HOW PANDEMIC TECHNOLOGIES HAVE TRANSFORMED OUR POST-PANDEMIC COURSES

Ryan Gantner and Erica Johnson
St. John Fisher University
3690 East Ave., Rochester, NY 14618 USA
rgantner@sjf.edu; ejohnson@sjf.edu

Abstract: In this paper several transportable examples of how faculty and students used the iPad and other technologies to enhance student engagement via student presentations and collaborations will be discussed. While these technological techniques may have blossomed during the pandemic, their academic utility transcends those times and serve to promote mathematical discourse in the post-pandemic time. Suggestions for adaptation, insights, what worked well and what worked less well, proposed enhancements and new directions will be presented. These electronic media provide a conduit for promoting mathematical discourse in diverse educational settings, spanning traditional classrooms to distance learning courses.

Introduction

The COVID-19 pandemic was a turbulent time in the collegiate academic landscape. Many of the protocols put in place to help keep us physically safer caused us to rethink the way we teach and learn. Technology played a crucial role in pandemic-era instruction and many faculty throughout the country experimented with new technology, familiar technology in new roles, or augmenting the use of previously-used technology. Now that most pandemic-era restrictions on interactions have been lifted, we explore which practices developed during the pandemic continue to survive in the post-pandemic educational landscape and which have given way to previous ways of thinking about learning.

The authors will comment on these trends through the lens of their own experiences. To do that, some background is necessary to become familiar with what the authors' experiences were so that the reader can align them with their own situation.

Setting

Both authors work and teach at St. John Fisher University. Formerly known as St. John Fisher College, the institution became known as St. John Fisher University during summer 2022. It has an enrollment of approximately 2700 undergraduate students and is located in suburban Rochester, NY. It is known for being the home of the summer training camp for the Buffalo Bills. Fisher has small classes; all math courses are less than 35, most are less than 22. Students primarily hail from New York state.

One technological piece that profoundly impacts our experience is the iFisher: Next Generation Learning Initiative. Through this program, St. John Fisher has invested resources to have a 1-1 iPad program. This means that all faculty and students currently have an iPad for their use, as well as an Apple Pencil.

Faculty were given iPads in summer 2021. The institution offered a two-part Apple Academy training program, including the option to become a Certified Apple Teacher. To date more than 240 of 300 faculty who engaged in the Fisher Apple Academy training are Certified Apple Teachers. Starting in fall 2022, all Fisher students have iPads and use them in varying ways. In fall 2022, Fisher was recognized as an Apple Distinguished School for 2022-2025. Opportunities for continued faculty development are available through the DePeters Family Center for Innovation and Teaching Excellence.

St. John Fisher University has made using classroom technology relatively easy. All of our classrooms have features that include computer projection systems, AppleTV systems (so students and faculty can quickly connect their iPads to the projectors), and document cameras which can display documents as well as capture nearby audio.

Life during the pandemic

St. John Fisher closed its campus in mid-March 2020, along with (nearly) everyone else. Classes were moved online for the rest of spring 2020 semester. We returned in-person in fall 2020 with restrictions including a 6-foot separation between desks, masks required, no collection of papers, and ritual cleansing of classroom work surfaces before and after use.

During the 2020-2021 academic year, some faculty were on-campus, some were remote. Some students were on-campus and some were remote. Even though the campus was open, there were still many courses that met synchronously over Zoom. Some faculty taught hybrid classes whereby some of the students met face to face and others met through Zoom on an alternating schedule. Despite these efforts, Fisher had a spike in COVID cases and all classes were moved online in mid-October 2020 until the end of the term.

For 2021 - 2022, the only requirements that remained were vaccinations, masks, and recording of classes. Many faculty recorded classes using Zoom because it was easy and allowed students to attend class virtually. The mask mandate was lifted in spring 2022. Going forward vaccinations will not be required.

What has persisted?

