iSTEM Evaluation Guide

by Evaluation Research and Development (ERAD)

at The University of Arizona and the iSTEM Project

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THE UNIVERSITY OF ARIZONA

Contents

Background information about iSTEM

The *iSTEM* project was funded by the National Science Foundation in 2012. It is a collaboration between the University of Arizona (UA), StrengthBuilding Partners (a youth mentoring program), the Pascua Yaqui Tribe, and public schools that predominately serve Native American and Latino youth. Using the FK framework, the *iSTEM* research design is based on the contention that a synergistic hybrid program combining two strategic approaches (in-school mentoring with out-of-school informal science education experiences) would be successful in engaging and retaining 3^{rd} – 8^{th} grade Native American students in STEM education. This age/grade range was selected based on STEM literature that suggests that engaging elementary and middle school students has the greatest impact on closing the STEM educational gap (National Science Board, 2010), and engaging these young students is critical in preparing them for relevant high school courses that then allows them to pursue a STEM career in post-secondary education (President's Council of Advisors on Science and Technology (PCAST), 2010.

Originally, the project included two schools: an intermediate school serving 3^{rd} – 5^{th} grade students and a traditional middle school serving 6^{th} - 8^{th} grade students. The intermediate school expanded to include 6^{th}-8^{th} grades by the end of the three years. A third school, also a traditional middle school, was later included when budget cuts resulted in the closure of the original middle school and the majority of the students were transferred to the new school. All three schools are predominantly attended by Native American and Hispanic/Latino students living near the U.S.-Mexico border.

The selection of STEM topics for the *iSTEM* program was based on the four *Grand Challenges for Engineering* themes: (1) Energy and Environment, (2) Health (3) Security and (4) Learning and Computation (National Academy of Engineering, 2009). Five themed modules per year (e.g. solar energy; global positioning system), each facilitated over a two month period, were developed and implemented. In-school "flash STEM" activities are completed by mentors/mentees during the students' lunch periods and aligned with informal out-of-school experiences on the same topic. The content of the *iSTEM* activities is related to real-world application specifically attuned to Native American culture and ways of learning as well as the context and geography of southern Arizona. All *iSTEM* project activities are theory-driven based on a Funds of Knowledge theoretical framework.

In-School Activities: Unlike many mentorship programs that occur outside of the traditional school day (generally as after school programs) the flash STEM activities were integrated into the school day and took place during the student-mentee's lunch hour every other week. Choosing to schedule these activities during the school day was a strategic decision based on the personal circumstances of the targeted student population. The majority of students who participate in this program live in rural locations, a significant distance from the schools they attend. Many of the students' families do not have vehicles, and for those that do the driving distance to and from the schools is too time consuming and costly. Thus, the only reliable transportation to and from schools for the students is the school bus service. Scheduling flash STEM activities during the school lunch periods provided an opportunity to integrate these supplemental activities into the traditional school day and bypass transportation related challenges.

Given time constraints at lunchtime, the in-school flash STEM activities are designed to last about 20 minutes, and to be easy enough for the mentor to engage the mentee during completion of the activity (Gomez, et al., 2015). Themed activities are pre-packaged for the mentor and student mentee, requiring minimal setup or the need to review instructions. The activities are also designed to feel less like "school-work." In particular, they are facilitated in a relaxed atmosphere—a designated, non-traditional classroom space in each of the schools, are "hands-on," and aim to be as fun as they are educational. For the majority of activities, *iSTEM* staff is present to assist in a supportive role (e.g., with setting up the activities). For activities that require a higher level of background knowledge or expertise (e.g., GPS device based activities), *iSTEM* staff play a larger role and more directly facilitate the activities between the mentees and mentors. The intent, however, is that the activities are self-paced, easy-to-follow, and focused on the module theme (e.g., solar energy; GPS). For example, making a solar bracelet is a pre-packaged flash STEM activity facilitated during the Solar Energy themed module. Materials include an assortment of white solar beads and multi-colored pipe cleaners for making the solar bead bracelet. Sunglasses and other objects are used to test the intensity of the sun in changing the color of the beads from UV exposure. Students enjoy making the bracelet, and are able to demonstrate and tell others about the principles of solar energy.

Every other week, "non-STEM activities" are built into the schedule to help facilitate a personal connection between the mentor and mentee by allowing them to choose their own activity – typically mutually held interests and hobbies – which may or may not be STEM related. The mentoring classrooms at the partnering schools are equipped with various materials that mentors and mentees can use during this time including a number of games, puzzles, art supplies, and various other activity items as well as activities associated with each of STEM-themed modules.

Field Trips: The *iSTEM* field trips were designed to directly relate to the modular themes students focused on during the flash STEM activities. During Year 1, the five modular themes included: (1) solar energy; (2) optics; (3) flight and motion; (4) GPS; and (5) astronomy. Associated field trips included solar robotics at the UA College of Engineering, station exploration at the UA Flandrau Science Center, the Pima Air and Space Museum, GPS scavenger hunt at the partnering schools, and the UA Planetarium and a star party led by UA's student astronomy club. Year 2's modular themes offered (1) solar energy; (2) mapping and GIS; (3) space, earth and soils; (4) watershed; and (5) ecology. Field trips included solar robotics at the UA College of Engineering, GIS mapping activities on the UA campus mall, soil activities at the UA Agriculture Center, Sweetwater Wetlands and water treatment plant, Arizona-Sonora Desert Museum, and UA Science Sky School on Mt. Lemmon. At the start of the program, field trips were held at the end of the themed module, but the timing of the field trips shifted depending on availability at the field trip sites. Field trips that began a new unit or that occurred mid-way through a module contributed to mentee excitement in participating in the activities, while field trips that occurred at the end of the module provided a wrap-up.

