REL NORTHEAST & ISLANDS

REGIONAL EDUCATIONAL LABORATORY at EDC

TO: Brooks Bowden, OK Park (IES)

FROM: Teresa Duncan, Jessica Heppen (AIR), Peggy Clements, Cheryl Rose, Katie Culp, Craig Hoyle, Jill Weber (EDC)

DATE: May 7, 2008

RE: Responses to follow-up OMB questions

Thank you for forwarding the questions from OMB. Our responses are below; we look forward to hearing back from OMB.

I. Student survey

- On pages 6-24 of this memo, we have provided a listing of all the items on the student survey, indicating which items are new, which ones were removed, and the sources for each item.
- Only items 16a and 16b are new
- We will pilot the student survey with nine 8th graders this month (May). One of our staff members in Maine has a daughter in 8th grade and has indicated that her daughter and friends would be willing to take the survey so that we may determine how long it takes students to complete it.
- We will send OMB the results of the pilot and the final version of the student survey.

II. Teacher survey

- Our plan is to administer the teacher survey to all the treatment (online) and control (face-to-face) group teachers.
- The purpose of the teacher survey is to provide context for the results; the data are also important for providing background information to establish comparability (in training, experience, etc.) between teachers in the treatment and control groups.
- Because we are working with small schools, with one, possibly two teachers in a building, we do not have the degrees of freedom to estimate a teacher-level effect. Again, the teacher data are to provide context and background information.
- Accordingly, the 2-level random effects model described in the OMB submission package is appropriate and consistent with the assumptions and design on which our power calculations are based. Please recall that this study involves randomization at the school level and so our HLM analyses represent impacts at the student and school levels. What

we have in the OMB package is the basic model for determining the intervention's impacts.

- Should we find significant intervention impact, we plan to use the teacher data to conduct post hoc analyses, and test for any interaction effects related to teacher characteristics.
- We had not planned to administer any surveys to the Classroom Proctors, but acknowledge OMB's interest in capturing information about who the proctors are and what they are doing during the class periods. The Classroom Proctors are scheduled to undergo a day-long training session prior to the implementation of the course, to help standardize the nature of the support they provide to their classrooms. During this training, we will collect background data (items 1-9 of the teacher survey) from the Classroom Proctors so that we may document the range in training and experience represented in the group.
- To capture what the Classroom Proctors are doing in the classroom, we propose to do the following. Because the Classroom Proctors are required to keep close contact with the Online Teacher, we will ask the Online Teachers to keep a running log of the reports/feedback that they receive from each of their Classroom Proctors. This documentation will help us keep track of both minor events (e.g., a student leaving the classroom during the math period) and major events (e.g., the causes of a server problem and when the server is expected to be back online). The back-and-forth between the Classroom Proctors and Online Teachers is a fundamental part of implementing the intervention; all we are asking them to do is to maintain a daily log of those conversations.
- Given the importance of online instruction to this region, we expect high initial response rates. Because of the relatively small number of respondents, we will be able to conduct multiple follow-ups of non-respondents (by individual telephone interviews, if need be) to ultimately reach that 90% response rate. The table below details the dates, activities, and expected response rates resulting from those activities.

2009	Action	Expected response rate %	Appx. N (out of 120)
4-May	Email teachers about the online survey going live on May 11; due May 15		
11-May	Email announcement to teachers about online survey (include logins)		
13-May	Email reminder about online survey; have School Liaisons remind each teacher	50%	60
15-May	Email to announce survey is due today	65%	78
18-May	First follow up email	75%	90
25-May	Second follow up email	80%	96
1-Jun	Begin telephone calls; offer to telephone interview or send paper copy	83%	100
8-Jun	Continue telephone calls (reminders/interviews); have School Liaisons collect completed paper copies (in sealed envelopes)	87%	104
15-Jun	Complete telephone reminders/interviews; have School Liaisons collect completed paper copies	90%	108

III. Sample Selection

Study Design

This study is an investigation of the use of an online algebra course to expand access to eighth graders who are ready to take the course but are unable to do so because they attend schools that are often small and in rural locations that do not offer the course until high school.

