



**Ready to Teach: Teaching Fractions Project
Final Evaluation Report**

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PROJECT OVERVIEW

In 2003, Twin Cities Public Television (TPT) set out to build on the success of the Rational Number Project (RNP) by developing an on-line version of their already proven face-to-face workshop. The Rational Number Project had resulted in a research-based fractions curriculum emphasizing the use of “manipulatives” that allowed students to develop numbers sense about fractions and gain fractions facility through hands-on exercises. To complement the curriculum, RNP project members at the University of Minnesota had developed a workshop to train teachers to use the curriculum effectively. TPT’s Ready to Teach: Teaching Fractions project was designed to make this achievement-enhancing training and curriculum accessible to a greater number of teachers and students, while at the same time, testing the efficacy of high quality online professional development as compared to face-to-face.

Building on our expertise in television production and our growing interest in interactive media, we worked with Dr. Kathleen Cramer, currently an Associate Professor at the University of Minnesota and co-author of the RNP curriculum, to create an online version of the face-to-face teacher workshop using rich media. TPT produced video clips of Dr. Cramer and teachers who received preliminary training on the RNP curriculum in real-life elementary classrooms, demonstrating the use of the curriculum with students. These clips became part of both the face-to-face and on-line workshops. The video clips were a crucial component of the workshops, helping teachers see the curriculum and related teaching practices in a real-life setting, and giving teachers a chance to observe how these practices impact student learning and fractions knowledge.

Development of the on-line course began in 2003. In the fall of 2003, we piloted our initial version of the on-line training. Learning Point/NCREL’s formative evaluation of this early version of the on-line course found several areas for improvement, not unexpected during the development of any new product. TPT took the feedback from the evaluator, and directly from participants, and addressed the issues that were problematic. The primary issues were those related to technology, on the part of TPT, the University of Minnesota, or the teachers themselves. TPT worked to address the technology problems that were under our control or influence, and worked with teachers to help them resolve issues on their end.

In the summer and fall of 2004 of TPT implemented a revised, on-line version of the RNP workshop. In order to evaluate the effectiveness of the on-line course, we originally planned on an experimental design with random assignment to the online version of the workshop, the face-to-face version, or a control group. However, we were unable to recruit sufficient numbers of interested participant candidates with the time flexibility to attend *either* workshop¹ – so we were unable to apply random assignment. As a result, we applied a quasi-experimental design involving three groups of teachers and their students. We mixed random assignment of teachers who could attend either workshop with assignment based on availability to create two treatment groups. Later in the process, the treatment groups helped recruit peers to participate as a comparison group of teachers who received no professional development and simply used their regular fractions curriculum. These three groups contained roughly similar representation in teacher education levels, teacher experience, demographics, etc.

¹ It was not feasible to offer both the online and face-to-face workshop during the exact same time period, and too few people were available for both times. Thus assignment became dependent on availability.

Post-course surveys and Learning Point interviews with teachers revealed that the treatment groups were, in general, very pleased with their experience in the course – both in the on-line version and the face-to-face workshop. Many of the issues that were reported by teachers during interviews after their participation in the on-line course were typical of other on-line courses: the desire for more or better communication with peers. TPT did what it could to facilitate communication between participants in the course, but we have since devised additional strategies that we believe will support better discussions in the future. Over-all, teachers in both groups reported being very satisfied with the quality of instruction and the content to which they were exposed. These early results foreshadowed the positive impact that participation in the two versions of the workshop would have on teacher instructional practices and student learning.

During the next stage of the evaluation, we asked teachers in the face-to-face and on-line groups to administer a test of fractions knowledge to their students before they began their unit on fractions. Our comparison group of teachers, who had not participated in either of the workshops, pre-tested their students as well.

During the implementation stage Learning Point visited a sample of classrooms that were being taught by teachers who had participated in the on-line or face-to-face versions of the RNP workshop. Teachers in both groups demonstrated the skills that they had learned through their participation in the workshops, although teachers in the face-to-face group exhibited a slightly higher number of behaviors such as asking questions and their students exhibited a higher rate of manipulative use. Teachers in both groups did a good job of covering the topics of each lesson, asked questions of their students, and students of both groups of teacher used the manipulatives that are a crucial part of the curriculum. The evaluators observed students who were engaged in the learning process, who were thinking about the concepts of fractions, and who were interested and excited about learning. They also observed teachers who had obviously learned the lessons of the RNP and were invigorated in their teaching of an area of math that can be very challenging for students.

Learning Point's interviews with the teachers during site visits revealed that teachers were very pleased with the curriculum. Respondents said that they found the hand-on activities with manipulatives to be very helpful in imparting to their students ideas of relative size, inverse relationships between fraction denominator and size, and other concepts that can be challenging for students to grasp. Teachers also reported that students were more involved and interested in the topic than previous students who were taught through standard, book-based approaches to the topic. In addition, teachers reported that their own thinking about fractions and instruction had been affected – allowing them to have a deeper understanding of the concepts and of how students thought about fractions.

As the bottom line of most professional development programs should be whether they achieve the desired impact on learning, we were most eager to see whether the training and curriculum would increase student achievement. Teachers in all three groups used the same instrument they used to develop the baseline to test their students again after completing fractions instruction, allowing us to assess student improvement, and to compare student improvement in the two RNP groups to that of students whose teachers used their standard fraction curriculum.

Learning Point's statistical analysis of the test data showed that students of the teachers who participated in the two RNP courses out-performed their peers in the comparison teachers' classrooms at a statistically significant level. This suggests that the difference between those who received the RNP training and those that did not was real, and not simply a random finding. The RNP and comparison groups of teachers were similar in terms of their experience and education, and the students in the two groups were similar in terms of their fractions knowledge before learning about fractions. The only important difference between the two groups of teachers and students was their participation in the RNP workshops and curriculum. Therefore we can feel safe in concluding that the reason for the improvement in the scores of the students in the RNP groups was due to their teachers' participation in the RNP workshops.

