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Appendix A: Participant Information Sheet

TIM Participant Information Sheet
Created by Dr. Chandra Hawley Orrill

Name: _____

E-mail address: _____

Where do you teach? _____ Grade level: _____

Have you used technology to teach math to your students in the past? (If so, what kinds of things have you done?)

What do you hope to learn this year as a TIM participant?

Why did you choose to participate in TIM?

Appendix B: TIM-Teacher Lens

Practice	The teacher...
Use of Algorithms	0- does not provide an algorithm or provide activities where students generalize or develop an algorithm 1- provides an algorithm for students to use without discussing why the algorithm works 2- provides an algorithm for students to use with the opportunity to see why it works 3- provides mathematical tasks in which students explore the tasks and students identify an algorithm
Mathematical Tasks	0- does not provide opportunities for students to work on mathematical tasks 1- provides opportunities for students to work on tasks that do not use resources (e.g. manipulatives or technology) and involve completing a procedure given by the teacher 2- provides opportunities for students to work on tasks in which students use appropriate resources and follow a procedure given by the teacher 3- provides opportunities for students to work on tasks in which students use appropriate materials, choose their own approach and provide a solution
Students' mathematical communication	0- does not provide opportunities for students to communicate their mathematical thinking 1- provides opportunities for students to provide an answer to the teacher or classmates 2- provides opportunities for students to share answers and their mathematical thinking with the teacher 3- provides opportunities for students to communicate their mathematical thinking with one another and facilitates student-to-student communication
Representations of Mathematical Concepts	0- does not provide representations of mathematical concepts 1- provides teacher-generated representations of mathematical concepts which the student uses to solve an investigation 2- provides opportunities for students to generate their own representation of mathematical concepts 3- provides opportunities for students to generate multiple representations of mathematical concepts

<p>Integration of Technology</p>	<p>0- does not use technology in their mathematics classroom 1- uses technology to tell information to their students (PowerPoint, projector) 2- provides opportunities for students to use technology as an activity in mathematics that is used to enhance students' computational skills 3- provides opportunities for students to engage in an activity where the teacher uses technology and the activity involves solving problems and tasks with the assistance of the technology (e.g.: teacher modeling how to use a spreadsheet to graph data, using virtual manipulatives) 4- provides opportunities for students to use technology to develop their mathematical knowledge and/or problem solving skills</p>
<p>Asking Questions that Elicit Student Thinking</p>	<p>0- does not ask questions 1- asks questions that elicit only a mathematical answer or definition 2- asks questions and follow-up questions that probe more deeply at students' mathematical ideas and thinking 3- facilitates by asking questions and encouraging students to ask questions about other students' mathematical thinking</p>

Appendix C: Baseline Interview Protocol

Purpose of question	Interview Question	Possible Follow-Up Questions
Background about teaching	Please tell me about your teaching background.	How long have you taught? What grade levels have you taught?
Background about mathematics teaching	Please tell me about your mathematics classroom.	What is your role in this classroom? What are the students doing?
Espoused views about technology's role in mathematics	Please talk about the use of technology in your mathematics classroom.	How do you use technology? How do students use technology? How does it help?
Espoused views about mathematics teaching	Please talk about how you think students' best learn mathematics.	What is your typical role as a mathematics teacher? What are the students typically doing? What resources or materials are needed? How do you know that learning is taking place?
Espoused and intended practices	Please tell me how you think this project has influenced your teaching.	What practices have you already used in your classroom? What practices do you plan on using?

Appendix D: Post-observation Interview Protocol

Purpose of question	Interview Question	Possible Follow-Up Questions
Intended practices	Please tell me about what you were planning on doing during today's lesson.	What were the goals of the lesson? What were your expectations prior to starting? What strategies did you plan on using to help the students learn?
Challenges of the observed lesson	Please talk about challenges that you observed.	What caused the challenges? How did you attempt to overcome them? What would you do differently next time?
Success of the observed lesson	Please talk about the successes that occurred during the lessons.	What factors led to these successes?
Espoused practices	Please talk about how the practices emphasized in this project influenced your teaching during these two lessons.	How effective were those practices? How did your students react to those practices?
Espoused practices	How did this lesson compare to how you taught this content last year?	What new practices have you used? What changes will you make for future lessons?

