

## *EXECUTIVE SUMMARY*

# EXPORTS, AMBASSADORS, AND CATALYSTS FOR CHANGE

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## The West Virginia Turnkey Solution Project — Final Report

### **Introduction**

West Virginia is divided into fifty-five counties, all of which have participated in Phase 9, the centerpiece and professional development component of the Turnkey Solution Project, a 1998 recipient of a \$7.2 million U.S. Department of Education Technology Innovation Challenge Grant. Since the first Phase 9 session in the spring of 1999, just over 1700 kindergarten through twelfth grade teachers have attended the week-long training, conducted by the EdVenture Group, which has, in collaboration with the West Virginia Department of Education and other partners, guided the project through five productive years. Working in interdisciplinary teams, Phase 9 teachers have created nearly 1,000 curriculum units, comprised of almost 6,000 standards-based, technology-rich, peer-reviewed lessons that span the entire curriculum, from core academic subjects to the arts, foreign language, and physical and vocational education.

These curriculum units reside on The Solution Site, the project's public web site, which currently averages about 1,355 hits per day. The site has attracted users from across the U.S. and from thirteen other countries, as well as national attention from teachers looking for creative, well-designed lessons aligned to content standards. The Phase 9 training model itself, refined over the project's five years, has also garnered the attention of educators with goals and interests similar to those of teachers trawling the Web in search of substantive lessons. Most are looking for innovative ways to help teachers embrace technology, use it well, and apply it to standards-based instruction—increasingly critical needs in a climate of rapidly changing technology, limited funds, and heightened accountability.

For a project primarily focused on professional development, the numbers of teachers trained and products created are critical measures of success. And, by all counts, the Turnkey Solution Project has more than met its goals of training teachers to use technology and creating an interactive website that provides a rich online resource for educators in West Virginia and beyond. As vital as these exports and ambassadors are, other Phase 9 support and dissemination pieces are equally important to the project's success and staying power. Before teachers attend Phase 9, they must complete the state-approved Technology Standards for Teachers prerequisite class to

gain the skills needed to complete the training successfully. After they complete Phase 9, teacher teams are required to train at least thirty colleagues in their home sites. The Phase 9 model also includes training for building principals—additional insurance that teachers have local administrative support and a voice in local technology and curriculum planning.

These project activities have brought the total numbers of teachers trained to almost 19,000 statewide, and helped secure a critical mass of proponents among teachers and principals. They have also helped the project meet its own dissemination goals as well as the Technology Innovation Challenge Grant program goals of using technology to leverage change and bring about sustainable school reform. The degree to which changes are sustained depends in large part on what the teachers themselves do, or at least set in motion: how deliberately they use their training and The Solution Site, how extensively they spread the training to others, how effectively they use the instructional resources and strategies with students, and how demonstrably everything devoted to enhanced learning translates into improved performance.

Students are, of course, the ultimate recipients of large-scale reform efforts, and, in addition to setting ambitious training and dissemination goals, Phase 9 leaders and other stakeholders also hoped to raise student achievement. As Project Director Lydotta Taylor frequently asked of the project and of the evaluation team, “Is it making a difference?” Though often the most compelling measure of a project’s success, improved student achievement is often the most elusive goal, especially when projects are, like this one, devoted primarily to bringing about changes in teachers and teaching and putting training and dissemination models in place.

In designing the summative evaluation, ROCKMAN *ET AL*, the project’s external evaluators for the grant’s final two years, continued to look at the capacity the project was building in teachers and in schools, but with an eye to whether it could be tied to measurable changes in student achievement—and, if so, what factors combined to produce those changes. We began with certain indicators. A Year 4 review of state standardized test scores showed slightly higher scores in counties where Phase 9 concentration was greatest. Teachers and administrators confirmed that they saw Phase 9 as an integral part of their concerted efforts to comply with state and federal standards for student achievement. Survey and site-visit data indicated that Phase 9 teachers were more attuned to standards and more confident in creating standards-based lessons.

