

**GeoCACHE  
Arizona GIS Education Conference, May 5-6, 2017  
Attendee Survey**

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The Arizona Geographic Information Systems Education Conference, May 5-6, 2017, was attended by 55 GIS-using educators and high school students from around the state. The meeting was supported by the GeoCACHE NSF Advanced Technological Education grant. A dozen attendees were alumni of GeoCACHE-provided professional development; the others were aware of the meeting through statewide advertising distributed by GeoCACHE. The event was supported by five staff associated with the grant. The program included five presenters from industry and four students who presented on their learning experiences. Thirty-seven educator participants completed a survey about their experiences at the conference and expectations for future GIS use. Participants completed the survey after both days of the meeting were over, within two days of the last session.

**Participants**

About half of the respondents (17) worked at the secondary level, with the rest split about evenly between elementary schools and college (Table 1). Most participants were very experienced in education (although not necessarily in using GIS). About half of the respondents reported having more than a dozen years of classroom experience (Table 2). Experienced teachers were prevalent in all instructional job categories with the exception of “informal education,” where both respondents were in their first three years.

**Table 1. Which of the following best describes your role? (N=37)**

	Elementary	Secondary	Post-Secondary
Formal educator	8	14	7
Informal educator	1	1	0
GIS analyst / instructor	0	0	1
Professional development coordinator, curriculum coordinator, or instructional support		2	3

**Table 2. How many years have you been teaching? (N=36)**

	Frequency	%
1-3	6	17%
4-6	1	3%
7-9	4	11%
10-12	7	19%
>12	18	50%

**Conference Feedback**

On each day of the meeting, attendees were asked to rate each activity in terms of its utility. Not all respondents attended both days. Sessions were rated on a four-point scale: Not useful/Somewhat useful/Useful/Essential. On Day 1, the most useful session was deemed to be the hands on lab with an ESRI educational trainer. The modal response was that the session was “Essential.” Medians for all the other sessions were 3 (“Useful”), although the last two components (a career panel of industry representatives and an “un-conference” brainstorming exercise) had somewhat lower mean ratings. The grand mean for Friday ratings was 3.24 (standard deviation .48).

**Table 3. How useful were each of Friday's components?**

Friday Sessions	Charlie Fitzpatrick keynote	User presentations	Working Lunch	Charlie Fitzpatrick lab	Career Panel	Un-conference
N	31	31	31	32	33	31
Not useful	3%	0%	0%	3%	3%	3%
Somewhat useful; could have been skipped.	3%	10%	10%	3%	21%	19%
Useful; good to have in program.	45%	52%	52%	25%	55%	48%
Essential; I needed this	48%	39%	39%	69%	21%	29%
Mean	3.39	3.29	3.29	3.59	2.94	3.03
SD	0.72	0.64	0.64	0.71	0.75	0.80
Median	3.00	3.00	3.00	4.00	3.00	3.00

The ratings were reflected in comments about ways to improve the sessions (Table 4). Respondents requested more time for hands-on activities (i.e., the ESRI lab), and they felt that the career panel was not tailored to the needs of educators. Other suggestions included a more formal needs assessment of participants to account for the wide range of GIS experience and teaching levels and more concrete examples of successful GIS lessons.

**Table 4. How could Friday's conference sessions have been improved?**

Comments (30 from 28 individuals)	Frequency	%
More hands-on time/activities	9	30.0%
Career panel more focused on attendee needs	6	20.0%
Sessions were OK	4	13.3%
Attendee needs assessment to align sessions with levels of experience and teaching	2	6.7%
Logistics: More breaks; coffee in the afternoon	2	6.7%
More demonstrations of classroom practice	2	6.7%
Presenter time: More consistency; more opportunity for interaction with presenters	2	6.7%
Unconference too long	2	6.7%
More time for interaction with colleagues.	1	3.3%

Similarly, for almost all respondents, the learning they expected to apply in the classroom involved basic or advanced skills in using or setting up GIS software (Table 5). Only two respondents cited conceptual issues.

**Table 5. Please identify at least one thing you learned on Friday that you plan to use in your teaching in the next academic year.**

Comment (32 comments from 32 individuals)	Frequency	%
Online GIS tools (tutorials, activities, data)	16	50%
Survey 123	7	22%
Intro to ArcGIS Online	4	13%
Setting up AGOL accounts	3	9%
Application of GIS to new disciplines and levels	1	3%
Concept of starting with data and letting it grow.	1	3%

The same questions were asked on the second day. The respondent sample is not identical, as a few participants left and others came in. Again the hands-on lab (conducted on this day by a Northern Arizona University instructor) received top billing, but it shared its “Essential” rating with presentations by students (Table 6). All other components were approximately equal in perceived utility, with the medians again being 3 (“Useful”). The grand mean was similar to the mean for the first day, 3.39 (standard deviation .45).