The design is a randomized controlled trial with randomization at the school level. Schools that do not currently offer a full section of Algebra I to eighth graders will be randomly assigned to receive a virtual algebra course (at no cost to them) or no virtual algebra course.

Target Population for the Study

We have decided to focus this study on Maine because of:

- the high degree of interest in virtual courses for students
- low overall enrollments in Algebra I among eighth graders across the state, and
- because Maine has a strong technology initiative that can support the infrastructure needed in the schools to offer an online course. Eighth-grade students in Maine currently use laptop computers in the course of their daily instruction, and engaging with information delivered online is a familiar teaching tool.
    - Because this infrastructure is already in place, implementation of the study will be facilitated and we anticipate a shorter start-up time than in states with more limited technology capacity.
    - However, we will need to take this contextual factor into account when interpreting the findings of the study, as this may affect the generalizability of the results. In locations where technology problems are more likely to occur, especially at start-up, educators should not expect the results we see in Maine until they achieve similar levels of technology integration.

The target population of **schools** consists of those in Maine that:

- serve students in Grade 8 and below, but not Grade 9 and above,[1]
- which do not offer one full section of Algebra I
- but *would* offer Algebra I to some of their eighth graders if they could.

Based on data from the CCD and information that we have about the local schools, we estimate that there are approximately **80-100** schools in the target population.[2]

The target population of **students** is eighth graders attending these schools and who are considered to be "ready for algebra." By "ready for algebra" we mean

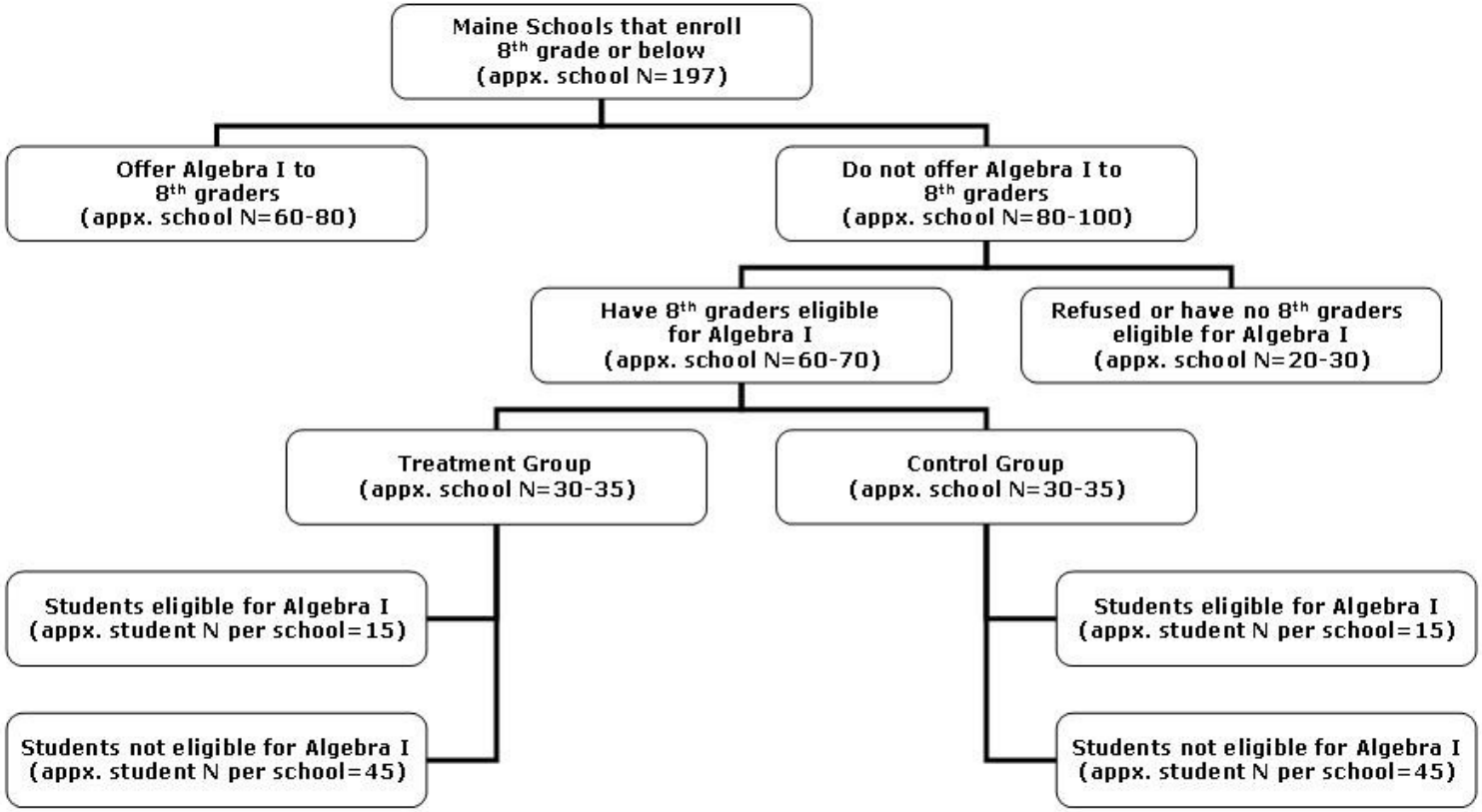
- those students who are considered by their schools (teachers, principals), their parents, and themselves to have sufficient mastery of pre-algebra concepts to take Algebra I.
    - Schools currently make decisions about which students are ready on the basis of teacher perceptions of preparedness, grades in prior math classes up through seventh-grade math, and, more rarely, scores on assessments such as algebra