These teachers were also, according to survey data, doing things differently in their classrooms: students were using more technology and more research and inquiry-based projects. Site visits and interviews with teachers, trainers, and principals confirmed that Phase 9 was a “catalyst” for change, not just in the degree to which teachers used technology but in what they used technology for. Evidence of gains among students was showing up in areas not typically captured in standardized measures: students from Phase 9 schools were, for example, taking prizes at regional Social Studies fairs. Statistical analyses of the Year 4 data also suggested that the value

of the Phase 9 model went beyond the tangible skills and products teachers were taking back to their classrooms. There were also intangible outcomes that benefited entire schools and had the potential to improve learning: a commitment to training others, a culture of sharing, increased networking, and a growing sense of leadership among Phase 9 trained teachers.

The challenge was to figure out how to link all the elements. The research design we developed and implemented in Year 5 attempted to do that—to continue documenting the ways in which Phase 9 has increased the thoughtful integration of technology and served as a catalyst for other technology-related initiatives, to assess longitudinal changes in student achievement in areas where that capacity exists, and to tease out those implementation factors most closely related to increases in student scores. The goal was not only to find the links, but also to inform project leaders as they looked for ways to sustain changes and export what appears to be a highly effective model for professional development.

## **The Research**

ROCKMAN *ET AL* conducted a series of summative evaluation activities during the project's fifth year to assess its impact on teachers, students, and schools. The methodologies used for the two major studies—one a study of changes in teachers and the other a study of student achievement—are outlined below. Descriptions of additional studies designed to triangulate findings follow.

### ***1. Studies of Changes among Teachers***

#### **A. Research Questions and Sample**

In May 2003, we administered an online survey to all teachers who had participated in the week-long Phase 9 training over the past 5 years. Guiding our research were questions such as:

- What is different in Phase 9 teachers' classrooms?
- How has Phase 9 influenced teachers' use of technology?
- To what extent have teachers used The Solution Site to integrate technology into curriculum and instruction?
- To what extent have teachers been involved in dissemination activities, and how have their efforts affected local use of technology and support for other technology-related initiatives?
- In what ways has Phase 9 participation affected school climate and created a sense of professional growth among teachers?

Approximately one fifth of the teachers trained by Phase 9 completed the online survey. Our final sample consisted of 297 teachers in grades K through 12, from a total of 201 West Virginia schools.

## B. Methodology and Data Analysis

To gain a more in-depth understanding of teachers' current classroom practices and other changes related to Phase 9 participation, we conducted a series of quantitative analyses designed to look for differences, trends, and evidence of the impact. They included:

- 1) Frequencies, crosstabs, and descriptive statistics to examine differences between individual items and composite means based on grade, subject taught, or year of participation in the project.
- 2) A paired comparison *t*-test to examine pre/post change scores in items related to teachers' classroom use of technology resources before and after Phase 9 training, and to establish statistical significance.
- 3) A reliability analysis to establish the internal consistency of individual survey items and the degree to which they actually measured what we intended.
- 4) An examination of simple descriptive statistics to check the distributions of our nine constructs, to ensure the variables were normally distributed and did not require transformations prior to regression analysis.
- 5) Regression analysis to examine relationships between the nine composites measured by our survey, controlling for differences based on years teaching experience, school enrollment, grade, and year of participation in the program.

## ***II. Studies of Student Achievement***

The second in-depth study conducted during the Phase 9 project's final year was a two-part examination of student achievement. The study allowed us to look closely at the classroom while also analyzing the broader impact of the project through statistical analysis of students' standardized test scores.

### A. Classroom Study

In the 2002-2003 school year, researchers conducted a pilot study that used multiple measures to assess the impact on student learning of teacher-created online lessons from the project's website, The Solution Site (<http://thesolutionsite.com>). Researchers worked with the West Virginia State Department of Education to create an original pre/post instrument that used teacher-made items, textbook items, and items from the Golden Horseshoe Exam, an eighth grade test that has been used to evaluate student learning in West Virginia history for over 75 years. Students in the experimental group completed the pre/post-tests before and immediately after their week-long lesson, as did the control group, whose traditional lesson covered the same content. Both groups also took the post-test one month later. The pilot study also included qualitative data (a portfolio of classroom artifacts, email interviews with students, a phone interview with the teacher, and technology aptitude surveys). The findings complemented a larger twelve-classroom study,

conducted by West Virginia University in Years 4 and 5, that used teacher-designed tests but no standardized instruments or qualitative data.

