Achieving Technological Literacy in Arizona for Students and Teachers (AT LAST): Interim Research Report

Needs Assessment Analysis and Implications on Training

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This report is primarily intended for Grant Principal Investigators and project leadership for the purpose of planning training for participating K-12 teachers. Additional uses and distribution of portions of the report may include data sharing with participants, annual reports to NSF, and outreach or publications.

Findings and Conclusions

This report provides an analysis and interpretation of data collected from the ATLAST Project Participant Survey which is part of an ongoing Needs Analysis that targets teachers participating in the Education Professions program in the Phoenix area. Survey data helps define the perceptions and attitudes of teachers relative to the technological topics and training being planned by the AT LAST Project Team. Inferences described here will be combined with ongoing observations from interactions with teachers to help shape AT LAST training.

Survey respondents were 25 female and one male high school teachers who currently participate in the Education Professions program which is part of the state-wide Career and Technical Education program in Arizona. Teachers provided responses to 23 survey questions as part of their participation in the AT LAST training program for improving technological literacy.

This analysis should be reviewed by the AT LAST team for accuracy and oversight purposes, **and conclusions or final interpretations should be corroborated by other data, additional feedback from teachers, and observations by other team members**. This will ensure triangulation of findings across multiple instruments, data sources, and observers to support accuracy and validity of AT LAST decision-making as the project matures.

This document reports survey findings in three levels. The first level (snapshot) provides short summaries of findings and implications on training. The second level provides discussion and data used to reveal each implication. The third level is an Appendix that provides details on administration of the survey, survey questions, raw data, and analyses which are organized in 10 tables.

Snapshot: Teacher Characteristics, Perceptions, and Implications on Training

#	Data	Implications
1	92% white - not of Hispanic origin.	Shift Cohort 2 outreach to teachers from underserved populations.
2	26 teachers from 26 different schools.	Cohort 1 sample represents large sector of Phoenix high schools.
3	88% have 7+ years teaching experience.	Leverage teachers' knowledge and skills of pedagogy to shape technological literacy curriculum.
4	Only 2 science teachers in Cohort 1.	Ensure all technical information is explained in an introductory format and that key concepts are accompanied by concrete examples.
5	85% have high-speed Internet access.	Outside-workshop learning can include all common Web tools.
6	92% perceive themselves as comfortable, intermediate-level computer users.	There is less need for one-on-one assistance and training for basic computer skills (keyboarding, common peripherals).
7	Many teachers have not used or are not comfortable using devises and capabilities that most students use.	Include familiarization training for special areas: game consoles, cellular text and Internet, instant message, iPods, and network-oriented tools. Provide research-based and locally-obtained (student interviews) information on student use of these capabilities. However, base priorities for training on: (1) knowledge defined by technological literacy standards and (2) instructional technology most available and useful for teaching.
9	Teachers are not familiar with some important overarching concepts and emerging technology practices.	Training should include concepts and standards that shape performance and behavior: ITEA and ISTE standards, digital citizenship, local career opportunities, reasons behind Internet safety rules and law, creative common rights (Web publication).
10	Teaching workloads and lack of time	Fully integrate learning projects with normal classroom learning activities,

	will be a challenge for engaging teachers in self-guided, project-based learning outside of workshops.	curriculum, student assignments, or teaching tasks. Blend technological literacy learning objectives (from standards) with high school discipline-specific and course-specific learning objectives.
11	Some teachers want more technology support from their district.	Make teachers aware that their districts are helping provide AT LAST training, and include district representatives in AT LAST training and other events.
12	Teachers identify technology according to its instruction and learning applications rather than its broader implications on society and student careers in technical fields.	Design training to dispel misconceptions and broaden understanding of technological literacy, technology industry, relation between technology and science, technology's impact on society, the "designed" versus the "natural" world, and other fundamental concepts.
13	Teachers prefer working with their closest colleagues when engaged in technology training.	Assign membership to small (2-3) teams based on locality (district), individual skills and experiences, and shared interests: Promote peer-to-peer mentoring support that leverages individual strengths (matched to fellow participants' weakness or lack of experience); Build camaraderie via learning community.
14	Teachers want the training being proposed but wish to avoid missing normal class time with students.	Schedule most workshops outside of normal school dates/times. Ongoing learning activities or projects at schools will be necessary to avoid loss of interest, motivation, and knowledge during breaks between workshops.
15	Additional comments and ideas provided by teachers validate the general plans for AT LAST training and reveal some important goals.	Enable each teacher to learn at his/her own rate (faster or slower than others). Choose a training site closest to most participants. Enable teachers to immediately implement what they learn in their classrooms. Provide a Web site where AT LAST training resources can be downloaded and new materials produced by teachers can be uploaded and shared with others.

Data and Discussion of Inferences

Characteristics of Training Cohort (Appendix: Table 1 data)

The ethnicity of 92% (24) of the respondents are "white - not of Hispanic origin." This indicates a need for greater outreach to non-white "traditionally underserved" populations to better represent the characteristics of the Phoenix Metro area. However, the intended training cohort does represent a broad coverage of local high schools, because all 26 teachers are from different high schools. Eighty-eight percent (23) have seven or more years teaching experience, so teaching knowledge and skills are substantial. This should reduce participants' challenge of learning new concepts (about technology) while attempting to master common pedagogical skills. Technological literacy necessarily involves the development of basic knowledge of science, but only two teachers currently teach science. This will produce both challenges and opportunities. Challenges would include: (1) Training will need to introduce technical concepts using concrete examples and non-mathematical explanations. (2) When teachers implement technological literacy curriculum at their schools, it may not reach many science students—those who might benefit more directly. However, students in non-technical courses may be exposed to important technical concepts not usually included in English and social studies curricula. Most teachers 85% (22) have high-speed access to the Internet, an important vehicle for this training. Finally, most teachers (92%, 24) consider their current level of technology training to be intermediate or higher. This indicates their previous experience has resulted in some degree of personal confidence which will be helpful, since computers and peripheral technology will be an integral component of the training platform.

Comfort Level in Using Technology (Reference Tables 2 and 3 for details.)

Teachers were asked to rate their level of comfort ("uncomfortable, somewhat comfortable, comfortable, very comfortable") and to indicate whether they have used several types of "devices for instruction." Results provide several inferences about respondents:

Inference 1: Basic computer training (e.g., keyboarding) is not necessary. Most teachers are already "comfortable" or "very comfortable" using a desktop (92%) or laptop (85%) computer and common accessories (81%).

Inference 2: Training in network-oriented, emerging, or technical devices is needed. Most teachers "have not used" or feel "uncomfortable" using response systems (69%), electronic tablets (65%), subject-specific devices (62%), and "smart" phones (50%).

Inference 3: Teachers need more experience using devices that young students commonly use. They "have not used" or feel "uncomfortable" using game consoles (69%), "smart" phones (50%), and iPod/MP3 (46%).

Inference 4: Training is not needed in use of basic communications and Internet browsing. Most teachers are already "comfortable" or "very comfortable" using email (88%) and browsing the Internet for information (92%).

Inference 5: Some common technology tools will be more useful than others, so priorities for training topics should be determined early to guide training development. Priority should be based on pedagogical usefulness as well as lack of familiarity. For example, extensive training on particular simulations is not likely to be productive, because simulations are typically limited in scope to a particular topic area. Teaching the use of general purpose tools (e.g., wikis, blogs, electronic portfolios, news readers) may be more fruitful for instructional use, because they can be applied to so many disciplines and diverse topics. But, teachers also need to be familiar with the tools and capabilities that students use every day and that affect their behavior.

Inference 6: Some tools that are very familiar to students are not familiar to teachers—there is a need to "level the playing field" here! For example, many teachers have not even used podcasts (58%), wikis (58%), news readers (39%), or instant messaging (35%). And, the skill level of those who have may be low. Even if some of these tools have less instructional application, raising teacher confidence to match or exceed student confidence for these technologies will reduce fear, increase student respect for teacher ability, and foster mutual discussion and interaction with tech-savvy students.

Familiarity with Technology Topics and Concepts (Appendix: Table 4, question 14)

Inference 1: Training needs to include many, if not all, of the concepts and topics surveyed in Question 14, because each is an important element of technological literacy. Most teachers are either "unfamiliar" or have low familiarity (90%) with digital citizenship, Web 2.0, creative common rights, Arizona technology industry, and science, math, and engineering. Learning these concepts will heighten and broaden teacher awareness and understanding of technology and address a common misconception that education-relevant technology refers only to

instructional devices, services, and systems. Knowledge of technology concepts and opportunities will shape teacher and student technology behavior and awareness.

Inference 2: Low familiarity implies that teachers may not be able to teach these concepts in a way that will lead to student understanding. While more teachers are "familiar" or "very familiar" (54%) with Internet safety issues, they may not have acquired more than basic rules to follow to help protect students. Greater knowledge would enable teachers to explain why such rules are enforced and thus legitimatize them for students.