Appendix E: End-of-Study Interview Protocol

Purpose of question	Interview Question	Possible Follow-Up Questions
Overview of TIM Project	Please talk about your experience in this project.	<p>How has this project influenced your knowledge of mathematics? What activities have had the largest impact on your math knowledge? How has this project influenced your technology skills? What activities have had the largest impact on your technology skills?</p>
Espoused Practices about mathematics teaching	Please talk about how this project has influenced your mathematics teaching.	<p>What is different in your math classroom now compared to a year ago? Activities? Your role in the classroom Checking for student understanding Questioning students</p>
Espoused practices about technology	Please talk about how your use of technology in your math teaching compares to a year ago?	<p>Do you use it differently? Do students use it differently?</p>
Intended Practices	How satisfied are you with your mathematics teaching this year?	<p>What is your role? What are the students doing? What would you like to do differently?</p>
Ideal Mathematics Classroom	How do you think students best learn mathematics?	<p>What role does the teacher have? What are the students doing? What resources or materials are needed? How do you know that learning is taking place? Does assessment have a role in your ideal classroom? What is it? How does it look?</p>

Appendix F: Project Staff Interview Protocol

Purpose of question	Interview Question	Possible Follow-Up Questions
Teachers' learning during TIM	Please talk about the goals of this project.	<p>What do you think the teachers thing the goals are?</p> <p>What leads you to think that they have learned these things?</p> <p>What barriers have hindered their learning?</p>
Overview of TIM workshops	Please tell me about the workshops.	<p>What activities took place?</p> <p>How did these activities support teachers' learning of technology? Math content?</p> <p>What was your role during the workshops?</p> <p>What were the teachers' reactions?</p>
Intended and Enacted Practices	Please talk about specific practices that you intend teachers to use in their mathematics classroom.	<p>How well will teachers be able to enact these practices?</p> <p>What support do teachers need in order to effectively implement these practices in their classroom?</p>
Participants' View of Mathematics	Are the teachers where you expected them to be in terms of their mathematics content knowledge?	<p>What do you think is their idea of good mathematics teaching?</p> <p>How does their idea of good teaching compare to yours?</p>
Participants' Technological Skills	Are the teachers where you expected them to be in terms of their technology skills?	<p>What were some of the technologies that they saw during workshops?</p> <p>How do you think they see technology being used in the classroom?</p> <p>What evidence do you have this?</p> <p>How did they develop throughout the project?</p>

Appendix G: Spreadsheet used to organize and analyze the video data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	File Name	Class	Plan	Start Time	End Time	Alg	Tasks	Comm	Reps	Tech	Ques	Comments			
2	dpolly_24	5th-EIP	3	3:36	4:00		2.3	3.3	4.3	5.3	6.3	base-10 blocks to help addition and subtractio			
3	dpolly_24	5th-EIP	3	4:00	4:14		2.3	3.2	4.3	5.3	6.2	T, "is this the tenths place? What place value			
4	dpolly_24	5th-EIP	3	4:15	5:09			3.2			6.2	T, "what are you doing w/ your units?"T, "and			
5	dpolly_24	5th-EIP	3	5:11	5:29			3.3			6.3	T, "I see a blue number up here. What does t			
6	dpolly_24	5th-EIP	3	5:27	7:39			3.2			6.2	T, "how many of these [points to rods] do you			
7	dpolly_24	5th-EIP	3	7:55	9:06		2.3	3.2	4.3	5.3	6.2	T, "you're trying to subtract 8 from 3 is that pc			
8	dpolly_24	5th-EIP	3	9:13	9:30		2.3	3.2	4.3	5.3	6.2	T asks S to read number 0.428 and 0.885. T			
9	dpolly_24	5th-EIP	3	9:34	10:07			3.2			6.2	T, "you started doing your subtract when you			
10	dpolly_24	5th-EIP	3	10:06	10:48		2.3	3.3	4.3	5.3	6.3	T, "why did you have to borrow?"S, "cuz 9 can			
11	dpolly_24	5th-EIP	3	10:46	11:02			3.2			6.2	T, "what place value are you working in right r			
12	dpolly_24	5th-EIP	3	11:15	12:11			3.2			6.2	T, "I see you were going to go borrow from th			

Appendix H: Spreadsheet used to analyze participants' enacted practices.

