

# 2017-2018 EPA SCAPE: TEACHER PRE- INTERVIEW REPORT

Arizona State  
University

Findings and Summary

University Office of Evaluation and Educational Effectiveness

## METHODS

In September and October 2017, the University Office of Evaluation and Educational Effectiveness conducted interviews with teachers prior to their implementation of the lessons developed by the EPA SCAPE program. Of the eleven SCAPE teachers, nine completed an interview (82%). Participants shared their plans for implementing the SCAPE lessons, provided feedback on their initial experiences in the SCAPE program, and outlined the support they desire during the academic year. Major themes are presented below, along with recommendations for ensuring the SCAPE program's successes.

## MAJOR THEMES

### Program Interest

Teachers were first asked how they heard about the opportunity to be a part of the SCAPE program. Of the nine teachers providing responses, four shared that their principals forwarded them an email from the Principal Investigator (PI) which described the SCAPE program and solicited their involvement. Three additional teachers were also contacted by email, with two teachers not able to remember the specific origins of the message and one teacher receiving an email from their district office. One teacher was approached by the PI directly due to their mutual involvement in an environmental group, and one teacher assisted the PI in authoring the original grant proposal.

The interviewees then shared what attracted them to the opportunity that spurred them to participate. Most teachers focused on the potential benefits that the program will have on improving the educational offerings and opportunities for their students. This included the procurement of water quality testing equipment for their lab. One teacher stated, "We're always looking for funding to buy equipment to enhance our laboratories with the kids." It also included the opportunity to bring their students out of the classroom to conduct fieldwork and engage in place-based education. One teacher expressed, "The main attractant is getting the students out into the real world doing sampling and especially on the Colorado River which is such a precious resource here in the west." For teachers, this fieldwork will lead to what they see as another advantage of the SCAPE program: creating a network of schools with which to share data on the water quality of the Colorado River, collectively learning about the status of the river, exploring future implications, discussing possible actions, and expanding their environmental awareness. One teacher stated, "It's a good opportunity to join in with some other schools and let my students see some data from both upstream and downstream to add to their awareness." Another teacher added, "The SCAPE program's emphasis on water quality as well as the connection to community and connecting to schools along with the encouraged service component aspect of it - all those matched really well with our philosophy of education and it seemed like a natural fit for our school."

Teachers also described the personal benefits the SCAPE program offers in terms of their own professional development and continued learning. One teacher stated, "As teachers, we lead these types of trips, but in this project we would be getting more of the technology piece into our offerings and receive some training ourselves." Another teacher stated, "This is my environment and I'm very interested to know about the quality of the river here."

Finally, one teacher noted that the schools participating in the SCAPE program are united only by their geographic proximity to the Colorado River, which does not limit program involvement to schools with more advanced science programs. This provides an opportunity to include schools in the program that do not normally have this type of opportunity. The teacher summarized, "I work with kids from underserved

areas and very rural schools, so this is an opportunity to bring some pretty stellar science and technology and STEM programming to those schools.”

### **Motivation**

Teachers were asked to characterize their motivation to implement the SCAPE lessons in their classroom. Most teachers tied their level of motivation to the ease in which they could readily adapt and integrate the SCAPE lessons into their existing curriculum. One teacher stated, “I’m willing because they go right in with what I already do. They dovetail in quite nicely.” Another teacher shared, “I’m very motivated. The lessons are perfectly aligned with my goals of my class.” One teacher who sees a need to make modifications to the lessons offered, “I don’t think there are any lessons that I intend to do exactly as presented. I’m interested in all of the lessons, so I would imagine doing a lot of similar lessons or modifying several of the lessons, but keeping what I see as the spirit of the program.” For teachers who have been given the freedom to create their own curriculum, the process of integrating the SCAPE lessons into their syllabus is more straightforward. One teacher shared, “It’s going to be extremely easy for me to tie the lessons right into my present curriculum. I’m actually quite lucky since I teach an elective science class. So I kind of get to do whatever I like.” Envisioning the work ahead, one teacher expressed, “To me it’s really exciting. I just can see that it’s a really rock solid program. To me, it’s really authentic learning.”