To understand the impact of *iSTEM*, a theoretical and culturally-driven hybrid program that combined mentoring with informal science activities, this study asks the following questions: (1) what were the challenges and successes to the *iSTEM* program? (2) what was the level of student-mentee enrollment and retention in *iSTEM*? (3) what was the level of mentor participation and retention in *iSTEM?* (4) what outcomes were evidenced for mentees' (a) science beliefs, (b) satisfaction with the *iSTEM* (perceptions of their mentors; engagement in activities), and (c) school-related indicators?

The *iSTEM* evaluation is conducted by an external evaluation team which works closely with project staff to coordinate the evaluation activities. The *iSTEM* evaluation employs a mixed-methods design, and includes a two-step (formative and outcome) evaluation. While student mentees are the focus of the *iSTEM* project evaluation, the perspective of the mentors is also obtained through mentor/student mentee observations and end-of the year surveys.

Prior to implementation of the *iSTEM* program, and on an annual basis, the evaluation protocols and assessments were reviewed and approved by the UA Human Subjects Institutional Review Board. Additional reviews and approvals were conducted by UA's Native American Studies department head and the local school district research board. Prior to enrollment into the *iSTEM* project, students are required to have parental consent as well as provide their own assent to participate in the program and the evaluation component. Once the program coordinator for the mentoring program receives all completed paperwork, the student mentee meets with an evaluation staff to engage in the evaluation component of the project. Evaluation staff read the evaluation survey to students at their request (typically 3rd-4th graders) with 5th-8th graders choosing to complete the survey alone.

Article Reviews for Evaluation Measures, Design, and Approach

The Test of Time in School-Based Mentoring: The Role of Relationship Duration and Re-Matching on Academic Outcomes	Design	Grossman, J. B., Chan, C. S., Schwartz, S. E. O., & Rhodes, J. E. (2012). The Test of Time in School-Based Mentoring: The Role of Relationship Duration and Re-Matching on Academic Outcomes. American Journal of Community Psychology, 49, 43-54.
From Skeletons to Bridges & Other STEM Enrichment Exercises for High School Biology.	Design	Riechert, S. E., & Post, B. K. (2010). From Skeletons to Bridges & Other STEM Enrichment Exercises for High School Biology. The American Biology Teacher, 72(1), 20-22.
Evaluation Capacity Building in a School-University Partnership Grant Program	Evaluation	Haeffele, L., Hood, L., & Feldman, B. (2011). Evaluation Capacity Building in a School-University Partnership Grant Program. Planning and Changing, 42, 87-100.
Collaborative Evaluation Communities in Urban Schools: A Model of Evaluation Capacity Building for STEM Education. New Directions for Evaluation	Evaluation	Huffman, D., Lawrenz, F., Thomas, K., & Clarkson, L. (2006). Collaborative Evaluation Communities in Urban Schools: A Model of Evaluation Capacity Building for STEM Education. New Directions for Evaluation, 109, 73.
Characteristic Collaborative Processes in School-University Partnerships	Evaluation	Gardner, D. C. (2011). Characteristic Collaborative Processes in School-University Partnerships. Planning and Changing, 42, 63-86.
Connectedness among Taiwanese Middle School Students: A Validation Study of the Hemingway Measure of Adolescent Connectedness.	Evaluation	Karcher, M. J., & Lee, Y. (2002). Connectedness among Taiwanese Middle School Students: A Validation Study of the Hemingway Measure of Adolescent Connectedness. Asia Pacific Education Review, 3(1), 92-114.
Influences on commitment to and learning of science among adolescent students	Evaluation	Simpson, R. D., & Troost, K. M. (1982). Influences on commitment to and learning of science among adolescent students. Science Education, 66(5), 763-781.
STEM Learning in Afterschool: An Analysis of Impact and Outcomes	Evaluation	Afterschool Alliance. (2011). STEM Learning in Afterschool: An Analysis of Impact and Outcomes. Afterschool Alliance. Web site: http://afterschoolalliance.org.
"Phronesis": Children's Local Rural Knowledge of Science and Engineering	Evaluation	Avery, L. M., & Kassam, K.-A. (2011). "Phronesis": Children's Local Rural Knowledge of Science and Engineering. Journal of Research in Rural Education, 26, 2.
An Educative, Values-Engaged Approach to Evaluating STEM Educational Programs	Evaluation	Greene, J., DeStefano, L., Burgon, H., & Hall, J. (2006). An Educative, Values-Engaged Approach to Evaluating STEM Educational Programs. New Directions for Evaluation, 109, 53.
Developing a Survey to Measure Best Practices of K-12 Online Instructors	Evaluation Tools	Black, E., DiPietro, M., Ferdig, R., & Polling, N. (2009). Developing a Survey to Measure Best Practices of K-12 Online Instructors. Online Journal of Distance Learning Administration, 12, 1.
Evaluation of a school-based mentoring program for at-risk middle school youth	Evaluation Tools	Converse, N., & Lignugaris-Kraft, B. (2009). Evaluation of a school-based mentoring program for at-risk middle school youth. Remedial and Special Education, 30(1), 33-46.
The 2002 User Friendly guide to program evaluation	Evaluation Tools	Frechtling, J. A., Frierson, H. T., & National Science Foundation (U.S.). (2002). The 2002 user friendly handbook of project evaluation. Arlington, VA: National Science Foundation, Directorate for Education & Human Resources, Division of Research, Evaluation and Communication.
Practicing Participatory Action Research	Participatory Research	Kidd, S. A., & Kral, M. J. (2005). Practicing Participatory Action Research. Journal of Counseling Psychology, 52(2), 187-195.