5th EIP 30-Sep division		dpolly_1						5th EIP 30-Sep division		dpolly_1				
		0.1	0.2	0.3	0.4	0.5				0.1	0.2	0.3	0.4	
	Algorithms	0	8	0	0	na	8		Algorithms	0.00%	100.00%	0.00%	0.00%	
	Tasks	4	5	1	0	na	10		Tasks	40.00%	50.00%	10.00%	0.00%	
	Comm	7	26	2	0	na	35		Comm	20.00%	74.29%	5.71%	0.00%	
	Reps	0	1	2	0	na	3		Reps	0.00%	33.33%	66.67%	0.00%	
	Tech	0	1	0	1	0	2		Tech	0.00%	50.00%	0.00%	50.00%	
	Questions	9	23	2	0	na	34		Questions	26.47%	67.65%	5.88%	0.00%	

Appendix I: Spreadsheet used to analyze interview data

Teacher	Code	Subcode	Sub (2)	Excerpt	Line number	File
Shantel	espoused practices	communicaton	EIP	<p>R: So do you think they're becoming more open sharing their response when I'm here and when I'm not here or just when the camera is in the room.</p> <p>I: They are like that whether the camera is on or not where before they were what I would call inactive learners they were waiting for me to give it to them now they're coming out and getting it they are active in their learning and they are learning I mean they are understanding it a lot better because they are active and doing participating they're raising their hands more before I would have to call on students who didn't have their hands up and were they weren't going to raise their hands but they were talking you know even when they weren't called on so they're participating</p>	104-113	jr-int-1
Shantel	espoused practices	communicaton	EIP	<p>increase throughout the year?</p> <p>I: And they are more comfortable with math also more comfortable with what their findings were even they knew that there's were different they would you know raise their hands and say "well I didn't get that I got" and I like that you know and I always tell them "be able to back it up if you can tell me you have an answer show me how you got it and prove to me that your answer is correct" and they were comfortable with doing that</p>	114-120	jr-int-1

Appendix J: Codes used to analyze interview data

<u>Code</u>	<u>Description</u>
Beliefs about learning	Participant shares their beliefs about how students learn.
Beliefs about learning mathematics	Participant shares their beliefs about how students learn mathematics
Beliefs about students	Participant shares beliefs about students in their mathematics classroom(s).
Beliefs about teaching	Participant shares beliefs about teaching mathematics.
Beliefs about technology	Participant shares beliefs about using technology in their mathematics classroom.
Collaboration	Participant shares experiences collaborating with a teacher or a professional developer.
Teacher-to-student communication	Participant discusses instances of communication between themselves and a student.
Co-planning	Participant discusses co-planning a lesson with a professional developer.
Education	Participant shares information about their education.
EIP to AGL classes	Shantel discusses similarities and differences between her EIP classes and her at grade level (AGL) classes
Espoused practices	Participant discusses instructional practices that they incorporated into their lesson.
Evidence about student learning	Participant discusses how she determined whether or not students learned during the lesson.
Intended goals	Participant shares the intended goals for the lesson.
Intended practice	Participant shares the instructional practices that she intended to use during the lesson.
Math knowledge	Participant discusses her knowledge of mathematics concepts that she taught.
Model teaching	Participant discusses watching a professional developer teach a lesson to her students.
Observations	Participant discusses observations of students that they made while teaching.
Professional development	Participant discusses the professional development experience in general.
Professional development activities	Participant discusses the activities that they completed during the professional development.
PD on teaching	Participant discusses how they think the professional development has influenced their teaching.
Perception of barriers	Participant discusses perceived barriers that prevent them from teaching in the manner that is suggested during the professional development.
Resources for lesson planning	Participant discusses resources they used to plan the lesson.

Reasons for participating	Participant discusses why they decided to participate in the professional development.
Mathematical representations	Participant discusses mathematical representations used during the lesson.
Resources	Participant discusses manipulatives and technology used during the lesson.
Student struggles	Participant discusses struggles that their students had during the lesson.
Tasks	Participant discusses tasks enacted during the lesson.
Teacher's role	Participant discusses teacher's role during the implementation.
TIM vs. typical	Participant discusses lessons that are aligned with the professional development compared with lessons that they have taught that were not aligned with the professional development.
VAT	Participant discusses the Video Analysis Tool (VAT).