### **Selection of the SCAPE Lessons**

The SCAPE program developed a curriculum consisting of eighteen lessons for teachers to use in their classrooms. Teachers were asked how much of the curriculum they planned to teach in the current academic year. Again, teachers tied this amount to how easily the lessons integrated into their existing curriculum. One teacher shared, “Based on the training I went to this summer, I would think that I’ll get at least 50% of it in there. A lot of it is very similar to what I’m already doing.” Another teacher expressed, “It’s a little tough to give you an exact number as I’m taking bits and pieces of it, like discharge and volume in riparian habitat, the field work stuff I already do with the kids. I don’t know, probably 40 or 50 percent, maybe even more.” According to teachers, their approach to integrating the SCAPE lessons is also closely tied to the freedom their states and districts provide them in adapting their curriculum. One teacher stated, “I’ll use maybe 25 percent of it. Since I am bound by law to teach what’s in the state science core, I have to cover everything in the core, so I can’t spend as much time as I would like on the SCAPE stuff. I would like to implement more, but I can’t.” Another teacher offered, “There’s some stuff that doesn’t really fit into my AP curriculum and so I can’t really add that, but then there’s a lot that does. Oh man, this is great. From environmental ethics and policy to all of the field work stuff: macro invertebrates and flows, ecological stuff. It’s really sharp, and it works. It works really well.” Another teacher shared, “I looked through the table of contents for the lessons and then anything that sounded like it was pretty close to something that was in the state core, I looked it over a little bit to see and just judged based on that. I picked and chose things that already go along with the state core. In a couple of instances, the SCAPE content is replacing my lessons. Then, in at least one instance, it is adding to my lessons.”

A few of the SCAPE teachers described how they plan to implement more of the SCAPE lessons by recruiting their fellow teachers to present some of the lessons in their classes. One teacher stated, “I’m talking with the humanities teachers who also teach juniors about doing a couple of the lessons, or equivalent lessons, that are in the first section which look at the historical and environmental attitudes.” Another teacher shared, “Because some of the modules tie in social sciences, I’m looking at not only working with science teachers, but also with social studies and language arts teachers because there is a good diversity of curriculum available.” A third teacher stated, “I’ve also tried to get the biology teachers

on board and they're not on board yet. So the chemistry section I'm going to do, with the PH, turbidity, temperature, and dissolved oxygen. I wish we could do more, but again, the biology teachers are just not on board yet."

One of the teachers had already presented some of the SCAPE curriculum to their class. The teacher stated, "We have done Unit One, and we will be doing the water testing on the site. So we'll be doing components from different units. So we are working towards it." Finally, one teacher shared, "I plan on teaching it all."

### **Implementation of the SCAPE Lessons**

Teachers were next asked to describe what they considered to be the positive aspects of implementing the SCAPE lessons in their classes. One of the main positive aspects that teachers described is the opportunity to get their students out of the classroom and into the field where they apply the concepts they are learning. One teacher stated, "The students will spend time out in nature collecting the samples, and so I think it enhances their appreciation of the natural world, to go out and do that." Another teacher expressed, "Getting the kids to have some more hands-on experience with the bread and butter science. You know, actually getting out and doing things. We do a lot of experiments and investigations in class, but they might not be as relevant as, 'Hey, let's look at the water we're drinking. Let's look at the water you're bathing in. Let's look at the water you're playing in.' That was kind of our goal, to bring everything to a concrete, at-home level." Another teacher offered, "The big, big benefit is to get them to have fun with it. It's designed to be pretty hands-on as well, so the kids get time to process and get their hands in it."

According to teachers, another positive aspect of the SCAPE program is its technology component. One teacher described, "I like the idea of trying to do more visual literacy with data, because I think that's more of a modern expectation for students, that they can do that. With all the GIS work that exists out there, that's a more relevant modern skill than, let's say, writing a lab report. So I like the way that they set that up." Another teacher stated, "There's some technology pieces that are brand new to me. So just another way to kind of interpret the data and to pull it in from other areas." A third teacher offered, "I've been doing dissolved oxygen through titrations up until right now. So there will be a lot more added benefit of just incorporating a little more technology into the curriculum." The opportunity to add relevant equipment to their lab is another benefit for teachers, with one teacher sharing, "I think certainly one of the positives is the hands-on experience with real probeware. That's kind of the state of the art in the field."