[1] The reason to exclude schools that serve higher than Grade 8 is that we assume these schools will have far more eighth-grade students who will be able to take the 9th- or 10th-grade Algebra I class within the same building.

[2] The CCD indicates that there are about 197 schools that serve Grade 8 and below, but not Grade 9 and above. Of those 197 schools, we estimate 40–50% do not currently provide Algebra I as a stand-alone class for eighth graders.

readiness tests (e.g., Iowa Algebra Aptitude Test, Orleans-Hanna Algebra Prognosis Test).

See figure on page 5 of this memo for a visual display of the Virtual Algebra study's sample selection process.


Maine Schools that enroll 8th grade or below (appx. school N=197)
Offer Algebra I to 8th graders (appx. school N=60-80)
Do not offer Algebra I to 8th graders (appx. school N=80-100)
Have 8th graders eligible for Algebra I (appx. school N=60-70)
Refused or have no 8th graders eligible for Algebra I (appx. school N=20-30)
Treatment Group (appx. school N=30-35)
Control Group (appx. school N=30-35)
Students eligible for Algebra I (appx. student N per school=15)
Students not eligible for Algebra I (appx. student N per school=45)
Students eligible for Algebra I (appx. student N per school=15)
Students not eligible for Algebra I (appx. student N per school=45)

