2021 ASEE ANNUAL CONFERENCE
Virtual Meeting | July 26–29, 2021 | Pacific Daylight Time
Paper ID #32541

Using Collective Wisdom to Enhance Experimental Learning During the COVID-19 Pandemic

Dr. Jason Yao, East Carolina University

Dr. Jianchu (Jason) Yao is a Professor with the Department of Engineering at East Carolina University (ECU), Greenville, North Carolina, USA. He is currently the Associate Dean for Academic Affairs of the College of Engineering and Technology. He received a B.S. and M.S. degrees in electrical engineering from Shaanxi University of Science and Technology, China, in 1992 and 1995, respectively, and the Ph. D. degree in electrical engineering from Kansas State University in 2005. He served as a controls engineer in China from 1995 to 2000. His current research interests include wearable medical devices, telehealthcare, bioinstrumentation, biosignal processing, and control systems. His educational research interests are laboratory/project-driven learning and integration of research into undergraduate education. Dr. Yao is a member of the American Society of Engineering Education and a senior member of Institute of Electrical and Electronics Engineers (IEEE), to which he has been an active volunteer.

Dr. Ricky T. Castles, East Carolina University

Dr. Ricky Castles is an associate professor in the Department of Engineering at East Carolina University. He is primarily affiliated with the ECU Electrical Engineering concentration. His research work focuses on the use of wireless sensor networks, microcontrollers, and physiological data collection for a variety of applications. His primary interest is in the area of adaptive tutorial systems, but he has ongoing projects in the area of hospital patient health monitoring. He is actively engaged in K-12 outreach through several venues.

Dr. Chris Venters, East Carolina University

Chris Venters is an Assistant Professor in the Department of Engineering at East Carolina University in Greenville, North Carolina, USA. He teaches introductory courses in engineering design and mechanics and upper-level courses in fluid mechanics. He earned his Ph.D. in Engineering Education from Virginia Tech in 2014, and his research primarily focuses on conceptual understanding in engineering mechanics courses. He received his M.S. in Aerospace Engineering from Virginia Tech and his B.S. in Aerospace Engineering from North Carolina State University.

Nic Herndon
Mrs. Melinda T. Doty, East Carolina University

Using Collective Wisdom to Enhance Experimental Learning During the COVID-19 Pandemic

The rapid escalation of the COVID-19 pandemic hit all educational institutions unprepared in Spring 2020 semester. Many schools had to pivot to online instruction with little preparation and minimal response time. The summer of 2020, while most universities offered few courses, was the time for faculty to regather resources and prepare for the fall semester. Many anticipated the likelihood of teaching online again and saw challenges associated with this instructional modality, especially for laboratory courses. A group of enthusiastic and experienced faculty members in the College of Engineering and Technology (CET) at East Carolina University congregated and started a weekly Faculty Connection Hour (FCH) to network and share pedagogical ideas for remote teaching. Many of these sessions focused on innovative ways to provide remote laboratory learning experiences comparable to their conventional face-to-face alternatives. A large number of faculty members contributed to and benefited from these discussions.

The FCH started with identifying some challenges of laboratory learning with remote instruction. The group was able to discover fifteen strategies that can potentially facilitate the adaptation of laboratory learning to online instruction. The group also recognized that, although there may not be a single strategy that can resolve all issues existing in a course, laboratory learning objectives can often be achieved by using a combination of different strategies.

Collective wisdom gathered from FCH discussions seemed to have equipped faculty with pedagogical ideas for the pivoting. Equally importantly, the connection built through these virtual meetings helped isolated faculty to recognize that they were not fighting the hardships alone; instead all members shared the same adversities. In a sense, it reduced stress and allowed faculty time to reset and unwind.

Background

<u>Basic Information about the College:</u>

East Carolina University is located in a small city with a population of less than 100,000. The CET is comprised of four academic departments (Construction Management, Computer Science, Engineering, and Technology Systems). CET faculty are typical of large state universities, consisting of tenured/tenure-track faculty, full time fixed-term faculty, and part time instructors. The CET employs approximately 100 full-time faculty members and enrolls approximately 3,000 undergraduate and graduate students. While the CET does offer some degree programs fully online, most degree programs are offered face-to-face. Prior to the pandemic, few faculty in the college had experience teaching online. The college offers a variety of graduate and undergraduate programs with a strong value placed on undergraduate teaching with close faculty-student interaction and strong student-student collaboration.