The expansive scope of the project is another positive aspect of the program. One teacher shared, "I really like that there are other schools in the Basin doing it, and there's the ability to collaborate with those schools. And this idea of acting locally and thinking globally is really another area where I feel like the SCAPE program looks really strong. Being able to connect with other schools and maybe do like an online seminar where my students are talking to students in Yuma, Arizona, or in Mojave or something, and realizing that we're all facing different water quality issues, I think is an asset." Another teacher expressed, "Looking at a much bigger picture whereas my class currently just really looks at our county. Now they'll be looking at a much bigger area." Another teacher said, "They're going to develop an extensive community amongst the other kids in the program, and I think that sharing is what sets the SCAPE project apart. It expands the learning beyond just the kids in my classroom." A fourth teacher stated, "To connect with all the Colorado Basin schools, schools we can exchange data with. That

component got my attention. Going out and doing your work, but then you can connect with all these other schools, and make sense of how and where we are impacting Colorado River water. So that aspect was very powerful. And I'm looking forward to it next semester when we'll be able to collect our data and then compare it with other schools."

### **Student Learning Outcomes**

The teachers were then asked to describe what they believed would be their students' main learning outcomes from the SCAPE lessons. The majority of teachers believed the lessons will lead their students to become more aware and active environmental stewards. One teacher stated, "I'm hoping that [the lessons] help impress upon them the big picture that it's not just us in this isolated little valley. There's stuff going on upstream that affects us and then everything we do here affects everybody downstream from us." Another teacher shared, "Most of them didn't even realize that the Colorado River is endangered. They didn't really realize that it hasn't flowed back to the ocean in 20 years. So I guess just the big picture and trying to be more environmentally conscious." A third teacher offered, "To recognize the importance of water in the West, to recognize that there are a lot of water quality issues that all require different responses. The community I live in is a relatively small community and somewhat isolated, and I think that to get to have students interact with students from other places and see that they're facing different issues also has a lot of value." Focusing on the awareness level the SCAPE lessons can raise, one teacher stated that students will learn "how we can avoid creating pollution in not only this area, but in all the country. They can know what they have to do and transmit this to their families to avoid any kind of pollution to our environment."

Teachers also highlighted additional outcomes they expected from their students. One teacher focused on how the lessons teach the scientific process to address identified problems, stating, "There's the basic chemistry that I'm trying to teach them, things like solution chemistry and pH and atomic theory. Then I want to teach them the scientific process. I want them all to be able to ask a question and then design a data collection method that allows them to get at that question." Two teachers hoped that the emphasis on fieldwork and applied learning will lead to positive learning outcomes. One teacher stated, "In traditional education, kids do data collection and then it doesn't go anywhere. But this is actually going to be put on the internet, shared, and compared. So they're actually utilizing that data and that's more, to me, real world stuff. To me, they can do much deeper learning and higher-level learning from that." Another teacher shared, "The typical question from students is: 'When am I ever going to use this?' I was hoping that it would be something we could give them hands-on, in a real way, they could really do some real testing. Just act like a real scientist basically. Give them some real experience doing something that's relevant at their home level."

### **Personal and Professional Development**

The objectives of the SCAPE program do not focus solely on student outcomes, but on the personal and professional development of the participant teachers as well. When asked what they personally hoped to learn or gain from their experience in the SCAPE program, teachers provided answers on a variety of topics. Many teachers looked forward to learning the data sharing and mapping technology that is a hallmark of the SCAPE program. One teacher stated, "Thus far, some of the data visualizations have been new to me. I had not used Google Fusion tables before. I haven't done any ArcGIS work before. Those are two things that are appealing to me." Another teacher shared, "I loved learning to use Excel and maybe some of those Google Fusion tables. That was all really new to me. So that's a new thing I can incorporate in my classroom and teach the kids how to build those. You know that will be kind of cool

where they can map it out throughout the drainage basin.” Another teacher offered a similar response, stating, “For me, the biggest thing that I’ll be learning is getting more familiar with the Google platform and Google Maps, tables, and things like that.” Another teacher expressed, “The GIS stuff and the ArcGIS and story maps and all of that is stuff that I’ve been looking at. So I want to be able to add a little bit of the technical pieces to my repertoire.” One teacher highlighted how the technological tools and equipment will continue to impact the classroom after the conclusion of the SCAPE program, stating, “I also really appreciate the funding that’s come along with this to acquire tools for the classroom that are going to be able to exist beyond the time that I’m with this program.”