Of all that we did, what continues to be of pedagogical and educational value today? What have we forgotten about? What do we hope to never see again? We will focus on how technology impacts communication, and divide that into three broad categories:

- Between faculty and students
- Between students and students
- Between faculty and faculty

Communication between faculty and students

Grading of papers

During the pandemic, we were not allowed to collect and return papers to students, in an effort to minimize the transfer of germs. Many of us at the university still adhere to this practice including one of the authors who continues to grade papers and provide student feedback primarily online. This means the way in which we collect and pass back papers is an evolving process, especially as Fisher has progressed through its iPad initiative.

When we were first sent home in March 2020, the easiest way to return papers electronically was within the LMS. Fisher currently uses Blackboard as its LMS. There are a few ways to grade submitted assignments in Blackboard and give students feedback. One way is to attach comments in various places in their uploaded work, which is easiest done if the comments can be typewritten rather than handwritten. This works for the most part but becomes difficult when the need arises to convey notation-heavy mathematics to students who are unfamiliar with typesetting conventions in mathematics. In theory there is a markup tool in Blackboard, but it is very glitchy and nearly impossible to use.

In the summer of 2020, the faculty received iPads and Apple Pencils. This allowed us to grade papers by hand using the Apple Pencil. Eventually the students would have iPads, but when we first received them, they did not. This means that the students had to submit their work to the LMS using some other way. Most students would write out their homework on a piece of paper. They could then snap a picture of it using their phone and upload the picture. Even better, they could convert the picture to a pdf.

Most Apple phones have a built-in pdf converter. Android phones could use a variety of free apps to convert to pdf. One suggestion was that students use CamScanner. Suggestions were provided on how to use it. The advantage of the pdf file over the jpg file is not only the universality and ease of markup, but also the ability to stitch multiple pages of an assignment together into one file, which allows for easier grading. This method of uploading documents remains a viable method for students to submit work, though our students don't typically do this anymore because they can do their homework using their own iPad and Apple Pencil using an app such as Notability.

Once students submit their work to Blackboard, the homework can be batch downloaded into a folder created for that assignment, then imported into an app on the iPad. One author uses Notability and the other GoodNotes, though the students typically use Notability. Both apps have nearly the same functionality, so either one gives us the ability to mark up the papers, making note of any grades to record in the gradebook. Then export the file as a pdf, save it, and pass it back.

About passing it back… there are several options to do this, each of which has drawbacks. One option is to create a separate Google Folder for each student in each class. Each folder is shared with the instructor and the student. Each graded homework file is then saved in that student's personal Google Folder. Besides the initial investment in setting up the shared folders with each student and alerting the students to their presence, passing back papers in this manner was tedious in other ways. At the time, selecting the correct folder to pass back files took more time than expected, especially due to the limited screen space afforded by the iPad. Perhaps the primary drawback is that the students are often unaware of when their papers are being returned. The fact that papers are waiting for them in their folders needs to be announced to the class. And even when we do, because the Google Folders are not integrated with the LMS, the homework submission, homework pass-back, and grades are not naturally linked together in the same place, causing confusion for students.

Instead of the Google Folder method, we have tried saving all graded homework files in one place, then attaching the papers one-by-one to Blackboard Assignment feedback using the gradebook feature. This eliminates some of the problems with organization from the students' point of view. However, it is arguably more tedious from the instructor perspective. In effect, the file is double-saved: first it is saved off of the iPad in a folder, then it is saved into Blackboard via the gradebook feature. And the latter step requires a formidable number of mouse clicks. Next year, the university is transitioning away from Blackboard toward Brightspace, which should have the ability to batch upload papers, an ability that our current LMS does not have.

Electronic grading of homework persists beyond the pandemic-era restrictions using these methods because of the advantages. Besides the nominal savings to the department's copy budget and environmental concerns regarding paper, one big advantage is that both the instructor and the student have an archive of all the graded papers that have been passed back. This is useful to see how students are progressing, to allow students to redo work, and for course or program assessment purposes. Of course, forcing the students to create a digital copy of their work makes their work easier to pass back and forth: not just to me via email or Zoom, but to each other. This opens up collaborations that were previously reserved only for in-person group meetings.

