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Arkansas Environmental and Spatial Technology Initiative

State-wide Evaluation
2003-2006
Final Report

making a meaningful difference

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We would like to dedicate this report to Warren Stewart, whose wise counsel, dedication and boundless good humor contributed so much to this project; and to P.G. Bradford, whose generous nature and good cheer never failed to light up the room. They are greatly missed.

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Executive Summary

Project Description and Population Served

The Environmental and Spatial Technology (EAST) Initiative is a performance-based learning environment utilizing community service, project-based, service learning, integrated with advanced technological applications in an interdisciplinary environment where the intellectual and problem-solving growth of students is the focus. The project currently serves 190 schools in eight states (Arkansas, California, Hawaii, Illinois, Iowa, Louisiana, Mississippi and Pennsylvania). At the outset of the current study (school year 2003-2004), Arkansas had approximately 130 EAST programs. The majority of EAST sites in Arkansas were in high schools (90%), with 7% at middle schools, and another three EAST programs that were implemented in an elementary school or college. Sites are spread over the predominantly rural state of Arkansas, with the majority in rural counties and the remainder divided roughly evenly between suburban and urban counties.

EAST's central concept is based on the importance of students' responsibility for their own learning, with a focus on cooperative learning, interdependence, and individual accountability, and development of problem solving, decision-making and higher-order thinking skills. The program is an elective that is intended to serve a diverse group of students, with diversity understood to include aptitude, academic motivation, and achievement levels, as well as race, gender, and economic background. Students with special needs, gifted students, at-risk students, and all students in between are placed on a level playing field by being in the same class. Ultimately, the goal should be to construct classes that are representative of the demographics of the school as a whole.

The instructional model relies on teachers (known as "facilitators") to guide and assist students as they pursue their projects, through which students connect with peers, faculty, community members, and business and university partners to identify and solve real-life problems. Facilitators play an important role as guides to help students navigate project responsibilities and helping students in learning to learn, but they do *not* generally act as consultants or technical assistants. The EAST classroom mirrors the modern workplace by providing a dynamic environment in which students with all degrees of skills, experience, and aptitudes work together. Students are trained in and have access to advanced technical applications in architecture, animation, computer-aided drafting, database development, 3D design engineering, digital imagery, global positioning systems, geographical information systems, networking, system administration, programming, desktop publishing, digital filmmaking, and web development. These applications are provided not as a program objective but as tools to support student projects, the experience of which fosters students' teaming skills, responsibility, accountability, and personal initiative; mastering and applying basic skills and concepts; and creative and critical thinking skills.

The EAST classroom is characterized as existing in three parallel "environments"—the physical environment, which should be conducive to team work, accommodating of the use of technological resources, and enabling students to locate necessary materials; the learning environment, which entails guided instruction, class management that encourages responsibility,

flexibility and productivity, and projects which focus on self-directed, student-centered learning, community service, the use of advanced applications, and teamwork and peer mentoring; and an environment of expectations, which provides an open and encouraging culture in which students learn from their mistakes and that focuses on student development rather than content delivery, an outlook for program achievement that looks to the future instead of simply moving from day to day, and student work that is monitored to ensure that it is conducted productively so that students can solve problems, meet project goals, and use technology appropriately to meet those goals.

The EAST program also includes state-sponsored professional development geared towards providing orientation to district and school administrators, training for aspiring facilitators in instructional methods, program philosophies and expectations and technical systems administration, technology training for facilitators and students, and partnership conferences to disseminate and celebrate program achievements and conduct additional training workshops for students and facilitators.