Combined with the qualitative data that showed teachers were positive about the RNP curriculum and methods they learned, and the observation data which showed teachers were implementing the RNP curriculum as intended, we conclude that the on-line and face-to-face versions of the Teaching Fractions workshop were both effective at improving students' knowledge of fractions in comparison to the group of students whose teachers received no professional development. In addition, since the difference between the on-line and face-to-face students was not statistically significant, we are satisfied that we achieved our goal of creating an on-line version of the RNP workshop that was as effective as the original.

GOALS, OBJECTIVES AND RESULTS

TPT has documented outcomes for the 1,073 students and 57 teachers who both completed the final version of the workshop and participated in the evaluation. The project's reach though, extends beyond those in the implementation/evaluation to teachers who participated in the pilot, teachers who participated in all or significant portions of the workshops but were unable to participate in the final evaluation, and the future students of teachers who participated. In addition, we hope to broaden the positive impact of the project further by establishing a distribution partnership (through which the course will be offered) and by disseminating the results of our research on the efficacy of this workshop and online learning in general.

1. Increase the school readiness skills of students, preparing them for grade level instruction in math.

And

2. Increase students' level of math skills.

Strategies/Objectives: By encouraging use of and providing training for the research-based RNP fractions curriculum, we aimed to increase the likelihood that students would gain fraction number sense and the fundamental concepts, such as partitioning, order and equivalence. Grasping these concepts not only enhances 4th and 5th grade skill level but also provides a far stronger foundation on which to build future number concepts than the traditional focus on operations.

Results: The RNP’s research already confirms the efficacy of the curriculum’s approach to grade level and future fractions learning.² A total of 1500 students completed both the pre-test and post-test across the two treatment groups (students whose teachers were trained online or face-to-face) and the comparison group that received no training. Our research supported previous studies.

Group	Pre-test Average ³	Post-test Average	Gain Score (Difference) ⁴
On-line (511 students)	8.56	18.82	10.26
Face-to-face (562 students)	8.0	17.76	9.77
Comparison (427 students)	8.85	15.49	6.63

On average, students in the on-line group gained 10.26 points from pre to post-test and students in the face-to-face group gained 9.77 points. Students in the comparison group gained an average of 6.63 points.

Students in the face-to-face and on-line group out-performed the students in the comparison group at a statistically-significant level.

Across the board, the RNP teacher training curriculum, whether delivered through a face-to-face workshop or the on-line course developed by TPT, resulted in increased student achievement in fractions.

Status of Goals 1 and 2: Met

3. Improve teachers’ content and pedagogical knowledge and skills in math.

Strategies/Objectives: Through the fractions workshops, TPT provided teachers with a greater understanding of number and fraction sense and its importance; articulated and/or reinforced concepts of estimation, flexible unit, and ordering, and taught teachers the value of hands-on work using manipulatives as a key tool for developing true understanding.

Results/Measures: Again, the RNP research on critical math content and pedagogical strategies has already validated the classroom curriculum and teacher training workshop content.

Through end-of-workshop surveys and follow-up interviews, teachers were asked about their experiences in the course — and its impact on them. Participants rated statements on a 5-point scale, with 5 being “Strongly Agree” and 1 being “Strongly Disagree.”

² Cramer, K. A, Post, T. R., del Mas, R. C. (2002) Initial Fraction Learning by Fourth- and Fifth-Grade Students: A Comparison of the Effects of Using Commercial Curricula With the Effects of Using the Rational Number Project Curriculum. *Journal for Research in Mathematics Education*. 33 (2) 111-144.

³ Learning Point’s analysis concluded that pre-test differences between the three groups were not statistically significant, suggesting that the students in each group started at about the same place before fractions instruction began.

⁴ The difference between the two groups whose teachers received training in and used the RNP curriculum and the comparison group that received no additional training and taught their standard curriculum was statistically significant, $\alpha=.0001$

Survey Statement	Online Mean Rating	Face to Face Mean Rating	Total Mean Rating
The content of this workshop was relevant to my teaching.	5	4.76	4.84
The materials for this workshop were well designed and easy to understand.	4.8	4.66	4.71
The content of this workshop can easily be applied to my teaching practice.	4.85	4.58	4.67
My effectiveness teaching fractions will improve because of this workshop.	4.8	4.71	4.74
The academic performance of my students will improve because of participation in this workshop.	4.65	4.5	4.55

Site visits and interviews with 14 teachers (eight from the online group and six from the face-to-face) during the school year gave evaluators an opportunity to observe teachers' actual application of what they learned and response to the approach in their own classrooms.

While there were slight between-group variations in the frequency with which they used the suggested teaching practices within the given lesson, both groups actively applied the practices that were modeled for them in the workshops. Teachers who participated in the face-to-face workshop engaged in questioning students and getting their responses with greater frequency than those who were trained on-line. Online workshop participants worked one-on-one with their students more frequently. This data might have proved valuable if there had been differences in learner outcomes, but as the outcomes were similar, the evaluators did not perceive that this data yielded significant between-group insights.

Observers also evaluated the extent to which teachers covered all of the steps described in the lesson they were teaching that day. The group of teachers trained on-line covered 79% of a lesson's steps. Teachers who were trained in the face-to-face workshop covered an average 83% of the steps. Overall, the evaluators concluded that differences in the application of techniques and behaviors learned in the workshop were not significant.

In interviews with the evaluators, all of the teachers in both groups reported positive results using the curriculum. In particular, a majority of teachers in each group mentioned either the manipulatives or the hands-on nature of the program as something that they liked about it.