Study Designs for Effectiveness and Translation Research	Participatory Research	Mercer, S. L., DeVinney, B. J., Fine, L. J., Green, L. W., & Dougherty, D. (2007). Study Designs for Effectiveness and Translation Research. American Journal of Preventive Medicine, 33(2), 139.
sing qualitative research to inform survey development on nicotine dependence among adolescents	Participatory Research	Nichter, M., Nichter, M., Thompson, P. J., Shiffman, S., & Moscicki, A.-B. (2002). Using qualitative research to inform survey development on nicotine dependence among adolescents. Drug and Alcohol Dependence, 68(1), 41.
Engaging Youth in Participatory Research and Evaluation	Participatory Research	Powers, J. L., & Tiffany, J. S. (2006). Engaging Youth in Participatory Research and Evaluation. Journal of Public Health Management and Practice. 12, 6.
Respondent-Driven Sampling in Participatory Research Contexts: Participant-Driven Recruitment	Participatory Research	Tiffany, J. (2006). Respondent-Driven Sampling in Participatory Research Contexts: Participant-Driven Recruitment. Journal of Urban Health, 83, 113-124.
Qualitative Research Designs: Selection and Implementation	Qualitative Research	Creswell, J. W., Hanson, W. E., Plano, C. V. L., & Morales, A. (2007). Qualitative Research Designs: Selection and Implementation. Counseling Psychologist, 35, 2, 236-264.
The utilization of qualitative and quantitative data for health education program planning, implementation, and evaluation: a spiral approach	Qualitative Research	de, V. H., Weijts, W., Dijkstra, M., & Kok, G. (1992). The utilization of qualitative and quantitative data for health education program planning, implementation, and evaluation: a spiral approach. Health Education Quarterly, 19, 1, 101-15.
Review of community-based research: assessing partnership approaches to improve public health	Qualitative Research	Israel, B. A., Schulz, A. J., Parker, E. A., & Becker, A. B. (1998). Review of community-based research: assessing partnership approaches to improve public health. Annual Review of Public Health, 19, 173-202.
Toward Integrating Qualitative and Quantitative Methods: An Introduction	Qualitative Research	Steckler, A., McLeroy, K. R., Goodman, R. M., Bird, S. T., & McCormick, L. (1992). Toward Integrating Qualitative and Quantitative Methods: An Introduction. Health Education & Behavior, 19(1), 1-8.
making sense of qualitative research: The qualitative research interview	Qualitative Research	D, C. -B. B., & C, . B. F. (2006). Making sense of qualitative research: The qualitative research interview. Medical Education, 40(4), 314-321.
Qualitative research methods	Qualitative Research	Sofaer, S. (2002). Qualitative research methods. International Journal for Quality in Health Care: Journal of the International Society for Quality in Health Care / Isqua, 14(4), 329-36.

Article Reviews for Mentoring

Engineering a Dynamic Science Learning Environment for K-12 Teachers	Design/ Mentoring	Hardre, P. L., Nanny, M., Refai, H., Ling, C., & Slater, J. (2010). Engineering a Dynamic Science Learning Environment for K-12 Teachers. Teacher Education Quarterly, 37(2), 157-178.
Peer mentoring of students in social work education	Mentoring	Topping, K. J., McCowan, P., & McCrae, J. (1998). Peer mentoring of students in social work education. Social Work Education, 17(1), 45-56.
Mentoring in Schools: An Impact Study of Big Brothers Big Sisters School-Based Mentoring	Mentoring	Herrera, C., Grossman, J. B., Kauh, T. J., & McMaken, J. (2011). Mentoring in Schools: An Impact Study of Big Brothers Big Sisters School-Based Mentoring. Child Development, 82(1), 346-361.
Mentoring At-Risk High School Students: Evaluation of a School-Based Program	Mentoring	Slicker, E. K., & Palmer, D. J. (1993). Mentoring At-Risk High School Students: Evaluation of a School-Based Program. School Counselor, 40(5), 327-34.
The Study of Mentoring in the Learning Environment (SMILE): A Randomized Evaluation of the Effectiveness of School-based	Mentoring	Karcher, M. (2008). The Study of Mentoring in the Learning Environment (SMILE): A Randomized Evaluation of the Effectiveness of School-based Mentoring.

Mentoring		Prevention Science, 9(2), 99-113.