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
1-4	1-4	School and class identifiers	standard		ID	No
5-7	5-7	Demographics	standard		Background	No
8	8	Think about the grades you earned during 6th, 7th, and 8th grade. How would you describe your overall grades in MATH classes?	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal survey)	Background	No
9	9	Which of the following math classes do you expect to take next year (starting next fall, Fall 2009)?	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal survey)	Background	Yes
10	10	Which of the following math classes do you expect to take while you are in high school?	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal survey)		Yes
11	11	Which of the following best describes your educational goals? Will not finish high school Graduate high school Some education after high school	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB	Background	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		Graduate college Go to graduate school I don't know		reviewed federal survey)		
12	12	**My math teacher:** a. Expects me to do my best all the time. b. Expects everyone to participate. c. Doesn't let me get away with being lazy. d. Expects everyone to work hard. e. Really listens to what I have to say. f. Believes I can do well in school. g. Is willing to give extra help on schoolwork if I need it. h. Helps me catch up if I am behind. i. Notices if I have trouble learning something.	Consortium on Chicago School Research	Classroom Personalism: Used with all students in Chicago Public Schools Elementary Level: Individual Separation = 1.66, Indiv Level Reliability = 0.73, School-Level Reliability = 0.84 High School Level: Individual Separation = 1.61, Indiv Level Reliability = 0.72, School-Level Reliability = 0.95	a-d = Academic Press; d-i = Classroom Personalism	Yes
13	13	**How much do you agree with the following statements about your math class?**	Consortium on Chicago School Research	Engagement: Used with all students in Chicago	Student Engagement	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		a. The topics we are studying are interesting and challenging. b. I usually look forward to this class. c. I work hard to do my best in this class. d. I am usually bored with what we study in this class. e. Sometimes I get so interested in my work I don't want to stop. f. I often count the minutes until class ends. g. This class really makes me think. h. No student wastes time in this class.		Public Schools Elementary Level: Individual Separation = 1.56, Indiv Level Reliability = 0.71, School-Level Reliability = 0.89 High School Level: Individual Separation = 1.33, Indiv Level Reliability = 0.71, School-Level Reliability = 0.97		
14	14	**In your math class, how often:** a. Do you find the work difficult? b. Are you challenged? c. Does the teacher ask difficult questions on tests? d. Does the teacher ask difficult questions in class? e. Do you have to work hard to do well?	Consortium on Chicago School Research	Academic Press: Used with all students in Chicago Public Schools Elementary Level: Individual Separation = 1.37, Indiv Level Reliability = 0.65, School-Level	Academic Press	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
				Reliability = 0.79 High School Level: Individual Separation = 1.68, Indiv Level Reliability = 0.74, School-Level Reliability = 0.93		
15		**→ Original item:** On a *typical day*, how much time do you spend studying or doing homework for your math class, outside of class time? 0 None 1 Less than 30 minutes 2 30-60 minutes 3 1-2 hours 4 More than 2 hours **→ Replaced with 2 items from TIMSS survey:**	GE Foundation survey	N/A (dropped)	Amount of Homework	Yes
	15a	*A) How often does your teacher give you homework in mathematics?*	TIMSS Contextual Background	Used with International Samples of 8th grade students (including	Amount of homework	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		0 ☐ Never 1 ☐ Less than once a week 2 ☐ 1 or 2 times a week 3 ☐ 3 or 4 times a week 4 ☐ Every day	Questionnaire (2003) Grade 8	U.S.)		
	15b	*B) When your teacher gives you mathematics homework, about how many minutes are you usually given?* 0 ☐ Fewer than 15 minutes 1 ☐ 15-30 minutes 2 ☐ 31-60 minutes 3 ☐ 61-90 minutes 4 ☐ More than 90 minutes				
16a & 16b	16a & 16b	**Please answer the following questions about your math class this year.** **Materials in my math class:** **a.** The textbook **b.** The handouts	New; adapted from course evaluation forms	Will be pilot tested	Course evaluation	Yes

VIRTUAL ALGEBRA STUDENT SURVEY

Item # (Original)	Item # (New)	Item	Source	Known Psychometric Properties	Construct	Potentially affected by Treatment
		c. My teacher's assignments d. The quizzes e. The tests/exams f. Technology – use of computers g. Technology – use of calculators and other tools **The instruction in my math class:**				

VIRTUAL ALGEBRA STUDENT SURVEY

Item # (Original)	Item # (New)	Item	Source	Known Psychometric Properties	Construct	Potentially affected by Treatment
17	17	*Approximately how many courses (including your current courses) have you taken that were delivered in the following modes?* **a.** Totally online course **b.** Hybrid course (a mix of online and regular-face-to-face instruction in the same course) **c.** Supplemental course (extra instruction for a particular course that requires use of a computer program)	University of Minnesota Multi-College Student Survey: Experiences with Instructional Technology	Field tested with a random sample of 1,100 students from four colleges associated with the University of Minnesota (Jorn et al., 2001) (reliability statistics for this item were requested but are likely unavailable b/c reliability of item would depend on verification from other respondents or administrative data)	Previous experience with online courses	No (controlling for VA course participation in T schools)
18	18	*What type of Internet connection do you have at home?* 0 ☐ Low speed (dial up) 1 ☐ High speed (cable, DSL, T1) 2 ☐ No Internet connection at home	University of Minnesota Multi-College Student Survey: Experiences with Instructional Technology	Field tested with a random sample of 1,100 students from four colleges associated with the University of Minnesota (Jorn et al., 2001) (reliability statistics for this item were requested but are likely unavailable	Background / Context	No