The Spring 2020 Semester-The Initial Pivot:

East Carolina University was on spring break when the coronavirus pandemic escalated to the point that university officials decided to pivot all undergraduate instruction online. Just as hundreds of other colleges and universities had to do in March of 2020 [1], East Carolina University faculty were forced to convert all courses to online class instruction with little preparation time. Students were asked not to return campus from the break and classes resumed online in the second half of the semester. Faculty tried their best to shift their lecture material and all assignments to accommodate online learning. Based upon student feedback and faculty observations, however, the spring semester was a challenge for both students and faculty and the learning outcomes for many students were not in many cases what was hoped for at the beginning of the semester. While the pandemic was hoped to be a short issue in the early months, it became clearer as time went on that this was going to last much longer than previously wished. In the summer, while few might have taken time off for refreshment, most of the faculty went right back into the fall semester preparation, understanding, or hoping, better preparation will result in better student learning.

A Very Complicated Situation:

Moving everything to online instruction presented the faculty and students with great challenges in many aspects and caused concerns on many levels.

While the college has several distance-education programs and many courses have been previously offered online, the level of online-teaching acceptance among faculty significantly varied. Due to their philosophical preferences or technological proficiencies, some faculty either doubted the effectiveness of or were incompetent with online instruction. Some faculty did not understand the difficulties faced by students trying to learn online using new technology. In some cases, students lived in areas with limited bandwidth. Some students lacked the use of laptops or other computing resources and often attended classes via mobile phones.

While working in an office environment was risky and discouraged, the lack of faculty interaction with peers left many faculty feeling a sense of isolation. Normal hallway discussions were restricted, making collaboration such as co-teaching multiple sections of the same course much harder. Similarly, not being able to come to campus not only limited faculty-student interactions (office hours, recitations, etc.), it also inhibited student-peer interaction (group projects, teamwork, etc.) and stopped most of extracurricular experience (e.g., student clubs/orgs). It also impaired essential hands-on learning because students were no longer able to access facilities and equipment required to conduct experiments, make observations and collect data [2].

Even for those who were comfortable with online teaching, difficulties do not stop there. In the rural area, one could not assume reliable internet access was always guaranteed to everybody. Lectures could be interrupted because of lost WIFI connections. Students might not finish an exam due to power outrage. All these technical hardships not only impaired learning, but also increased faculty workload and caused academic integrity issues [3].

Planning for Fall 2020- The (Limited) Return to Campus

The university valued the importance of face-to-face instruction and planned for a limited return to campus for the Fall 2020 semester. Under this plan, the university tried to offer face-to-face instruction as much as possible with most courses offered in a hybrid format with some instruction face-to-face and other instruction done online. Large lecture courses were still offered online, while other courses were held in larger classroom than would normally be necessary to hold the expected enrollment. Students and faculty were required to wear masks at all times on campus. Each classroom was outfitted with disinfectant wipe dispensers and hand sanitizer allowing students to wipe down their workspace before each class and to sanitize their hands. In order to minimize interactions with others on campus, the university implemented an academic calendar that split the Fall 2020 semester into two blocks (about eight weeks in length), with courses finished in these units of time. The intention of the block scheduling was to, (a) reduce the level of traffic on campus as only half of the courses were offered in each block; and (b) if one a block was able to finish with face-to-face instruction without being interrupted by a return to fully online instruction, the quality of that part of schoolwork would be protected. While this consideration was well-intended, it required teaching plans to be completely reworked, with the worry that instruction would be rushed without allowing students sufficient time to digest and absorb the content.

Even worse, different levels of the university attempted to respond to such an unprecedented situation and make plans for the Fall 2020 semester. The many changes made to try to keep faculty and students safe meant the arrangements were dynamically adjusted; resulting in extreme difficulty for faculty to do classroom planning. The university implemented space capacity limits in all classrooms which restricted the number of students who could be enrolled in each section. This was particularly challenging for laboratory courses that rely on dedicated equipment because extra sections of courses needed to be scheduled in order to allow all students in a course to access the equipment while adhering to capacity limitations. Many other attempts to keep faculty and staff safe also required adjustments to normal campus operations. Walking traffic patterns were adjusted to keep people spaced apart. Disinfection procedures were developed and supplies were procured. Special signage was added throughout campus to explain the new rules and to provide the latest information. However, all these detailed adjustments eventually would impact classroom practices, inevitably causing another layer of stress to faculty.

Recognizing how isolated faculty members were and how unprecedented the challenges were, the CET decided to launch a program to connect faculty. This program allowed faculty to share concerns, discuss challenges, and learn about best practices from colleagues. This paper elaborates upon this program and presents the results collected from a faculty survey.