Article Reviews for Informal Science Education

Fun Is Not Enough: Attitudes of Hispanic Middle School Students toward Science and Scientists	Attitudes	Sorge, C., Newsom, H. E., & Hagerty, J. J. (2000). Fun Is Not Enough: Attitudes of Hispanic Middle School Students toward Science and Scientists. Hispanic Journal of Behavioral Sciences, 22(3), 332-45.
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Development of Knowledge about Electricity and Magnetism during a Visit to a Science Museum and Related Post-Visit Activities	Informal Learning	Anderson, D., Lucas, K. B., Ginns, I. S., & Dierking, L. D. (2000). Development of Knowledge about Electricity and Magnetism during a Visit to a Science Museum and Related Post-Visit Activities. Science Education, 84(4), 658-79.
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The things of science: Assessing the learning potential of science museums	Informal Learning	Falk, J. H., Koran, J. J., & Dierking, L. D. (1986). The things of science: Assessing the learning potential of science museums. Science Education, 70(5), 503-508.
Investigating public science interest and understanding: evidence for the importance of free-choice learning. Public Understanding of Science	Informal Learning	Falk, J., Storksdieck, M., & Dierking, L. (2007). Investigating public science interest and understanding: evidence for the importance of free-choice learning. Public Understanding of Science, 16(4), 455-469.
Using the Contextual Model of Learning to Understand Visitor Learning from a Science Center Exhibition.	Informal Learning	Falk, J., & Storksdieck, M. (2005). Using the Contextual Model of Learning to Understand Visitor Learning from a Science Center Exhibition. Science Education, 89(5), 744-778.
Pardon Me, Didn't I Just Hear a Paradigm Shift?	Informal Learning	Gibbons, M. (2004). Pardon Me, Didn't I Just Hear a Paradigm Shift?. Phi Delta Kappan, 85, 461-467.
Free-choice Learning. Youth Today	Informal Learning	Pittman, K. (2002). Free-choice Learning. Youth Today, 11(7), 63. http://www.youthtoday.org/publication/article.cfm?article_id=283
Toward an Agenda for Advancing Research on Science Learning in Out-of-School Settings	Informal Learning	Rennie, L. J., Feher, E., Dierking, L. D., & Falk, J. H. (2003). Toward an Agenda for Advancing Research on Science Learning in Out-of-School Settings. Journal of Research in Science Teaching, 40(2), 112-20.
Virtual Communities and their Importance for Informal Learning	Informal Learning	Andreatos, A (2007). Virtual Communities and their Importance for Informal Learning. International Journal of Computers, Communications & Control, 2(1), 39-47.
Schools and informal science settings: collaborate, co-exist, or assimilate?	Informal Learning	Adams, J. D., Gupta, P., & DeFelice, A. (2012). Schools and informal science settings: collaborate, co-exist, or assimilate?. Cultural Studies of Science Education, 7(2), 409-416.

Article Reviews for Informal Learning-Technology

Well-Being to "Well Done!": The Development Cycle in Role-Playing Games	Informal Learning-Technology	Barr, P., Khaled, R., Noble, J., & Biddle, R. (2006). Well-Being to "Well Done!": The Development Cycle in Role-Playing Games. Lecture Notes in Computer Science, 3962, 96-99.
A gaming approach to learning medical microbiology: students' experiences of flow	Informal Learning-Technology	Beylefeld, A. A., & Struwig, M. C. (2007). A gaming approach to learning medical microbiology: students' experiences of flow. Medical Teacher, 29(9), 933-940.
Past, present, and future of computer-tailored nutrition education	Informal Learning-Technology	Brug, J., Oenema, A., & Campbell, M. (2003). Past, present, and future of computer-tailored nutrition education. The American Journal of Clinical Nutrition, 77, 4.
Informal learning with PDAs and smartphones.	Informal Learning-Technology	Clough, G., Jones, A. C., McAndrew, P., & Scanlon, E. (2008). Original article: Informal learning with PDAs and smartphones. Journal of Computer Assisted Learning, 24(5), 359-371.
Computer Supported Collaborative Learning Using Wirelessly Interconnected Handheld Computers	Informal Learning-Technology	Zurita, G., & Nussbaum, M. (2004). Computer Supported Collaborative Learning Using Wirelessly Interconnected Handheld Computers. Computers and Education, 42(3), 289-314.
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Social software, web 2.0 and learning: Status and implications of an evolving paradigm	Informal Learning-Technology	Ravenscroft, A. (2009). Social software, web 2.0 and learning: Status and implications of an evolving paradigm. Journal of Computer Assisted Learning, 25(1), 1-5.
Schooling the Mobile Generation: The Future for Schools in the Mobile-Networked Society	Informal Learning-Technology	Selwyn, N. (2003). Schooling the Mobile Generation: The Future for Schools in the Mobile-Networked Society. British Journal of Sociology of Education, 24(2), 131-144.
Personal Digital Assistants in medical education and practice	Informal Learning-Technology	Smørdal, O., & Gregory, J. (2003). Personal Digital Assistants in medical education and practice. Journal of Computer Assisted Learning, 19(3), 320-329.
Toward a model for the study of children’s informal Internet use	Informal Learning-Technology	Young, K. (2008). Toward a model for the study of children’s informal Internet use. Computers in Human Behavior, 24(2), 173-184.
A Self-Learning Multimedia Approach for Enriching GIS Education	Informal Learning-Technology	Zerger, A., Bishop, I. D., Escobar, F., & Hunter, G. J. (2002). A Self-Learning Multimedia Approach for Enriching GIS Education. Journal of Geography in Higher Education, 26(1), 67-80.

Created Assessments Description

Mentee pre- and post-program beliefs survey: At the beginning and end of each academic year, the pre- and post-survey assess beliefs about school belonging, the importance of science and mathematics and of doing well in these subjects, interest in STEM activities, books, TV programs, and intention to attend higher education, particularly in a STEM field of interest. The survey is completed by the student mentees independently or with the assistance of the evaluation team (e.g., reading the questions to the student mentees). The survey is comprised of items from the following surveys: iSTEM School and Career Interest Survey (Kier, Blanchard, Osborne, & Albert, 2013); STEM Semantics Survey (Tyler-Wood, Knezek, & Christensen, 2010); Science Curiosity Scale (Harty, & Beall, 1984); Sense of School Membership (Goodenow, 1993); Hemingway Measure of Adolescent Connectedness (Karcher, & Sass, 2010); Frequency of Hands-On Experimentation and Student Attitudes Toward Science (Ornstein, 2006); and Modified ATSI (Weinburgh & Steele, 2000). Cronbach's alpha reliability for the 39 items is .868.

