



*University Consortium for*  
**GEOGRAPHIC INFORMATION SCIENCE**

**UCGIS Report:  
Capturing new opportunities in GIScience Education**

*Summer 2020*

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## Motivation

Education was disrupted in the wake of COVID-19, and GIScience education was no exception. Educators and instructors were forced to rapidly adjust to pandemic-induced remote teaching and now are bracing for an academic year with many “new normals.” The UCGIS Education Committee held a workshop entitled *Capturing New Opportunities in GIScience Education* on June 2 as part of the 2020 UCGIS Annual Symposium. We invited the community to think about how the COVID-19 pandemic presents opportunities for improving GIScience Education rather than challenges that must be overcome to return to “the way things used to be.” The session used rapid breakout discussions and collaborative document construction to help participants collectively address how lessons learned from the pandemic can be used to improve GIScience learning and teaching. The session included 26 participants and used three rapid breakouts to focus discussion around three topics: 1) Opportunities, 2) Equity and Accessibility, and 3) Effectiveness. Participants in each breakout group recorded discussions in live edited Google docs. This report synthesizes discussions across breakout groups to highlight barriers, opportunities, and ideas within each of the three topics.

Among the many thoughtful ideas and considerations discussed, many instructors were concerned with keeping students connected, technologically capable, and engaged in the remote turn to teaching. General solutions focused on maintaining a flexible educational environment through synchronous and asynchronous learning by deeply engaging with universal design learning pedagogies. Across topics, considering the best ways to keep students motivated, connected, and learning fueled discussions and ideas for forward looking best practices. This report summarizes key takeaways from the breakout sessions and provides a more complete list of discussion points and takeaways in the Appendices.

## Session Format

The education session used a rapid breakout group format that allowed for a mix of large and small group discussion and feedback. This format allows for discussion and participation across the participant pool, creating a more dynamic workspace than a panel or series of presentations. In short, the participants in this session worked and participated, rather than just listening. We proposed the three series of topics below to the group at large, and organized different sized breakout rooms to address these topics. Participants wrote notes in shared Google Documents during group discussion, and reported back to the full group after a certain amount of time had passed. A small sample of groups reported their findings to the whole group before transitioning into new breakout groups. At the end of all breakout groups, a large group discussion closed the session.

The following list represents breakout group topics and sub-topics to trigger discussion. For more details, please see Appendix I for a list of 'Breakout Takeaways' from each session. See 'Session Description' details in Appendix II and for more structural details see the 'Organizational Plan for Interactive Panels' in Appendix III.

### **1. New Opportunities**

- a. Identify new opportunities in teaching and learning that emerged since the pandemic.
- b. Leverage students' interests and motivate them to engage with their learning.

### **2. Equity and Accessibility**

- a. Promote digital equity and improve access to technology.
- b. Employ universal design as a strategy for engaging students by offering flexible formats.

### **3. Effectiveness**

- a. Develop faculty capabilities to teach more effectively in a multi-modal environment.
- b. Improve assessment of learning outcomes.
- c. Enhance collaboration among faculty within and among institutions.
- d. Add value to the GIScience educational experience at our universities.

## Key Takeaways

Here we highlight key takeaways that were discussed across several breakout groups or could have major implications for GIScience education as we head into a dynamic academic year. Please see Appendix I for a more complete list of takeaways from each breakout group.

## Barriers

1. Technology and access to technology were key barriers identified across breakout groups. Ranging from fundamental barriers like access to basic computing, internet, and software needs, to specific needs in fieldwork, UAS, or other applications, technology remains a key barrier in COVID-19 impacted coursework. Offering multiple ways to access course software and hardware (giving away licenses, remote logins, loaner computers, etc.), distributing content asynchronously as students have internet access, and providing flexible options for students can help overcome this barrier and ensure equitable access.
2. Concerns in student support and connections were also regularly raised in breakout groups. Between office hours, troubleshooting, building a sense of community, and connecting across the virtual divide, many questions exist about facilitating courses when held entirely remotely. Connecting with campus resources on teaching and learning, building in active learning into synchronous coursework and allowing asynchronous students means of participation, and structuring formal and informal office hours into the semester provide additional ways to connect and build community with students.
3. The magnification of existing inequities in higher education was another barrier identified. Interlaced with other concerns, some students are being impacted in ways magnified by structural inequalities. Support for these students may need to go above and beyond the existing affordances provided by departments, programs, colleges, and universities, and risk further negative implications on at-risk student groups. Advocating for student support for marginalized and under-resourced students and faculty is essential in classroom and administrative spaces to provide as much support as possible for these groups.