The Faculty-Connection-Hour (FCH) Series

The Faculty Connection Hours (FCH) started on June 17 and ended on July 29, a week before the beginning of the fall semester. The authors of this article severed as the core faculty group that led the discussions. A wide range of relevant topics were discussed, including sharing challenges and concerns regarding how to delivery laboratory instruction and protect experiential learning. Faculty were also concerned about exam administration and student engagement and wanted to identify useful literature to support changes in pedagogy. Table 1 summarizes the FCH series experience including topics covered and the number of faculty participating in discussions each week. A core group of experienced faculty members were selected to plan the topics to be addressed and to lead the discussion each week. One notable exception to the weekly discussions was the July 22 meeting which was in a town hall format allowing faculty to express concerns to the CET dean and to hear the latest updates on planning and best practices for the Fall 2020 semester. While all these sessions were relevant and helpful to prepare faculty to the coming semester, the remainder of this paper will focus primarily on experiential learning strategies discussed during the FCH. One thing worth noting: although only the June 24 session was dedicated to experiential/laboratory learning, this topic was frequently brought up and discussed in almost all of the other sessions.

Table I Summary of the Faculty-Connection-Hour Series in Summer 2020

Date	Attendance	Topic
June 9	Core group	Planning meeting
June 17	32	General discussion (concerns, challenges)
June 24	35	Lab courses
July 1	33	Efficiently use DE time in a hybrid model
July 8	38	Literature-guided DE/online teaching
July 15	23	Remote exams and tests
July 22	77	Dean's town hall meeting
July 29	21	Classroom management

Experiential Learning: The Challenges of Moving Online

On June 17, although the time was planned to talk about general issues that needed to be addressed in to get ready for the fall semester, the discussion quickly went to challenges in delivering experiential learning activities to students online. The group quickly realized that, instead of reaching any solutions, a good thorough understanding of the constraints newly imposed by COVID-19 was necessary. In addition to difficulties encountered by learning in general, such as student engagement, experiential learning was expected to result in more challenges due to students potentially not being able to access laboratory facilities or tools. At this time, the Fall 2020 semester was still planned to be in-person, however social distancing requirements significantly reduced the allowed capacity in laboratories and restricted usual interactions students may have with one another such as lab partners sharing a workbench. There was also significant uncertainty about whether the number of cases of Covid-19 diagnosed on campus would result in the need to once again pivot instruction online, so faculty were directed to simultaneously prepare for face-to-face instruction with a back-up plan for remote instruction that could be implemented on short notice. Some of the challenges of experiential learning activities in the midst of a pandemic are listed below:

- *Limited airflow*: There was significant concern of airborne spread of the virus in circulated air in centrally conditioned buildings.
- *Social distancing in confined spaces*: In order to allow for students to sit further apart, learning spaces were restricted in occupancy so they could not hold the same number of students as they normally do. This resulted in section sizes getting smaller and need for more sections which in some instances creates scheduling challenges.
- *Busy schedules:* Schedules for many lab spaces had already been crowded and had little room to offer extra flexibility, such as added lab sections (due to reduced section sizes), etc. It was particularly challenging to try to get all students who need access into the campus laboratories safely.
- *Use/exchange of equipment*: some laboratory activities required students to share equipment or operate equipment together, which created concerns for virus spreading. Extra protocols need

to be put in place to wipe down equipment and work surfaces in some instances or to order additional supplies in other cases so as to reduce the need to share supplies and equipment.

- *Active learning that requires close contact*: Group discussions, collaborative learning, over the shoulder troubleshooting, etc. became much more difficult if possible, at all.
- *Student internet reliability*: Many students were not planning to come back to campus in Fall 2020 and instead continue to take courses online. Many other courses were implemented as a hybrid of online learning and face-to-face which required significant bandwidth for students to access either online lectures or learning management tools. This presented a challenge for many students who were sharing an internet connection with roommates or family. Some students lived in rural areas where bandwidth was severely limited. This presented a challenge for students to be about to fully participate in online courses and continue to learn remotely.

Going through these challenges, a general collaborative scheme was conceived, requiring faculty and lab supervisors to work closely to achieve the experiential learning goals. Faculty were expected to reexamine learning objectives of lab activities and to identify alternative learning experiences that can achieve the same (or similar) objectives. When redesigning the learning activities, one should reduce gathering time, by requiring students to prepare more beforehand and analyze data outside of laboratory spaces after gathering. Encouraging discussion using tele-communication, instead of in-class discussion was important for maintaining room capacity limitations while still engaging students. One should also reduce equipment sharing/exchange during lab activities, and/or develop cleaning/disinfection routine if equipment sharing/exchange is inevitable. Whenever possible, faculty should help direct traffic flow to reduce the chance that students run into each other to prevent virus spreading. In some instances, faculty recorded videos of themselves conducting experiments and had students collect data from the videos rather than interacting directly with the equipment. In other instances, faculty transitioned from physical labs to simulated labs in a digital environment. Some faculty created hands-on learning kits and sent those home with students so that some of the lab components of courses could be done remotely without the need to gather the class together.