#### B. Statistical Study

This study looked at the longitudinal effects of teachers' participation in Phase 9 training on student achievement. Using individual student data provided by the West Virginia Education Information System (WVEIS), researchers examined the impact of Phase 9 on students in 5<sup>th</sup> through 8<sup>th</sup> grade, by test and by grade, using three different sets of analyses.

- 1) A paired sample *t*-test procedure allowed us to test for significant change in Phase 9 students' pre/post achievement test scores on the SAT-9 standardized achievement test used throughout West Virginia during the period of study.
- 2) Having isolated significant changes in test scores, we used a regression analysis of between-group differences, Phase 9 vs. Comparison, to compare the test scores of students in Phase 9 classrooms where significant growth had occurred to the scores of a comparison group of students (from the same districts as the experimental group but from schools with no Phase 9 teachers), controlling for extraneous variables such as ethnicity, gender, and special education identification.
- 3) Hierarchical Linear Modeling (HLM) allowed us to determine which changes in teacher practices resulting from participation in Phase 9 best predict their students' Spring 2002 test scores, controlling for students' test scores prior to teacher participation in Phase 9, as well as an index score created using multiple measures of a school's overall past Phase 9 participation. We assessed the extent to which participation in Phase 9 by teachers affected their students' achievement directly, and what changes in teacher practices tied to Phase 9 resulted in higher achievement for students.

### **III. Additional Studies**

- A. Surveys and Interviews with Principals
- B. Survey of 2nd Generation Teachers
- C. Phase 9 Training Pre/Post Study
- D. Solution Site Studies
  - 1) Pop-up Unit Survey
  - 2) Site Analysis
  - 3) Trainer and Expert Interviews

## The Findings

### I. Teachers

- ***As a result of Phase 9 training, teachers are using more technology in their classrooms and using it more often than they did before their participation in the project.*** Data from the 2003 teacher survey show statistically significant increases in teachers' use of computers in general, the Internet and the Web, email, word-processing software, multimedia software, digital cameras, desktop publishing, and presentation software. For each of these applications, the majority of teachers attribute increases in use to participation in Phase 9.
- ***Participation in Phase 9 helps clarify, deepen, and reinforce teachers' understanding of pedagogy.*** A third of the teachers responding to the survey reported that the training increased their understanding of constructivist principles "a lot," another 48% said "somewhat." Similar percentages (28% and 50%) said that the training increased their ability to incorporate constructivist strategies into their teaching. In some cases, the training gave teachers the theoretical underpinnings of what they were already doing in their classrooms. In others, it gave them practical ideas for how to translate the theories they already knew into practice.
- ***Phase 9 training enhances not only teachers' technology skills but also their ability to integrate technology into instruction, thus avoiding the separation of technology and classroom practice that has handicapped some technology training and made technology an add-on.*** Teachers' responses to various survey questions indicate that Phase 9 training has significantly increased their skill and comfort with technology. Perhaps more important, many say that it was "the process of developing units and lessons" that took them to that next step of becoming "more effective in using technology with students" and integrating "technology into the curriculum more easily."
- ***Phase 9 has helped teachers become more attuned to content standards, more confident in designing instruction that meets them, and more knowledgeable about how to integrate technology into standards-based lessons.*** Given the push for standards-based instruction, it is unlikely that Phase 9 could take all the credit for teachers' growing understanding of how to meet standards. However, it can take a great deal of credit for supporting such efforts: the overwhelming majority of teachers (97%) say they have, over the last few years, learned more about how to use technology to meet standards; half say this is "mostly" or "wholly" due to Phase 9; another third say it is at least somewhat due to the project. Just over 80% of the survey respondents say that Phase 9 helped them create and use standards-based lessons. Similar percentages

(81%) of the Phase 9 teachers also report that they “often” or “routinely” ask students to complete instructional tasks related to district or state standards; just over half say this is due to Phase 9.