VIRTUAL ALGEBRA STUDENT SURVEY

Item # (Original)	Item # (New)	Item	Source	Known Psychometric Properties	Construct	Potentially affected by Treatment
				b/c reliability of item would depend on verification from other respondents or administrative data)		
19	19	**How much do you agree with the following statements?** **a.** I enjoy doing things on a computer. **b.** I am tired of using a computer **c.** I concentrate on a computer when I use one. **d.** I feel comfortable working with a computer. **e.** I think that it takes a long time to finish when I use a computer **f.** I feel comfortable using E-mail to contact my teachers.	Computer Attitudes Questionnaire	Psychometrics examined with 1300 students in 7th and 8th grade in rural TX (Knezek & Christensen, 1995) Internal Consistency for Computer Enjoyment; Cronbach's alpha = 0.82	Computer Enjoyment (possible mediator)	Yes
20		**→ Item set dropped (b and c to be included with item set 19). Replaced with items from ELS 2002 survey on extent of use of computers in mathematics**	Computer Attitudes Questionnaire and Project Links	N/A (dropped)		

VIRTUAL ALGEBRA STUDENT SURVEY

Item # (Original)	Item # (New)	Item	Source	Known Psychometric Properties	Construct	Potentially affected by Treatment
	20	**How much do you agree with the following statements?** a. Using computer software is a fun way to explore math. b. I enjoy lessons on the computer. c. I get a sinking feeling when I think of trying to use a computer. d. I like learning on a computer. **→ Replaced with items from ELS 2002 survey on extent of use of computers in mathematics** **In your current or most recent mathematics class, how often do/did you use computers in the following ways?** a. Review work from the previous day. b. Do word problems or problem solving activities. c. For graphing. d. To practice math drills. e. To analyze data	Educational Longitudinal Study (2002) (NCES)	Used with nationally representative samples of 10th grade students (OMB reviewed federal survey)	Extent of use of computers in math	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		f. To apply what was learned in class to new situations or problems **g.** The teacher uses/used the computer to instruct us individually. **h.** The teacher uses/used the computer to demonstrate new topics in mathematics				
21	21	**How much do you agree with the following statements?** **a.** A computer is an important tool for learning mathematics concepts. **b.** Computer examples and simulations have helped me understand the concepts in my classes. **c.** Using a computer makes learning math more complicated than it needs to be.	Project Links Student Survey (PLSS; University of Maryland)	Field tested, item statistics not available (can be dropped if requested)	Value of Technology in Math (possible mediator)	Yes
22		**→ Dropped. In the study, the online course will not use email and therefore the data yielded by these items will be inaccurate.** **How much do you agree with the following statements?**	Student Computer Attitudes Questionnaire (SCAQ)	N/A (dropped)	Comfort with Technology (possible mediator)	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		a. E-mail makes it easier to ask my teachers questions when I need help. **b.** I don't like e-mailing my teachers. **c.** More courses should use E-mail to disseminate class information and assignments. **d.** The use of E-mail creates more interaction between students enrolled in the course. **e.** E-mail provides better access to the instructor. **f.** I prefer E-mail to traditional class handouts as an information disseminator.				
23		→ **Dropped in favor of math attitudes items from one source:** **How much do you agree with the following statements?** **a.** Studying mathematics makes me feel nervous. **b.** I am always under a terrible strain in a math class. **c.** I am able to solve mathematics problems without too much difficulty. **d.** Anyone who works hard can do reasonably well at math.	Attitudes Toward Math Inventory (ATMI), Project Links Survey (PLSS), NAEP (2000, 2003)	N/A (dropped)	Math Self-Confidence (possible mediator)	Yes