Factors that Inhibit Use of Instructional Technology (Appendix: Table 4, question 15)

Inference 1: The lack of extra time needed for learning will challenge trainers in their efforts to promote ongoing learning and implementation outside of workshops. Thus, learning activities need to be integrated into participants' required curriculum and teaching tasks as much as possible. Most teachers (79%) indicate they do not have time or do not see enough value given the time required to learn (42%). The best solution may be to enable teachers to use specific technologies to accomplish normal teaching tasks and activities. If trainers can demonstrate how certain tools can actually reduce their workload or provide more student learning per hour expended, motivation and willingness to adopt would be increased. This assumption is further supported by the fact that most teachers feel that acquiring new skills will help (58%) them be more effective.

Inference 2: AT LAST training may have direct value in improving teachers' perceptions of district support. Several teachers (29%) indicate their district is not providing enough support for implementing instructional technology.

Technology Concepts (Appendix: Table 5, questions 16-18)

Inference: Training should embed certain research and data-collection components (e.g., interviews, focus groups, open discussion) to answer important questions about existing concepts and beliefs. Effective communication and collaboration will depend partially on definitions and interpretations that are shared and have a common foundation. Most teachers think their students are currently making "many real-world connections" using technology (62%). What type of technology exposure do teachers associate with "connecting experiences?" Are they referring to direct connection to technology industry and careers, or are the experiences superficial (e.g., browsing the Internet)? What tools and skills can AT LAST training provide that result in more comprehensive and useful connections? What do teachers interpret as "real-world" experiences? There is also much disparity in what teachers recognize as "learning objects." Are their concepts tied to digital materials (origin of the term), or do they refer to a broader, less defined set of non-digital objects (handouts, textbooks, etc.)? A specific, operational definition for learning objects" needs to be established and used during training. Similarly, a common purpose and set of expected outcomes for training should be established if possible. Teachers currently perceive training as valuable across a diverse set of tools and applications—some of which may have minimum value and relevance to their needs. Conversely, they may see less value and relevance in knowing more about subjects like regional industry and careers, even though this is important for students who will join the regional workforce. It is important for Ed Profession teachers to

keep in mind that their students need a comprehensive understanding of technology—not just instructional technology. Tours of local high-tech industry would help promote this awareness.

Training Preferences (Appendix: Table 6, question 19)

Inference: Teachers seem to prefer working with other teachers who are close in proximity and have the same affiliation (e.g., same district or region). Engaging participants in team-based learning and peer-to-peer mentoring is a direct way to leverage this preference. To maximize the effectiveness of teaming, each teacher's strengths and skill set should be identified early in the training cycle (e.g., Workshop 1). This will enable team assignment based on strengths and weaknesses, so learners can contribute their own unique strengths (e.g., knowledge, skills, experiences) and gain support from others in their weak areas. The advantages to teaming include comfort, trust, and camaraderie among peers and reduction of trainer one-on-one assistance. Most efficient learning may occur in small teams (2-3 individuals). Rotating team membership frequently (according to individual skills sets) will increase diversity of interaction across teachers. Teaming will also encourage ongoing learning, shared exploration and experimentation, and facilitate implementation via joint project work outside of workshops.

Training Preferences (Reference Table 7, open-ended question 20.)

Inference 1: Twenty-one responses to an open-ended question about what teachers expect to gain from training show that the most prevalent expectations are to:

1. Improve their effectiveness for teaching students by leveraging technology: 57% (12)
2. Gain more ability (knowledge/skills) to use technology: 33% (7)
3. Increase personal confidence for using technology: 19% (4)
4. Improve understanding of technology: 10% (2)

Inference 2: Responses also further support the idea that teachers tend to restrict their focus to technology that is directly applied to teaching and learning. This excludes some critical knowledge and skill elements of technological literacy as it is defined by established standards, which emphasize the need for teachers and students to: (1) develop a broader understanding of science and technology and its impact on the world (not just academics); (2) improve skills for using technology resources that are not directly tied to instruction but are used in day-to-day activities or preparing for a career; (3) become more aware of new and emerging technologies; and (4) recognize the academic and career pathways that lead to professional success.

Training Preferences (Appendix: Tables 8 and 9, open-ended questions 21-22)

Inference: The number of responses and apparent thought teachers put into their responses to two open-ended questions about scheduling training indicated: (1) Teachers are seriously considering participation or are already committed to the training and (2) Interference with normal teaching dates/hours is the biggest concern. While preferences for dates/times of training during the school year varied a great deal (very few common preferences), most teachers (85%) request that summer training occur earlier rather than later during the break (69%) or that "anytime" works for them (15%).

Training Preferences (Appendix: Table 10, open-ended question 23)

Inference: Teachers have some good suggestions for training, and several echo what was planned in the original grant proposal. They include: (1) Enable teachers to learn at their maximum rate (according to existing knowledge and skill level) by providing options to complete assignments early and begin more advanced learning; (2) Choose a training site that is closest to the majority of participants; (3) Enable learners to immediately apply their new skills in their classroom—integrate into Ed Professions curriculum; and (4) Provide a Web site where lessons and teacher-produced materials can be accessed and shared.

Appendix

Survey Administration, Procedures, and Content

Tables 1 - 10

Survey Administration

Vehicle: Survey Monkey

Survey first available to respondents online: 9/22/08

Survey online instructions: Survey provided "consent" information that described the purpose and other key information (e.g., type of personal information requested in the survey, risks and benefits of participation, and confidentiality)

Data Collected but not used in this report: First and last name and email addresses provided by respondents.

Survey Front Matter: Consent Information (page 1)

I give my consent to the following: For this survey you were selected because you are an Education Professions teacher in the Phoenix, AZ area. Sponsored by the National Science Foundation (NSF), this study is being conducted by Jeannette Shaffer at the National Center for Teacher Education (NCTE) at Maricopa Community Colleges. We ask that you read this form and ask any questions you may have before agreeing to be in the study.

Background Information If you agree to be in this study, please complete and submit the following survey. The survey asks for basic background information, your comfort level with integrating technology, and technology integration training needs.

Risks and Benefits of Being in the Study There are very minimal risks from taking part in this study, but in any research, there is some possibility that you may be subject to risks that have not yet been identified. The possible benefits of your participation in the research are that you will develop your technology knowledge and skills that you can directly apply to your classroom teaching.

Confidentiality The records of this study will be kept private. In any report we might publish, we will not include any information that will make it possible to identify a subject. Research records will be stored securely.

Withdrawal Privilege Participation in this study is completely voluntary. Even if you agree to participate now, you are free to withdraw from the study at any time. If you withdraw, your data will be eliminated from our data bank and paper copies of materials will be destroyed. Your decision will not affect your relationship with Maricopa Community Colleges or otherwise cause a loss of benefits to which you might otherwise be entitled.

Costs and Payments Participants who meet all requirements will be provided with a stipend. Teachers will receive $500 for completing all five workshops ($100/workshop) and $200 for submitting a completed Real Learning Object and eportfolio ($100 each) that meet specified criteria.

Voluntary Consent Any questions you have concerning the research study or your participation in the study, before or after your consent, will be answered by Jeannette Shaffer. She can be contacted by phone at 480-731-8062 or by email at jeannette.shaffer@domail.maricopa.edu. Her office is located in Maricopa Community Colleges, 2411 West 14th Street, Tempe, AZ 85281. If you have questions about your rights as a participant in this research, or if you feel you have been placed at risk; you can contact the Chair of the Human Subjects Institutional Review Board, through the Maricopa IRB Office, at 480-731-8128. I have read the above information and have had the opportunity to ask questions and receive answers. I consent to participate in the study.

Table 1: Responses to Survey Questions 1-11

#[1]	Item	Responses (N=26) Important points and proportions greater than 25% are highlighted in blue.				
1	Continue with survey? (after reading consent agreement)	**100% (26)**				
4	Gender?	**96% (25)** Female				
5	Ethnicity?	0% American Indian or Alaskan Native	0% Asian	4% (1) Black/African American	4% (1) Hispanic/ Latino	0% Native Hawaiian/ Other Pacific Islander
		92% (24) White-not of Hispanic origin	0% Two or More Races	0% Some Other Race	**Only 8% (2) teachers are from non-white "traditionally underserved" population**	
6	School At Which You Are Employed?	Florence High School, Apollo High School, Agua Fria High School, Mountain View High (Mesa), No response, Thunderbird High School, Raymond S. Kellis High School, Metro Tech High School, Queen Creek HS, Red Mountain High School, Dobson High School, Ironwood Centennial High School, Peoria High School, Fountain Hills HS, Sunrise Mountain High School, Cactus High School, Gilbert High School, Willow Canyon High School, Dysart High School, Estrella Foothills High School, Basha High School, Moon Valley HS, Glendale High School, Greenway High School, Sunnyslope High School The training cohort will represent broad coverage of local high schools. All 26 teachers are from a different high school in the Phoenix Metro area. (Possible exception; One teacher did not respond.)				
8	K-12 Teaching Experience?	0% 1-2 years	12% (3) 3-6 years	**46%** (12) 7-15 years	**42%** (11) 16+ years	**88% (23) have 7+ years teaching experience**
9	Courses Currently Teaching?	**92% (24)** Career & Technical Education (CTE) Courses		**35% (9)** English	0% Fine Arts	
		0% Math	8% (2) Science	12% (3) Social Studies	**31% (8)** 0% Other	
10	Which best describes your internet access at school? (some respondents checked more than one choice)	0% No access	0% Dial-up modem service	8% (2) Limited access due to availability of computers	19% (5) Limited access due to county or school restrictions	**65%** (17) High speed service (DSL modem, cable modem, etc.)
		19% (5) High speed wireless network	8% (2) Not sure	0% I do not use the Internet	**Up to 85% (22) have some form of high-speed access to Internet (cable modem, wireless, etc.)**	**Up to 27% (7) have limited access to the Internet—<u>may have special needs</u>.**
11	Which best describes your level of technology training?	8% (2) Novice – new, just started taking advantage of technology training opportunities	**46%** (12) Intermediate – have attended many trainings but still have much to learn	**31%** (8) Experimenter – like to try new technology and ways of doing things		
		15% (4) Expert – am comfortable with technology and often help or train other educators	**Two teachers (novices) may need to pair with experienced learners.**	**Choosing "Experimenter," shows confidence, so 92% (24) can be viewed as having an intermediate level of confidence in their learning ability.**		