- **Phase 9 teachers say that the project has helped them make significant changes in classroom practice and how they use technology with students.** Survey responses and comments from teachers indicate that Phase 9 gives them skills and knowledge they can use. As one teacher noted, “having knowledge by itself doesn’t mean much, but when you can use that knowledge to enhance student or teacher learning, that makes all the difference.” A majority of Phase 9 graduates say that their students often or routinely use technology integrated in inquiry-based learning projects, make presentations or share products, research topics they select, evaluate information, work on long-term projects, and analyze or synthesize information to solve problems. Many schools are engaged in a variety of initiatives that encourage such practices, but close to half or more of the teachers responding to the Phase 9 survey say these practices have increased as a *direct* result of Phase 9.
- **Feedback from principals confirms that Phase 9 teachers are different.** Principals continue to say that Phase 9 teachers use more technology than those who have not had the training, and are more likely to try new technologies and use technology in different ways. When asked if someone visiting their school could spot Phase 9 teachers, 85% of the principals surveyed said “yes”—not only because they’re the teachers with laptops, but because their students are more likely to be using technology to do their work. If the visitors lingered, principals say that they could also see that Phase 9 teachers are more willing to try new programs, spend more time preparing lessons that are exciting and teach relevant concepts, and more willing to assist their colleagues and collaborate with them on lessons and projects.
- **More recent Phase 9 graduates appear to be taking a wider range of skills back to the classroom.** Graduates of the earlier years of Phase 9 training provided, in their home sites, specific training in applications such as PowerPoint, use of the LCD projector, and introduction to The Solution Site lessons. Later graduates seem to serve as on-demand technology mentors, offering a greater variety of skills and advice and taking the lead in technology and curriculum planning.

## II. Students

- **According to teachers, Phase 9 has made a noticeable difference in students' classroom use of technology.** Two-thirds of the survey respondents indicated a significant change in how and how often students use technology; another one-fourth see at least a moderate change. Just over a half of the respondents see significant changes in the kinds of technology students use and the kinds of assignments and research they do; another third noted a moderate change.
- **Teachers also indicate that Phase 9 has improved student motivation and learning.** Forty percent of the Phase 9 trained teachers see a significant impact on students' use of higher-level thinking skills and motivation; an additional 45% note at least a moderate impact. Similar percentages see a significant or moderate impact on students' understanding of the curriculum, collaboration with peers, and achievement.
- **A study comparing content taught with a Solution Site lesson with traditional classroom materials suggests that The Solution Site helps teachers engage students in the content, motivate them to complete assignments in innovative ways, and retain content longer.** Although students whose teachers used a Solution Site history unit made similar gains in pre/post-tests of content when compared to students who used other materials, those who used The Solution Site appeared, according to their teacher, more motivated and more willing to go the extra mile. Interestingly, they also had higher content retention than their peers when tested a month following the lesson.

*Note: The following findings are from the statistical study of standardized test scores of 1,915 students in grades 5, 6, 7, and 8, in classes of 29 Phase 9-trained teachers. The study compared their scores to those of a matched comparison group of 975 students from the same districts as Phase 9 schools, but from schools where teachers had not participated in Phase 9.*

- **A review of standardized test scores for students in classes of Phase 9-trained teachers showed significant positive changes at 6<sup>th</sup>, 7<sup>th</sup>, and 8<sup>th</sup> grades—for every grade level studied except for 5<sup>th</sup>.**
  - **6<sup>th</sup> grade Phase 9 students made gains in two content areas, Social Studies and Reading.** 6<sup>th</sup> grade Phase 9 students' abilities in reading-related skills such as vocabulary, word knowledge, and skills related to understanding facts and concepts and making inference from written materials were significantly better after exposure to Phase 9-trained teachers than they were prior to exposure. 6<sup>th</sup> grade Phase 9 students also had statistically significant positive growth in Social

Studies. The gains were apparent from 1999 to 2002 and from 2001 to 2002. Comparison group students showed negative change in these content areas, but had significant growth in Math and Science. 6<sup>th</sup> grade Phase 9 students also showed positive growth in mathematics, science, and total basic scale scores, but the change was not large enough to be statistically significant.