Lab supervisors, in addition to regular supporting roles, were expected to carefully plan out the logistics and equipment preparation in great detail; set up safety and health behavioral expectations for students; train students with skills and knowledge to cope with the new learning environment, and communicate with faculty whenever issues arise. Many additional supplies were ordered to transition learning to more distributed models and to provide appropriate PPE and disinfecting supplies for cleaning.

<u>Enhance Experiential Learning: Strategies and Coping Techniques</u>

June 24 was the dedicated day for experiential learning, when faculty gathered to brainstorm and contribute any possible ideas that might help them to achieve the same or similar learning objectives while complying with COVID-19 related regulations. After brainstorming with the faculty, several options were presented and implemented in various courses.

A. *Offer multiple shifts of a lab section*: Under this strategy, students in a lab section were divided into multiple smaller groups (so that the number does not exceed the defined room capacity) and come to work on the essential parts of the lab that require them to meet in the space. This strategy requires the labs to be redesigned so that some learning activities and analysis can achieved before and after the gathering so as to minimize what must be done in the lab. Any lab activities that could be done outside of class such as computations or plotting data were shifted to a remote learning activity while only performing tasks that required direct interaction with campus resources in the face-to-face learning environment.

B. *Rotate between groups:* Under this strategy, students in a lab are divided into two groups, with each group taking turns coming to lab to gather experimental data. The first group does the first part of the lab and then the second group does another part of the lab. The groups then share what they gather with the other group. Both groups use the same data to finish work afterwards (analysis, discussion, conclusion, etc.). While one group is working in the lab, the other group could observe and interact with them through webcams, if technologies allow.

C. *Add lab sections with student TA's help*: If lab scheduling permitted, the number of sections offered could increase beyond the number originally planned. New sections can be added to reduce section sizes for social-distancing purposes. These added sections can be covered by hiring teaching assistants.

D. *Add concurrent sessions:* This strategy was slightly different from C, in that under strategy C the added sections occur at a different time than the original time. Under this strategy each section of a lab course is broken into two groups, one taught by the instructor and the other supported by a teaching assistant, both occurring concurrently. This strategy could be implemented if facilities permitted the exercises to be completed in different spaces, possibly in two lab rooms next to each other. In this way the instructor can support the section covered by the TA, if necessary and both the TA and instructor could float between rooms. This strategy was not possible to implement if the hands-on exercises required access to specific equipment only available in one room but was a good strategy for some courses that do not have specific equipment requirements.

E. *Observe remotely*: If, due to both space and scheduling constraints, A, B, C, D are not viable, an instructor can demonstrate the operations of equipment, collect and share data with students, and ask the students to finish the work afterwards (similar to [4]).

F. *Replace hands-on experiments with software simulation*: many software programs (virtual reality, augmented reality, SIMULINK, etc.) offer intuitive user interfaces as well as powerful physical system modeling, which allows hands-on work that could replace some of the hands-on activities. This strategy allowed physical teaching apparatuses to be replaced with software simulation, various aspects of which have been discussed in [5].

G. *Use pointing devices:* To transition those interactions that usually require close contact, for example, an instructor troubleshooting electric circuits or helping a student debug code, a pointing device (a laser pointer or a yard stick) can conveniently help to maintain social distance.

H. *Screen sharing:* For many code-debugging or software-use labs, students can gain similar help by remotely sharing their screens to their instructor instead of showing them in person. This eliminates the needs to meet and avoids personal contact. Tips and tools of this alternatives have been introduced by [6].

I. *Strict PPE requirements:* Some learning experiences, such as those involving machines that require multiple operators, do not allow a safe distance regulated by guidelines. In these situations, stricter personal protection equipment may be an option to make essential learning activities possible. Policies and regulations are provided by various government levels (e.g., [7], [8]) for this alternative. Other university resources ([9, 10]) would be helpful also.

J. *Use personal lab kits:* Some laboratory platforms (e.g., circuit breadboards, microcontroller kits) are portable and affordable, making it possible to either require students to purchase their own or provide them with individual lab kits and ask them to complete laboratory activities in their own space. Research has demonstrated that "no significant differences [using kits and existing instructional equipment] in the achievement of the learning objectives or in the students' experiences." [11]

K. *Offer open lab times to maximize time flexibility*: Some experiential learning, if minimal or no supervision is required, can be achieved by making lab space/facilities available throughout weekdays and allowing students to complete labs at time of their convenience, avoiding crowded lab sections. This appears fairly common for computer labs [12, 13].