VIRTUAL ALGEBRA STUDENT SURVEY

Item # (Original)	Item # (New)	Item	Source	Known Psychometric Properties	Construct	Potentially affected by Treatment

e.	If I get bogged down in a math problem I am confident that I can usually find my way out.
f.	I am pretty good at math.
g.	I have to work hard to keep up in my math class.
h.	I've usually done well in mathematics.
i.	I often feel like I'm missing something important in math class.
j.	There are some concepts that I've encountered in math that I don't think I'll ever understand.

→ Replaced with:

How much do you agree with the following statements?

a.	I usually do well in mathematics.
b.	I would like to take more mathematics in school.
c.	Mathematics is more difficult for me than for many of my classmates.
d.	I enjoy learning mathematics.
e.	Sometimes, when I do not initially understand a new topic

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		in mathematics, I know that I will never really understand it. **f.** Mathematics is not one of my strengths. **g.** I learn things quickly in mathematics.				
24		**→ Dropped in favor of math attitudes items from one source:** **How much do you agree with the following statements?** **a.** Mathematics is important in everyday life. **b.** Mathematics is one of the most important subjects for people to study. **c.** High school math courses would be very helpful no matter what I decide to study. **d.** I have found mathematics to only be useful in math classes. **e.** Beyond passing a required course, I don't see the reason for learning the mathematics I am studying. **f.** Learning and understanding math concepts is important.	Attitudes Toward Math Inventory, Project Links Survey, NAEP	N/A (dropped)	Value of Math (possible mediator)	Yes
	23	**→ Replaced with:**				

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		How much do you agree with the following statements? **a.** I think learning mathematics will help me in my daily life. **b.** I need mathematics to learn other school subjects. **c.** I need to do well in mathematics to get to the college or university of my choice. **d.** I would like a job that involved using mathematics. **e.** I need to do well in mathematics to get the job I want.	TIMSS Contextual Background Questionnaire (2003) Grade 8	Used with International Samples of 8th grade students With U.S. samples, factor validity is attained and Cronbach's alphas for SCLM, LM, and UM, respectively, are: 0.83, 0.71, 0.79	Math Attitudes – SCLM, LM, UM (possible mediators)	Yes
25		**→ Dropped in favor of math attitudes items from one source (see new #22, #23)** **How much do you agree with the following statements?** a. I have usually enjoyed studying mathematics in school. b. Mathematics is dull and boring. c. I enjoy tackling challenging math problems. d. Mathematics is something I need to be able to use in				

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		other courses, but it's not particularly interesting on its own. **e.** I like math. **f.** I might like math more if I had a different teacher.				
26	24	**How much do you agree with the following statements?** **a.** I would like to avoid using mathematics in college. **b.** I am willing to take more than the required amount of mathematics. **c.** I plan to take as much mathematics as I can during my education. **d.** The challenge of mathematics appeals to me. **e.** I don't want to take any more mathematics courses than I absolutely have to.	Attitudes Toward Mathematics Inventory	Psychometrics derived from use of survey with a sample of 545 high school students mathematics high school classes (Tapia & Marsh, 2004) Cronbach's alpha = 0.88, Test-retest reliability = 0.78	Math Motivation	Yes
27		→ **Dropped in favor of math attitudes items from one source (see new #22, #23)** **How much do you agree with the following statements?**	Project Links Student Survey	N/A (dropped)	Attitudes toward Math	Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		a. Spending a lot of time (half an hour or more) working on a problem is a waste of time. If I don't make progress quickly, I'd be better off asking someone who knows more (a classmate, my teacher.) what to do. **b.** When learning math, it's often valuable to work in groups. **c.** When studying math, I prefer to work alone. **d.** Mathematics is intrinsically more difficult than other subjects.				
28	25	*How difficult was this math test?* 0 Very difficult 1 Somewhat difficult 2 Normal 3 Fairly easy 4 Very easy	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal survey)		Yes
29	26	*How important was your success on this math test to you?* 0 Not very important 1 Somewhat important	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal		Yes