- **7<sup>th</sup> grade students in classrooms with Phase 9-trained teachers showed a significant increase in knowledge and skills related to investigating problems in science and recalling scientific facts and concepts.** In Science, Phase 9 students had statistically significant positive growth from baseline to 2002, with scaled test scores that were 21 points higher on average; they also showed statistically significant positive growth from 2001 to 2002, scoring 13 points higher on average. Overall, however, 7<sup>th</sup> grade Phase 9 students had change scores that were lower in all SAT-9 content areas (results show significant change based on special education status). 7<sup>th</sup> grade comparison-group students' scores declined as well, showing a statistically significant *negative* change in all content areas; in Science, the negative change was not quite large enough to be significant at the .05 level.
- **8<sup>th</sup> grade Phase 9 students showed gains in Total Basic scores and in Math and Science.** 8<sup>th</sup> grade Phase 9 students showed a positive gain of approximately 8 points on average in their Total Basic scores from baseline to 2002. This growth was significantly different and higher than comparison group students'. Phase 9 students' gains in Math (603 to 613, 10 points) and Science (578 to 583, 5 points) were also significantly different, and higher than comparison group students.
- **Statistical analysis of test data showed significant growth for 8<sup>th</sup> grade Phase 9 students in:**
  - Vocabulary or word knowledge and skill related to understanding facts and concepts,
  - Problem solving and procedures related to mathematics,
  - Knowledge and skills related to investigating problems in science and recalling scientific facts and concepts, and
  - Knowledge of concepts, and generalization and inquiry skills related to effective problem solving in the social sciences.
- **5<sup>th</sup> grade Phase 9 students had change scores that were, overall and in all content areas, slightly lower than comparison students'.** The Social Studies scores, from baseline scores to 2002 scores, were significantly lower, with an

average change score of negative 10 points compared to a positive change of 33 for comparison group students. Interestingly, further examination by gender showed that male Phase 9 students actually showed positive growth (+18) on average—it was female 5<sup>th</sup> grade Phase 9 students who had a decrease in performance. However, the growth by male 5<sup>th</sup> grade Phase 9 students was still lower than comparison group 5<sup>th</sup> grade male students. Further examination of the data showed no statistically significant differences by special education status.

- ***Phase 9 students in the lowest SES category consistently had change scores that were positive and always significantly higher than students in other SES categories.*** This might suggest that Phase 9 has a greater effect and is more beneficial for teachers of students in lower SES schools. It is difficult to draw this conclusion on these data alone, however, because we did not have any comparison-group students in the lowest SES category.

### ***III. Dissemination Activities and The Solution Site***

- ***Analysis of student achievement data and teacher practices revealed that a key determinant of student achievement was the level of dissemination of Phase 9 practices within a school.*** It seems clear, from statistical analyses of survey data from Phase 9-trained teachers, that there is a synergy between what teachers gain from Phase 9, what support they have in their schools, and what changes they make in their classrooms.
- ***Participants from the first year of Phase 9 training reported a significantly higher rate of dissemination efforts when compared to teachers participating in the four subsequent years.*** This may be the result of several factors: these teachers have had more time to train teachers and take part in dissemination activities (suggested also by the fact that 2002 and 2003 teachers reported lowest rates). It may also be that the earliest participants were the most enthusiastic technology users to begin with, the real trailblazers, and they continue to encourage their peers. It may also be that, with more and more teachers trained, and with teachers from smaller, more remote areas participating, there are simply fewer teachers to train.
- ***The Solution Site continues to win positive responses from teachers in and outside the Turnkey Project, who commend it for the ease of use, the richness of the content, and the value of teacher-created, standards-based lessons.*** Many of the satisfied Solution Site users are Phase 9 teachers, but data from site use show that the majority of users are not—and that the site has a robust life of its own outside the

project. Regardless of their location, visitors to the site are most likely to be searching for specific topics.