L. *Offer night/weekend shifts:* If regular scheduling options run out, night/weekend lab shifts are an option to schedule high-demand spaces. This may not be a common or popular practice in higher education, but worth considering if other options are not permitted.

M. *Come prepared:* While many laboratory exercises already included pre-lab assignments, this strategy maximized the work students could do before coming to the lab. Normal introductions to the hands-on exercises for the day could be delivered via video rather than in person. This strategy was designed to speed up the in-class part of the learning process and reduce the gathering time and therefore chances of being infected.

N. *Use alternative approaches/materials:* In some cases, laboratory exercises can be redesigned to reduce reliance on specific laboratory equipment and to transition learning into using equipment students readily have available in their home environment. One faculty member shared that he was going to use kitchen items for his thermal systems experiment. Similar approaches can be used for other courses to conduct meaningful experiments and gain equivalent learning experience by using items/material either existing in home or easily acquired at low cost from hardware or department stores.

O. *Purchase extra sets with student fee:* For some classes, investing some money in order to get extra sets of lab equipment may reduce reliance on shared resources under a constrained schedule and increase safety compliance.

While some of these ideas are more general and can be applied to a variety of courses, others may be specific and only helpful in a small subset of courses with certain common attributes. Throughout the discussion, faculty were advised that adopting one strategy is often insufficient to fix all the problems, and a combination of multiple strategies (see Table II) may bring a better chance to maintain the quality of learning yet protect safety. Table 2 shows how multiple strategies listed above were used in various courses. Some courses added sections and hired more TAs for support. Other courses offered more open lab time to give students flexibility in when they completed assignments.

TABLE II: A COMBINATION OF MULTIPLE STRATEGIES MAY BRING SOLUTIONS THAT ALLOW US TO PROVIDE SAFE AND EFFECTIVE EXPERIENTIAL LEARNING.

CSCI 1234	**TSYS 4231**	**ENGR 1111**	**CMGT 2341**
A+C	D+E+F	G	B

Results

In August 2020, the Fall semester began with a mix of online and face-to-face instruction. Unfortunately, after just two weeks of in-person instruction, the number of cases of Covid-19 identified on campus was high enough that university officials once again terminated in-person undergraduate instruction. Students living in dormitories were sent home. All instruction was once again transitioned to online learning. While it was very frustrating for many faculty who had redesigned experiments for in-person learning to pivot instruction again, many of the techniques developed were very useful during the pivot to online learning.

In November 2020, an eight-question survey (attached in Appendix) was administrated through the college listserv to gather data on how faculty believed that the FCH series in the summer had helped them. Six survey responses were received. Additionally, two other responses were received via emails, both of which indicated that they didn't respond to the survey because they could not recall many details due to two reasons: it has been too long from the FCH events to the survey time (~four months) and more importantly, there were many training/supporting events organized by other units in the university and it is hard to tell which one helped with what.

Despite the small number of responses, the results received were overall positive. All responses indicated that the session helped them mentally, engage students, and administer exams. They appreciated the community built. Most of them found practical ideas and tools/technologies (e.g., Canvas tips) shared by others helpful.

Specifically, people reported how they have used the experiential learning strategies presented during the FCH sessions. Among the fifteen ideas collected during the FCH discussions, some seemed more useful than others for various contexts. For example, simulation replaced labs and take-home kits have been used by two out of the six responders. The same number of responders had to require stricter PPE for what they did in the lab. One out of the six respondents offered addition sections in the fashion of open labs or extra sections supervised by teaching assistants. There was another faculty member who decided to rotate their sessions to allow half of the students to operate equipment and complete the procedures in the lab, while the other half observed via webcams, both groups sharing the same data to finish other parts of the learning experience.

Figure 1. Adoption of experiential learning strategies presented at the faculty connection hours

Conclusions:

This paper presents an effort attempting to prepare College of Engineering and Technology faculty for all the uncertainties and changes they had to face as the result of the COVID-19 pandemic. The series of discussions organized by faculty across different departments certainly have helped many faculty members facing the enormous challenges in multiple facets. The ideas collected from these sessions particularly assisted in transitioning essential experiential learning to appropriate contexts in order to comply with capacity limitations, PPE requirements, and social distancing. Experiential learning was understandably one of the most impacted areas of teaching and learning given all of the constraints. The authors wish such a discussion at an ASEE-DELOS session provides an opportunity for fellow instructors to share and summarize their practices in response to the disaster.