## Opportunities

1. Revisiting and rethinking the geospatial curriculum in its various places and forms is an opportunity in this time. From delivery methods, technological approaches, and means of interacting with students and their growing knowledge, skills, and practices in GIS, rethinking GIS for remixed delivery provides an opportunity for educational reflection. Instructors, departments, and students should take this opportunity to rethink how they want to teach and learn GIS. This can include new ways of connecting with content, with students, with learning management systems, with locations, or with ideas.
2. Interfacing with new technologies remains an opportunity. Whether in finding ways to remotely connect with existing software, or building new practice with open technologies, reaching students will require more work. Capitalizing on that work will improve the educational experience for students and faculty. These improvements will include finding innovative ways for interactions between and with students, engaging with conferencing technologies, and trying out new ways of 'doing' GIS.
3. Improving the flexibility and accessibility of course content is a major opportunity for GIScience. While revising content, the opportunity arises for developing more accessible course materials (captioning, transcripts, etc), connecting with flexible course design pedagogies, and considering new ways of creative expression of geographic and spatial knowledge.

## Ideas

1. Taking advantage of different pedagogical approaches (and engaging with teaching and learning theory, pedagogical practice, and curriculum design) to support student learning. One pedagogy, Hyflex (hybrid flexible) constructs a course so that it is accessible for students from many different modalities and means of technology access. This multi-modal approach provides the flexibility for learners in the remote, COVID-19 disrupted space.
2. Universal Design for learning construct courses to meet broad and diverse learner needs. Rather than making one time accommodations for students with different learning needs, preferences, or abilities, courses can be designed to be

immediately accessible for all students. This design supports all student learning and provides a strong base of support for the entire course.

## Conclusion

Overall, participants spoke to the upcoming and existing challenges of teaching and learning GIS in the era of COVID-19 with a clear understanding of the magnitude of the challenges ahead, but also with clear strategies to address them. Many of the different topics and prompts yielded similar concerns and ideas. The thoughtful discussions, summarized below, reveal the care and attention of GIS instructors in this challenging time.

The opportunities breakout considered the technological issues creating barriers for students that might stymie new opportunities in the remote space. However, the strengths of the opportunities, like taking advantage of the affordances of the flexible remote learning environment, engaging with new ideas and trying new things in the teaching and learning space, and building options for students to interact with course content made these barriers worth overcoming for participants.

The equity and accessibility breakout considered inequalities created and magnified by the remote turn and continued disruptions in higher education due to the pandemic. The barriers discussed were similar to those considered in other breakouts, with clear needs to support under-resourced and under-privileged students through unique efforts in ensuring access to technology, internet, and connectivity. However, considering the review of course content and curricula necessary for adapting teaching to the remote style, building equitable and accessible course content now has a new and immediate opportunity. Coupled with taking advantage of accessible course technologies and computational or cloud computing, questions of equity and accessibility could be addressed through a holistic course review.

The final breakout considered the effectiveness of teaching in this mode. Expertise in online and remote learning provides important ideas and context for effective teaching, but students who were not expecting or seeking online courses will have different needs. Throughout discussions, participants emphasized the importance of keeping connected with students in clear and consistent fashions, whatever the preference or prevailing support mechanism may be.

## Appendix I

### Breakout Takeaways

#### New Opportunities Breakout Takeaways

##### Barriers

- Field classes (UAS/UAV), challenges of “going out into the field”
- Restructuring student support, including virtual means of communication and dealing with additional costs
- Technology issues for students
  - Wifi/internet
  - Computer access
  - VPN/VM laggy
  - Operating System (e.g., non-Windows)
- Student engagement barriers in large, non-interactive settings