1: Item number on survey (sequence); Items 2 (first name) and 3 (last name) skipped; Item 7 (email address) skipped

Table 2: Responses to Survey Question 12

12	Rate your comfort level when using each of the following devices for instruction (when students use the devices).	0=Have Not Used	1=Uncomfortable	2=Somewhat comfortable	3=Comfortable	4=Very Comfortable
12a	Desktop Computer	0% (0)	4% (1)	4% (1)	23% (6)	**69% (18)**
12b	Laptop Computer	4% (1)	4% (1)	8% (2)	**35% (9)**	**50% (13)**
12c	Computer Accessories (e.g., printer, scanner, flash drives)	0% (0)	4% (1)	12% (3)	**44% (11)**	**40% (10)**
12d	Student Response Systems (e.g., clickers)	**46% (12)**	23% (6)	15% (4)	12% (3)	4% (1)
12e	Mobile/Smart Phone	**46% (12)**	4% (1)	12% (3)	23% (6)	15% (4)
12f	Multimedia Equipment (e.g., digital cameras, recorders & video)	4% (1)	12% (3)	**31% (8)**	19% (5)	**35% (9)**
12g	Computer Projector	8% (2)	12% (3)	12% (3)	**31% (8)**	**39% (10)**
12h	Slates/Tablets	**60% (15)**	8% (2)	12% (3)	12% (3)	8% (2)
12i	iPod/MP3 player	**27% (7)**	19% (5)	15% (4)	19% (5)	19% (5)
12j	Interactive Whiteboards or Smart Boards	19% (5)	19% (5)	23% (6)	19% (5)	19% (5)
12k	Game Consoles (or Game Software)	**50% (13)**	19% (5)	15% (4)	8% (2)	8% (2)
12l	Subject Specific Devices (e.g., calculators & probes, GPS, sensors)	**46% (12)**	15% (4)	15% (4)	12% (3)	12% (3)

Inference 1: Basic computer training (e.g., keyboarding) is not necessary. Most teachers are already "comfortable" or "very comfortable" using a desktop (92%) or laptop (85%) computer and common accessories (81%).

Inference 2: Training in network-oriented, emerging, or technical devices is needed. Most teachers "have not used" or feel "uncomfortable" using response systems (69%), electronic tablets (65%), subject-specific devices (62%), and "smart" phones (50%).

Inference 3: Teachers need more experience using devices that young students commonly use. They "have not used" or feel "uncomfortable" using game consoles (69%), "smart" phones (50%), and iPod/MP3 (46%).

Table 3: Responses to Survey Question 13

13	Rate your comfort level when using each of the following applications for instruction (when students use devices).	0=Have Not Used	1=Uncomfortable	2=Somewhat comfortable	3=Comfortable	4=Very Comfortable
13a	Email	8% (2)	0%	4% (1)	23% (6)	**65% (17)**
13b	Internet for Research	0%	0%	0%	**44% (11)**	**56% (14)**
13c	Presentation Software (e.g., Power Point)	4% (1)	4% (1)	0%	**42% (11)**	**50% (13)**
13d	Class/Course Site (e.g., web site, Blackboard, WebCT)	12% (3)	8% (2)	24% (6)	24% (6)	**32% (8)**
13e	Webinars/interactive virtual events	**42% (11)**	12% (3)	12% (3)	23% (6)	12% (3)
13f	Computer simulations or virtual reality applications (Froguts.com, 2nd Life, Sims)	**42% (11)**	23% (6)	12% (3)	23% (6)	0%
13g	Instant messaging/Chat (e.g., MSN, AOL, Skype)	**35% (9)**	12% (3)	12% (3)	12% (3)	**31% (8)**
13h	Blogs	**27% (7)**	19% (5)	**31% (8)**	12% (3)	12% (3)
13i	Wiki	**58% (15)**	12% (3)	12% (3)	8% (2)	12% (3)
13j	Forums/Discussion Boards	**27% (7)**	12% (3)	23% (6)	12% (3)	**27% (7)**
13k	Electronic Portfolios	23% (6)	23% (6)	**27% (7)**	19% (5)	8% (2)
13l	News readers (e.g., iTunes, iGoogle, MyYahoo, Bloglines)	**39% (10)**	**27% (7)**	8% (2)	12% (3)	15% (4)
13m	Podcast	**58% (15)**	15% (4)	12% (3)	8% (2)	8% (2)

Inference 1: Training is not needed in use of basic communications and Internet browsing. Most teachers are already "comfortable" or "very comfortable" using email (88%) and browsing the Internet for information (92%).

Inference 2: There is a strong need for peer mentoring and teaming among teachers due to their varied experiences with different tools. Each teacher's strengths and skill set should be identified, so they can be assess individually and matched to peers for the best shared learning.

Inference 3: Teaming should be implemented at the beginning of training (Workshop 1). This will ensure participants get: (1) opportunities to network with several other teachers (across schools if possible). It will also ensure efficient sharing of knowledge and basic skills to: (1) provide greater comfort when learning; (2) reduce the amount of one-on-one assistance needed by trainers for basic tasks; and increase comradeship among participants. The most efficient learning may be produced by small teams (maximum of 2-3 individuals) that are rotated frequently to increase interaction across teachers and enable them to share as many different types of knowledge and experience as possible.

Inference 4: Maximizing peer-to-peer learning will enable training to focus on less familiar but most exciting and useful tools. Peer-to-peer learning will extend and encourage learning between workshops. It will also pave the way for project-based learning outside workshops.

Inference 5: Some of the less familiar tools will be more useful than others across teachers. For example, teaching the use of particular simulations is not likely to be productive, because they tend to focus on specific topics and disciplines. Teaching the use of general purpose tools (e.g., wikis, blogs, electronic portfolios, news readers) will be more fruitful, because they cut across disciplines—can be used for STEM and liberal arts disciplines with equivalent value.

Inference 6: Some tools that are very familiar to students are not familiar to teachers—there is a need to "level the playing field" here! For example, many teachers have not event used podcasts (58%), wikis (58%), news readers (39%), or instant messaging (35%). And, the skill level of those who have may be quite low.

Table 4: Responses to Survey Questions 14-15

14	How familiar are you with the following topics?	0=Unfamiliar	1=Somewhat Familiar	2=Familiar	3=Very Familiar
14a	Digital Citizenship (communication, commerce, law).	77% (20)	15% (4)	8% (2)	0%
14b	Internet Safety (protecting personal information).	8% (2)	39% (10)	31% (8)	23% (6)
14c	Web 2.0 (e.g., blog, wiki, flickr, google maps).	62% (16)	19% (5)	19% (5)	0%
14d	Creative Common Rights (a way to share rights).	80% (20)	12% (3)	8% (2)	0%
14e	Arizona's Technology Industry.	72% (18)	16% (4)	12% (3)	0%
14f	Active Learning Pedagogy.	65% (17)	19% (5)	8% (2)	8% (2)
14g	Science Instruction and Technology.	69% (18)	23% (6)	8% (2)	0%
14h	Math Instruction and Technology.	76% (19)	20% (5)	4% (1)	0%
14i	Engineering Instruction and Technology.	88% (22)	8% (2)	4% (1)	0%

Inference 1: Training definitely needs to include many, if not all, these important concepts and skill domains, because each is an integral part of technological literacy. Most teachers are either "unfamiliar" or have low familiarity (90%) with digital citizenship, Web 2.0, creative common rights, Arizona technology industry, and science, math, and engineering.

Inference 2: Low familiarity implies that teachers do not know how to apply these concepts, nor are they able to effectively teach the concepts. While more teachers are "familiar" or "very familiar" (54%) with Internet safety issues they have probably received only cursory training that enables them to follow a few basic rules.

Note: "Active learning pedagogy" is a different subject that is not specifically related to technological literacy, so was not included in analysis.

15	Which factors inhibit your use of instructional technology?			
		50% (12) Classroom environmental factors, such as software or hardware.	4% (1) My understanding of students' preferred learning style limits.	13% (3) Course subject and/or nature of curriculum.
		29% (7) My district's support of technology in the classroom.	**79% (19)** Time constraints – time to learn new technology.	**42% (10)** Trade-off – the time to implement technology and the value of the learning opportunity is not balanced.
		58% (14) My technical skills.	8% (2) I do not have on-site (e.g., classroom, lab) support.	4% (1) Other.