The SCAPE teachers also look forward to participating in a community of practice. One teacher stated, “Getting to know people, other teachers from out-of-state, passionate teachers and how they are taking initiative through this project to raise awareness, be a part of it with our students. Community of practice, absolutely.” Another teacher shared, “Connecting with other groups will be kind of cool. Sharing ‘Our water temperature is this, and our water quality is that, and what do you guys get for your dissolved oxygen down in Yuma?’ I’ve been kind of sequestered in my little box in teaching this class to that point. So that’s another piece that I hope to hook up with some of the people that we trained with and see what they’ve been up to.” A third teacher expressed, “I can collaborate with different teachers from around the country. That’s always really valuable. I already got to see a lot of things that different teachers were doing in their classroom this summer when we all met in Telluride. I have been doing macro- and vertebrae collections, but I just learned a few more helpful tips for standardizing it and making it more scientific as we’re collecting in the field. So I learned some better field collection techniques. And just really being able to share is always so important.” To one teacher, the far-flung nature of the community of practice enhances the professional development from the program. The teacher stated, “I don’t know anything really about the water quality issues that are being faced in other parts of the country. I can speculate that down in Arizona there’s more salinity and there’s less water, but I have no idea what Pinedale, Wyoming is dealing with. Or, are there issues in Mojave due to the history of uranium mining? We’ll find out!”

The teachers also believe that their participation in the SCAPE program will improve their classroom teaching. One teacher stated, “It will help me learn where the community is at, because the kids are a reflection of what their parents talk about at home. It can help me gauge attitudes in the community and maybe what things I might need to stress more than others.” Another teacher shared, “I’m always looking to add more hands-on activities to my curriculum. I’m always looking for ways to take things from the abstract to the concrete.”

### **Program Challenges**

Next, teachers were asked to describe the challenges they anticipated facing as participants in the SCAPE program. One challenge that many teachers described facing, and expect to continue throughout the program, is overcoming administrative and bureaucratic obstacles. In two cases, the bureaucracy of the teachers’ school district posed a challenge. One teacher stated, “The biggest are financial. I want to order the stuff, so that I can get out with the kick nets and do all that, but I haven’t had any luck getting in contact with my district, and I can’t afford to go out and just purchase it. We’re a tiny rural school with a small budget.” Another teacher shared, “The biggest one that I’m running into is the bureaucracy of my district.” Another teacher expressed a different kind of administrative challenge, stating, “We are a new school, so we are not only trying out a new curriculum, but we have many operational challenges and many paperwork challenges. So those are certainly bigger challenges than curriculum.” Finally, one

teacher voiced their frustration with getting access to the local water source, sharing, “Actually getting access to the water, which I thought would be pretty easy, but is turning out not to be. And it’s gotten to the point where it looks like the field trip isn’t even going to happen. So I’m not even going to be able to take the kids out to the water, I’ll have to bring the water to them. It’s just a messy bureaucracy.”

Teachers also anticipate that they will face some technological challenges. One teacher stated, “I know some of those fusion tables that we worked with this summer, they were kind of challenging for us teachers. Just that new technology. I think there’s such a learning curve, and getting the kids on board and the first couple times that you build them there will be a struggle. And you just need a lot of practice to get it to where it can be a quick process. So I think that’s kind of a challenge.” Another teacher shared, “Probably the biggest is our school has very poor access to computers. It’s challenging to get computer time, yeah, we have to schedule time in.”

Teachers also expressed that they anticipate challenges with allotting enough time for a project with a large scope such as the SCAPE program requires. One teacher shared, “Oh, the amount of time...the loads that the teachers carry. They have so much on their plates and being able to show them that this is doable and that it will enhance their teaching. Just the logistics is the big thing. I have no worries about being able to get kids to a river, to a body of water to do the actual data collecting, but as far as the in-class work, just being able to work out the timing is the biggest thing.” Another teacher offered, “The scope of it is very bold. It’s big. It involves a whole lot of watershed and it involves getting kids out. I would say it’s specifically time management. How do I fit so much in when I have a very cookie-cutter set curriculum? I’ll do some of it in my chemistry classes which will be sweet. But it’s just fitting it in. I’m pretty nervous about trying to make it all happen and trying to do as much as I can to get it all in.”