##### Opportunities

- Preserving field camps to make them accessible for all
  - Anyone can experience the “Geology of the Black Hills” for example
  - Accessible components for all learners and all interested in the topic
- Cloud computing and remote access to GIS software/services
- Virtual communication / remote office hours (easier student access)
- Local: Take advantage of students’ local opportunities (home/place)
- Trying new things due to interest and need
- Making content more relatable (e.g., COVID-19 examples)
- Synchronous/asynchronous course materials allow flexibility for learners
- Flexibility of content delivery allows for different engagement
- Small group interactions through breakouts were successful
  - Equivalent to think-pair-share, group documents, etc.
- Student led presentations/sessions increased engagement

## Ideas

- HyFlex (also known as the hybrid flexible course format) is “an instructional approach that combines face-to-face (F2F) and online learning” ([Milman, 2020](#)). The approach was discussed as an idea to provide maximal flexibility for students in AY20-21. The approach does require some additional planning and design, but allows students to participate face-to-face, synchronously online, and asynchronously online helping to make courses more accessible to learners.

## Equity and Accessibility Breakout Takeaways

### Barriers

- Technology issues are many and include:
  - Connectivity (especially in rural or low access areas)
  - Bandwidth (video, data downloads are bandwidth heavy)
  - Computing (loss of campus computers might leave students underpowered)
  - Monitor size (laptop/chromebook monitors are small)
- Conversion to digital lecturing
  - Time and energy required for engagement
  - Can't just convert a 75 minute lecture to online
- Timezones and balancing synchronous and asynchronous learners needs
- Student support and engagement - strategies and optimization
- Students of different economic backgrounds have vastly different connections and access to technology

### Opportunities

- Lab computers available anywhere anytime, provided internet access allows
- Refreshing content for universal design and accessibility, including updating pedagogy
- Asynchronous-enabled instruction allows broader access to material, and reflective practice
- Open Source can be more accessible and more broadly installed - worth considering a range of softwares and technologies in a course context

- Using auto-captions for ease of understanding/accessibility, enabled easily through Google Docs, Slides, Powerpoint, and other technologies

## Ideas

- Universal design for learning is a pedagogical structure wherein learners with diverse abilities, preferences, skillsets, and so forth are able to connect with and learn course content. This allows for broader support of learner needs in the classroom and structural support solutions for accommodations or other learner needs. By formalizing curriculum and creating course content accessible to all learners, all learners benefit from a universally designed environment.  
<http://universaldesign.ie/what-is-universal-design/the-7-principles/the-7-principles.html>.

## Effectiveness Breakout Takeaways

### Barriers

- Staying connected with colleagues (to offset: virtual coffee / watering hole / hallway meetings)
- Change to course: expectations, grading, delivery, etc.
  - Assessments can be more difficult
  - Cheating on high stakes exams
  - Zoom quizzes (short polls)
- Asynchronous is difficult to keep students connected and engaged (e.g., live polls don't work), but synchronous requirements create other issues.
- Workload is already overwhelming
- Inequities are being magnified
- Faculty teaching assessment in chaotic environments
- Learning Management System (LMS) needs to be learned/relearned and is more than ever a required course component.

### Opportunities

- Reconnect with pedagogical best practices (rubrics, resource sharing, etc.) to make the transition better for all involved (i.e., going back to basics)
- Discussion about teaching, courses, and pedagogy across department
- Renewed look at LMS, can help us more than we think

- Cloud services can help with remote collaboration (e.g., Google Docs, GitHub, etc.)
- Develop multi-modal courses and coursework
- Share ideas on GIS education across broad communities of interest
- Collaborations within and across departments
- Allow students to express creativity by expanding potential of coursework
- Speaking to and sharing common experiences

## Ideas

- Structure remote office hours and connections in diverse ways to connect with students. Spring semester found low attendance - ask and discover what works for each cohort.
- Pass/fail was divergently successful in different cases in the Spring. Think about ways to make it successful (or to support students with different needs).

## Appendix II

### Session Description

*Tuesday June 2, 2020 from 3:00 pm - 4:30 pm EDT.*

**Title:** Capturing new opportunities in GIScience Education

**Number of participants:** 26

### Description

In this session, the UCGIS Education Committee invites the community to think about how the COVID-19 pandemic presents opportunities for improving GIScience Education rather than challenges that must be overcome to return to “the way things used to be.” Through rapid breakout discussions and collaborative document construction, we will collectively address how lessons learned from the pandemic can be used to:

- Leverage students’ interests and motivate them to engage with their learning.
- Promote digital equity and improve access to technology.
- Improve assessment of learning outcomes.
- Employ universal design as a strategy for engaging students by offering flexible formats.
- Develop faculty capabilities to teach more effectively in a multi-modal environment.
- Enhance collaboration among faculty within and among institutions.
- Add value to the GIScience educational experience at our universities.