Inference 1: It may be challenging to find ways to keep teachers engaged outside of workshops. Learning activities need to be integrated into participants' required curriculum and teaching tasks. Most teachers (79%) indicate they do not have time or do not see enough value given the time required to learn (42%). One solution is to request teachers use specific technologies they are learning in their normal teaching activities.

Inference 2: Most feel that acquiring new skills will help (58%).

Inference 3: We need to get additional description of what many teachers interpret as "environmental factors." Do they want more technical support, or are they referring to factors that trainers have no control over?

Inference 4: The training provided by AT LAST may have direct value in improving teachers' perception of district support. Several teachers (29%) indicate their district is not providing enough support.

Table 5: Responses to Survey Questions 16-18

16	To what extent does technology in your lessons allow your students to see or experience real world activities in the subject they are learning?	**62% (16)** Many Connections	**35% (9)** Slight Connection	4% (1) No connection		
Inference 1: The high proportion of those who indicate "many connections" (62%) calls for additional discussion with teachers. What type of technology experiences will teachers identify? Are they referring to direct connection to S&T industry and careers, or are the experiences superficial (e.g., browsing the Internet) and not directly tied to real-world applications? If not directly connected, what tools and skill sets can AT LAST training provide that result in more comprehensive and directly connected experiences? What do teachers interpret as "real-world" experiences?						
17	To what extent do you use learning objects (re-usable resources or units of learning) in instruction?	**27% (7)** Use Daily	**23% (6)** Use Weekly	**12% (3)** Use Monthly	**19% (5)** Use 1 – 8 times per year	**19% (5)** Have Never Used
Inference 1: There is much disparity in what teachers recognize as "learning objects?" Training needs to clarify the concept, using the most common definitions. Are their concepts tied to digital materials (origin of the term), or do they refer to a broader, less defined set of non-digital objects (handouts, textbooks, etc.)? To ensure a common focus and understanding among learners, training should define "learning objects." This helps define the type of training and topics to focus on—digital tools and development of objects using those tools.						
18	I would benefit from technology training in the following areas (check all that apply).	15% (4) Productivity Applications (word processing, spreadsheets, databases)	**58% (15)** Slates/Tablets	**35% (9)** Website editing software	**39% (10)** Textbook/Course websites	
		46% (12) Use of simulations or visualizations	**73% (19)** Electronic Portfolios	**42% (11)** Podcasting	**58% (15)** Learning Objects (re-usable resources or units of learning)	
		54% (14) Collaborative applications (e.g., blogs, wikis, web conferencing)	**62% (16)** Clickers	**31% (8)** Laptops	12% (3) Subject Specific Technology (e.g., calculators & probes, GPS)	4% (1) Other
Inference 1: The large percentage of responses in 10 of the 12 target areas indicates teachers perceive training as valuable across several technology domains. A follow-up discussion that provides more detailed definition of each domain may identify areas that are perceived as the most valuable or highest priority. **Inference 2**: Results of previous questions (e.g., high comfort level using common computer tools) may attribute to low percentage in "productivity applications." It is likely that teachers have already received sufficient training and/or possess basic computer productivity skills. **Inference 3**: Less interest or perceived value in "subject specific technology" indicates a potential motivation deficit for learning in this domain. However, if topics are tied to knowledge of future student careers, and training is supplemented with exciting tours of high-tech industry, this deficit may be overcome.						

Table 6: Responses to Survey Question 19

19	I would benefit from technology support and information in the following format (check all that apply).	**73% (19)** One-on-one with trainer	**81% (21)** District Class Meeting (face-to-face) with other Ed Professions Teachers	**62% (16)** Regional Class Meeting (face-to-face) with other Ed Professions Teachers	**27% (7)** Small online discussion groups
		46% (12) Community Web Site for Education Professions Teachers	**46% (12)** Quick Guides/Tutorials	**27% (7)** Newsletter	**39% (10)** Email
		19% (5) Live Chat	15% (4) Instructional Design Consulting	**27% (7)** Technology Big Brother/Sister (Mentor)	**46% (12)** Video Demonstrations
		19% (5) Podcast	**39% (10)** Conference	23% (6) Online Conference	4% (1) Other (please specify)

Inference 1: The majority of teachers prefer training that is in-person (versus virtual) and real-time (versus asynchronous). Most teachers want to connect with trainers one-on-one (73%) instead of being trained online or electronically: live chat = 19%, podcast = 19%, online conference (23%).

Inference 2: Teachers want to train with others who are part of the same local organizations. Most teachers prefer working with others in their own district (81%) versus those within the region (62%) even though they all belong to Ed Professions.

Inference 3: Many teachers want adjunct training materials and resources. About half the teachers (46%) want Web site, guides or tutorials, and video demos to help them learn.

Inference 4: Teachers may prefer "equal partners" and collaborative learning, rather than a mentor-mentee relationship. Only 27% indicated they would benefit from a "Big Brother/Sister mentor.

Table 7: Open-Ended Responses to Question 20

What do you personally hope to gain/learn from this [training] experience?
I would like to feel comfortable with the technology available to use it. I also hope to be able to demonstrate my competency so that I will be given technology. Right now I just have a desk top.
Better understanding of how to use some of the technology as well as gain the support of others who use technology well on a regular basis in the classroom.
How to best prepare my students for college/their future as far as technology is concerned.
No response
No response
I hope to gain more confidence in using technology so that I can keep up with the technology that my students use daily!
I hope to increase my technology skills.
Any and all new technology to keep the students motivated to learn in the classroom.
No response
Relevance in my lessons. Teach my students to use the materials.
More technology applications that I can use in the classroom.
I hope to gain more personalized training to meet my students needs in my classroom.
How to incorporate technology in my lessons to help my students use it in their F.E. lessons if applicable.
No response
Specific ideas and knowledge about how to better use the technology I have (Moodle, iclickers, Smartboard) to be a more effective teacher and to learn some new ways to use technology to have students gain new connections to the subject of teaching and education. (like maybe video streaming of actual lessons, resources on line about lessons, etc.)
No response
improved technology skills
I would love to become comfortable with learning new technology.
Ways to actively engage students through the use of technology.
I better understanding of technology usage
I hope to learn about technology that will improve my lessons. Although I'm getting better about some technology, there is other types that I still shy away from. For example, I see how many teachers have made a website (page) to aid in their instruction. This can be a great resource for their students. This is something that still seems out of my reach.
How to integrate more technology into the classroom.
21 century applications for timeless teaching skills.
I hope to be able to successfully integrate more technology into my daily lessons with students.
Increase my knowledge and comfort with the newest technologies
I hope to learn how to use technology in a way that will make my students' learning more efficient and attractive to them.

Inference 1: The most evident expectations for training are: improved effectiveness for teaching or helping students learn, improved ability to use technology, increase self-confidence for using technology, and improve understanding of technology. The 21 responses to this question show that teachers hope to gain the following benefits:

5. Improve their effectiveness for teaching students by leveraging technology: 57% (12)
6. Gain more ability (knowledge/skills) to use technology: 33% (7)
7. Increase personal confidence for using technology: 19% (4)
8. Improve understanding of technology: 10% (2)

Inference 2: Teachers appear to view technology in a somewhat limited scope—how to use it for teaching. This aspect may be the most important to teachers, and training needs to focus on it. However, technological literacy standards emphasize the need for teachers and students to: (1) develop a broader understanding of science and technology and its impact on the world (not just academics); (2) improve skills for using technology resources (e.g., Internet, electronic devices) in day-to-day living; (3) understand new and emerging technologies; and (4) recognize the potential and benefits of pursuing technical courses, degrees, and careers.

Table 8: Open-Ended Responses to Question 21

If you were to attend a technology literacy training session during the winter, when would be the best time for you to attend? (Days and/or dates please)
Weekends or during break. We get out for break on Dec. 12th
January any day would be best.
In the winter pretty much anytime would be good.
Evenings or Saturdays - difficult to miss more class time!
I would need to decide when offered
The best days would be a M, W, F after November 15th.
Very difficult to schedule - ((Monday, Thursday, or Friday)
Wednesdays, after 3pm.
Any time
Weekends, Early Feb.
January or February October, November and December are too packed
January or February
Anytime after school. Days vary.
Anytime
Flexible
I don't like to miss too much school.
mid November
Tues. Thur. after 3:30
Anytime.
unsure let me know the dates
I don't want to do it during my Winter break 12/20 through 1/3 nor do I want to attend during my Spring break 3/14 - 3/22. The rest of the time is workable in small doses.
Middle of January 2009
Weekend conference
The best time for me would be evenings ranging from 4-7. I am flexible in terms of dates.
(NOT Dec), Jan. Tues, Wed, Thurs are okay Feb. Tues, Wed are okay
Saturdays are best for me, but probably not in December.

Inference 1: Teachers are seriously considering participation or are already committed to the training. This is indicated by the fact that all answered this question or indicated they wished to know more about training time options.

Inference 2: Interference with normal teaching dates/hours is the biggest concern. Preferences for dates/times vary with only a few common (repeated) suggestions.