One teacher summed her experience this way:

"I think it's just marvelous that there is just so much prior hands-on playing, exploring, and thinking about fractions -- so much more than I've ever done with any other curriculum. Students are not even looking at the symbols, not even thinking about the words at first. They are just comparing and looking at the sizes of piece, which is bigger, how many fit in the unit...It has changed my whole way of teaching fractions. I'm hoping it will change my way of teaching in other areas too."

Another participating teacher described the difference between the RNP approach and her regular curriculum:

“[The regular curriculum] tends to teach more process than understanding so kids can leave knowing how to convert a fraction to an equivalent and add or subtract and still not really intuitively know what they’re doing. Then if they get into a situation where they forget the rule or there is something slightly different they don’t really know how to handle it. This way, they have tools to draw from. When they have that understanding of what they’re working with, they have tools to draw from and they can take what they know and do things that maybe other students that have just learned the rules can’t.”

Six of the eight on-line teachers stated that the RNP curriculum was better than the one they would have used, as did all six of the face-to-face teachers Learning Point interviewed. Only two teachers in each group had used manipulatives prior to their involvement with RNP, and a few said that they had used them occasionally. Almost all of the teachers in both groups found the manipulatives to be very helpful in teaching their students about fractions. Most teachers in both groups (8/8 on-line, 4/6 face-to-face) also reported that their experience with the RNP changed the way they think about teaching fractions.

Status of Goal 3: Met

4. Improve teachers’ capability to assess students’ strengths and weaknesses in math and to provide effective grade-level math instruction

Strategies/Objectives: The Teaching Fractions workshop – especially its use of video – helps teachers to “see” and diagnose common fractions mistakes. In addition, the RNP’s standards-based curriculum focuses on students’ showing what they know using manipulatives and articulating how they solved problems, giving teachers frequent and immediate insight into the level of student understanding. Finally, the curriculum provides a test to measure fractions learning as well as student interviews that can provide deeper insight into their level of understanding.

Results/Measures: Activities/behaviors which were observed in the classrooms Learning Point visited demonstrate that the teachers applied the ongoing dialogue/assessment practices modeled in the course. These activities were counted per five minute period (to alleviate inequalities based on the length of class time).

Classroom Activity	Online Participants		Face-to -Face	
	Avg Count	Rank	Avg Count	Rank
Teacher working 1 on 1	1.37	4	.96	5
Teacher asking initial question	3.55	3	3.97	3
Teacher asking follow-up question	3.62	2	4.13	2
Students answering questions	5.14	1	5.65	1
Students explaining answers	.98	5	1.6	4
Students building on answers	.29	6	.23	6

While there are variations between the online and face-to-face groups, the differences are small and their relative reliance on any given technique or practice is almost identical. (Ranked in order from most frequent to least frequent, they differ only on the 4th and 5th most frequent practice.)

Finally, the test scores themselves are indicative of the results. See page 4.

Status of Goal 4: Met

5. Increase the capacity of schools and school districts to provide effective math education by creating a cadre of well-trained teachers.

Strategies: By creating an online version of the Teaching Fractions project, we increased the number of teachers who could participate to improve their instruction. By studying the efficacy of online professional development (and what components or qualities make it most effective) we hoped to validate and encourage its use as a cost-effective, flexible solution to meet teacher training needs.

Results/Measures: Fifty-seven teachers completed the final version of the workshop and participated in the evaluation (1027 students). The project's reach though, extends beyond those in the implementation/evaluation to teachers who participated in the pilot, teachers who participated in all or significant portions of the workshops but were unable to participate in the final evaluation, and the future students of teachers who participated. Over the course of the entire grant period we trained a total of 160 teachers from 125 schools (in 58 school districts) to use the RNP Fractions curriculum. Assuming an average classroom of 25, the project had a direct impact on 4,000 students. Given the results and their feedback, we would assume that these teachers would continue to implement the curriculum, thus the continuing impact would be around 4,000 per year.

In addition, we hope to broaden the impact of the project further by establishing a distribution partnership through which the course will be marketed and offered.

Status of Goal 5: Met

In addition to the goals outlined above, TPT set out to attempt to answer three questions with broader application.

1. Will professional development workshops delivered digitally be as effective as face-to-face workshops in improving teacher performance in the classroom and ultimately, improving student achievement?

The results of the study as reported above confirm that media-rich online professional development can match the results of face-to-face. Teacher practice and student growth were essentially the same for both of our treatment groups and student achievement substantially exceeded the results of the comparison group.

We understand from our research and colleagues in the field that there have been few, if any, other studies that look at this issue. Thus, perhaps the most far-reaching impact of our grant is the evidence that supports digital delivery of professional development as a viable option that can be both an effective and efficient means to improve teaching and learning.

2. Will follow-up through digital support tools help teachers better learn and retain the information provided in professional development workshops, further enhancing their performance and improving student achievement over the long-term?

Unfortunately, TPT's efforts to answer this question were inconclusive. In addition to the workshop, TPT offered a website with additional teacher resources (ESL and Special Ed adaptations), electronic versions of the manipulatives, and a section with family activity suggestions. Though the online workshop did not remain continuously accessible, teachers from the online group did receive the video clips on a CD ROM so they could watch them again and again. Finally, TPT invited teachers to participate in an online discussion *during* the period in which they were teaching the curriculum.

Because these were "follow-up" support, Learning Point's plan was to ask teachers about their use of these resources as part of the observation interviews which took place months after the workshop ended and during the time teachers were implementing what they learned. While TPT received anecdotal feedback from teachers who used and appreciated the extra materials, none of the fourteen teachers who were part of the observation/interview portion of the study made use of them. With insufficient data, we were unable to draw a link between the project's success and support tools.

