

The Importance of Apps during COVID-19

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doi: [10.18833/spur/4/1/15](https://doi.org/10.18833/spur/4/1/15)

Prior to the social distancing order that occurred in March 2020, my undergraduate collaborators and I at the University of North Georgia were very fortunate to have already incorporated a number of apps into our research. Similar to Microsoft Teams (MT), the Slack app (Slack n.d.) allows for sharing documents, facilitating conference calls (with the paid version), sending direct messages, and providing change notifications. Additionally, Slack offers more than 1400 additional apps than MT and is compatible with Windows (W), OS X (O), iOS (i), Android (A), and Linux (L).

Prior to Slack, new students received assistance from myself and a seasoned research student and were given a copy of a training PowerPoint of 150 slides that included video and visual training modules. Once the switch was made to the Slack workspace, the PowerPoint was replaced with a set of more relatable “wiki-like” pages that are generated and stored in Dropbox Paper (Dropbox Paper n.d.; similar to Google Docs with a sleek modern look; WOIAL), which automatically syncs to a Slack channel with how-to information. Slack has allowed the students (even the more introverted) to freely communicate through direct messaging and conference calls as well as to share and discuss documents on nearly any device. When issues or questions arise, I receive notifications on all my electronic devices, thereby allowing for responses in real time.

A next step was the Asana app (Asana n.d.; WOIA), where I am able to assign, oversee through a Kanban board (task lists sorted by “Overview,” “To Do,” “In Progress,” “Completed,” and “Findings”), and attach deadlines for each student project. These tools work wonderfully as long as each student utilizes them (i.e., searches through the Dropbox Paper wikis first when questions arise). There are times when notifications in the Slack app are not turned on by the students, leading to missed action items, or an assigned task may not have been moved into the correct column within the Asana Kanban board, thereby producing incorrect project status reports. Recently, a switch was made from Asana to Clickup (Clickup n.d.; WOIAL), which furnishes a host of other organizational options, apps, and daily reminders of tasks that are due, overdue, or upcoming. Since there is a paid Clickup subscription, the team has been encouraged to utilize this organizational tool outside of research in which a goal may have multiple tasks and due dates.

These apps have been game changers in terms of organization and productivity not just for the research group but

also for me by keeping me updated on the big picture and the most emergent due dates. Since the advent of COVID-19, all monthly group meetings are being held online via Slack. Additionally, to keep everyone in the group positively motivated and to provide a reminder that group members are in this together, quick pulse meetings are held each week. These check-ins allow for status updates of personal (mental and physical) as well as project health. They have been so well received that I intend to continue them post-pandemic. Overall, these apps have helped the research group and me stay on task as well as remain upbeat and motivated during this unparalleled event.

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Lessons Learned from a Virtual Summer Undergraduate Research Program

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doi: [10.18833/spur/4/1/11](https://doi.org/10.18833/spur/4/1/11)

In summer 2020, North Carolina A&T State University and Elon University were poised to debut their Research Experiences for Undergraduates (REU) program in mathematical biology funded by the National Science Foundation (NSF). However, as COVID-19 continued to spread, it became evident that a residential program would not be feasible.

When NSF issued guidance on options for the program, student participants already had been accepted. The program could have been canceled or postponed, but the directors decided to hold the program virtually so that students would have the opportunity. Although the directors did not have experience running a virtual program, they learned from the experience and have recommendations for program directors in similar situations.

Take the Risk

Running a summer program virtually is intimidating. Mistakes were made, but opportunities were provided for students during a challenging time when many programs canceled. The students were very appreciative, and the opportunity may have outweighed the mistakes.

Spend Time on Community Building

Students in residential programs naturally spend a considerable amount of time together. Often students can brainstorm in one location and head down the hall to meet with a mentor at a moment's notice. Personal connections, which foster strong collaborations, are difficult to establish through virtual meetings. Open communication is necessary for those working on group projects. Online activities such as game nights may seem unnecessary at first, but non-academic interaction can bring a sense of normalcy to an otherwise unusual situation.

Plan Technological Interaction

Although mentors have recently increased usage of online meeting platforms, many are still learning how to use these platforms most efficiently. Students successfully collaborated through online resources such as formatting using LaTeX through overleaf.com, programming in Matlab® through mathworks.com, and sharing files through Google Drive. Still, more versatile venues should have been established for student discussion. Consulting an institution's technological center before beginning an online program may be advisable to ensure that meeting "spaces" will match programmatic goals. For example, virtual spaces were needed for each research team. Breakout rooms in Zoom were attempted, but the required hosting duties resulted in hindrances to students meeting at times convenient for them. University technology experts would likely have provided suggestions about more suitable ways to achieve desired "spaces."

Consider Different Program Models

The community and personal mentoring of typical REU programs cannot be completely reproduced in a virtual setting. However, students in the NCA&T-Elon program were able to gain research experience in mathematical biology and strengthen their communication skills through weekly oral presentations and collaborative papers. Perhaps some programs could be created that provide a hybrid experience combining shorter residential programs with virtual elements. Such programs could be offered when less funding is available, leading to more opportunities for students.

The next NCA&T-Elon REU program is planned to be in-person, but the situation will be adapted as needed to offer undergraduate research opportunities.

Acknowledgment

The REU summer program was funded by NSF DMS no. 1851957/1851981.

Undergraduate Research at a Liberal Arts College during a Time of Disruption

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doi: 10.18833/spur/4/1/13

Over the past 20 years, Rollins College has supported collaborative undergraduate research between students and faculty, which has resulted in consistent success, as evidenced by countless peer-reviewed publications and conference presentations (Rollins College n.d.). Due to the COVID-19 pandemic, the authors, who have expertise in acoustics, optics, and astrophysics, decided to pivot from the experimental components of their research and focus instead on computational studies. Many of their usual research practices were adapted, creating new techniques to optimize the remote research experience for their undergraduate students.

A great deal of teaching occurs during summer research, whether that is demonstrating the application of skills learned in coursework, developing techniques specific to an area of research, or instilling skills and best practices for any research lab. Prior to the pandemic, these undergraduate research collaborations typically consisted of eight-hour days over eight weeks in the summer. During the disruption, modifications due to the pandemic resulted in a shift to remote discussions for a few hours each day and research extending across the entire summer.

The students were asked to work more independently and on their own time frame. These changes resulted in much more deliberate growth in their time management skills and skills as independent researchers who take ownership of their work.

Table 1 lists several potential barriers to remote research alongside the authors' solution(s). As seen in Table 1, networking and communication web tools needed to be used, as well as approaches to thoughtful discussions that would normally occur spontaneously throughout research. These tools have allowed them to mimic working together with the students in the same laboratory space, whether that was discussing code or analysis software, results of the studies, or next steps and guidance for the next research stage. In many ways, meeting applications allowed the replication of much of a "normal" summer of research.

With this model, the authors hoped to foster independence while maintaining a level of accountability. One author elected to use Toggl (Toggl n.d.) to help students keep track of their schedules and project time. Students noted a small increase in their time management. As most of the students participated in research prior to this remote work, they may have already developed strong personal accountability in regard to managing their time.