Table 9: Open-Ended Responses to Question 22

If you were to attend a technology literacy training session during the summer, when would be the best time for you to attend? (Dates please)
Any time as long as I know in advance so I can make plans
1st, 2nd, or 3rd week in June would be best
The best time in the summer is in early June.
Early summer is better
I would need to decide when offered
The best days would be the first week or so of June.
May -
8am-3pm Any week day.
Any time
July or late June. Everything is scheduled for "right after school gets out" and then I can only do one thing.
Right after school is out like the first week of June
Last week of May - 1 week of June
Early July
Anytime
week of July 27th
I don't really know my summer plans so anytime.
right after school gets out
May 25 afternoons
Anytime
summer workshop before are after state conference
June 1st through July 20.
Beginning of June
June. Out of the country in July.
Anytime in June would be best, and I would prefer mornings, if possible.
First three weeks of June (I'm gone for July)
Weekdays in June, towards the beginning of the week, would be best.

Inference 1: Teachers are seriously considering participation or are already committed to the training. (Same reason as described above in previous table.)

Inference 2: Most teachers (85%) request that training occur in early or mid summer (69%) or that "anytime" works for them (15%).

Table 10: Open-Ended Responses to Question 23

Question 23: Other information we should consider when planning technology training activities for Education Professions teachers?
I would like the sites to change depending on the people who attend. If a lot of people are coming from the East Valley, I would hope it would be held in the East Valley.
No response
No response
No response
No response
Perhaps this could be offered at the annual conference of CTE professions in Tucson which is usually at Ventana Canyon Resort.
No response
Learning curves. some teachers will work faster than others. Be ready for the next assignment for them. Then they won't feel like they have wasted their time waiting for others to catch up. Similar to our own students.
After school, small chunks at a time.
With gas prices like they are please try to have them at a centralized location.
Please include me! Thanks so much Jeanette, you have been so helpful already.
No response
No response
make sure teachers have time/opportunity to incorporate actual teaching materials in technology, that is to say, change their lesson plans. So they are not just learning about a new piece of technology and never have the time to figure out how to put it into a lesson or add to their curriculum.
No response
No response
I learn best by hands on learning
None
No response
If I'm learning something in a workshop over the weekend, I'm going to want to be able to use it on Monday. I don't want to spend my time learning things that will require a district meeting to buy new technology and I will be able to use it 2 years from now. So lets say, you are going to teach me how to make a power point. I want to know how to put in the things that I would talk about on Monday, so when I come back to school, I am one lesson closer to being a better teacher.
Lessons to be used. Maybe a place where teachers could upload lessons and sharing could happen.
TIME away from current duties, so conferences are best.
Maybe consider the curriculum of the Education Professions and Advanced Education Professions program and how to best supplement technology into the program.
No response
No response

Inference 1: Teachers have some good ideas or suggestions for training, and these echo what was planned in the original grant proposal. They include: (1) Enable teachers to learn at their maximum rate (according to existing knowledge and skill level) by providing options to complete assignments early and begin more advanced learning; (2) Choose a training site that is closest to the majority of participants; (3) Enable learners to immediately apply their new skills in their classroom—integrate into Ed Professions curriculum; (4) Provide a Web site where lessons and teacher-produced materials can be accessed and shared.

Achieving Technological Literacy in Arizona for Students and Teachers (ATLAST)
NSF Project # 0802487
Evaluation Report prepared by Albert Schwabenbauer, January 30, 2009
At Last Annual External Evaluation Report:
Executive Summary:

I have visited the At Last project team on site on four separate occasions, August 2008, November, 2008, and twice in January, 2009. I have had full cooperation from the project team and open access to interview key members of the project team and review all project records.

Specifically, I have reviewed the project work plan and schedule, the staffing plan to execute this project as well as the project website and management planning and budget controls employed. I have also attended project planning meetings and met individually with key project staff during the start-up phase of this project.
My observations are that this is a very experienced project management team with both the technology and management leadership skills needed to accomplish the goals of the project plan. I want to especially complement Mr. Ray Ostos, the PI for maintaining a very open collegial team environment. The CO-PI's and supporting team members are all experienced professionals.

Mr. Ostos's selection and hiring of Jeannette Shaffer as the key project coordinator was a critical decision. Jeannette has the right prior experience to work with high school faculty and students, gain their confidence and lead all the workshop training activities.
The project team has reviewed the original proposed workshop plan and has made several very significant and positive changes to the plan. Specifically, a survey was conducted on both the readiness of the classroom as well as the teachers at the different schools to conduct high technology education. Is the classroom wired? Do teachers and students have access to computers and the internet? What is the current level of teacher knowledge as far as computer and communications technology?

Based on this survey a decision was made about the type of workshop and materials which would most benefit the teachers in their current classroom setting. The original plan to include both students and teachers in the workshops was changed. The pilot teacher cohort will have workshop training with no students present. Also, the initial pilot training session was delayed from August until January to provide more time to survey teachers, organize material to meet their needs and have a more successful training encounter. These changes and the additional up front planning time was especially critical and will result in a workshop and training program and materials which meets teacher needs and expectations. Also, this new plan provides the opportunity to work with teachers after the first two pilot workshops in

January and February, 2009 with the final three workshops scheduled for June, 2009. The team has also decided that each year's cohort of teachers will not only receive the 5 training workshops planned but will receive follow-on support thru the entire remainder of the grant period. That would be 3-years for the first year and 2-years for the second year. This will also allow that cadre of teachers and this project to reach and interact with a greater number of students over the 3 year period.

The project researcher, (Joseph Matoon) has done an excellent job working with the project team, helping to design survey formats and analyzing results to improve the workshop educational materials focus and also suggest improvements for future teacher cohort selection and training.

Although cohort #1 is principally white female teachers, the high schools selected do represent the diversity of student population in the Maricopa County and Phoenix service area.

The first workshop was conducted on Saturday, January 24th, 2009 at Glendale Community College with 8 high school teachers attending. A second cohort of workshop #1 with 6 teachers is currently underway the last week of January at Chandler Gilbert Community College. The technology topics covered included Google Apps, Clickers, and cell phone polling. The teachers learned to log into google apps and create their own blogs and discussed how they might introduce this technology in the classroom with their students. In a similar manner they learned about clicker technology and discussed classroom applications. I have reviewed the teacher workshop evaluations. They were all extremely positive. I have provided a detail analysis of the evaluation as an appendix to this report. The extensive effort which the AT LAST team has placed on planning the workshops to meet the teacher needs has obviously been well received. Within the first 3 days after the workshop half of the teachers have scheduled follow-up sessions with Jeannette Shaffer at their school to discuss planning activities in the classroom which will be discussed in February at the 2nd workshop.

The Zoho website, which is being used for the ATLAST project team to post their activities appears to be an excellent project management tool and contains all the current project planning documents.

The administrative staff at the National Center for Teacher Education at the Maricopa CC District offices, specifically Pam Asti has supporting the PI with developing project budgets, expenditure commitments, and actual cost reporting and tracking.

AT LAST (Achieving Technological Literacy in Arizona for Students and Teachers):
Project Goals:
There are four goals of the project's education component and the team expects to achieve them all.

Goal 1: Provide Arizona participants with knowledge and understanding of regional high-tech industry, impact on Arizona residents, and future career opportunities for students.

Objectives: AT LAST training will provide Arizona participants with the ability to:

1.1: identify key technologies associated with rapid-growth industry in Arizona.

1.2: understand the implications and impact of Arizona high-tech industry on regional economy, natural environment, and population.

1.3: identify and explain the basic concepts of research, manufacturing, applications, and markets of key technologies that drive regional industry.

1.4: outline the different academic and career pathways for students who wish to become science teachers, technologists, scientists, or engineers.

Goal 2: Enable participants to understand the purpose of technological literacy and its impact on student success.

Objectives: AT LAST training will provide all participants with:

2.1: understanding of links between technology and the natural, social, and designed world.

2.2: knowledge of how technology affects the lives and wellbeing of all people.

2.3: knowledge of research on technological literacy and its implications for teaching.

2.4: ability to apply technological literacy standards to science and non-technical disciplines.

Goal 3: Enable participants to leverage Web 2.0 capabilities and instructional technology tools to attract students to technology subjects matter and improve their technological literacy.

Objectives: AT LAST training will provide all participants with:

3.1: knowledge of how students use technology outside the classroom and how to channel these interests and motivation to the study of science and technology.

3.2: awareness of a broad range of Internet information and social interaction resources and how they can be tapped for technological literacy education.

3.3: ability to use Web tools to develop real-world learning objects (RWLOs) and eportfolios.

3.4: ability to maintain up-to-date knowledge on technology using Internet RSS news feeds.

Goal 4: Integrate research within the AT LAST project that addresses key issues and questions about technological literacy in education.

Objectives: The AT LAST research will:

4.1: define a model of technological literacy training for teachers.

4.2: explore methods to improve technological literacy via collaborative learning.

4.3: identify factors that increase and sustain interest in technology.

4.4: disseminate findings that benefit the improvement of technological literacy nationwide.

Key Project Staff:

I have met with the project team members listed below and have summarized their current position and their role and responsibility on the AT-Last project.

PI: Mr. Ostos is the Director for the National Center for Teacher Education (NCTE). Ray has led the initial project planning activities and hired Jeannette Shaffer as the project coordinator. Ray has demonstrated excellent leadership across all Arizona educational organizations needed to support the AT-LAST project and also been a strong advocate to market the project.