Mentee end-of-year follow-up survey regarding their mentor*:* A final data collection instrument is given to mentees about their mentor and the mentoring experience. Items included relational aspects about the mentor (i.e., feeling excitement, importance, or special), participation in activities and field trips, time spent with mentor, and mentor's interest in mentees' activities, advice giving, and mentor's visits. Items on the mentee survey were modified from two surveys: Measuring the Quality of Mentor-Youth Relationships" (Jucovy, 2002) and project-specific items such as field trips and the iSTEM mentor. Cronbach's alpha reliability for the 18 items is .925.

Mentor end-of-year follow-up survey regarding their mentee*:* Mentors completed the same questions presented to mentees with the exception of four additional close-ended questions and an open-ended question allowing the mentor to provide additional information.

Mentee/mentor observation checklist*:* The evaluator notified and received permission from the International Center for Leadership in Education to use the Student Engagement Walkthrough Checklist (Jones, 2009) to record observational data. A member of the evaluation team observes and scores the engagement checklist as the mentor/mentee pair engages in *iSTEM* activities. The observational engagement checklist assists in capturing data on positive body language, consistent focus, verbal participation, student confidence, and fun and excitement. The scale for rating ranged from Very High to Very Low. Pairs were observed from 10-30 minutes at a time and the timing of the observation could occur in the first ten minutes, the middle ten minutes, or the last ten minutes of an activity. The time block was also recorded to provide additional context for the observation (i.e., reading instructions at the beginning or the early stages of the project look differently than the culmination of the activity). Similarly, the level of engagement with the mentor can appear different from the beginning to the end, thus noting the time of observation provides this additional context to make inferences from the data. The second set of five items in the checklist measure individual attention, clarity of learning, meaningfulness of the work, performance orientation, and rigorous thinking. Cronbach's alpha reliability for the ten items was .938.

Mentee report card data*:* At the end of each academic year, copies of each mentee's report card are provided to the evaluation team by school staff. Science and mathematics quarterly grades as well as school absences are then recorded in the evaluation database.

Statistical Analyses

Both descriptive, inferential, and t-tests were utilized to provide analysis of the multiple data sources.

The pre-post beliefs survey analysis included descriptive statistics (i.e., means and standard deviation) and then a matched t-test for identifying statistical significance.

Mentor and mentee surveys were aggregated and reported as means (standard deviations) in a comparative side-by-side table. Independent sample t-test was performed, but statistical significance was not present. An additional analysis for the mentee survey included aggregated mean scores by mentor type (e.g., tribal, university, or professional).

The observation checklist utilized aggregated mean scores in general reports. Additional analyses could include the separation by mentor type.

Students' report cards were examined for absences, and grades in math and science. Changes across the four quarters were noted as well as year-to-year when students participated for two or three years.

Qualitative data analysis utilized coding by themes for the mentor survey, the items within the pre-post beliefs survey, and evaluation notes included with the observation checklist. The use of quoted material allowed for mentor and mentee views to be included in evaluation reports and manuscripts.

Appendices of Assessments

A. Pre-post beliefs survey

Survey for i-STEM Mentees-Before

About You: Name: ______________________________ Birthdate: ______________ Today's Date: ______________

First Name Last Name mm/dd/year mm/dd/year

1. I am	
◯ Boy/Male	◯ Girl/Female
2. I am a	
◯ 3rd grader	◯ 6th grader
◯ 4th grader	◯ 7th grader
◯ 5th grader	◯ 8th grader
In	
◯ Fall Semester	◯ Spring Semester
At	
◯ Lawrence	◯ Hohokam
3. At home, I mostly speak	
◯ English	◯ Spanish
◯ Other ______________	

4. Fill in the bubble that you feel best describes your feeling about school	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. I enjoy being at school.	◯	◯	◯	◯	◯
b. Doing well in school will help me in the future.	◯	◯	◯	◯	◯
c. I feel like I am a real part of my school.	◯	◯	◯	◯	◯
d. Teachers or other adults here notice when I'm good at something.	◯	◯	◯	◯	◯
e. Classmates here like me the way I am.	◯	◯	◯	◯	◯

4. Fill in the bubble that you feel best describes your feeling about school	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
f. I feel close to at least one teacher or adult in this school.	◯	◯	◯	◯	◯
g. I am included in lots of activities at school.	◯	◯	◯	◯	◯
h. My teachers treat students as equal.	◯	◯	◯	◯	◯
i. I care what teachers think of me.	◯	◯	◯	◯	◯
j. I feel proud of my school.	◯	◯	◯	◯	◯

5. Fill in the bubble that you feel best describes you, your feeling or opinion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. I would like to listen to scientists talk about their jobs.	◯	◯	◯	◯	◯
b. I am interested in seeing scientists work in their labs.	◯	◯	◯	◯	◯
c. I like to take stuff apart to see how it works.	◯	◯	◯	◯	◯
d. I enjoy science-related activities at school.	◯	◯	◯	◯	◯
e I think about science outside of school.	◯	◯	◯	◯	◯

5. Fill in the bubble that you feel best describes you, your feeling or opinion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
f. Math is an interesting subject.	○	○	○	○	○
g. Math will be useful for my work in the future.	○	○	○	○	○
h. For me, being good at math is important.	○	○	○	○	○
i. Science is an interesting subject.	○	○	○	○	○
j. Science will be useful for my work in the future.	○	○	○	○	○
k. For me, being good at science is important.	○	○	○	○	○
l. I enjoy participating in hands-on science related activities.	○	○	○	○	○
m. I would like to have a career in science.	○	○	○	○	○
n. I would enjoy a career in science.	○	○	○	○	○
o. I like to share what I've learned in science class or clubs with my friends and family.	○	○	○	○	○
p. I can be successful in science classes.	○	○	○	○	○
q. Learning things in science is hard for me.	○	○	○	○	○
r. I am able to understand topics in science and technology.	○	○	○	○	○
s. I enjoy talking about science with my friends.	○	○	○	○	○

6. Fill in the bubble that you feel best describes your family's interest in your pursuit of Science	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. My family is interested in the science courses I take.	○	○	○	○	○
b. My family has encouraged me to study science.	○	○	○	○	○

7. Fill in the bubble that you feel best describes you.	Strongly Agree	Agree	Disagree	Strongly Disagree
a. I like to read things about science and technology.	○	○	○	○

If you check " Strongly Agree" or "Agree", please provide some examples. If you check " Strongly Disagree" or "Disagree", please give a brief reason why.