- ***Trainers see a positive trend in the quality of units submitted to the review process, one that reflects national trends in technology integration.*** Trainers and expert reviewers observed an increase in the technical and pedagogical quality of the units. Trainers see greater emphasis on integration to content standards as well as shifts toward rubrics and other authentic forms of assessment. These changes reflect not only the refinement of the Phase 9 training, but also state and national emphasis on standards and assessment. Technically the units are more stable and sophisticated; the activities designed for students still rely heavily on word processing, although opportunities to create products with PowerPoint and Excel are increasing.
- ***Solution Site units with a language-arts focus continue to top the list of the most popular units.*** Seven of the past year's most popular units are language arts-related, and targeted to K-1 or 5<sup>th</sup>-6<sup>th</sup> grade students. The most popular (gauging by the numbers of visitors to The Solution Site) are "Cruisin' the Island of the Blue Dolphins," (a unit frequently used in training) and "The Adventures of Tom Sawyer." Units new to the site this year also ranked among the most popular.
- ***Phase 9 teachers continue to use the site for ideas and activities, generally more often than for entire units.*** Respondents to the 2003 teacher survey were four times more likely to use selected lessons and activities than the entire unit. Even with their own units, Phase 9 teachers are more likely to pick and choose than to use units in full. High school teachers are more likely than teachers in lower grades to use their own units, perhaps because they are more tied to schedules, specific content, and course rotations.
- ***Teachers report that they are more likely to use Solution Site units in fairly traditional ways, and that they tend to interact with the web-based activities somewhat more than students do.*** Data on classroom implementation show that teachers use Solution Site units more often with full classes than with interdisciplinary teams or students engaged in independent projects. Teachers are gradually encouraging students to interact directly with the unit and lesson activities, combining online activities with paper copies of student activities.
- ***The strength of The Solution Site continues to be the course content.*** While there seem to be positive responses to the recent site innovations, such as the revised search options, it may take time and some additional promotion for these to catch on. Only a few educators have used The Solution Site's newer features—a message board, a student artifact site, and reviews section.

- **Efforts to address goals related to pre-service teachers are underway.** Creating Solution Site features especially for pre-service teachers, long-term goal of the Turnkey Solution Project, is part of the current plans. Project personnel have recently focused more of their attention on this aspect of the Phase 9 training. In addition, a section of The Solution Site especially for prospective teachers is under construction.

#### **IV. Schools, School Climate, and Sustainability**

- **A positive school climate, measured by items such as flexibility of school curriculum, principal support of technology use, Internet access, and a shared vision among teachers—all endorsed and often created by Phase 9—appears to contribute to student achievement.** When examining the classroom level predictors, we found that SAT-9 reading scale scores were significantly higher on average for students in classrooms of teachers who reported a school climate that is more supportive of Phase 9 activities. A 1-point difference in reported School Climate and Support is associated with a positive 2.10 point difference in students' spring 2002 SAT-9 reading scale scores on average, while controlling for their previous year's score and special education status.
- **There is also a clear correlation between factors such as a positive school climate and support for Phase 9 activities and student achievement.** Indeed, school climate and support of Phase 9 activities explains approximately 99 percent of the original 17 percent of variation in students' reading scale scores attributed to teacher/classroom level differences. The fact that nearly all of the variation in students' reading scale scores is associated with the extent to which a school supported Phase 9 activities is exceptional. That school administrators supported and encouraged teachers engaged in Phase 9 activities is an indication of both the potential value of the efforts as perceived by the school-site administrators and the very evident outcomes on student performance noted by teachers.
- **Phase 9 teachers continue to be engaged in local activities that improve their colleagues' skills and their schools' overall capacity.** Phase 9 graduates are most active in providing informal help with technology to colleagues (85%), but three fourths also serve on technology or curriculum committees and share lessons across grades and subjects. Almost two-thirds help write technology or school improvement plans, or conduct formal training and professional development. Approximately half of the Phase 9 teachers make presentations, attend conferences, or share ideas with other schools. Although numbers are smaller, a third are also writing grant proposals.