Project Goals

The EAST evaluation involved two parallel and interdependent studies: a three year **implementation study** designed to provide insights into the variations in the implementation of the EAST program in different contexts throughout the state, and a two year **outcomes study** that sought to determine the impact of the initiative on participating facilitators and students by comparing eight schools who were randomly assigned from a larger pool of applicants to begin a new EAST program during the 2004-2005 school year, with a matched group of control students in eight schools that were assigned from the applicant pool as delayed implementation schools. Following are the major research questions that the EAST evaluation study sought to answer:

Implementation Study—conducted in all existing EAST schools statewide throughout all three years of the project (2003-2006)

- What recruitment strategies are being used?
- What are the characteristics of EAST schools, students, and teachers?
- What are the nature, quality, and intensity of training activities for EAST facilitators and students?
- What are the nature, quality, and intensity of the EAST instructional practices and how do they differ in the various program settings?
- What are the nature and quality of the measures currently being used to document program implementation?
- What are the nature and quality of the assessments currently being used to measure teacher and student outcomes?
- What are the nature and quality of participating schools' partnerships with local industry and community organizations, and what factors influence these partnerships at the local level?
- What are the nature, quality, and intensity of EAST parent involvement programs and activities?
- What are the nature and quality of administrative support for the program?

- In what ways and to what extent do the EAST National Center and the ADE support implementation of programs and practices in the participating schools?
- What are the nature and quality of dissemination activities offered to participating sites, and what is the level of participation in these activities?
- What steps have participating schools taken to sustain EAST beyond the three-year start-up period?
- What are the costs associated with the EAST program?
- What obstacles, if any, have been encountered to program implementation, and what steps were or can be taken to overcome these obstacles?

Outcomes Study—conducted during Years 2 and 3 of the evaluation (2004-2006) at 16 schools that were randomly assigned as new implementers (target) or delayed implementation (control) schools prior to the beginning of the study

- What is the impact of exposure to the EAST program on students' attitudes towards learning and school?
- What is the impact of exposure to the EAST program on students' problem solving skills and content knowledge in math and English language arts?
- What is the initiative's impact on facilitators' attitudes towards teaching, classroom practices, and content knowledge?
- What influence do additional factors, including environmental factors, participant demographics, training conditions, instructional practices, and varying degrees of program integrity, appear to have on the impact of the EAST program on student and teacher outcomes?

Results from the Implementation Study

Data for the implementation study were obtained from facilitator and student focus group interviews, principal interviews, observations of EAST classes, and on-line principal and facilitator surveys that were administered in the spring of each year.

On the principal and facilitator surveys, schools reported using a combination of student recruitment and selection strategies that promoted general awareness of the program and those that targeted specific students. Since casting a wide net is not sufficient to ensure diversity and representativeness because of self-selection, the more targeted strategies would need to have been used to counterbalance such selection effects (by targeting recruitment towards the students who would be less likely to enroll on their own) if these goals were to be achieved. However, it was unclear specifically what kinds of criteria were used for the targeted strategies, and discrepancies between principals' and facilitators' responses about what criteria were used as well as about who had primary responsibility for student placement imply that, to the extent that schools were making proactive efforts to ensure diversity, it is unclear how effective these efforts would have been. Comparisons of demographics of EAST students and non-EAST students in the same schools were conducted as part of the outcomes study and are discussed below.

Surveys also asked facilitators and principals to report on their perceptions of the impact of program training activities. Both groups have expressed very positive feelings about the

training process throughout all three years of the study. When asked to rate the adequacy of EAST training for bringing their skills to the level they needed as a facilitator, facilitators reported that the training was best for raising their skills in the instructional methods advocated by EAST, and also provided favorable ratings to training they received in assessing their own progress in facilitating EAST. The lowest ratings were for training in the specific technology applications used in the lab, for which fewer than half of respondents felt the training was at least *adequate*. It is unclear, however, the extent to which these lower ratings reflected a problem with the training per se, or difficulty with the expectation of the EAST model that the facilitators should be able to guide students in the use of sophisticated technologies, even while having little or no expertise in those technologies themselves.

While ratings of training support were mostly very positive, ratings of other types of external program supports that were obtained from both principals and facilitators were more mixed. Availability of technology support, availability of funding to support participation in EAST training, opportunities for the facilitator to work with other EAST teachers, availability of support on logistics of program implementation, consistency of EAST philosophy with other school/district reforms, and time for facilitators to reflect on what they had learned were the highest rated. However, testing policies and practices, state-mandated curriculum frameworks, and grading policies and practices were seen as inhibiting effective implementation by substantial proportions of principals and facilitators.