____

____

	Strongly Agree	Agree	Disagree	Strongly Disagree
b. I like to watch TV shows about science and technology.	○	○	○	○

If you check " Strongly Agree" or "Agree", please provide some examples. If you check " Strongly Disagree" or "Disagree", please give a brief reason why.

____

____

If you are **middle school students** (6th to 8th graders), please **answer a few questions on the next page**; otherwise, you have completed this survey. Thank you very much for your honest feedback!

8. Fill in the bubble that you feel best describes your plan or opinion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
a. I will attend a college.	◯	◯	◯	◯	◯
b. I will graduate with a college degree in a science-related field.	◯	◯	◯	◯	◯
c. I will get a job in a science-related field.	◯	◯	◯	◯	◯

8. Fill in the bubble that you feel best describes your plan or opinion	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
e. A career in science would allow me to work with others in meaningful ways.	◯	◯	◯	◯	◯
f. Scientists make a meaningful difference in the world.	◯	◯	◯	◯	◯
g. Having a career in science would be challenging.	◯	◯	◯	◯	◯

Congratulations! You have finished the survey !

Mentor Survey for i-STEM Mentees

About You: Name: ______________________________ Birthdate: ____________ Today's Date: ____________

First Name Last Name mm/dd/year mm/dd/year

Fill in the bubble that you feel best describes your mentor relationship.	Very True	True	Sort of	Not Very True	Not True at All
1. When I'm with my mentor, I feel excited.	○	○	○	○	○
2. When I'm with my mentor, I feel important.	○	○	○	○	○
3. When I'm with my mentor, I feel relaxed.	○	○	○	○	○
4. When I'm with my mentor, I feel special.	○	○	○	○	○
5. When I'm with my mentor, I feel bored.	○	○	○	○	○
6. My mentor makes science interesting.	○	○	○	○	○
7. My mentor presents material in a clear way.	○	○	○	○	○
8. It's fun to do iSTEM activities with my mentor.	○	○	○	○	○
9. I enjoyed the iSTEM field trips because I got to spend more time with my mentor.	○	○	○	○	○

Fill in the bubble that you feel best describes your mentor relationship.	Very True	True	Sort of	Not Very True	Not True at All
10. My mentor supports my interest in STEM activities.	○	○	○	○	○
11. My mentor encourages me to try to do my best.	○	○	○	○	○
12. My mentor is interested in my ideas.	○	○	○	○	○
13. I wish my mentor asked me more about what I think.	○	○	○	○	○
14. When my mentor gives me advice, it makes me feel stupid.	○	○	○	○	○
15. I trust my mentor's advice.	○	○	○	○	○
16. My mentor usually visits on the days they say they will.	○	○	○	○	○
17. I would like to spend more time with my mentor.	○	○	○	○	○
18. I hope my mentor will come back next year.	○	○	○	○	○

iSTEM Mentee Year-End Survey 2015-16

The following survey was designed to ask about your experiences participating in the iSTEM program. Your responses are valuable in shaping future programs like iSTEM. Please answer honestly and there is no right or wrong answer.

About the STEM Guides and the iSTEM activities	All the time	Most of the time	Sometimes	Not very often	Never
It's fun to do iSTEM activities with the STEM Guide.					
The STEM Guide presented the material so I could easily understand.					
The STEM Guide supported my interest in STEM activities.					
The STEM Guide encouraged me to try things on my own.					
The STEM Guide encouraged me to try to do my best.					
The STEM Guide was interested in my ideas.					

About iSTEM and my classes	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I am doing better in my classes because of iSTEM.					
I feel more prepared for my science classes because of iSTEM.					
iSTEM makes me excited to learn more about science, technology, engineering, and math (STEM).					
iSTEM makes me excited to take more math and science classes.					
iSTEM makes me want to learn more about jobs in STEM.					
I want to come to school every day so I do not miss the iSTEM program.					
I learned a lot of new things from the iSTEM activities.					
The things I learn in isTEM are important to me.					

Field trips

Did you go on any field trips?	Yes	No			
If Yes to above question					
I enjoyed the iSTEM field trips.	All the time	Most of the time	Sometimes	Not very often	Never
I was able to make connections from the activities we did to the field trip.	All the time	Most of the time	Sometimes	Not very often	Never
How many did you go to?	1	2	3	4	5
What was the most memorable experience from a field trip?					

STEM Careers	Yes	No	I'm not sure
Do you know any adults who work as scientists?			
Do you know any adults who work as engineers?			
Do you know any adults who work as mathematicians?			
Do you know any adults who work with computers or technology?			