Appendix: College of Engineering and Technology Faculty Connection Hour Survey

Thanks for your time to complete this survey. Your input is important.

Recognizing most of the faculty were isolated and lost the opportunity to interact with each other because of the pandemic crisis, the College of Engineering and Technology (CET) organized multiple faculty connection hours in the summer to help CET faculty to prepare for the fall semester. Discussion included possible challenges, student engagement, and experiential learning within constraints.

The survey attempts to achieve two purposes: (a) Q1-Q7 find how much the discussion during the faculty connection hour events helped our instructions in the fall semester; (b) Q8-Q14 gauge faculty interest and preference for future development opportunities.

Again, your honest feedback is greatly appreciated.

Q1 How many times did you attend the faculty connection hour(s)?

Q2 What did you benefit the most from the faculty connection hour(s)?

Q3 I believe that I was better prepared for my lab course(s) because of attending the faculty connection hours.

A. TRUE (1)
B. FALSE (2)

Q4 The faculty connection hour(s) helped me mentally while preparing for the fall semester.

A. TRUE (1)
B. FALSE (2)

Q5 The faculty connection hour(s) helped me better engage my students in the fall semester.

A. TRUE (1)
B. FALSE (2)

Q6 Many strategies were suggested to provide meaningful hands-on experiential learning experience under the COVID environment. Selected the ones you have applied to your course(s).

1. Offer multiple shifts in a section (1)
2. Rotate b/w groups (share data b/w groups, group interact through webcams) (2)
3. Add lab sections with student TA's help (3)
4. Add concurrent sessions (1 by instructor + 1 by TA) (4)
5. Observe remotely (5)
6. Replace hands-on experiments with software simulation (6)
7. Use pointing device (to maintain social distance) (7)
8. Strict PPE requirements (8)
9. Provide take/mailed-home lab kits (9)
10. Offer open labs that student can signup (10)
11. Offer night/weekend shifts (11)
12. Introduce ahead of time, student come prepared, analyze after leave (12)
13. Use items/material (existing in home or cheap to acquire) (13)
14. Purchase items with student fee (14)
15. Demonstrate experiments remotely; student analyze data and write report (15)

Q7 If you have used strategies you learned from the faculty connection hour(s), please provide the following information. Course number and name: Briefly describe laboratory learning involved in the course: Strategy (or strategies) utilized in the course: How did the strategy help?

____

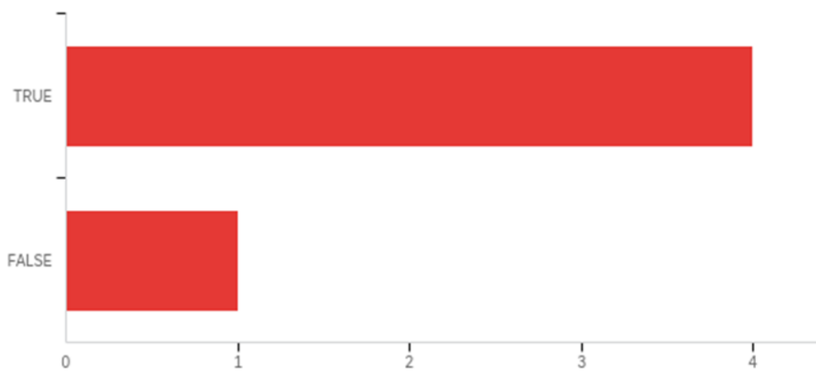
Q1 - How many times did you attend the faculty connection hour?

5
1
all but 1
1-2
Yes

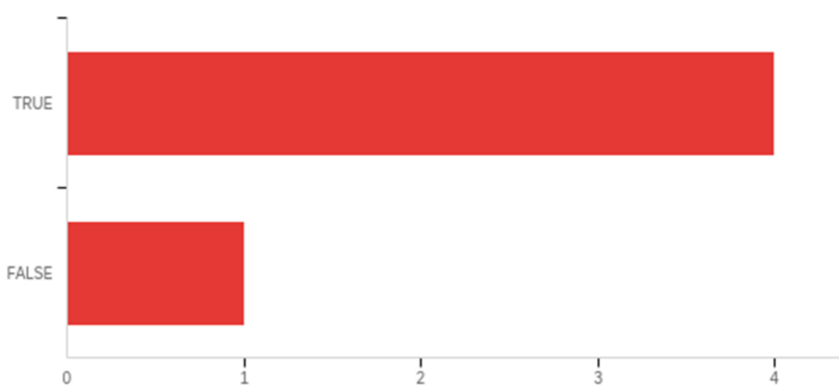
Q2 - What did you benefit the most from the faculty connection hour(s)?