However, by far and away the biggest drawback is that grading takes longer this way. Sometimes substantially longer. With paper assignments, the transition in grading one paper to the next is a matter of flipping over a sheet of paper. Now, it's a matter of clicking in about 10 places and waiting for the file to open and render completely. It's longer still when papers are graded one-problem-at-a-time – the first problem on everyone's paper, then the second problem, etc. There is a realistic limit of about 8 or 9 papers that can be open in GoodNotes at a time without making navigation overly cumbersome, so for classes of more than that, files need to be opened and closed multiple times before they are fully graded.

Other forms of communication between faculty and students

One of the most basic changes was a simple organizational switch up to make using the LMS, Blackboard, easier for students. It continues to reap benefits today. Because of the pandemic, it was important to ensure that course information was organized, easy to find, and not overwhelming for the students. For course management, instead of uploading files and assignments to Blackboard, on an as-needed basis, materials were organized by week, in order to create an easy to follow system during these stressful and complicated times. This reorganization created a shift in mindset from "file repository" to a course instructional supplement. Furthermore, organizing by week created manageable bits for students and a record of the course pace for the faculty. It is easy for the instructor to see what materials are covered each week and to make adjustments as necessary. Utilizing Blackboard creates additional options for students to rely on, as an alternative to aspects students rely on like calendars, push notifications, and looking back to the syllabus. During this period, a Google drive folder was created for each class through which the instructor could share additional class materials like activities or notes.

Technologies implemented during the pandemic have also impacted the delivery of electronic content to class. The ease with which instructors can create slides or pdf notes using the iPad is a real asset. The instructional icing is the easy shareability created by the combination of the iPad and Google drive. Using the Notability (or similar) application, instructors can write notes from class on the iPad and display them using the projector. These completed class notes can be uploaded to the class Google drive folder that the students can access. These notes can replace those created using a Zoom whiteboard or SmartBoard Technology - with the added benefit of being easy to share with the class.

Pdf notes can be easily created with the iPad and can be uploaded to Blackboard or the Google drive folder, available for students to download. Instructors can use Blackboard or the Google drive to upload materials (like notes or an activity) for class. Students can download the pdf file, upload the file into Notability, and update it with their work and annotations.

Google docs, Jamboards, Google sheets (or Numbers files) can all be used for in class group activities, allowing students to update the same document in real time. Notability and Google suite products are not the only options for sharing files. Other technologies that can be used for file sharing include: AirDrop, Classroom App, OneNote and OneDrive products. Learning Management Systems like Blackboard or applications available in the Google Suite (like Google documents) make it easy for students to share assignments like homework, writing assignments, or daily tries on problems to be discussed in class.

One of the authors requires students to create a Google document reflecting their attempts at a task in preparation for class. Students update their Google Preparation document as the semester progresses. Tasks are either discussed or used as the foundation of further discussion, as appropriate. Using a Google document makes it easy for students to share

their pre-class tries with the instructor or with the class. For more information on this assignment, please see the ICTCM 2023 paper, The Preparation Task Document: An Evolution of an Effort Journal by Erica Johnson.

We used Zoom technology during the pandemic and discovered the utility of Zoom as a means of communication. Not only were students able to attend conferences electronically that they would not have been able to in a face-to-face environment, also on the day-to-day, Zoom facilitates faculty sharing their work with students. Zoom also allows students to share their work with each other, with the class, or with the professor. Naturally these uses remain. For those who want to record their classes, Zoom can be used, creating a record of what happened for those who miss or allowing students to revisit a particular class. Zoom allows instructors to be more flexible in meeting students for office hours, whether it be for tutoring or for academic advising. The Notability app on the iPad, in combination with the Apple pencil, is especially helpful when giving students feedback on homework - either by email or during a Zoom tutoring session. While helping a student with a complicated math problem by email used to be difficult, now the instructor can upload a picture of the student's work into Notability, make comments using the Apple pencil, save a copy in their Google drive, and share the file with the student.