Project Coordinator: NCTE has hired a full-time Project Coordinator, Jeanette Shaffer to support project day-to-day operations under the PI's guidance. Jeannette has 16 years of teaching experience and is currently completing a PhD in Instructional Technology. Her prior experience in computer education and managing grants to integrate technology into the high school curriculum make her ideally suited to manage the detail project activities on this grant.

Co-PI: Mr. Gerry Corcoran, Executive Director of the Educations Professions program – provided opportunities to present the ATLAST Project at Future Educators of Arizona (FEA) state events for teachers and students, and provide the Career and Technical Education (CTE) Directors and FEA Advisors directories with contact information on teachers participating in the workshop training, hosting FEA Technology Summer Camp for FEA students, and reviewed the curriculum for FEA Technology Summer Camp for students.

Co-PI: Dr. Veronica Diaz, Director of the Maricopa Center for Learning and Instruction (MCLI) – has provided training materials to be used in workshops, consulted on curriculum and design of workshops, recommended Maricopa faculty to assist with workshop training and training of Project Coordinator, consulted on development of survey instrument, connected Project Coordinator with Arizona Technology Education Alliance (AzTEA), has invited all ATLAST participants to attend Maricopa's Teaching and Learning Technology Conference free of charge.

Co-PI: Dr. Karen Poole, Associate Director of Center for Workforce Development – connected the PI with industry partners, provided Program Coordinator with resources from previous technical project with AVNET, connected the project with resources available

within the Maricopa community (cybersafe DVD for workshop training),

Trainer: Ms. Shelley Rodrigo, Faculty Professional Developer at Center for Teaching and Learning at Mesa Community College - developed training materials for first workshop, helped with selecting and reserving facilities for workshop, main trainer for first workshop, consulted on Web 2.0 technologies.

Trainer: Dr. Steve Clayden, Program Director, Business / Personal Software Solutions at Gateway Community College – has not been involved at this time.

Project Technologist: Stu Rodberg, Maricopa Community College – designed logo for branding of project, created web page for ATLAST Project, created informational flyer for project, created email graphic to market first workshop, and installed Joomla for possible interactive environment/website for ATLAST Project.

Research Leader: Dr. Joseph Matoon, is serving as Research Leader and executes the research component of AT LAST. He has developed survey instruments to use with the pilot teacher cohort and has reviewed and analyzed their initial feedback.

I have requested responses to key questions to determine the effectiveness of the management and planning of the project work plan and have included them below. AT-LAST team responses are in italics:

Project Management:

1. For project management, provide feedback on the usefulness of the ZOHO project reporting tool. How is it being used? What type of information is posted, etc?

   Zoho Projects is a free Zoho web product. Zoho Project is the project management software used for managing project tasks, tracking milestones, communicating dates of meetings, providing ATLAST Co-PI with project updates, and housing documents for the project. Zoho Project is occasionally used for tracking time spent on project tasks but has not been used consistently. We have placed all the website links (ATLAST website, Facebook, Google Apps, blogs, etc.) for our project in Zoho for the ATLAST Team. They can be found under the tab for Documents. Once the document page is open click the ATLAST tag which can be found in the bottom right corner of the page under Popular Link Tags. The link for Zoho: http://atlast.projects.zoho.com

2. Do you have other reports such as a budget/actual expenditure report from the Maricopa College District for the grant? How often do you receive it?

   Pam Asti is supporting Ray Ostos, the PI in this activity.

   An Excel spreadsheet was developed to maintain current budgeting information for the ATLAST grant. This spreadsheet is updated as expenditures are incurred. This allows for a more current and accurate financial information. This spreadsheet is reconciled to the MCCCD web financial database every two weeks. This ensures that all expenses are recorded correctly in both systems. It may take over a month for an expense to be recorded in the MCCCD system. The ATLAST spreadsheet is located on the NCTE share drive so that everyone involved with the ATLAST grant may access it at anytime. The system allows for reports to be developed for internal and external purposes.

3. Please provide information on the AT LAST website development. What is the current development status, how it is intended to be used, any feedback/comments from users, etc?

   Currently, a page within the National Center for Teacher Education (NCTE) website has been designated for the ATLAST Project. This web page contains information about the project and a link to the workshop registration. In addition an education version of Google Apps has been obtained and set-up for ATLAST participants. Google Apps provides information about the ATLAST Project, workshop registration, workshop agenda, calendar of training events for participants, collaborative group work space for Tech Trio teams, collaborative applications for participants, learning journals (used for qualitative data collection and preparation for eportfolio), communication applications (email & chat) for project, ATLAST blog, and materials and training provided at workshops. A Joomla shell has been installed for a possible ATLAST web site that utilizes Web 2.0 applications.

4. The original project plan had 4 goals. Do we agree that we still plan to achieve these goals? *Yes.*

5. I do think that based on our initial cohort of teachers and their comments that they are

particularly focused on goal 3 as being of most benefit to their effectiveness in the classroom. Starting the initial training schedule and focusing on goal 3 is a very positive change from the original plan.) *Yes, I agree.*

Teacher and Student Workshops and Technology Training:

We have made significant changes in the planning of the teacher and student training and the timing which I believe has greatly increased the likely project success and its impact in the classroom. Working closely with the first pilot teacher cohort and understanding their readiness for the technology training as well as the capability of their school/classroom was a critical addition to the plan and although it requires a delay to the original training schedule plan it greatly improves the likely success of the project.

I have also extracted from the pilot teachers feedback survey document one question and the teacher responses which I felt was particularly supportive of the change made in the original training plan and schedule and shows the expectation which the teacher's have about the importance of this technology training in the classroom.

What do you personally hope to gain/learn from this experience?

1 .I would like to feel comfortable with the technology available to use it. I also hope to be able to demonstrate my competency so that I will be given technology. Right now I just have a desk top.
2. Better understanding of how to use some of the technology as well as gain the support of others who use technology well on a regular basis in the classroom.
3. How to best prepare my students for college/their future as far as technology is concerned.
4. I hope to gain more confidence in using technology so that I can keep up with the technology that my students use daily!
5. I hope to increase my technology skills.
6. Any and all new technology to keep the students motivated to learn in the classroom.
7. Relevance in my lessons. Teach my students to use the materials.
8. More technology applications that I can use in the classroom.
9. I hope to gain more personalized training to meet my students' needs in my classroom.
10. How to incorporate technology in my lessons to help my students use it in their F.E. lessons if applicable.
11. Specific ideas and knowledge about how to better use the technology I have (Moodle, iclickers, Smartboard) to be a more effective teacher and to learn some new ways to use technology to have students gain new connections to the subject of teaching and education. (like maybe video streaming of actual lessons, resources on line about lessons, etc.)
12. I would love to become comfortable with learning new technology.
13. Improved technology skills
14. I hope to learn about technology that will improve my lessons. Although I I'm getting better about some technology, there is other types that I still shy away from. For example, I

see how many teachers have made a website (page) to aid in their instruction. This can be a great resource for their students. This is something that still seems out of my reach.
15. Better understanding of technology usage
16. Ways to actively engage students through the use of technology.
17. How to integrate more technology into the classroom.
18. 21st century applications for timeless teaching skills.
19. I hope to be able to successfully integrate more technology into my daily lessons with students.
20. Increase my knowledge and comfort with the newest technologies.
21. I hope to learn how to use technology in a way that will make my students' learning more efficient and attractive to them.

Participants for Training:
There are two groups of participants: The primary recipients will be high school teachers and students in the Education Professions program.
The original plan is to provide training for 60 teachers and 1200 students (juniors and seniors) directly and then have the teachers implement technological literacy curriculum in their classroom. Students with a special interest in becoming science and technology teachers will be selected to complete the workshops with their teachers.
Teachers and students will be completing workshops separately for the first year so we have the opportunity to build-up teacher confidence when using technology. However, after the Summer Institute for Teachers and the Summer Tech Camp for students, teachers and students will work together to create Real-time Learning Objects (based on the technology they learned) to be used in the classroom. Workshops are available to all students and not just those interested in teaching science and technology. This provides the opportunity for the grant to have a bigger impact.
Note: It's not really mentioned here but participants will participate in the project for three years instead of one. This will lend to higher success rate of teachers implementing technology with students and becoming technological literate.

The primary recipients of the training will receive about 60 hours of training, 40 hours workshop and 20 hours self guided. Trainers will visit the schools periodically to provide additional guidance between workshop events. Workshops 1-3 will be completed consecutively by the teachers in August and early September. Four students will complete workshop 4 with their teacher and an additional four with workshop 5.
The training schedule has been altered because there was a need to understand our audience, their technology knowledge, and availability of technology in their schools. The first 3 months of the project was used to meet and visit teachers in their schools and at FEA state sponsored events. In addition, the original training schedule assumed that school districts, schools, and the state department of education would release in-service time for the ATLAST professional development to be delivered. This did not happen. We were forced to find another way to deliver the workshops. A Needs Assessment Survey was created to gather

information about the teachers' technology comfort level and dates when they would be willing to attend ATLAST Workshops. Based on teacher response Workshop 1 and 2 were planned for the winter of 2009. Based on experience as an Instructional Technology Resource Teacher the Project Coordinator planned for Workshop 1 to be offered in January and Workshop 2 in February. The reason for this adjustment is so that teachers can learn in chunks, take that information back to the classroom and implement a project in the classroom. After implementation, teachers attend Workshop 2 to reflect on their experience and to learn new technology that will be implemented in their classroom. Workshops 3, 4, and 5 will be offered as a summer institute in June. In between Workshop 2 and the summer institute (Workshops 3,4, 5), webinars, mini-sessions, and Tech Trio teams will keep the participants connected to the project.
One-on-one training was also been offered during the first 5 months for teachers. The Project Coordinator worked with teachers to implement technology they had in their rooms and were not comfortable implementing themselves. Teachers did take advantage of this opportunity and training included student response systems, blogs, eportfolios, and course management systems.