Facilitators were more consistently positive about the support available from their school administrations, with large majorities agreeing that their principals supported class scheduling in their schools in ways that benefited the EAST program. Principals also echoed the facilitators' impressions about their willingness to provide flexibility and facilitate class scheduling. Principals also expressed strong agreement with almost all EAST philosophies, such as the value of learning in a real world context, encouraging self-directed learning, and the value of group work. The only notable exception was that a small majority of principals felt that *most students learn best in classes with students of similar abilities.* This was a somewhat surprising finding, given that the large majority of facilitators had said that they were supported in creating mixed-ability classes. Substantial majorities of principals saw EAST as integral to their school's overall academic program, although larger majorities saw the EAST program as benefiting *from* other coursework than the numbers who saw EAST as providing project opportunities or developing skills that were applicable *to* other courses.

Results from the Outcomes Study

EAST classroom observations were conducted in the eight study schools in winter 2004, spring 2005, fall 2005, and spring 2006. Each facilitator was observed a total of eight times, four times in each year. Additional measures that were used to assess the program's impact on facilitators' fidelity to the model included the end-of-year program ratings (completed by consensus by the team of EAST, Inc. personnel at the end of each program year) and online principal and facilitator surveys. Since the end-of-year ratings aligned, for the most part, with the classroom observations, ratings from the latter instrument were used as the focus for analyses. In both years of the outcomes study, observations were consistently strong across almost all schools for physical environment; however, overall fidelity, and fidelity in educational

environment and in environment of expectations—as well as in the six sub-ratings within these two environments—were much more variable and in both years reflected programs that ranged from those that were still performing near the low end of the scale to those that were already approaching model programs.

An important additional aspect of program fidelity that could not be addressed through classroom observations is the approach that EAST schools take to advertising and recruiting students for participation, and screening and placing interested students into EAST classes. It should be noted that the EAST model itself does not advocate that the program is appropriate for everyone, so a degree of prescreening may be appropriate; but if the study schools did not succeed in creating classes that were representative of the school population within the limitations specified by the model, it might not be possible to determine whether any study findings are applicable to types of students for whom the program *is* intended but who may have been underrepresented in the sample. Comments from school-based EAST staff in interviews and on surveys implied that there are categories of students (e.g., students with serious behavioral or attitude problems, "grade seekers," and students who are accustomed to greater structure and more formal measures of progress) for whom some schools considered EAST to be less appropriate. As in the statewide surveys for the implementation study, surveys of the outcome-study schools' recruitment and screening procedures revealed a mix of strategies aimed at broad dissemination and those that were targeted towards specific students, but the criteria used for this targeting were not always clear, and the effectiveness with which criteria may have been implemented was called into question by the fact that most facilitators did not agree with their principals' assertion that the principal played a role in recruitment and selection. Demographic comparisons revealed that EAST students were not representative of their non-participating peers on several demographic variables, including race, gender, grade level, Title I eligibility, gifted status, and special education status.

Other potentially important characteristics on which the groups might have differed but that were not measured included traits such as comfort with technology, self-discipline, ability to focus on long-term goals, and a willingness to take on responsibility, which the EAST developers consider necessary for EAST students to possess to at least some degree (and on which the EAST students would therefore *not* necessarily be expected to be representative of the school). Traits on which the developers thought that EAST students *should* be representative of the school included the ability to work independently, leadership ability, and willingness to work hard (among others), as well as hindering characteristics such as disciplinary problems, not taking school seriously, and emotional or socialization problems. On a Year 3 recruitment survey, very few schools reported that they made explicit efforts to obtain diversity on most of the latter characteristics. For this reason, and since self-selection would be likely to favor students who possess the positive traits and to weed out students who possess the hindering traits, it can not be assumed that EAST classes were representative of their schools on these characteristics. The EAST director has indicated that it may not be preferable, from a programmatic perspective, to make such recruitment issues a top priority while a program is first becoming established in its early years. Nevertheless, study results must be interpreted with this caveat in mind.