**Table 6. How useful were each of Saturday's components?**

Saturday Sessions	Negotiating Problems of Practice	User presentations	Working Lunch	Student presentations	Mark Manone lab	Next steps for User Group
N	32	33	32	32	30	31
Not useful	6%	0%	0%	0%	0%	0%
Somewhat useful; could have been skipped.	16%	12%	13%	3%	0%	6%
Useful; good to have in program.	34%	42%	56%	41%	27%	48%
Essential; I needed this	44%	45%	31%	56%	73%	45%
Mean	3.16	3.33	3.19	3.53	3.73	3.39
SD	0.92	0.69	0.64	0.57	0.45	0.62
Median	3.00	3.00	3.00	4.00	4.00	3.00

More hands-on time was again the most common suggestion for improvement (Table 7). The second most common comment was that the session were fine. Some respondents reiterated a need for better differentiation of content and more concrete demonstrations. A new concern was uncertainty about the future of the AZ GIS effort going forward.

**Table 7. How could Saturday's conference sessions have been improved?**

Comments (29 from 28 individuals)	Frequency	%
More hands-on time/activities	7	24%
Sessions were OK.	6	21%
Attendee needs assessment to align sessions with levels of experience and teaching	4	14%
More demonstrations of classroom practice	3	10%
Unclear what are the next steps for AZGIS	3	10%
Need to emphasize importance of attending both days	2	7%
Logistics: More breaks	1	3%
More time for interaction with colleagues.	1	3%
Presentations: Timing during the day	1	3%
Problems of Practice: Example of what was expected.	1	3%

Although technical skills (creating story maps and adding data layers) were cited as likely to be used in the coming year, day-2 comments also cited more conceptual learning, such as GIS integration across age groups and content areas, and a desire to incorporate more student-centered pedagogy (Table 8).

**Table 8. Please identify at least one thing you learned on Saturday that you plan to use in your teaching in the next academic year.**

Comments (31 from 30 individuals)	Frequency	%
Adding layers and data to a map	9	29%
Application of GIS to new disciplines and levels	5	16%
Story maps	5	16%
Student-centered approaches	5	16%
Specific tech tips	3	10%
Problems of Practice: hosting course materials	2	6%
GIS videos	1	3%
Ideas for next steps in AZ GIS education	1	3%

Considering both days, the most common highlight of the conference was networking with other GIS users, followed by presentations by educators and by students (Table 9). This despite the session ratings that emphasized technical learning.

**Table 9. Please describe one highlight from the conference.**

Comments (33 from 33 individuals)	Frequency	%
Networking with other GIS users	8	24%
Lesson presentations	5	15%
Student presentations	4	12%
Increased knowledge of GIS	4	12%
Charlie Fitzpatrick presentations	3	9%
Conference team effort and support	3	9%
Increased knowledge of pedagogy	3	9%
General appreciation for conference	1	3%
Inspiration for continued work with GIS	1	3%
Group exercises	1	3%

The subset of attendees who did presentations were asked about their experience. Most felt the experience was very positive in terms of support from the conference team and the technology infrastructure (Table 10). The only complaint was a persistent problem with sound amplification.

**Table 10. If you presented at this conference, please share a comment about this experience**

Comments (16 from 12 individuals)	Frequency	%
Experience was positive	11	69%
Experience was positive, except for AV problems.	2	13%
Could have done more with more emphasis on desktop ArcGIS	1	6%
Attendee needs assessment to align sessions with levels of experience and teaching	1	6%
Presentations should have been required in GIS rather than PowerPoint.	1	6%
(One presenter noted value of presentations by students and beginning GIS teachers)		

### Support for GIS Education

Besides the session ratings, participants were asked about present challenges and future support, the overall conference, and their future plans. Reflecting the interest in hands-on learning, most respondents cited their greatest challenges as being improving their own skills and confidence with GIS and finding the time to pursue the learning and create GIS lessons (Table 11). A variant of this concern was finding a way to impart a level of technical skills to students that would allow them to investigate significant issues. Three respondents cited an institutional concern with convincing administrators or teaching peers to accept and learn about GIS.