Finally, two teachers anticipated challenges in meeting the program’s planned objectives. On the topic of creating a network of schools to share data, one teacher stated, “This connecting with other schools is really contingent on other teachers sharing the same vision I have, of wanting to have this data and wanting to have seminars online and interact with students from another school.” On the topic of the planned stewardship projects, another teacher shared, “One [challenge] is helping [the students] find opportunities to actually do stewardship projects. Although there’s all kinds of water quality issues in our Basin, to my knowledge there’s not a lot of work that high school students can be doing up here. And so to be able to connect the students with meaningful stewardship projects that would complement the scientific work they’re doing.”

### **Program Support**

According to the SCAPE teachers, the number of SCAPE lessons that they implement in their classes is contingent upon the flexibility they have in adjusting their curriculum. This situation will require the support of their school’s leadership. Teachers were asked to describe the level of support they have received from their school’s leadership to implement the SCAPE curriculum. Most teachers described the positive support they have received from their school leadership. One teacher stated, “Oh, it’s been phenomenal. My school is very, very supportive. They have all been wonderful and we’re really lucky. They’ve given me full day field trips to go up to [local lakes], right where the river starts. So yeah, my district has been fabulous, really cooperative in filing out all the paperwork and very helpful. Our district’s been great to me.” Another teacher offered, “I know all the administrators in the schools I work with and they’ve been really positive about the program, about what we do with kids in the watershed program and this is addressing the needs of the secondary school kids. I have enough of a working relationship with the

teachers and the administrators that I feel confident that I will get support.” A third teacher shared, “Complete endorsement. All the teachers here are responsible for designing their own curriculum, and we have an administration that’s very supportive of that.”

Two teachers also described how their school leadership had become involved in the actual program activities. One teacher stated, “The administrator in the charter school that’s very, very rural just absolutely loves this stuff, and he’s always expressed interest and appreciation in having us work with the schools and teachers. And I’ll mention that the vice principal is actually going to be coming on one of our trips too, so he has shown interest in being involved in that.” Another teacher shared, “They’ve been supportive. They said ‘Yeah, go for it. This is your thing, do it.’ They’ve stayed out of it. I have a good bit of freedom to be able to implement and to do what I need to. My superintendent came in during the meetings one day and hung out for a little bit, but that’s about it. And there hasn’t been a lot of friction about it at all. It’s been pretty positive, I would say.”

Teachers also described the support they have received from their school leadership in completing the paperwork required to participate in the SCAPE program. One teacher shared, “Applying to the SCAPE program had some additional paperwork burdens that were placed on our business operations, in terms of qualifying for the EPA grant. They did all the hard work to get that paperwork in compliance. I felt supported in the extra work that I know our business office had to do.” Another teacher expressed, “I haven’t needed any support and I anticipate that they will, they were happy that we are part of the grant. And they have facilitated the paperwork portion of it.”

One teacher described a less supportive situation, stating, “Nothing. Zero. I can’t even get them to sign off paperwork without having them call the district, and then waiting a week on a decision. Oh, I have their blessing, but I have no support. They’ll say, ‘Yeah, sure you can do whatever you want in your classroom.’ But I don’t have any real support.”

### **Anticipated Support from SCAPE Program**

Teachers were then asked to describe the kind of support that they would like to receive from SCAPE program leadership as they implement the SCAPE lessons. All teachers responded that they are happy with the current level of support they are receiving in terms of frequency of communication, usefulness of information, and in planning training and site visit logistics. The teachers do anticipate needing support in the area of technology and data-sharing. One teacher stated, “I would like more instruction around using some of the data visualization, particularly the Google Fusion tables and ArcGIS. I think being able to connect with whoever is the expert in that realm and see what kinds of products students can actually produce from that and where the value is would be helpful.” Another teacher shared, “I can foresee maybe a little refresher might be needed on the technology portion. I haven’t played with those fusion tables since the [training]. So I might need a little refresher of that. So I think mostly the technology support.” A third teacher expressed, “For me it’s using the Google apps and if I had a person associated with the group that was familiar with SCAPE that could help me navigate those apps, if I had any questions, that would be where I anticipate needing the most support.”