What did you benefit the most from the faculty connection hour(s)?
Peer faculty community built
sharing of practical ideas
sharing ideas for online teaching with others
Help with canvas and testing issues
a lot

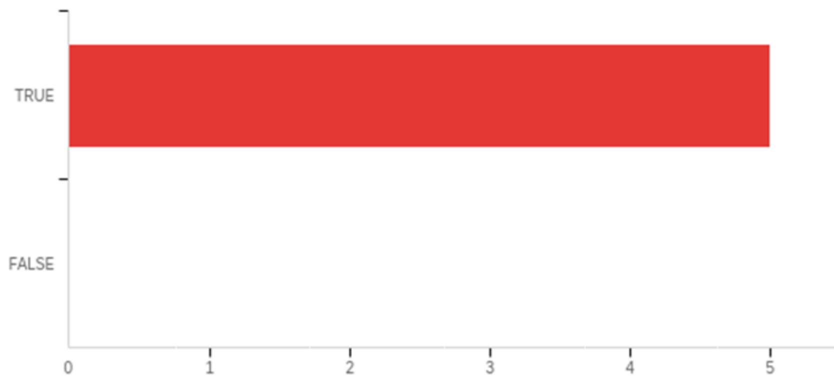
Q3 - I believe that I was better prepared for my lab course(s) because of attending the faculty connection hours.



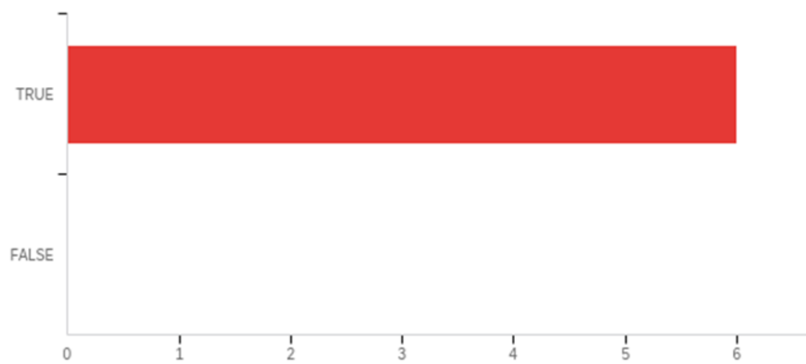
Q4 - The faculty connection hour(s) helped me mentally while preparing for the fall semester.



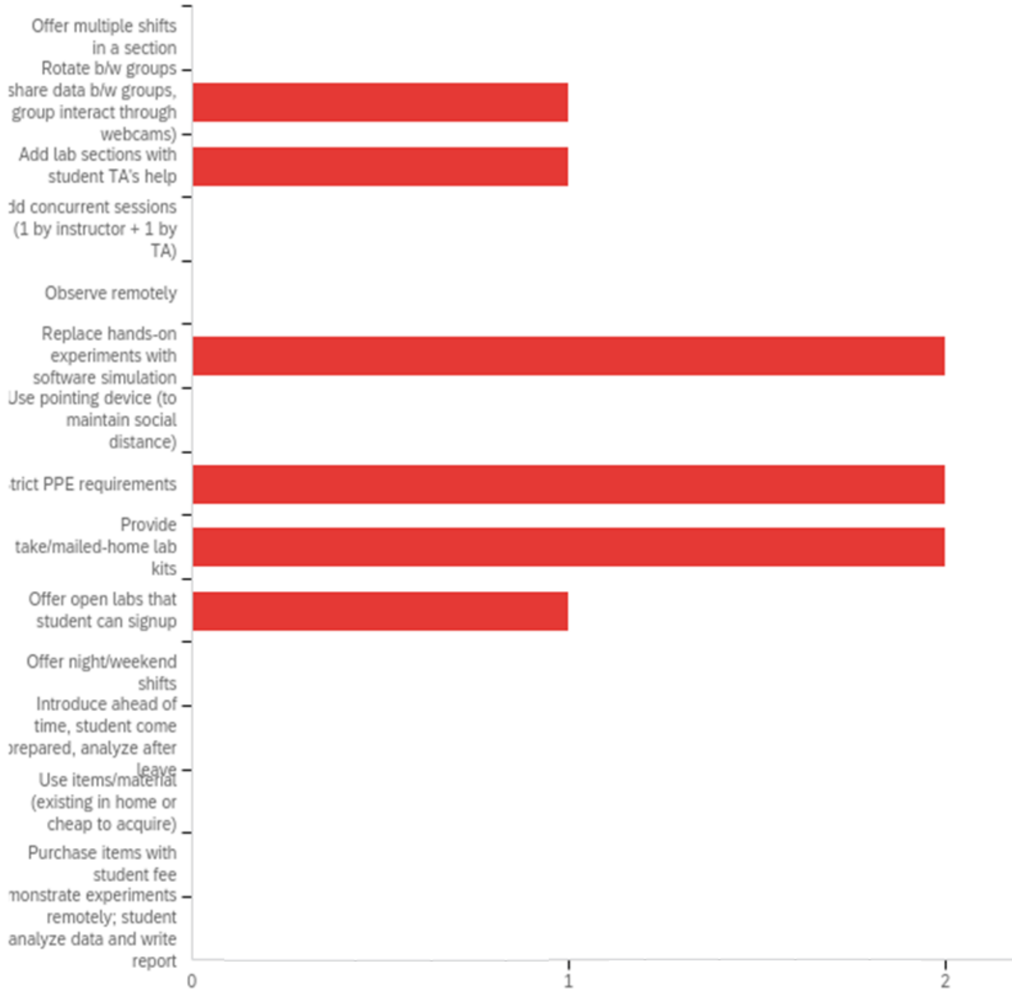
Q5 - The faculty connection hour(s) provided me ideas to administer my tests and exams.