**Table 11. What is the biggest challenge you face with teaching with GIS?**

Comments (32 from 32 individuals)	Frequency	%
Personal knowledge of GIS technology	10	31%
Time for learning and implementation	8	25%
Convincing colleagues to embrace GIS	4	13%
Balancing technology operations with integration into learning	3	9%
No problems cited	2	6%
Differentiating professional development for different levels of learners.	1	3%
Lack of access to technology	1	3%
Limitations of ArcGIS Online	1	3%
No class of students in which to implement GIS	1	3%
Size and complexity of data sets	1	3%

The concerns cited in the survey were discussed in detail on the second day of the conference during sessions on Problems of Practice faced by participants in their work. Additional details that emerged from the discussions were a concern that students as well as educators lack general computer skills. Students may also lack the maturity to engage in authentic problems or the perspective to recognize the importance of the issues under study. Issues among colleagues included a reluctance by administrators to allot time and resources for GIS learning and course development and a fear of technology among other teachers. Participants also mentioned that GIS projects require new classroom management skills.

Technology access issues included not only insufficient numbers of computers, but lack of technical support, software, reliable Internet access, and professional development.

Face-to-face meetings were the type of support participants would most like to see from a GIS User Group, whether that means local meetings or support for attending major events elsewhere (Table 12). However each of six suggested types of support was rated as Useful or Essential by most respondents. A number of attendees reiterated their responses using the "Other" option. Specific suggestions focused on two areas: More frequent, local, and targeted conferences; and accessible resource banks of lessons, contacts, and technical support.

As with the challenges, solutions were discussed during the conference sessions. Examples of resources that might be provided by a user group included short (5-minute) online training modules; pre-recorded webinars; demonstrations of GIS lessons; and training series that culminate in completed projects. In general, participants looked to the group to overcome the isolation of working in a technology area that is new to most educational systems.

**Table 12. What types of support from the User Group would be most useful to you?**

Types of Support	Mentoring	Webinars	User Group Conferences	Ongoing discussion with other GST educators	Technical tips on a User Group web site	Support for attending major meetings	Other (describe below):
N	37	36	37	37	36	37	16
Not useful; would not participate	5%	6%	0%	5%	0%	0%	13%
Somewhat useful; might participate	24%	31%	16%	19%	22%	11%	13%
Useful; would probably participate	35%	33%	30%	38%	39%	30%	19%
Essential; would definitely participate	35%	31%	54%	38%	39%	59%	56%
Mean	3.00	2.89	3.38	3.08	3.17	3.49	3.19
SD	0.91	0.92	0.76	0.89	0.77	0.69	1.11
Median	3.00	3.00	4.00	3.00	3.00	4.00	4.00

### Summative Ratings

Asked to rate the meeting in comparison to other types of professional growth opportunities, respondents were split between describing the event as “Superior” and “Essential” (Table 13). All respondents said they were inspired to increase use of GIS with students after the conference. All but one attendee felt they learned something at the conference that would improve the teacher’s ability to engage students in learning with GIS.

**Table 13. How would you rate the overall value of the conference? (N=37)**

Not valuable	0%
Somewhat valuable. As good as any other way to learn and interact with professionals.	8%
Valuable. This was a superior way to learn and interact.	46%
Essential. I would not otherwise have been exposed to these materials and experiences.	46%
Mean	3.38
SD	0.64
Median	3.00

Ratings of the conference were similar across roles, years of educational experiences, levels at which respondents worked, and previous experience with GeoCACHE. With one exception, mean daily ratings and overall ratings were 3.0 or above on the four-point rating scales. The exception was for three post-secondary support staff who tended to have lower daily mean (2.84) and overall (2.67) ratings. The overall rating for this small subgroup was significantly lower ( $F[3,35]=3.17, p<.05$ ).

## Summary and Recommendations

In the final year of a project, the most salient questions have to do with sustainability: Are the activities worthwhile to continue, and if so, what resources will support them? Benefits of the GeoCACHE project identified through observations of lessons and surveys of participating students include:

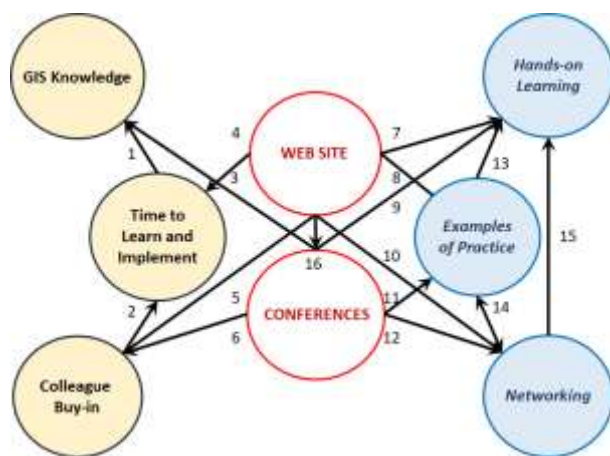
- Teacher development of lessons that addressed both GIS technical knowledge and higher levels of conceptual understanding.
- High numbers of ISTE technology standards being addressed in classrooms.
- Increased use of 21<sup>st</sup> Century skills by students after exposure to GeoCACHE lessons.