3. What characteristics of the online professional development had the most impact?

In post-workshop surveys participants rated statements related to the value of various workshop components on a 5-point scale, with 5 being "Strongly Agree" and 1 being "Strongly Disagree."

Activity/Component	Online Mean Rating	Face-to-Face Mean Rating
Small group activities made a significant contribution to the success of the workshop.	3.8	4.62
The instructional videos made an important contribution to the workshop.	4.8	4.42
The lecture/discussions made an important contribution to the workshop.	4.35	4.63

It is clear that videos played a much greater role in the online course than the other components. In follow-up interviews with 14 of the online teachers, the majority mentioned the video clips as particularly helpful. A typical comment:

“It was good to know the theory and background behind why these techniques work, but I found actually seeing somebody teach [the RNP curriculum] most helpful for me.”

While the small group activities received a lower rating for the contribution to the success of the experience, follow-up interviews revealed a strong desire for them as a component. Several interviewees expressed disappointment in the activity level of their small groups. Teachers in the online workshop were assigned an online partner – and given several assignments over the course of the workshop in which they were expected to dialogue. They were also assigned to a discussion group made up of 4-6 participants. Unfortunately, a few of the teachers didn’t complete the discussion aspects of the assignments, leaving their partners and groups without sufficient correspondents. Attrition was an exacerbating problem as participants dropped out without notifying TPT, their partner, or their group.

Outside our work with Learning Point, TPT made an effort to answer the question of critical components from a slightly different perspective: **what are the components of effective teacher professional development?** We then looked at strategies to translate those components or concepts into an online format. The study itself and the nature of this particular workshop (teaching a set curriculum) restricted application of some of those practices. For example, taking assignments to the classroom (job-embedded training) was impossible with summer workshops and has limited application unless teachers are taking the course concurrent with their fractions teaching. Nonetheless, we recognize the value of bringing the ideas back to the classroom as soon as possible and have made revisions to workshop assignments to implement this strategy when feasible.

Because, the concept of developing a community of learners is critical strategy for successful professional development, TPT remains committed to small group activities and discussion as an important component of online delivery. We now understand how essential it is to establish slightly larger groups to take attrition into account and set very clear expectations for participation in the discussion groups, to encourage acknowledgement and response to

participants' postings, and to have the course facilitator monitor and support participation in discussions.

Also related to community building, we understand that the very best practice for online professional development is actually a blended model where participants have an opportunity to meet face-to-face to develop relationships early in the course. TPT attempted to accommodate this need by holding a "launch" meeting for participants at which they were oriented to the technology, got a chance to meet each other, and began the first lesson. In follow-up communications our participants told us they would have appreciated even more time in face-to-face relationship building, hypothesizing that having stronger personal relationships would have enhanced the online partner and small group activities. Unfortunately, face-to-face meetings of online learners are not always feasible – especially for nation-wide programs. Establishing subset groups that are in proximity to each other might be a solution; another might be to experiment with video conferencing.

Other practices that are important and possible to achieve within an online environment included: accountability (accomplished with an expectation rubric supported by incentives), classroom modeling (achieved with video clips) and reflection (realized through a journal, paper or discussion assignments).

RESEARCH AND EVALUATION STRATEGIES

TPT and Learning Point originally embarked on a plan to use a fully experimental design with randomized assignment to a control and two treatment groups. However, several factors stood in our way of full implementation. The training staff (Dr. Kramer and her associates) could not feasibly implement both the online workshop and face-to-face workshop during the exact same time period. As a result, two separate times were set for the workshops. Unfortunately, an insufficient number of teacher/participants were equally available for both times. Therefore, a portion of the assignments had to be made on the basis of availability, disallowing random assignment. Recruitment challenges and attrition prior to and during the workshop(s) intensified the challenge.

Committed to a scientifically based evaluation plan, TPT and Learning Point worked together to create the closest replication of our original design. While we no longer had random assignment, teachers in the summer 2004 workshops were assigned based on availability – not on an indicator of preferred learning mode. Unfortunately, Minnesota schools were also going through substantial cut-backs and turmoil during this period and we lost a portion of online participants due to lay-offs and reassignments to other grades or subjects. To maintain a sufficient number of participants for the online group, we were forced to offer the online version of the workshop again in the fall of 2004. The following table illustrates the retention challenge we faced.

Group	Goal	# at Registration	# at Orientation	# Completed Workshop	# Completed Evaluation
Online ⁵	50	62	43	31	28
Face-to-Face	50	48	39	39	29
Comparison	50	29 ⁶	n/a	n/a	24

We maintained a three group plan that allowed for the comparison of the effects of the on-line course to those of a face-to-face version of the training and a third group that received no additional training. The summative evaluation focused on two key strategies: observation of teachers using the curriculum and pre-and post-tests of the students whose teachers participated in the workshop and those in the comparison group. This allowed the evaluators to assess the impact of the on-line course on a group of 4th and 5th grade teachers and their students in comparison to that of teachers who participated in a face-to-face workshop, and to a group of teachers who used their normal fractions curriculum.

DATA COLLECTION

A copy of each of the data collection tools is included in Appendix A.

Post-workshop Surveys.

At the end of the workshops, participants were asked to complete a survey that gathered their demographic data, rated their experience with and perception of the workshop content and formats, and gathered open ended questions. We received 48 completed surveys (done in class) from the face-to-face participants, and 22 from summer online participants. (We were unable to retrieve the fall participant survey data.)

Interviews. In fall 2004, staff at Learning Point Associates conducted telephone interviews with teachers who had completed the online and face-to-face training. Interviews were conducted with 14 online participants and 15 face-to-face participants. In addition, LPA staff attempted to interview several teachers who had dropped out of the online course in order to discover why they had left the training. We were able to reach three teachers who began the online workshop but did not complete it.