Analyses were conducted to estimate the impact of EAST participation on 16 outcomes in the areas of academic skills, problem solving skills, motivation for school, self-directed learning style, and motivation to pursue further learning. (There were differences in test and survey response rates by gender, grade level, and socioeconomic status, and among control students, by ethnicity and English proficiency; however, the resulting samples of EAST and control students with available outcome data remained statistically indistinguishable on most characteristics, and differences that did exist were modest. Conclusions about program impact should therefore be valid for the types of students participating in EAST at the study schools.)

Among the 16 student outcomes that were studied, analyses indicated that participation in EAST appears to have a positive, statistically reliable impact in five domains. These included three problem solving domains (defining the characteristics of a problem, assessing the outcomes of a solution, and revising strategies in response to the assessment of outcomes), one motivation domain (motivation for school derived from accomplishment), and self-directed learning style. The preponderance of evidence for program effects in the area of problem solving skills seems consistent with one of the most central goals of EAST, and may point to a particular strength of the program. Although no direct effects were found indicating an impact of the EAST program on students' math and reading test scores, this is a notoriously difficult relationship to demonstrate. Given the myriad of other factors that influence academic achievement and the limitations of standardized testing for measuring such skills, this should be taken as a failure to find a relationship, but certainly not as evidence that none exists. However, the domains on which EAST *has* been shown to have an impact are widely recognized as being important for both academic and career success.

There were a number of other factors that were found to reduce the likelihood of success in achieving some of these objectives, particularly coming from a low income family and attending an urban school, while the absence of initial skills and proclivities in many of the outcome areas (including motivation) would also act as a handicap. Importantly, however, findings indicated that while these conditions would put a student at a disadvantage, for the most part they were *not* observed to reduce the magnitude of the impact of EAST participation. In other words—in the case of motivation, for example—EAST can still be beneficial *in spite* of low initial motivation. The one notable exception where EAST was found to have provided less benefit for certain students was that, while participation was found to have an impact on developing students' problem evaluation skills, it only proved to be beneficial in this domain for students who were initially unskilled at alternative generation. This should not be taken to mean, however, that students who *are* already skilled at alternative generation can not benefit from the program, since they could still benefit (at least) in the other four domains.

The fact that there were almost no indications of measured characteristics which reduced the observed impacts of EAST further underscores the importance of involving a diversity of students in the program. However, the ambiguities about the recruitment and selection procedures imply that schools may not be achieving this in all cases. If that is so, the program—at least in these newly implementing schools—might not be reaching certain groups of students who could benefit from the program as regularly as it might, especially those types of students who are less likely to seek it out. At the same time, if there are categories of students who tend not to enroll in EAST, it raises the possibility that the program impacts for such students might

be smaller than the impacts observed in this study. In short, if enrollment is not representative of the schools, it could mean that some students who could benefit may be missing out, but could also mean that we cannot be sure whether there might be other students who might *not* benefit. While it may be inappropriate for ADE to dictate to the schools how they should conduct their recruitment efforts, it is important to be aware of the implications of these procedures for evaluating the program.

Recommendations

The following recommendations have emerged from this study:

Recommendations for the program.