Secondary recipients will be provided with presentations about the project at the state Career and Technical Education (CTE) conference, the Future Educators of Arizona conference (FEA), and NACCTEP.

There is a plan to present a workshop session at a National Conference, NACCTEP.
The plan is to recruit secondary participants at two major annual conferences sponsored by NACCTEP and the league for Innovation, with two workshops at each conference over the three years.

The training team will consist of 2 rotating trainers, an instructional technologists and at least 6 Maricopa CC Technology faculty. Workshop 1 utilizes 2 Maricopa faculty as trainers for the workshop and support after the workshop. A third faculty member is assisting with Workshop 2 and will likely be a trainer. Trainers, instructional technologists, and Maricopa faculty are being accessed as needed to meet goals of the grant. ATLAST business partners may also contribute as trainers in future workshops.

Training Development:

Content and materials for technological literacy training will be prepared by re-purposing existing materials produced by our collaborating ATE projects and centers. These will include introductory modules like *The Semiconductor Transistor, The Fabrication of a Semiconductor, Introduction to Electronics, Micro-Electro Mechanical Systems (MEMS), Introduction to Biotechnology,* and *Nanotechnology: A Small World.*
The Project Coordinator is currently working with Maricopa's ATE center to potentially feature electronic modules that are part of MIT's I-Lab. I-Lab is being considered because the equipment and modules are available to high school teachers and technology is used to

remotely control equipment which is too expensive for most schools to purchase. I-Labs also encourage critical thinking and problem solving. The team will select elements from these materials that are most exciting, reveal key concepts, and are most compatible for re-design in an RWLO format. RWLOs will be introduced during the summer institute and teachers' RWLO will be completed in September,2009 with the assistance of an Education Professions that attended the student summer tech camp. The team will select materials and align learning objectives with standards developed by ITEA and the National Academy of Engineering. All workshop activities are being aligned with standards so teachers will be familiar with the standards before starting RWLOs at the Summer Institute. Training materials, scheduled events, assignments, and submission of completed RWLOs and eportfolios by participants will provided online via the AT LAST Web site. (Currently teachers' materials will be submitted to the Google Apps learning environment because teachers are not permitted to submit materials to the ATLAST web page linked to the NCTE web site. The Google Apps learning environment will be beneficial because teachers can post their own materials and take ownership of the environment. Every participant is an author and contributor instead of just an observer.)

Training Activities and Content:

Training content will be organized in three major areas: Technological Literacy: definition, purpose, impact, teaching methods, standards; Regional Technology: Arizona industry, community impact, academic and career pathways; Using Instructional Technology: Web-based resources and tools for developing RWLOs and eportfolios. Secondary participants will receive the same training with the exception of regional technology and stipends.

Technological literacy. The first three workshops will introduce teachers to basic concepts on technological literacy, standards, regional technology sectors, and how they affect students across disciplines.

This plan has been altered because we want to meet the needs of the teachers and meet them where they are at. The Needs Assessment Survey guided training being offered at the first training. Teacher participants are comfortable with technology they use daily but have not been exposed to a large field of technology. Several teacher participants are not confident in their ability to use the technology they have in their classrooms so the training will start with the major area: Using Instructional Technology. Workshop 2 will introduce teachers to the major area Technology Literacy and will expand the area of Using Instructional Technology.

Participants will be introduced to examples of RWLOs and eportfolios and the tools and resources they will use during training.

Learning journals will replace eportfolios for the first two workshops so teachers may concentrate on implementing the technology and reflecting on their learning experiences

until the end of the school year. Eportfolios will be mentioned but not introduced until the summer institute when RWLOs are introduced.

Trainers will introduce RSS news feeds and help participants set up their own accounts. The accounts will begin accumulating late-breaking news on science and technology according to each participant's search criteria which match their technology interests. RSS feeds will be introduced during Workshop 2 or Workshop 3. They will be introduced to the RWLOs templates and begin outlines for their first RWLO. Trainers will demonstrate templates, how to populate the fields with content, and how to transform completed templates into RWLOs that can be published on the Web. Similarly, Trainers will provide an introduction to TaskStream and guided practice that enable teachers to create an initial design for their eportfolios.

Google Apps (specifically Google Sites) will be used for the communication and eportfolios. Google Sites has a smaller learning curve and permits the participant to focus on content instead of learning a new system. In addition Google Sites is free, sustainable beyond the grant, and teachers may set-up Google Sites at their schools to use with their students. (The implementation of Google Apps is being modeled in a way that teachers could do the same with their students.)

Near the end of this workshop series, teachers will begin preparing materials and a lesson plan to begin implementing technological literacy curricula at their schools. The eportfolio will highlight a teacher's RWLO and learning experiences each school year. They will continue to use Web resources, templates, and tools throughout the academic year.

Regional technology. Some of the prevalent technologies within Arizona high-tech industry are: microsystems, semiconductors, electronic instruments, bio/medical devices, and nanotechnology. Technology Faculty will introduce basic concepts of these technologies, demonstrate aspects of high-tech manufacturing, and discuss related job markets, impact on economy, factors that determine student success in technology programs, and career pathways in industry. Technology Faculty will work individually with teachers and support teacher/student teams as they develop RWLOs that focus on technological literacy objectives. Faculty presentations, demonstrations, and direct support of participant hands-on learning, will be spread across the five workshops.

Regional Technology will be covered during the summer institute. However, teachers will be notified during the school year of any opportunities being offered by our industry partners, for instance presentations and speakers through the Nanotechnology group.

Using Instructional Technology. Follow-up training visits to schools will be scheduled periodically as needed to ensure smooth and continuous progress with the tools and projects

(RWLOs and eportfolios). Participants will choose technology topics for RWLOs that can be aligned with technology literacy objectives. Participants will have the option to collect and organize RWLO content from multiple sources: (1) articles and other informative material on technology (e.g., text and graphics) captured by their new RSS accounts; (2) introductory technology curricula produced by previous ATE projects; (3) results of their own online searches and downloads from technology education Web sites (many that are ATE); and (4) over 100 pre-captured and annotated URLs with links to full-text articles collected for this training via MyNSF RSS service. A Web-based interactive multiple-choice test template will be provided to enable participants to embed knowledge assessments in their RWLOs.. Participants will conduct tryouts of their RWLOs at their schools as they are developed during the academic year.

Yes, this will happen during Fall 2009.

They will be encouraged to seek out science and technology courses and conduct tryouts with students who are new to the technology being featured.

Yes, this will be encouraged or will be the assignment.

A provided evaluation sheet will be used to collect tryout data (e.g., learner perceptions of the RWLOs, scores on embedded assessments) and help participants revise and improve their RWLOs. *Yes.*

Training for using TaskStream will be conducted in a similar manner, but participants will do most eportfolio work after mastering the tools and techniques for producing RWLOs. Each individual's eportfolio will contain technological literacy achievements, RWLOs, lessons learned and skills developed for instructional technology, plans for continuing to advance their own technological literacy, and plans for implementing technological literacy as practicing teachers. *Yes.*

Science and Technology Teaching Symposium. Training will culminate with a Symposium that enables participants to show, share, and celebrate their achievements and network with education and technology representatives across Arizona. Key educators (e.g., CTE Directors, K-12 administrators), representatives from Arizona high-tech industry employers, and parents will attend.

Yes, in 2010 … this event may be held at the State CTE Conference in Tuscon.

Attendees will learn how education is being aligned to meet workforce needs through technological literacy. A judging process will be used to provide cash prizes and recognition awards for the best RWLOs and eportfolios.

Research, Assessment and Evaluation:

Joe Matoon has been involved and supporting the development of survey instruments and reviewing feedback from teachers. Please comment on his involvement and how it has helped in the development of the training plan to date.

A research component will be embedded in the AT LAST project to further our knowledge and understanding of teacher technological literacy. Dr. Greg Pearson, Program Officer, National Academy of Engineering and co-author of *Tech Tally*[6] and *Technically Speaking*[2] a comprehensive review of technological literacy, was consulted prior to formulating this plan. Information we acquired from discussions and research findings of the Academy verified the need for the research proposed here. For greater efficiency, measurement efforts and materials will be jointly applied for learning assessment, evaluation, and research purposes.

Joe Matoon has created a general data capture sheet for school visitations with teachers and/or students. It is a tool to be used to capture data that would not otherwise be captured in surveys or workshop observations.

These include periodic assessment of participant learning, skill development, attitudes toward technological literacy, and perceptions of the technology tools.

Joe Matoon assisted the Project Coordinator and Co-PI Veronica Diaz in creating the Needs Assessment Survey. The Needs Assessment Survey was used to capture teacher participants' comfort level and knowledge of technology.

Most assessments will be administered online for both primary and secondary participants.

Yes, the Needs Assessment Survey was administered using Surveymonkey.com.