Pre and Post-Testing. A set of pre-tests and a set of post-tests were photocopied and sent to all of the teachers in each of the three groups, along with a set of detailed instructions for administering the tests. Teachers were asked to administer the pre-tests and mail them to the evaluator in a postage-paid envelope. We also asked the teachers to keep the set of post-tests, administer them immediately upon completion of their fractions curriculum, and return them to LPA. The evaluation results include completed pre-and post-tests from 28 teachers who took the workshop online (511 students), 29 who attended the face-to-face workshop (562 students) and

⁵ Note that the online figures are the combined total for summer and fall workshops. The fall workshop was added due to the attrition of 15 participants between registration and orientation and another 10 who did not complete the course during the summer.

⁶ We reduced the goal from 50 to 30 to balance against workshop participant numbers.

24 from the comparison group (427 students). A psychometric evaluation of the fractions assessment is included as Appendix B.

Site Visits. In February of 2005, while most teachers were using either the RNP curriculum (the two program groups) or their normal fractions curriculum (the comparison group) to teach their students about fractions, a team of Learning Point evaluators visited fourteen treatment classrooms – eight schools where a teacher had participated in the on-line course and six schools where a teacher had participated in the face-to-face workshop. In each school, an evaluator visited the classroom of the teacher and conducted an observation while the teacher used the RNP curriculum. Either before or after the observation, the evaluator also conducted an interview with the teachers regarding his or her experience using the RNP curriculum.

Prior to conducting the site visits, observers received training on the use of the observation instrument. Learning Point created a glossary of terms to clearly define the behaviors that we would be looking for with an emphasis on those indicated by the workshop. Next, Learning Point used the video clips that were part of the RNP course to practice using the observation instrument and calculate inter-rater reliability. By the conclusion of the training, inter-rater reliability between the three evaluators on the behavioral count portion of the observation instrument ranged from 75% to 85%.

Using the classroom observation instrument described above the evaluators observed a classroom lesson and recorded descriptive, narrative information regarding classroom activities and counts of pre-specified behaviors in alternating, five-minute segments. The behavior count data allowed for analysis of the number of different kinds of teacher and student behaviors observed during each alternating five-minute segment. Learning Point analyzed these data by calculating the average number of behaviors per category for each classroom and then averaging the number of behaviors across teachers for the on-line and face-to-face groups.

In addition to the behavioral counts, Learning Point used the narrative, descriptive data to examine the extent to which teachers implemented the RNP lessons as described in the RNP lesson book. Each RNP lesson includes several discrete steps. By comparing the narrative data with the steps described in each lesson, the evaluators were able to assess the extent to which teachers covered all of the steps described in the lesson.

Learning Point's analysis of lesson coverage began with each observer comparing their own narrative data to the lesson plan for the day observed, noting the lesson items covered, and recording an estimate of the percentage of the lesson items covered for that teacher on the day observed. Once each observer had coded their own observations, the observers exchanged their observations with another observer. Each observer then calculated the percentage of the lesson that was covered in the other observer's notes as a check of accuracy. Learning Point then averaged the two ratings for each teacher/classroom observed.

STRATEGY TO ATTAIN GOALS

While all of TPT's originally stated goals have been met within the project, we have requested an extension in which to pursue distribution of the workshop (through a third party) and to continue dissemination of the results through professional journals as well as distribution of our

dissemination CD-ROM (see dissemination below.) We expect to complete both of these activities within twelve months.

PRODUCTS OR STRATEGIES RECOMMENDED FOR WIDE DISSEMINATION

Online Workshop Distribution

As stated above, TPT has begun preparing the online course for distribution by a third party. In addition to migrating out of the WebCT platform (which was its temporary home because it is the online platform used by the University of Minnesota, we are making refinements to the workshop and its materials. For example, for the project period, participants' "final project" was teaching the curriculum and participating in the evaluation including pre- and post-tests, observations and interviews. As we prepare to transfer the course to a professional development provider, we are increasing options within the course assignments to work with students, establishing an appropriate final project (fitting for a 2-credit course) and developing rubrics by which future facilitators can grade participation.

We have begun discussions with several potential distribution partners including PBS Teacherline, NCREL, NCTM and Tapped In. Our goal is to establish a distribution partner by the end of calendar year 2005, and have the partner offer the course as many times as possible through the end of our agreement with the University of Minnesota and the RNP. That agreement concludes in June, 2007. We will, of course, pursue extension, should demand for the workshop and ongoing distribution opportunities warrant it.

Project Evaluation Distribution

In September 2005, *eSchool News* feature an article written by TPT's William Burns, on the use of video in online professional development and what we learned through the Teaching Fractions project. A copy of the article is included in the attachments.

During our extension period we will seek additional avenues by which to disseminate information obtained through our Ready to Teach: Teaching Fractions experience. We have identified several publications that serve our target audience of principals, curriculum coordinators and superintendents and will submit articles as appropriate. In addition, we will work through TPT's communications department to seek recognition of the projects' outcomes in local media.

We believe that the most cogent part of our project was the affirmation that online teacher professional development can be as effective as face-to-face professional development. Therefore, we have focused our dissemination plan on the creation and distribution of a multi-media presentation that highlights the potential of online professional development, perspectives on its use, the details of the Teaching Fractions project, and illustrations of how media rich online professional development attends to best practices in teacher professional development.

The primary format of this presentation is an interactive CD ROM, chosen because it has the potential to include high quality video and to model the media-rich "learning" we are promoting. In this case, users can explore on their own to learn about online professional development and the Teaching Fractions project.

The content of the CD ROM will also be accessible (downloadable) from TPT's website. However, because of our extensive use of embedded video, people who access the site on dial-up modems will be encouraged to order the CD ROM and/or view a modified version of the interactive presentation.