Communication between students

Zoom is one of many technologies (Facetime, Snapchat, FB Messenger, for example) that facilitate mathematical conversations when not all of the participants are in the same room as it allows participants to see one another and to share their work with each other, with the class, or with the professor. During the pandemic, using Zoom in class was a boon, in that we were able to social distance and communicate mathematically using Google Documents, Jamboards, or Spreadsheet software like Numbers or Google Sheets.

Google documents are one author's go-to, having tried Google Sheets and Jamboard and found both of them limiting in certain favored ways. Furthermore, in fall 2021, students had repeated issues with the Jamboard app and the workaround was to shift to using Google docs. They were reliable and it was easy to share a link to a Google document that students were allowed to edit. Students posted their responses in a variety of ways, but mostly by taking a snapshot (photo or screenshot) of their work and uploading it to the shared Google document. Not all students use their iPads so using Google docs also accommodates the widest range of technology use by students. Other colleagues prefer Jamboard or Numbers. With each of these technologies, questions and comments could be updated in the file in real time.

While it was great for students to be able to share their written work, collaboration was much harder when students need to socially distance, regardless of the technology. Our post-pandemic norms allow for the same electronic communication without the need for

social distancing. Zoom made screen sharing easy but all of our classrooms have at least one projector and the additional capacity to change the input to the projector. This means the input could be the document camera, the computer, or an iPad in the room. When the technology worked as intended, a student could share files from their personal ipad. This was especially helpful when the student wanted to share their work to help direct the class conversation. Edits can be made in real time, as part of the classroom conversation. This can replace Zoom Technology for student-to-student in-class sharing as it has the benefits of the e-sharing and being able to interact with each other face-to-face.

Naturally students also communicate mathematically outside of class and Zoom continues to allow students to use technology to discuss their work. Whether it be homework, writing assignments, or studying for an exam, having students communicate mathematical ideas is crucial to their mathematical development. When students miss class it is easy to get notes from a peer. A student can upload an electronic copy of their notes to their Google Drive and share a link with their classmate.

Communication between faculty

The Google drive has really become an integral part of the life of a faculty member. Before the pandemic, it was available and many faculty members utilized it. Post-pandemic it is pervasive and used by almost everyone. Most faculty have no trouble understanding what a shared folder is and its use is expected - whether it be the shared documents of Departmental or University-wide business or committee work. The convenience of being able to access your files anywhere is remarkable. Additionally, the Google drive is a boon for teaching and for professional research collaborations. With a QR code, faculty can share links to more information on a particular topic - be it a manuscript for a research paper or instructional support blog. It was instrumental in the creation of our pre-prepared presentation and this proceedings paper.

Sharing is caring! And that is evident in the way that technology that has persisted post-pandemic has really enhanced the way in which students and faculty communicate with each other. We will continue to use many of the technologies outlined in this presentation. We will still continue to collect assignments electronically and to require students to document their tries, as well as create shared spaces for students to collaborate with one another as a means to develop their mathematical understanding. Some enhancements will be due to the shift in Learning Management Systems from Blackboard to Brightspace.   We may even try new technologies! Other changes will arise because we find technologies that do what we want (hopefully) better than those we are currently using. Future questions and research directions of interest are how to create equity in students' technological (iPad usage and otherwise) backgrounds. One author in particular, would like to harness the background of the students who are more experienced technology users. This particular project is at the zygote stage and this author has not thought carefully about important beginning level questions like what student prompts (questions) should be given to the student iPad experts for them to share their tips and what modalities should be used for said experts to share their tips. We are, however,

excited to think harder about these important questions, learn more, and, in a best case scenario, will have an update for ICTCM 2024!