Appendix K: Spreadsheet used for the analysis of Question Two

<u>Tasks</u>	<u>Class</u>	<u>Plan</u>	<u>Summary of Intended</u>	<u>Summary of Enacted</u>	<u>Espoused Data</u>
29-Sep	AGL	1	division tasks in the context of real-world scenarios, level-2; goal is recognize "equal sharing"	dilluted tasks, decontextualized after students started struggling, difficulties working w/ base-10 blocks, level-2	<p>I: What were some signs that some of them just weren't getting it?</p> <p>J: O.K. Well as far as looking at the base-10 blocks one of the things the problem all they had to do was take 19 of something and divide it by 3 they were still multiplying they you know I: So they had 3 rows of 19 each, like 3 times 19?</p> <p>J: Yes. And I wanted to I would want to ask them why did we do that and why didn't that work and the kids</p>
30-Sep	EIP	1	division tasks in the context of real-world scenarios, level-2; more modeling of tasks as a result of 9/29 enactment; goal is recognize "equal sharing"	dilluted tasks, decontextualized, difficulties w/ fundamental division, level 2 despite intent	<p>Were there common mistakes?</p> <p>J: Yes for some because they are not what is it for their facts their multiplication facts they're not that good at them because they don't practice enough they you know the numbers were wrong like they would have 7 times 5 but they would say that 7 times 5 is 30 or things like that it would just be multiplication errors.</p> <p>I: So they would get wrong the minor computations within the larger problem?</p> <p>I: You mentioned earlier that w/ your class you had to make that</p>

Appendix L: Spreadsheet for the Analysis of Question Three

Class	Date	Planning	Task level	math work	Mathematical representations	technology	Task Description
4th	19-Jan	DA	3	none	SG		S select their own tangram puzzle and us
4th	16-Feb	IN-NC	3	answers, computation	SG	t	S use calculators and choose their approac
4th	16-Mar	CO-C	3	answers, computation	SG		S use tiles and choose their approach to c
4th	14-Oct	IN-C	1	answers	N		round-the-world
4th	14-Oct	IN-C	2	arrays	SG		S make multiplication arrays on typing pap
4th	21-Oct	IN-C	1	answers	TG		partial product
4th	18-Nov	CO-C	1	answers	N	t	Brainchild problems
4th	18-Nov	CO-C	1	answers	N		dice game
4th	18-Nov	CO-C	1	no	N		board game
4th	18-Nov	CO-C	1	no	N		flash cards
4th	18-Nov	CO-C	2		CG	t	factor game
4th	19-Dec	IN-C	2		SG	t	S use website to make bargraphs, scripted

Appendix M: Description of Participants' Enactments (page 1 of 3)

	Date	Lesson Topic	Class	Description of enacted task types
Direct Adoption	9/29	Division with base-10 blocks	Shantel-AGL	Shantel assigns division tasks. Students use base-10 blocks to represent the division problem and solve the task. Students also solve the task using the traditional division algorithm.
	9/30		Shantel-EIP	Shantel assigns division tasks. Students use base-10 blocks to represent the division problem and solve the task. Students also solve the tasks using the traditional division algorithm. At the end of the lesson, students are introduced to an alternative algorithm and solve three tasks using an alternative algorithm.
	1/19	Tangram Puzzles	Keisha	Students are given a worksheet with tangram puzzles on it and two sets of tangrams. Students select a tangram puzzle and attempt to use the pieces to make the puzzle.
Co-planned lessons related to professional development content	11/18	Various multiplication tasks	Keisha	Students play the Factor Game (http://illuminations.nctm.org/ActivityDetail.aspx?ID=12) with an assigned partner.
				Students play a board game in groups of 3-4 students. Students answer questions about their multiplication basic facts and move their game piece when they answer correctly.
				Students work with a partner to review flash cards about basic multiplication facts.
				Students use the BrainChild personal learning system to independently complete multiplication computations and one-step word problems. Students are given four multiple choice options for each problem and receive immediate feedback on whether they are correct.
				In a group of four, students roll two dice and generate a two-digit by a one-digit multiplication problem. Students independently use the traditional algorithm to complete the tasks. One student in each group does not work on the tasks; instead, they use the calculator to get the answer and provide feedback to the other students.
	3/16	Area and perimeter of rectangle	Keisha	In groups of four, students are given plastic square tiles and four rectangular objects around the classroom. Students are told to measure the area and perimeter of all four objects.