C. Mentor survey of mentee

I-STEM Mentor Survey

About You: Name: ______________________________ Today's Date: ____________

First Name Last Name mm/dd/year

Fill in the bubble that you feel best describes your mentor relationship.	Very True	True	Sort of	Not Very True	Not True at All
1. My mentee is excited when I show up.	○	○	○	○	○
2. I put in effort to make my mentee feel important.	○	○	○	○	○
3. I put in effort to make my mentee feel relaxed.	○	○	○	○	○
4. I put in effort to make my mentee feel special.	○	○	○	○	○
5. My mentee looks bored when they are with me.	○	○	○	○	○
6. I make science interesting for my mentee.	○	○	○	○	○
7. I explain the activities to my mentee so they understand it.	○	○	○	○	○
8. The i-STEM activites are fun to do with my mentee.	○	○	○	○	○
9. I enjoyed the longer time I spent with my mentee during the iSTEM field trips.	○	○	○	○	○
10. I support my mentee's interest in i-STEM activities.	○	○	○	○	○
11. I encourge my mentee to do their best.	○	○	○	○	○

Fill in the bubble that you feel best describes your mentor relationship.	Very True	True	Sort of	Not Very True	Not True at All
12. My mentee thinks of interesting ideas.	○	○	○	○	○
13. I regularly asked my mentee about what they thought.	○	○	○	○	○
14. I try and give my mentee advice when needed.	○	○	○	○	○
15. I think my mentee trusts my advice.	○	○	○	○	○
16. I usually visit my mentee when I say I will.	○	○	○	○	○
17. I would like to spend more time with my mentee if time allowed.	○	○	○	○	○
18. I will continue to mentor my mentee next year.	○	○	○	○	○
19. My mentee does not listen when I try and help.	○	○	○	○	○
20. My mentee likes doing the activities.	○	○	○	○	○
21. I did not enjoy all the readings in the activities.	○	○	○	○	○
22. The activities took too much time to do.	○	○	○	○	○

Next page →

Please provide additional feedback about the program, if any.

D. Observational checklist

Mentee Engagement Walkthrough Checklist

* Required

Today's date is... *

MM/DD/YY

Which school/activity are you observing? *

- Lawrence Intermediate School
- Hohokam or Valencia Middle School
- Out of school activity
- Other:

Mentor and Mentee *
Please list the Mentee and Mentor names

The mentor is a ... *

- Community member
- STEM professional
- Undergraduate student

Observations

Observations *

	Very High	High	Medium	Low	Very Low
Positive body language: Mentees exhibit body postures that indicate they are paying attention to the instructor, their mentor, and/or other students	○	○	○	○	○
Consistent focus: All mentees are focused on the learning activity with minimum	○	○	○	○	○

	Very High	High	Medium	Low	Very Low
disruptions.					
Verbal participation: Mentees express thoughtful ideas, reflective answers, and questions relevant or appropriate to learning.	○	○	○	○	○
Student confidence: Mentees exhibit confidence and can initiate and complete a task with limited coaching and can work in a group or individually as appropriate to the learning.	○	○	○	○	○
Fun and excitement: Mentees exhibit interest and enthusiasm and use positive humor.	○	○	○	○	○

Perceptions

When you have the opportunity, you will interview the mentees using the following 5 categories. There are sample questions that follow each category to assist the interview.

Individual attention

Mentees feel comfortable seeking help and asking questions. (Question to ask: What do you do if you need extra help?)

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Clarity of learning

Mentees can describe the learning outcome. This is not the same as being able to describe the activity being done. (Questions to ask: What are you working on? What are you learning from this work?)

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Meaningfulness of work

Mentees find the work interesting, challenging, and connected to learning. (Questions to ask: What are your learning? Is this work interesting to you? Do you know why you are learning this?)

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Rigorous thinking
Mentees work on complex problems, create original solutions, and reflect on the quality of their work. (Questions to ask: How challenging is this work? In what ways do you have the opportunity to be creative?)

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Performance orientation
Mentees understand what quality work is and how it will be assessed. They also can describe the criteria by which their work will be evaluated. (Questions to ask: How do you know you have done good work? What are some elements of quality work?)

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Overall level of student engagement *
When possible, use both observations and perceptions to assign the rating. If only observations is available, please use those items to assign an overall score. NOTE: the scale order is switched from the observations scale so be careful in selecting the appropriate score.

	1	2	3	4	5	
Very Low	○	○	○	○	○	Very High

Person completing this form *

- ☐ Evaluation Assistant
- ☐ Evaluator

E. Activity survey

Module#/Activity# ___/___

Mentor iSTEM Activity Survey

Name________________________________ Date:___/___/______ School

Lawrence	Hohokam

Activity Name_________________________

1. I bonded well with my mentee today.

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

2. I learned something new about STEM today.

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

3. Was your mentee interested with the iSTEM activity today?

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

4. Today's iSTEM activity was difficult to understand.

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

5. I enjoyed working through the iSTEM activity with my mentee.

Student iSTEM Activity Survey

Module#/Activity# ___/___

Name________________________________ Date:___/___/______ School

Lawrence	Hohokam

Activity Name_______________________

1. Today's instructions were easy to understand?

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

2. I needed my mentor's help to understand today's iSTEM activity?

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

3. Today's iSTEM activity was fun.

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

4. I can explain WHY the activity was important

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

5. I will share what I learned with others.

Strongly Agree ○ ○ ○ ○ ○ Strongly Disagree

2014 iSTEM Mentor Activity Survey

Module#/Activity# ___/___

Name________________________________ Date:___/___/2014 School | Lawrence | Valencia

Activity Name/Description____

1. How much did you enjoy the session?

   Not at all ◯ ◯ ◯ ◯ ◯ Extremely delighted

2. Did the activity allow for bonding to occur with your mentee?

   Not at all ◯ ◯ ◯ ◯ ◯ Most of the time

3. How much would you say the session was iSTEM related?

   Not at all related ◯ ◯ ◯ ◯ ◯ Completely related to

4. Did you use any of the iSTEM activities in the packet?

   Yes ◯ No ◯ If yes, please make sure to fill in the activity above.