These findings have face validity in that the same benefits were reported during PI-facilitated discussions at the conference, as well as the fact that they address the ongoing need for GIS-trained workers and persistent complaints from employers that new employees lack 21<sup>st</sup> century skills such as collaborative problem solving.

On the other hand, integrating GIS into instruction took more time than GeoCACHE planners anticipated. In the first year, training emphasized GIS technology; in the second, the emphasis was on pedagogy. Both seem to be necessary. Teachers reported that one issue was fitting in enough keystroke-level knowledge of the GIS software (ArcGIS Online) that students could undertake authentic investigations. According to the PI directing the GeoCACHE professional development component, completing the planned 55 hours of training appeared to be related to implementation: Those teachers who did not go on to completed lessons averaged only 35 hours of professional development.

GeoCACHE has chosen to address sustainability through the establishment of an Arizona Educational GIS User Group (AZEdG), with the 2017 meeting serving as a kickoff to the effort. As discussed above, the most pressing needs for these potential AZEdG members are personal knowledge of GIS technology, time for learning and implementation, and convincing colleagues to embrace GIS. The favored media for support are regional and local conferences and web-based technical support. Support content should emphasize hands-on learning, examples of GIS lessons and student products, and networking with other educational GIS users. Figure 1 illustrates how these needs, media, and content might interact:

**Figure 1. GIS user needs, media, and content.**



The effectiveness of this model would depend on leveraging the intersections:

- GIS knowledge depends on time to learn and implement.
- Colleague buy-in will affect time to the extent that AZEdG reaches out to policy makers who control resources such as release hours and training opportunities.
- 3-4. Users expect the web site to help them expand their GIS knowledge, but the site will only be used if in the long run it saves time in learning/implementation.
- 5-6. The web site and conferences will promote colleague buy-in to the extent that they are resources for potential GIS users and for administrators, not just for existing AZEdG members.

- 7-12. Hands-on learning, examples of practice, and networking are specific user expectations for both the web site and conferences.
- 13-15. Examples of lessons and student products will promote networking and hands-on learning if the setting goes beyond to show-and-tell to encourage users to, confer, adopt, and adapt.
- 16. Although not mentioned in survey, conference management functions on the web site might help promote events and facilitate registrations and presenter submissions.

At the conference, participants sorted suggested action items at three levels: Individual educator, the educational organization, and the User Group (Table 14).

**Table 14. Action items by level of agency**

Action	Individual	Organization	User Group
Show value of GIS	Start with students (small) successes. Discuss successes with administration and staff.	Partner with parents. Partner with a community group or GIS mentor.	Hands on demonstrations. Invest in 21st Century Learning.
Support GIS educators	Network; take advantage of what is there.	Provide training; collaborate to streamline training	Centralized information hub. Networking opportunities. Small training pieces (5 min).
Integrate GIS in curriculum and classroom	Baby steps; search for prepared story map or lesson. Obtain account from ESRI.	Partner with mentor teacher.	Webinar (Pre-Recorded). Training for a completed project at the end.
Manage time constraints	Align projects with standards. Cover multiple standards with each project. Flipping.	Fewer interruptions. Technology available for students outside of class. Shared projects with external stakeholders (students provide data or analysis; organization provides missing component).	Organize/provide/facilitate interaction with stakeholders and educators. Provide PD.
Provide foundation to learn new technologies	Pre-visit with teacher		Shared successes/techniques

The intersections in Figure 1 illustrate how these efforts need to overlap. For example, an individual creating a project aligned with multiple standards requires not only the time to learn and implement, but the colleague buy-in to secure the resources in the first place.

Given the desire networking and accessible support, along with the dispersed potential membership of AZEdG, a persistent and active web presence would seem to be a top priority. This resource could require substantial time, expertise, and institutional commitment, and would need to be among the early deliverables of the user group. The GeoCACHE project is currently pursuing a no-cost extension of the grant to support additional face-to-face and online meetings, along with outreach to educators and other GIS professional organizations. A challenge for this final effort will be balancing the immediate needs of educators (GIS knowledge, implementation, and colleague outreach) with investment in long-term infrastructure (i.e., the web presence). Some staff hours in the coming year should be devoted to recruiting a webmaster and investigating an institutional home for the AZEdG resources within one of the GeoCACHE grantee institutions or another committed stakeholder.