Approximately what percentage of your math and/or science students are students with disabilities? _____%

a. If you are teaching at least some students with disabilities, to what extent do you agree that this course supports you in this teaching? (circle one)

1	**2**		**3**	**4**
Strongly Disagree	Disagree	Agree	Strongly Agree	

Please explain your answer:

About You

1. What grade(s) do you currently teach? (check all that apply)

K □ 1 □ 2 □ 3 □ 4 □ 5 □ 6 □ 7 □ 8 □ 9 □ 10 □ 11 □ 12 □

2. How many years have you been teaching? (If it is your first year, write "1") _____

3. Is/are the grade(s) you teach departmentalized in your school? **Yes** □ **No** □
   a. If so, what subject(s) do you teach?_____

4. If you use a CMSI math and/or science curriculum, which one(s) are you using?
   _____

5. Is your school part of the Cluster 4 Initiative? **Yes** □ **No** □

6. Why did you decide to take this course?

7. Are you taking this course with the goal of gaining any of the following credentials? (check the box to the right of all that apply):

Middle Grades Math Endorsement	
Middle Grades Science Endorsement	
8th Grade Algebra Certification	
Master's Degree	
Other (Please explain)_____ _____ _____	

a. Have you experienced barriers or challenges in pursuing this/these credential(s)? Please explain.

b. What supports, if any, have you received to help you pursue this/these credential(s)? Please explain.

c. What help that you are not currently getting do you need in pursuing this/these credential(s)?

[i]The frequencies in this table were updated on 9/15/08 due to an error found. It is our policy to check one another's statistics for consistency. The update does not change the findings or implications of this report.