Conclusions from the session will be gathered in a Google Doc edited live by the discussants and participants. The Education Committee and UCGIS will use conclusions from the session to inform priorities in the coming years. Session participants will be invited to continue working with the committee to improve GIScience education as we go boldly into the future.

## Appendix III

### Organizational Plan for Interactive Panels

Forrest J. Bowlick, UMass Amherst

This plan outlines how to build interactive, group-based discussions through remote, synchronous, and collaborative efforts. This plan provides a well outlined and functional example for discussions and presentations in a variety of contexts.

#### Digital Platform and Operations

For operations, I have found success using Zoom to manage the technological side of these discussions. In classrooms and conference sessions, Zoom's affordances of chat, breakout rooms, and simple reactions allows for a well moderated discussion and interaction. For collaborative document work, Google Docs (with appropriate open editing capacities for all involved) allows for a familiar way for people to work on ideas together.

A general format might look like this. A moderator or host introduces the panel, discussion, or ideas, sets up the framework for what the session will look like, and manages questions about said format or flow from the audience. Using the 'raise hand' functionality in Zoom and accepting questions through chat is the best way to manage such questions. This might be paired with a technical director who is in control of things like muting and unmuting audience members, creating breakout rooms, sending informative messages through chat, and managing the recording, but one person can handle both positions if they are familiar with the technology.

Panelists or discussants should therefore only be responsible for their content and their ideas. If sharing slides, they should know how to use the screenshare functionality in Zoom without issue. They should plan for auto-captioning using their preferred technology for accessibility.

## Audience Expectations and Supporting Technologies

Audience members or participants should know in advance what is required of them so they can be in an appropriate setting. Positioning the session as a collaborative work time should indicate to participants that they are expected to work and not be a passive observer. This works well in classes too, where each day's work is known in advance so students can participate appropriately, and not feel surprised or embarrassed.

The general schedule and flow should be introduced in the session description distributed beforehand and outlined in the introduction by the moderator. The plan should be clearly outlined with expectations, goals, and general operation of the session. For example, if collaborative work is to be done, the links to those collaborative pages should be prepared in advance and set up for sign-in free editing, as not everyone may have a Google Account. This assumes good faith of participants to not edit, delete, or place inappropriate content in the workspace. Higher security or accountability (requiring sign in, password, etc.) comes with a greater chance of things going wrong.

For the documents themselves, I prefer a light organization to allow groups to create content given their prompt more organically. However, tighter organization should be pre-set in every collaborative document. Never assume your structure will make sense when simply explained to workgroups. Build it in for them.

Throughout the session, mixing workgroups, coming in and out of the large main group/room, and deciding on group 'leaders' or 'moderators' should be planned in advance and explained to the entirety of the session. For example, panelists might make good room leaders if the audience is small - if too large, not every participant might be able to feel involved. Knowing in advance how many people are planning to attend a session is important. (Zoom has pre-registration options for this, which also reduces the possibility of 'Zoom-bombing' by troublemakers.)

For example, the whole group could listen to one question to a panel, and the panel's responses, then go to 'small' groups to consider, then come back to the large room, recap, listen to another question, go into larger groups to consider, come back, etc. The result is movement - digitally of course - but movement nonetheless to change energy,

focus, and attitude. While we are still in our same place, the digital space feels active, maintaining connection and content awareness.

A general philosophy for these sessions is outlined below, as considered after our session of this nature in the UCGIS symposium by Miriam Olivares from the Yale Libraries and edited by myself. Successful interactive sessions are based on:

- Enthusiasm and energy from the panelists/moderators/technical support
- Assumption of good faith and effort in work from all involved.
- Mixing of groups and changing the number of participants per session.
- Open Google Docs to avoid login issues
- Extremely relevant topics
- Enough time for discussion, not rushed as usual
- Enough time to recap, not rushed as usual
- Engaged group and willingness to participate

Generally, these sessions require work, preparation, and planning. However, they are highly successful in building community and connections, and allow for a different type of interaction than 'talking head' panels.