We anticipate the CD ROM's completion early in October. TPT plans to distribute the CD ROM to all project participants, the advisory board, other Ready To Teach projects, identified peers in the field of online professional development, and members of the Minnesota Association of School Administrators (superintendents, curriculum directors, etc.). We will also offer the CD ROM by request to all PBS education professionals. TPT expects to distribute 1500-2000 copies of the CD.

EVALUATION LESSONS LEARNED

The biggest challenge TPT encountered in the project was recruiting and retaining a sufficient number of participating teachers. Issues included teacher availability, teacher commitment, and teacher assignment stability.

To address these in the future, TPT would recommend:

- 1) Start "marketing process" with substantial lead time in order to broaden the reach and frequency of key recruitment messages to garner sufficient interest.
- 2) Offer online and face-to-face workshops concurrently in multiple sessions within different time frames to increase the likelihood that teachers could be randomly assigned and not face the availability issues.
- 3) Make participation requirements and obligations extremely clear including a rubric for successful participation.
- 4) Consider graduate credit option in addition to or in lieu of participant training stipend – an increased incentive.
- 5) Substantially (at least 20%) over sample in order to account for teacher moves, layoffs and reassignments and general attrition.

Appendix A:
Data Collection Tools/Instruments

Post-Workshop Teacher Survey

Instructions: Please take a few moments to complete the following questions. The survey should take about 15 minutes to complete. Your responses will be kept strictly confidential and results will be reported on an aggregate basis only. Please fill in the circle corresponding to your answer or provide a written response where appropriate.

A. Teacher Demographics

Gender - Are you: Male Female

Racial Background - Are you: (Chose one)

- American Indian or Alaskan Native
- Asian
- Black or African American
- Hispanic or Latino
- Native Hawaiian or Other Pacific Islander
- White

Number of years teaching at your current school? (Chose one)

- 0 -1 2 - 3 4 - 5 6 - 7 8 - 10 10 – 15 15 or more

Number of years teaching at your current grade level(s)? (Chose one)

- 0 -1 2 - 3 4 - 5 6 - 7 8 - 10 10 – 15 15 or more

Total number of years teaching grades K-12? (Chose one)

- 0-2 3-5 6-10 11-15 16-20 21-25 26 or more

Please further identify your work by:

Grade LEVEL:

- 4 5 6 Spec. Ed.

AT-RISK: Do you work in districts, schools, and/or classroom with a majority of students who are Title I eligible or a majority who are eligible for free or reduced lunch?

- Yes
 No

LIMITED ENGLISH PROFICIENCY: Do you work in districts, schools, and/or classroom with a significant number of students who have a language other than English spoken as the primary language in their homes?

- Yes
 No

Post-Workshop Teacher Interview Questions

1. “Please describe your experience with using the Rational Numbers Project fractions curriculum so far”.

[depending on response, prompt:

- “What aspects of the curriculum worked well”?
- “What aspects of the curriculum did not work well”?
- “Why do think that it did/didn’t work”?

2. “What were the strengths or positive aspects of the curriculum”?

3. “How closely does the Rational Numbers Project curriculum match the curriculum that you would have normally used this year?

[depending on response, prompt:

- Does the RNP curriculum cover the topic of fractions as well or better than the curriculum you would have used”?

4. “What changes would you suggest to improve the curriculum”?

5. “What differences in student behavior and understanding have you noticed this year compared to the way you taught fractions before”?

[depending on response, prompt:

- “Have you noticed any difference in students’ attention or involvement during the lessons? If so, please describe them”.
- “Have you noticed any difference in students’ thinking or understanding of fractions? If so, please describe them”.
- “Have you noticed any changes in the dynamic of the classroom, e.g. students more excited about learning fractions, fewer discipline issues during the lesson”?

6. “Does it seem like the manipulatives have had an impact on the ability of students to learn fractions”?

[depending on response, prompt:

- “Why do you think the manipulatives have/have not affected students’ fractions learning”?
- “What changes would you suggest to improve the use of manipulatives”?

Ready-to-Teach Fraction Test

Transparency Items – Teacher please use the enclosed transparency, or write these items on an overhead transparency.

(1)

$$\frac{7}{8} + \frac{12}{13} =$$

(2)

$$\frac{3}{8} + \frac{5}{12} =$$

(3)

$$\frac{8}{9} - \frac{7}{8} =$$

NAME _____

RNP Fraction Assessment

The purpose of this test is to find out what you know about fractions. You will be shown 3 problems at the overhead. **Estimate** the answer by recording in each box the **whole number** the answer is closest to.

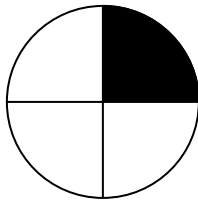
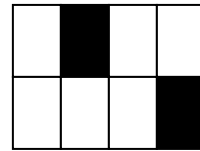
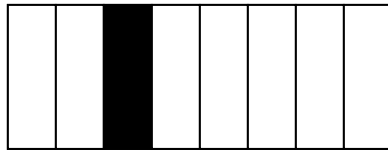
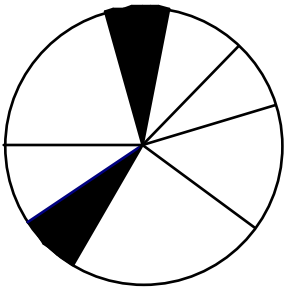
(1)

(2)

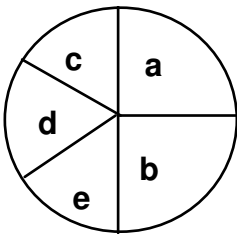
(3)

Continue to work on the rest of the test on your own.
 Show all the work you do to solve each problem.