- The successes observed in this study provide additional reason to continue to expand the program. However, because participating schools were self-selected, it should not be inferred that the program should be encouraged for any school who does not really want it.
- While the state may not want to dictate program recruitment and selection policies, the importance of more proactively reaching out to populations who are less likely to seek out the program, especially traditionally underserved or under-represented groups, might be further stressed as programs mature, with an emphasis that casting a wide net is not sufficient to fully ensure diversity.
- The observation rating form could serve as a useful tool for focusing discussions around "site health" visits.
- Further study of program impacts could be valuable for helping to identify whether the skills and attitude changes that EAST develops have long-term impacts on students' further education, or even on choice of career paths.
- Further study may also be warranted in order to more closely examine the extent to which program benefits may be influenced by other affective student characteristics, and the extent to which the program may be able to help students overcome certain characteristics such as a lack of interest in school. This could help further strengthen the value of the program by achieving a more targeted diversity, identifying and encouraging participation from types of students who might be shown to benefit but who traditionally might not apply. Since there are likely to be a number of student characteristics that are relevant to success other than the demographic indicators available from school records, school personnel who know the students may be in the best position to identify appropriate candidates. The targeted recruitment efforts that were often used by the schools can therefore be an effective way to accomplish this balance, as long as referring staff use appropriate criteria. We agree that diversity is a laudable goal for EAST enrollments, but it is not clear whether this should necessarily mean that enrollment should be representative of the school in all cases.
- Another potential objective for further research would be to explore the impacts of better established programs. It is quite possible that programs that have had the opportunity to become fully established might demonstrate even stronger impacts for a larger number of outcomes.

<u>Recommendations for replication of the evaluation methodology.</u>

- The value of development of a logic model early in the study can not be overemphasized. Particularly for a program such as EAST, for which adaptability and responsiveness to specific circumstances are among its most important distinguishing features, it is critical to clearly define the parameters within which this flexibility is meant to exist, both to help new practitioners understand what is expected of them, and to help researchers recognize the program that is being evaluated. This process can be quite time consuming, particularly if the program design has never been explicitly laid out before, but it is in this very situation when it is needed the most. It should be noted, however, that it may not be possible to create a written program description that is detailed enough for someone with no prior familiarity to implement or to evaluate the program. It may very well be that a program such as EAST requires personal training from existing staff to be replicated or evaluated, which would have significant implications for the cost of replication.
- Measuring program fidelity is a crucial part of program evaluation, especially when the programs that are being studied are in the earlier stages of implementation. Observation is an important method for collecting evidence of fidelity, especially when interactions between students and teachers form an essential part of the model. However, there may also be critical aspects of program fidelity that cannot be assessed through passive observation alone, especially if resources do not allow for frequent enough observations to obtain a representative picture of the program in a short period of time. In such cases, interviews and/or surveys of site-based program staff and of monitoring staff can provide an invaluable complement to observation, and can also access potentially important factors (such as teachers' attitudes and beliefs) that would be extremely difficult if not impossible to infer from observation.
- Assessing the possibility of the existence of selection effects can be exceedingly difficult. It may be worth implementing additional behavioral or attitudinal measures to try to evaluate student characteristics that are expected to influence program outcomes, even if they do not represent goals of the program per se. However, since it is presumably impossible to directly assess all potentially salient variables, it is equally important to make inferences about the likelihood of unmeasured selection effects by examining the procedures used to identify participants.
- Conducting a randomized evaluation design in a public school setting is extremely challenging, and in some circumstances, its pitfalls can be so severe that it may not be the best approach. Where the conditions exist that make it possible—most notably, the opportunity to randomly select schools (or classrooms) for participation, or at least to randomly assign applicants to participating and control conditions—there are a number of additional conditions that must be achieved in order to maintain the integrity of the study. One of the most important issues is to ensure the cooperation of participating schools—including the control schools—throughout the study. Possible strategies can include providing incentives, involving the schools in discussions about the value of the evaluation and in the process of designing the evaluation, providing schools with formative feedback throughout the study to make it more valuable, sanctioning of the evaluation from authorities, and laying out the obligations of participation in the evaluation as a condition for program participation. Nevertheless, it is important to avoid making schools feel like the study is being forced down their throats, as lack of

cooperation can invalidate the randomization process. This is most challenging when control schools are being asked to participate actively in the study. Unless the program is already considered desirable and can be offered as a reward for cooperation, it might be best to design the study in such a way that only the most minimal involvement is required from control schools.