VIRTUAL ALGEBRA STUDENT SURVEY						
Item # (Original)	**Item # (New)**	**Item**	**Source**	**Known Psychometric Properties**	**Construct**	**Potentially affected by Treatment**
		2 ☐ Important 3 ☐ Very important		survey)		
30	27	*Please describe your level of effort on this math test.* 0 ☐ Could have tried much harder 1 ☐ Could have tried harder 2 ☐ Tried about has hard as I could 3 ☐ Tried very hard	NAEP Background Survey (2000)	Used with nationally representative samples of 8th grade students (OMB reviewed federal survey)		Yes

References in this table:

Jorn, L., Martyr-Wagner, M., et al. (2001). *Multi-college student survey: Experiences with instructional technology*. Twin Cities, MN: University of Minnesota

Kadijevich, D. (2006). Developing trustworthy TIMSS background measures: A case study on mathematics attitudes. In *The Teaching of Mathematics, Vol. IX*, pp. 41–51. http://elib.mi.sanu.ac.yu/files/journals/tm/17/tm924.pdf

Knezek, G., & Chirstensen, R. (1995). *A Comparison of Two Computer Curricular Programs at a Texas Jr. High School Using the Computer Attitude Questionnaire (CAQ) Technical Report 95*. Texas Center for Educational Technology Telecommunications and Informatics Laboratory

Tapia, M. & Marsh, G. E., II (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly, 8*(2), 16-21.

NOTES and SOURCES:

Item 16 (a and b) is the only new item set in the student survey. As suggested by OMB, we will pilot test the survey on a sample of 9 eighth graders in Maine. In so doing, we will conduct Respondent debriefing and data review. We will report to OMB the results of the pretesting and any changes to the survey instrument that were made based on the findings.

Respondent Debriefing
Respondent debriefing typically consists of follow-up questions at the end of an interview that are designed to obtain quantitative information about respondents' interpretations of survey questions. These questions help researchers determine whether concepts and questions were understood by respondents in the same way that the survey designers intended. In an interviewer-administered survey, the debriefing questions may be followed by a discussion between respondent and interviewer, to further probe the respondent's reaction to and comprehension of the questions in the survey instrument.

Data Review
A data review of the pilot test results is conducted to identify questions that have higher than expected or desired levels of non-response (either don't knows or refusals). High item nonresponse in a pilot test could indicate poor question wording, generally unavailable data, or non-applicability of the question to a significant subset of respondents. Because data review involves examination of quantitative results from the pilot test, larger numbers of respondents may be needed with more complex instruments to ensure that an adequate number of respondents are asked each question.

SOURCES:

ATMI: The Attitudes Toward Mathematics Inventory (http://www.rapidintellect.com/AEQweb/cho25344l.htm) was designed to investigate the underlying dimensions of attitudes toward mathematics. The 49-items of the ATMI were constructed in the domain of attitudes toward mathematics to address factors reported to be important in research. Items were constructed to assess confidence, anxiety, value, enjoyment, motivation, and parent/teacher expectations. Consideration was given to previous research as follows:

1. *Motivation* (Singh, Granville, & Dika, 2002; Thorndike-Christ, 1991). The motivation category was designed to measure interest in mathematics and desire to pursue studies in mathematics.

Exploratory factor analysis of the ATMI (Tapia & Marsh, 2004) resulted in four factors identified as Self-confidence. Value of mathematics, Enjoyment of mathematics, and Motivation. The Self-confidence factor consists of 15 items. The Value factor and the Enjoyment factor each consist of 10 items. The Motivation factor consists of five items. Table 1 shows sample items from each one of the factors. The complete inventory is available from the first author upon request. Alpha coefficients for the scores on these scales were found to be .95, .89, .89, and .88 respectively (Tapia & Marsh, 2004). From
http://www.thefreelibrary.com/Attitudes+toward+mathematics+of+precalculus+and+calculus+students-a0163980003

Tapia, M. & Marsh, G. E., II (2004). An instrument to measure mathematics attitudes. *Academic Exchange Quarterly, 8*(2), 16-21.