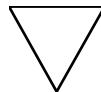
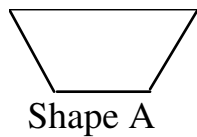
(4 a, b) Look at each picture carefully. Circle the **two** pictures that show $\frac{2}{8}$ shaded in. You may need to draw in lines to determine if $\frac{2}{8}$ are shaded.



(5) What fraction of the circle is part c? _____



(6) If shape A is the unit, what fraction name can you give to 2 triangles? _____

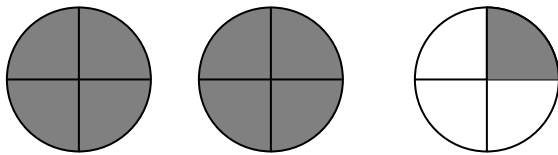


(7) Write the fraction name for the shaded part: _____



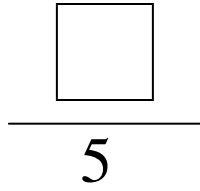
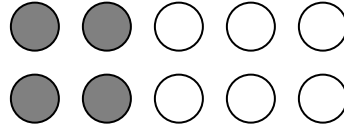
(8) Using pictures of circles for chips or tiles, draw a picture to show the fraction, $\frac{1}{6}$ using 12 circles.

(9) The whole circle is the unit. Write 2 fraction names for the picture for the amount shaded.

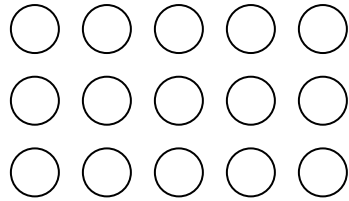


(a) _____ (b) _____

(10) How many fifths are shaded?

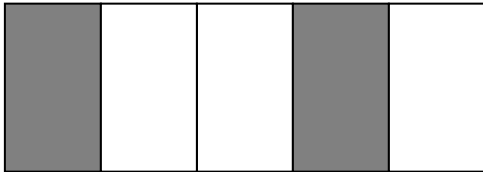


(11) Circle $\frac{2}{3}$ of the set:

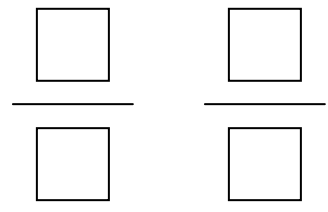
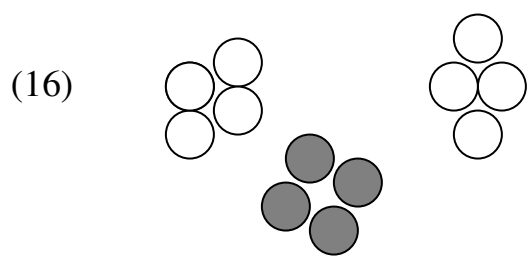
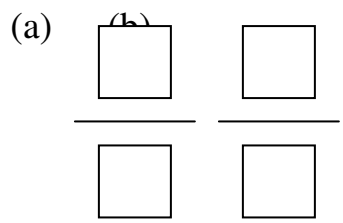
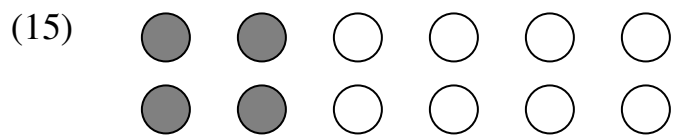
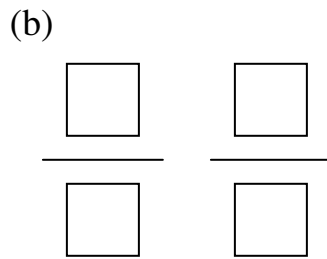
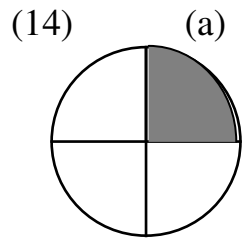


(12) is 3-fourths of some length. (a) Draw the whole length below. (b) Explain why it is the whole.

(13) Two-fifths of the rectangle below is shaded.
 Draw lines on the picture to show 15 equal parts.
 What fraction is shaded now? _____



For problems 14 –16 give two names for the shaded amount:



For problems 17-21, circle the larger fraction. If equal, circle both fractions.
Explain your reasoning for each one.

$$(17) \frac{3}{4} \quad \frac{2}{3}$$

$$(18) \frac{1}{2} \quad \frac{5}{8}$$

$$(19) \frac{3}{12} \quad \frac{7}{12}$$

$$(20) \frac{4}{9} \quad \frac{4}{11}$$

$$(21) \frac{4}{6} \quad \frac{5}{14}$$

You may use your fraction circles on the last five problems. Draw a picture to show what you did with the circles.

(22) Liana ate $\frac{3}{8}$ of a small pizza. The next day she ate $\frac{1}{4}$ of a small pizza.

How much pizza did she eat altogether?

(23) Ann and Josie receive the same allowance. Josie spent 4-ninths of her allowance on CD's. Ann spent 1-third of her allowance repairing her bicycle. Josie spent how much more of her allowance than Ann?

(24)

$$\begin{array}{r} \frac{5}{6} \\ + \frac{2}{6} \\ \hline \end{array}$$

(25)

$$\begin{array}{r} \frac{1}{2} \\ - \frac{3}{8} \\ \hline \end{array}$$

(26)

$$\begin{array}{r} \frac{1}{3} \\ + \frac{2}{6} \\ \hline \end{array}$$

(27) Did you use fraction circles on the last 5 problems?
Circle: Yes or No.