Appendix M: Description of Participants' Enactments (page 2 of 3)

	Date	Lesson Topic	Class	Description of enacted tasks
Co-planned lessons not related to professional development content	3/17	Equivalent decimals, adding and subtracting decimals	Shantel-EIP	Shantel reads decimals orally to students who represent the decimal with base-10 blocks on a place value mat and write the decimal in numeric form. Towards the end of the lesson, students only write the numeric form of the decimal.
			Shantel-AGL	Shantel reads decimals orally to students who write the numeric form on a miniature whiteboard.
				In the school's computer lab half of the students work on skills-based decimal tasks (http://www.aaaknow.com/dec.htm)
				In the school's computer lab half of the students work on web-based addition and subtraction tasks (http://nlvm.usu.edu/en/nav/category_g_2_t_1.html) that are represented in both written form and with virtual base-10 blocks.
	3/22	Adding and subtracting decimals	Shantel-EIP	In the school's computer lab students work on web-based addition and subtraction tasks that are represented in both written form and with virtual base-10 blocks.
Independently planned lessons related to the professional development content	10/4	Array models of multiplication	Keisha	Students draw array models of multiplication on construction paper and cut them out.
	10/12	Partial product algorithm for multiplication	Keisha	Students are introduced to the partial product multiplication algorithm. Students then use the algorithm to complete tasks.
	12/14	Identifying triangles by side length	Shantel-EIP	Students create a triangle on a geoboard that resembles one that Shantel has shown on the overhead projector. Students use rulers and are told to classify the triangle based on the side lengths.
	1/19	Estimating linear units	Shantel-EIP	Students are given measuring tools that are 1 centimeter, 1 decimeter and 1 meter long. Students examine objects in the classroom and have to locate 15 objects; five each that could appropriately be measured in centimeters, decimeters and meters.
			Shantel-AGL	Students are given measuring tools that are 1 centimeter, 1 decimeter and 1 meter long. Students examine objects in the classroom and have to locate 15 objects; five each that could appropriately be measured in centimeters, decimeters and meters.
3/16	Multiplication and division puzzles	Keisha	Students are given a worksheet with multiplication and division puzzles and a calculator. Students work with assigned partners to complete the puzzles.	

Appendix M: Description of Participants' Enactments (page 3 of 3)

	Date	Lesson Topic	Class	Description of enacted tasks
Independently planned lessons not related to professional development content	10/28	Identifying the LCM	Shantel-AGL	Shantel reads numbers to students who identify both the common multiples and the least common multiple for the numbers.
			Shantel-EIP	Shantel types numbers into a computer that is shown using an LCD projector. The students read the common multiples and the least common multiple off of the computer screen.
	11/9	Identifying prime and composite numbers	Shantel-EIP	Students make arrays using a specific number of tiles. Students examine the number of arrays that was made to determine if a number is prime or composite.
			Shantel-AGL	Students make arrays using a specific number of tiles. Students examine the number of arrays that was made to determine if a number is prime or composite.
	11/18	Various decimals tasks	Shantel-EIP	Shantel types in two decimals into a computer that is shown using an LCD projector. Students add up the two decimals on paper.
				Students read a decimal off of a worksheet and represent it using base-10 blocks.
				Students use the Brainchild to complete tasks related to adding, subtracting and multiplying decimals.
				Students use the Playstation to complete tasks related to decimals, percents and fractions.
			Shantel-AGL	Shantel types in two decimals into a computer that is shown using an LCD projector. Students add up the two decimals on paper.
				Students read a decimal off of a worksheet and represent it using base-10 blocks.
				Students use the Brainchild to complete tasks related to adding, subtracting and multiplying decimals.
				Students use the Playstation to complete tasks related to decimals, percents and fractions.
	12/19	Bar Graphs	Keisha	In the school's computer lab, students work with an assigned partner to use a web-based tool to create bar graphs for survey data that they had collected a week earlier.
2/16				Arithmetic Mean