The teachers also want to build a strong community of practice so they can share ideas and collaboratively learn from what each other is doing. One teacher stated, “I would appreciate additional support in trying to keep track of who’s doing what. Are there any other teachers out there that have this shared vision of collaborating and having our students interact digitally in some way? And if the SCAPE program provided some sort of facilitation of that, like sending out a Google survey that interested

teachers were connected through that, or having an additional chatroom available whenever we're doing our quarterly conference calls, I could see that being an asset." Another teacher shared, "I love the idea of having some quarterly feedback and opportunities to blog with teachers."

### Final Thoughts

Finally, teachers were provided an opportunity to share any additional thoughts and ideas about the SCAPE program that had not been covered during the interview. Seven teachers provided responses:

- "I think it's a great thing. Because I know that was not an easy thing to get the grant from the EPA and set the whole thing up and all that and doing all the lesson plans and so forth. It was quite a large endeavor, which I really appreciate."
- "I really did appreciate the flexibility that was shown in accommodating a second training late in July. It was really appreciated that that extra time and attention was devoted to that."
- "I really enjoy the program. I enjoy spending time with [the PI]. I did learn a lot at the workshop. I just wish that I could do more for the grant. Especially to get to where we are, above and below the Dam. So I wish I could do more, and it's just going to be tough. But you know, we'll see."
- "This is an excellent opportunity for our students who do not get many opportunities to go out and learn like other schools. But transportation will be a challenge for us."
- "I know that SCAPE has a timeline, but one of things I really appreciate about how this was conceived is that it's going to have long-term effects. It's going to impact schools. I know there are even teachers talking about sharing that knowledge with other teachers, other schools in their local area, and I see its impact going beyond the scope of the grant. The teachers are going to be equipped with the knowledge, the tools to carry this on in the future and maybe improve, enhance, and diversify some of the different curriculum and tailor it to their needs. I can definitely see it being something that is going to be an integral part of our work with high school and even working with middle school students. To me that's so empowering."
- "I think the only thing is so far my impression is that the people doing these projects are really motivated and anxious to help, really friendly, and I see them as a good resource."
- "I think it's turned out to be much bigger in scope than I originally thought it was going to be, and I'm impressed by that. I'm impressed with how much has gotten done in this project, and I've been happy to be a part of it."

## SUMMARY AND RECOMMENDATIONS

Overall, the SCAPE teachers consistently expressed their enthusiasm for and confidence in implementing and integrating the SCAPE curriculum in their classrooms. They also shared their satisfaction and appreciation for the training and ongoing program support they have received from SCAPE program leadership.

Based on their responses, we make the following recommendations:

- **Provide orientation and training to all SCAPE teachers.** During the interview scheduling process, it was discovered that two teachers participating in the SCAPE program had not yet received training on their responsibilities for the program. An interview was completed with one of the teachers, but no useful information could be obtained, so the interview was cut short. The interview with the second teacher was not scheduled due to a similar expected result. As the academic year

has already commenced, it is recommended that an ad hoc training take place with these two teachers so that they may confidently implement the SCAPE curriculum in their respective classrooms.

- **Proactively develop a SCAPE teacher community of practice.** When describing their expectations for support as they implement the SCAPE curriculum, many of the teachers' responses focused on the topic of developing and maintaining an active community of practice. The teachers desire to share their own experiences and learn from other SCAPE participants as they implement the SCAPE lessons. When asked to provide recommendations on how to actuate this idea, teachers provided a few actionable activities, including sharing an email list of teacher participants among the community, setting up a communication platform, and providing opportunities for open dialogue during the quarterly meetings.
- **Develop a plan for technological support.** The SCAPE teachers anticipate needing additional technological support when entering and sharing their data collected from the field. As this component of the project is one of the key elements that attracted the teachers to the program, SCAPE leadership should anticipate, plan, and implement a strategy for ensuring SCAPE teachers are fully supported as they implement these program components.