5. How interested was your mentee in the iSTEM activity?

   ☐ Not at all interested
   ☐ Interested just a little
   ☐ Somewhat interested with mentor prompting
   ☐ Interested for most of the activity
   ☐ Extremely interested in the activity
   ☐ NA, no iSTEM activity today

6. Did you use any of the games provided?

   Yes ◯ No ◯ If yes, please describe the game you played with your mentee.

   ____

7. Feel free to leave any other comments.

2014 iSTEM Student Activity Survey

Module#/Activity# ___/___

Name_________________________________ Date:___/___/______ School

Lawrence	Valencia

Activity Name/Description____

1. How much did you enjoy the session?

   Not at all ◯ ◯ ◯ ◯ ◯ Very enjoyable

2. I was able to "bond" with my mentor during the activity?

   Not at all ◯ ◯ ◯ ◯ ◯ Most of the time

3. Today's iSTEM activity was easy to understand.

   Strongly Disagree ◯ ◯ ◯ ◯ ◯ Strongly Agree

4. I can explain HOW the activity related to iSTEM learning.

   Strongly Disagree ◯ ◯ ◯ ◯ ◯ Strongly Agree

5. I can explain WHY the activity was important.

   Strongly Disagree ◯ ◯ ◯ ◯ ◯ Strongly Agree

F. Mentor pre-program survey

Pre-Survey for mentors

Name________________________ Date:________ School ________________________

Activity Name________________________

1. I am comfortable with using technology.

   Strongly Agree ◯ ◯ ◯ ◯ ◯ Strongly Disagree

2. How clear are the instructions for today's activities?

   Strongly Agree ◯ ◯ ◯ ◯ ◯ Strongly Disagree

3. How available are the staff to answer questions you may have?

   Strongly Agree ◯ ◯ ◯ ◯ ◯ Strongly Disagree

4. How difficult is it to find and prepare the materials for the activity of the day?

   Strongly Agree ◯ ◯ ◯ ◯ ◯ Strongly Disagree

5. I enjoyed working through the iSTEM activity with my mentee.

   Strongly Agree ◯ ◯ ◯ ◯ ◯ Strongly Disagree

G. Student interview questions

Mentee Interview Guide

This is the interview guide for iSTEM mentees. The interview will follow a semi-structured interview as we have themes we would like to cover but need the flexibility to explore the deeper meaning of themes. Due to the connections made with the mentees, I [Nick] will complete all the interviews solo. As part of the introduction, confidentiality will be stressed with the emphasis that no member of SBP or mentors will have access to the interview notes. The ideal location would be any room that is quiet such as the conference room in the main office, or the room next to the SBP room. Due to how uncomfortable the kids are with having their photo taken, I would opt out of using an audio recording device. I may ask if it would be ok to record the interview but the likelihood of them saying yes is small.

Introduction question to serve as an icebreaker, if you could be any superhero who would you be? why?

Interview themes

School experience
Grasping the concept of science
Expectations of mentoring
Expectations of iSTEM

School Experience/Typical day

I am interested on how your typical day at school is. Please walk me through your typical day starting with the time you wake up.

Follow up questions:
Do you eat breakfast?
What is your first class?
How do you like that class? [Repeat for all classes if necessary]
What do you do during lunch?
Do you eat lunch? Why or why not.

When school ends, what do you do?

Transition: I would like to change gears a little bit if you do not mind…could you please define what science is? It does not have to be a perfect definition. I simply want to know how you define science.

Grasping the concept of Science

What kind of science classes are you taking?
Tell me what you think of your science teacher.
Describe the qualities of a good science teacher.

Expectations of mentoring

Please describe what you expect to happen in this mentoring program. [Elaborate based on responses]
[If person has a mentor] In the past month, how often has your mentor come to visit you?

How do you feel when your mentor shows up?
How do you feel when your mentor does not show up when they say they were?
If you had the option of changing your mentor, who would want? Why?

Transition: If it is alright, I would like to switch topics one more time and ask you questions about iSTEM, is this alright?

Expectations of iSTEM

Who was the one who described what the iSTEM program was to you?

Let's pretend you were [above person] and I am you, describe the iSTEM program to me.
-That was fun! Good job!
What is your view of iSTEM today compared to when you first joined the iSTEM program? [Elaborate based on answer]

- Can you describe what caused the shift in feeling toward iSTEM?

Let's talk iSTEM activities. Overall, how do you feel about the activities?

- What was your favorite? Why? Who did it with you?
- Which activity did you not like? Why? Who did it with you?

Would you like to lead an iSTEM activity for another iSTEM mentee?

Unique iSTEM questions for Mentees without mentors who also completed iSTEM activities with Rachel and November.

Between Rachel Paz and November, who would you prefer doing the activities with? Why?
What advice would you give to Rachel to make her a better activity leader?
What advice would you give to November to make her a better activity leader?
Have you ever done an iSTEM activity with a friend? Could you please describe that experience?
Do you prefer doing activities with your mentor and you, your friend and your mentor, or with your friend and UA staff?

H. Interview questions for non-continuing mentors

1. Describe your relationship with your mentee?
2. What did you find most enjoyable about being a mentor?
3. What do you think your mentee would say was most enjoyable?
4. What challenges did you experience in the relationship building?
5. Were you able to participate with your mentee during any of the field trips? If so, how was this experience different from the classroom time?
6. How has the mentoring experience impacted your life?
7. In the future, will you choose to mentor again? Can be in work, neighborhood, in school, etc.
8. What might the iSTEM program do to better assist mentors?
9. What might the iSTEM program do to improve the mentoring program?
10. Why are you choosing to stop mentoring?
11. Any additional comments you might add about the program.