Teacher Site Visit Interview

Ready-to-Teach Fractions: Teacher Interview Questions

As you know, Learning Point Associates is evaluating the Twin Cities Public Television's Ready-to-Teach Fractions program. Part of the evaluation includes the classroom observation and some interview questions about your experience using the curriculum. All of your answers will be kept confidential and none of your responses will be associated with your name in any reports of the findings of the evaluation.

We would like to record your answers so that we will have an accurate account of your answers during the interview. Is that alright?

1. "Please describe your experience with using the Rational Numbers Project fractions curriculum to teach students about fractions."

[depending on response, prompt: - "What aspects of the curriculum worked well?"
 - "What aspects of the curriculum did not work well?"
 - "Why do think that it did/didn't work?"

2. "How does the Rational Numbers Project curriculum compare with the curriculum that you would have normally used this year?"

[depending on response, prompt: - "Does the RNP curriculum cover the topic of fractions as well or better than the curriculum you would have used?"

3. "For the class as a whole, what differences in student behavior and understanding have you noticed this year compared to the way you taught fractions before?"

[depending on response, prompt: - "Have you noticed any difference in students' attention or involvement during the lessons? If so, please describe them."
 - "Have you noticed any difference in students' thinking or understanding of fractions? If so, please describe them."
 - "Have you noticed any changes in the dynamic of the classroom, e.g. students more excited about learning fractions, fewer discipline issues during the lesson."

4. “Did you use manipulatives (circles, tiles, etc) in your fractions instruction prior to this year?”

IF NO

“How have the manipulatives (the circles, tiles, etc.) have had an impact on the ability of students to learn fractions?”

[depending on response, prompt: - “Why do you think the manipulatives have/have not affected students’ fractions learning?”
- “What changes would you suggest to improve the use of manipulatives?”

IF YES

“How does using the manipulatives this year as part of the RTT approach compare to the ways that you used them last year?”

5. “Has the use of the RNP changed the way you think about teaching fractions?”

[depending on response, prompt: - “How?”

6. “Have you used the on-line support materials for English language learners or special education students while using the Ready-to-Teach curriculum?”

- “Have these materials been helpful? In what ways?”

- “Do you have any suggestions for improving the on-line support materials?”

7. “As you may know, TPT produced a brief television program and video about the Ready-to-Teach Program, and created a Web site to inform parents about the project. Do you know if many parents have seen the video or visited the Web site?”

- “What kind of feedback have you heard from parents about the video and the Web site?”

8. “What changes would you suggest to improve the curriculum?”

Site Visit Classroom Observation Instrument

TPT Ready-to-Teach Classroom Observation Protocol

Date: _____

Observer: _____

School name: _____

Teacher: _____

Grade: _____ Number of students: _____

Ready-to-Teach Fractions unit: _____

Start time of observation: _____ End time: _____

Site Visit Classroom Observation – Description

1-5

10-15

20-25

30-35

40-45

Site Visit Classroom Observation – Behavior/Practice Tally

Practice	Definitions (where needed)	5-10 minutes	15-20	25-30	35-40	45-50
Teacher leading instruction	Teacher telling students what to do, giving directions, or lecturing					
Teacher working 1-on-1 w/student						
Teacher asking initial questions	Initial question – begins a discussion of a topic					
Teacher asking follow up questions	Follow-up questions – to either the original student who responded to the first question, or to other students who are following up on the first student’s answer					
Students answering questions						
Students explaining answers						
Students using manipulatives	3 - all students using manipulatives the whole 5 minutes 2 - 50/50; at least half of the students use them at some point, or they’re used at least half of the time 1 - few students use manipulatives 0 - no students use during the 5 minutes					
Students working in groups	2 - students in groups the whole 5 minutes 1 - students in groups part of the time 0 - students working individually					
Students building on other students’ answers						
Students asking questions						

Appendix B

Psychometric Analysis of Fractions Assessment

Test Validation

The Rasch model (Wright and Masters, 1982) was used for all item analyses for the pre- and post-tests. This model provides estimates of item locations (calibrations) along a common measurement continuum. Calibrations define the hierarchical order of the items and are expressed in log-odds ratios (logits). An odds-ratio for an item is the level of performance of an item relative to the performance of a total set of items. In order to determine the spacing of each item calibration, an associated standard error estimate is calculated and used to define distinct strata along the continuum. Unidimensionality along the construct is determined by goodness-of-fit statistics; in the case of Rasch models, infit statistics. Infit statistics compare each person's observed to expected response pattern for each specific overall score. The expected value of the mean-square version of this statistic, the infit mean-square, is 1.00. Deviation above 1.00 indicates potential departures from unidimensionality; values less than 1 flag potential violations of local independence. This value, when standardized, approximates a z-distribution with a mean of zero and a standard deviation of one. The criterion value for goodness-of-fit for these analyses is 1.4.

Reliability (Separation Indices)

Reliability estimates were calculated on both the pre- and post-test items. More specifically, person separation reliability is comparable to the Kuder-Richardson 20 (KR-20) measure of internal consistency which is typically measured on items (rarely on persons). KR-20 measures test reliability of inter-item consistency with values ranging between 0 and 1. A higher value indicates a stronger relationship between items on the test; better tests are typically within the 0.80 and 0.85 range. Each estimate of reliability in the Rasch model ranges from 0 to 1, which is identical to the classical reliability statistics.

Reliability

Results from the pre- and posttest indicates strong internal consistency of the test items at both testing occasions. Specifically, person reliability was 0.83 at pretest and 0.84 at posttest which indicates that items consistently that the items reliability measure a unidimensional construct, as initially intended. There were no items on the test that fell outside of the acceptable range for fit; which further illustrates the validity of the items. Person Real Separation was 2.22 and 2.25 respectively which shows that items are moderately able to discriminate across student ability levels in Algebra performance