Results will drive feedback and support for learning, formative evaluation and revision of materials and training methods, and identification of indicators of project impact and success.
Yes, this guided the training of the first workshop.

Assessment data will be shared with the External Evaluator for greater efficiency and consolidation of resources. AT LAST research questions address the nature, current level, and attitudes associated with teacher and student technological literacy. Their function is to guide the training and help reveal factors that contribute to increased knowledge and skills associated with technological literacy.

Joe Matoon has created a workshop evaluation tool to be used at the end of each workshop.

The close relationship between AT LAST training goals and technological literacy research questions is the reason we combined research and evaluation efforts. Broad research and evaluation questions stated in the plan, but the design research method to be employed often reveals more specific questions to pursue as results unfold.

Yes, we are doing this with Mr. Matoon's assistance. We will discuss what tool is the most appropriate for the situation in order to collect the needed data.

Quantitative and qualitative measures will be employed to assess effectiveness and impact of the training.

Yes… Needs Assessment Survey, Data Capture Sheet, and Workshop Evaluation. Teacher participants' learning journal will also provide qualitative data. Google Analytics will be used to track web metrics but Mr. Matoon said this was not real valuable data as far as research is concerned. It will mainly be used to track participants' behavior in Google Apps and how we can improve the resources and usefulness of the learning community.

As noted by the National Academy of Engineering in an extensive longitudinal study, a clear definition of technological literacy is needed before the most effective training and assessment can be developed. We used the three-dimensional model produced in the Academy's study to devise more specific indicators of teacher technological literacy (Figure 1). The three dimensions identified here reflect the knowledge/skill focus of AT LAST training.

Research Questions

We are not far enough long to answer any of the below questions but the first thing we did is find out where the teachers are with their technological literacy level and designed training to meet them at the level where they are. This was in an effort to not overwhelm them and cause them to become discouraged.

1. What training events are critical to achieving each dimension of technological literacy?
2. What are the most motivating aspects of technological literacy learning?
3. What are immediate benefits of future teacher technological literacy?

Evaluation Questions

1. Are the training methods effective in improving technological literacy?
2. Is the training disseminated and used widely enough to produce the expected impacts?

Each workshop is being offered in two locations based on areas with the highest concentration of participants. Workshops are also being offered in two formats. One as a full-day Saturday workshop and the other as a two part workshop offered in the evenings. This was done with the purpose of working around teachers' teaching schedules.

Assessment

Competency-based pre-tests, posttests, direct observation of individuals and teams at work *(This is planned for the first workshop),* interviews, focus groups, and criterion-based evaluation of participant RWLOs and eportfolios will be used to measure the three dimensions of technological literacy identified in Figure 1: Knowledge and Awareness, Critical Thinking and Decision Making, and Capability to Apply Knowledge. In addition, the Research Leader and External Evaluator will track changes in attitudes, perceptions, participant feedback, and participant choices in technology topics. Attitudes toward technology are also important indicators of "knowledge and action intentions" as well as progress toward literacy.

Competency-based knowledge tests with mixed response types (multiple-choice, short-answer, free response) will be used to measure awareness and knowledge of regional high-tech industry and the impact and opportunities afforded by the technologies they represent. An initial comprehensive pre-test will assess baseline technological literacy. Short pre-tests and posttests will accompany each major training event such as Technology Faculty demonstrations and guided team discussions on high-visibility topics (e.g., growth and impact of biotech on Phoenix economy and ecology). Pre- and posttests will be designed to measure knowledge and capability to plan, develop, and use RWLOs and eportfolios using the provided instructional templates and tools. Competency-based questions will also address participant ability to knowledgeably weigh advantages and disadvantages of technology dependence, different applications, and regulation policies based on expected impact (e.g., environmental impact of Phoenix Metro semiconductor manufacturing).

Measures of affective elements will be intertwined with training events. Participants will complete a comprehensive survey prior to beginning training as part of the online enrollment process. It will assess initial attitudes, technology concepts, perceptions of technological literacy, and expectations of the training.

This was accomplished using the Needs Assessment Survey.

Short evaluations and surveys will accompany each posttest to capture participant perceptions of the event and learning materials to reveal interest and level of motivation toward the activities and the featured technology topics. Near the end of training, a survey of "future plans and career intentions" will be used to reveal changes in perceptions and attitudes and provide an opportunity to explore other training effects such as teachers being more inclined to explore the use of other online instructional resources or students more inclined toward a science teaching career.

Much of the data collected will be used for more than one function—research, formative evaluation, and/or summative evaluation. For example, scores on fact-based questions about regional technology will be matched to training objectives to assess effectiveness of instructional methods (formative evaluation), and the same data will be

examined to look at the correlation between knowledge gain and attitude toward technical subject matter. Similarly, assessments of participant RWLOs and eportfolios will reveal the level of skill gained via training, popularity of certain technology topics and multimedia formats, and participant "mental models" of what best demonstrates achievement of technological literacy. Teacher and student participants will be randomly selected across and within demographic groups for interviews and focus groups. The collection of qualitative data on perceptions and motivational factors will provide additional information on elements that can be added, emphasized, or removed from the training design to maximize interest and retention.

Secondary participants will complete a similar but reduced set of online pre- and posttests, surveys, and individual interviews. They will submit RWLOs and eportfolios via the AT LAST Web site and will receive feedback on quality and recommendations for improvement in the same manner as primary participants. Since the secondary recipients will have a different experience it will be worthwhile to do a follow-up at the end of training and six months later (could be an e-mail survey) to determine the teacher's success in applying the training in the classroom. It would be a qualitative assessment but if we perform the same survey with the primary participants it will be interesting to see if the classroom outcomes are the same.

Here were some summary thoughts about evaluation and measures of project performance, success and impact which I plan to include in subsequent evaluation reports as we gain feedback from both teachers and students involved in the AT LAST project and workshops.

Summative measures of project success (across and between demographic boundaries and project years for primary and secondary participants) will include, but not be limited to:

Quantitative: number of teachers and students offered training, number of participants who complete training, technology knowledge and skill score gains, gains in attitude scores, number and type of educator and industry representatives who actively support the project.

Qualitative: participant attitude, technology confidence, and perception of training value as evidenced by interviews and open-ended questions and comments on surveys, permanent adoption of AT LAST curriculum as evidenced by opinions of CTE and school administrators.

The external evaluation will focus on major project goals but will also identify unexpected outcomes which will be discussed in annual evaluation reports and shared with project leadership to assist in-process formative evaluation and improvement.

When appropriate, the external evaluator will verify the perceptions of Trainers, Technology Faculty, and Instructional Technologists and the Research Leader's findings with his own observation methods to ensure accuracy and non-biased conclusions.

This will include directly observe implementation of technological literacy learning activities in the classroom and evaluate RWLOs and eportfolios produced by teachers and students.

Differences between students who complete workshops and those who don't and differences between the performance, retention, and outcomes of primary and secondary participants will be analyzed.

The evaluation process will review qualitative and quantitative data on the dissemination of the AT LAST training model and research findings to determine broader impacts and sustainment of innovations.

Finally, the following assessment questions will be probed:

Is there a profound and lasting change in teacher performance caused by this training?

We can probe this with follow- teacher interviews or electronic surveys at regular (6 month intervals) while the project is on-going.

<u>Appendix –</u> **Workshop #1 Evaluation**

(8 teachers---conducted on Saturday, January 24,2009 at Glendale Community College)

Ratings were a 4 point scale: Strongly Agree, Agree, Disagree, Strongly Disagree

The

The survey covered the following topics:

Facilitators demonstrated ample knowledge of technology and its value to teachers.

Strongly Agree-6; Agree-2 (Clearly, the teachers were impressed with the quality and knowledge of the technology trainers!)

The goals and outcomes of this workshop were explained clearly.

Strongly Agree-5; Agree-1; Disagree-2.

The presentations and speakers were effective in engaging my attention.

Strongly Agree-5; Agree-3

The training activities helped me understand what I was expected to do and why.

Strongly Agree-3; Agree-4; Disagree-1. (In discussions with Jeannette Shaffer, the first workshop needed to spend more time on the hands-on activities which was addressed in the second cohort for workshop #1.)

Materials provided will assist me to implement the technology in my classroom.

Strongly Agree-5; Agree-3

The workshop helped me to connect, network, and team with teachers from other

schools.

Strongly Agree-5; Agree-3

Facilitators gave good advice on how to begin implementing the tools at my school.

Strongly Agree- 4; Agree-3 (1 did not respond)

I would recommend this workshop to other teachers

Strongly Agree-7; Agree-1

(This is a strong positive endorsement !)

I will be able to incorporate the information and tools in my classroom.

Strongly Agree-3; Agree-4 (1-not sure)

The fact that already 50% have scheduled with Jeannette to visit their school and meet personally to plan how to implement in the classroom is a very positive indicator.)

Only one teacher appeared to question how to use this technology in the classroom in her response.

<u>Other comments from teachers:</u>

<u>Aspects of the workshop which were most valuable:</u> Demonstration of Google Apps and starting my own blog.

Learning how to set-up my own blog and it could be a great tool in my classroom.

Google Apps Clickers and Polling

Working thru the ATLAST website

The hands-on aspects

Great information

Knowing who to contact with questions