PLSS: Project Links Student Survey (1997), University of Maryland Physics Department. This survey has been developed by the Project Links evaluation team to measure how interaction with the computer modules developed by the project affects the attitudes, beliefs, and expectations of students towards mathematics. The current draft version of the survey includes

- 54 general statements about mathematics and their views of mathematics. Students are asked to agree or disagree with these items on a five point scale
- 6 items specifically rating the module in the class on a 10 point scale.

(Some of these items were not appropriate for 8th grade students.)

TIMSS (2003) Grade 8 Student Survey (see http://timss.bc.edu/timss2003i/PDF/T03 Student 8.pdf).

Kadijevich, D. (2006). Developing trustworthy TIMSS background measures: A case study on mathematics attitudes. In *The Teaching of Mathematics, Vol. IX*, pp. 41–51. http://elib.mi.sanu.ac.yu/files/journals/tm/17/tm924.pdf

Statements 8a–8d, 8f, 8g, 9a–9e of the TIMSS 2003 Grade 8 Student Questionnaire used as Indicators. Item 8e was not used because of its inappropriate loading on the first underlying factor concerning all twelve statements. Self-Confidence in Learning Mathematics (SCLM) was measured by a 4-item Likert scale administered by means of statements “I usually do well in mathematics”, “Mathematics is more difficult for me than for many of my classmates”, “Mathematics is not one of my strengths”, and “I learn things quickly in mathematics” (see statements 8a, 8c, 8f and 8g of the Questionnaire; to achieve positive meaning, scoring 1–4 was reversed for items 8a and 8g). Usefulness of Mathematics (UM) was measured by a 4-item Likert scale administered by means of statements “I think learning mathematics will help me in my daily life”, “I need mathematics to learn other school subjects”, “I need to do well in mathematics to get into the faculty/university of my choice”, “I need to do well

in mathematics to get the job I want" (see statements 9a, 9b, 9c and 9e of the Questionnaire; to achieve positive meaning, scoring 1–4 was reversed for all these items). Liking Mathematics (LM) was measured by a 3-item Likert scale administered by means of statements "I would like to take more mathematics in school", "I enjoy learning mathematics", and "I would like a job that involved using mathematics" (see statements 8a, 8d and 9d of the Questionnaire; to achieve positive meaning, scoring 1–4 was reversed for all these items).

CAQ: Student Computer Attitude questionnaire - http://www.tcet.unt.edu/research/

Computer Attitude Questionnaire CAQ is a Likert instrument for measuring middle school students' attitudes on all Young Children's Computer Inventory subscales plus computer anxiety.	CAQ	v5.14 (pdf) v5.22 (pdf)

Used by **Attitudes Toward Information Technology**, **Project for the Longitudinal Assessment of New Information Technology Attitudes in Education**, Dr. Gerald Knezek and Dr. Rhonda Christensen, Developed by the Texas Center for Educational Technology

Knezek, G., & Chirstensen, R. (1995). *A Comparison of Two Computer Curricular Programs at a Texas Jr. High School Using the Computer Attitude Questionnaire (CAQ) Technical Report 95*. Texas Center for Educational Technology Telecommunications and Informatics Laboratory

ELS 2002: Education Longitudinal Study of 2002 – Extent of use of computers in mathematics: http://nces.ed.gov/surveys/els2002/pdf/StudentQ_baseyear.pdf

NAEP (2000) & (2003) Grade 8 Student Survey

CCSR Surveys: Consortium on Chicago School Research: http://ccsr.uchicago.edu/content/page.php?cat=4&content_id=25

MCSS: University of Minnesota Multi-College Student Survey: Experiences with Instructional Technology http://dmc.umn.edu/surveys/student-eval/student-eval.pdf

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