- ***The skills, ideas, and support Phase 9 teachers share in their own schools have a positive impact on school climate.*** Almost 60% of the teachers surveyed see a significant change in all teachers' fluency in using technology for teaching since the start of Phase 9; combined with those who see at least a "moderate change," the total comes to 92.8%. Just under half also see a significant change in teachers' satisfaction; again, combined with those who see a moderate change, the totals reach almost 90%. The same is true of changes in teachers' involvement in school improvement, in teacher collaboration, and in increasing the depth of the curriculum they teach.
- ***Teachers gain personally from Phase 9 as well.*** Phase 9 teachers report being reinvigorated by the sharing and collaboration encouraged by the project. They find that their personal motivation has increased, and they take pride in being team players, better role models, mentors for their colleagues, and instructional leaders in their schools. They also feel they get more respect as educators.
- ***Teachers who feel they have experienced the most professional growth (as measured by items such as teacher satisfaction, involvement in school improvement activities, teacher collaboration, increased proficiency with technology) are also most likely to have implemented more technology-related classroom practices.*** The extent to which teachers say they grew professionally as a result of Phase 9 was found to be a positive and statistically significant predictor of the extent to which teachers made changes in their general classroom practice.
- ***Teachers who report a higher degree of professional growth from participation in Phase 9 also use The Solution Site more, have a school climate that is supportive of Phase 9 activities, and are more comfortable sharing what they have learned about technology with other teachers.*** Again, the elements of Phase 9 working in concert appear to support the kinds of changes in schools envisioned in the goals and design of the Turnkey Project.
- ***There also appears to be a quantifiable link between changes in teachers and changes in students—in collaboration, motivation, achievement, understanding of subject matter, and use of higher-level thinking and research skills.*** The extent to which teachers make technology-related changes in classroom practices, and the extent to which they experienced professional growth, are, according to statistical analyses of survey data, the best predictors of the extent to which teachers reported seeing changes in students.
- ***School support for Phase 9 and the changes it endorses is critical to continued growth and change among teachers.*** Teachers with a higher degree of school support for Phase 9 activities and greater use of The Solution Site also reported the highest

degree of professional growth. Analysis of the teacher survey data also found that school climate and support of Phase 9 activities were both positive and statistically significant predictors of the extent to which teachers use The Solution Site. A positive school climate and support of Phase 9 activities can also be statistically linked to teachers' frequency of use of varied technology related resources since Phase 9.

- ***There are still challenges for Phase 9 teachers, especially those related to training and dissemination.*** Teachers note the difficulties involved in encouraging teachers nearing retirement to use new technologies. Those in small schools and small districts are finding it hard to locate enough teachers to train; some say they don't feel confident enough to offer their services to the entire county. They also say that collaboration across the curriculum is hampered by different schedules and different standards.
- ***There are indications that sites with more trained Phase 9 teachers have greater flexibility in schedules and curriculum.*** This finding is based on comparisons of a small sample of teachers about to take part in training and those who had previously been trained. The former report a few more constraints in home sites. It may be that the Phase 9-trained teachers helped, either before or after they attended the training, bring about changes. It may also be that schools that encourage and accommodate changes are more likely to send teachers to Phase 9.
- ***Teachers repeatedly, often voluntarily, say that Phase 9 changed their views of technology and served as a catalyst for further forays into technology training and use.*** Although some data suggest that those who, early on, signed up for the training were the trailblazers, and that trained teachers who return to their home sites encounter resistance from older and more recalcitrant teachers, there are also many indications that this project reaches a wide spectrum of teachers and inspires both the timid and the bold.