Q6 - The faculty connection hour(s) helped me better engage my students in the fall semester.



Q7 - Many strategies were suggested to provide meaningful hands-on experiential learning experience under the COVID environment. Selected the ones you have applied to your course(s).



Q8 - If you have used strategies you learned from the faculty connection hour(s), please provide the following information. (a) Course number and name; (b) Briefly describe laboratory learning involved in the course; (c) Strategy (or strategies) utilized in the course and how did it help.

If you have used strategies you learned from the faculty connection hour(s), please provide the following information. (a) Course number and name; (b) Briefly describe laboratory learning involved in the course; (c) Strategy (or strategies) utilized in the course and how did it help.
ENGR3050
N/A
IENG 3020/3021 - Robotics in CIM - Hands on robotics / programming - shipped robot kits to my students - helped them to continue hands on activates distance

References:

1. The Chronicle of Higher Education. “Covid-19 Has Forced Higher Ed to Pivot to Online Learning. Here Are 7 Takeaways So Far”. https://www.chronicle.com/article/covid-19-has-forced-higher-ed-to-pivot-to-online-learning-here-are-7-takeaways-so-far/.
2. David Christian and Danny McCarthy. “Experiential Education during the COVID-19 Pandemic: A Reflective Process.” Journal of Constructivist Psychology, DOI: 10.1080/10720537.2020.1813666
3. Fiseha M. Guangul, et al. “Challenges of remote assessment in higher education in the context of COVID-19: a case study of Middle East College” Educ Assess Eval Account. 2020 Oct 21 : 1–17. DOI: 10.1007/s11092-020-09340-w
4. Arizona State University, “Teach Online” https://teachonline.asu.edu/2020/04/strategies-for-remote-labs/. Last accessed April 13, 2021.
5. Mohammed Taqiuddin Taher and Ahmed S. Khan, “Effectiveness of Simulation versus Hands-on Labs: A Case Study for Teaching an Electronics Course,” 2015 ASEE Annual Conference and Exhibition, Seattle, WA.
6. Purdue University, “Sharing and Presenting Work in Remote Classrooms,” https://owl.purdue.edu/owl/teacher_and_tutor_resources/teaching_resources/remote_teaching_resources/sharing_and_presenting_work_in_remote_classrooms.html. Last accessed on April 13, 2021.
7. OSHA, “Laboratory Workers and Employers,” https://www.osha.gov/coronavirus/control-prevention/laborator. Last accessed on April 13, 2021.
8. CDC, “Guidance for General Laboratory Safety Practices during the COVID-19 Pandemic,” https://www.cdc.gov/coronavirus/2019-ncov/lab/lab-safety-practices.html. Last accessed on April 13, 2021.
9. NCSU. “Personal Protective Equipment Requirements for Laboratories,” https://ehs.ncsu.edu/laboratory-safety/personal-protective-equipment-requirements-for-laboratories/. Last accessed on April 13, 2021.
10. BU, “Personal Protection Equipment (PPE) in Laboratories Policy,” https://www.bu.edu/researchsupport/compliance/laboratory-safety/personal-protection-equipment-in-laboratories-policy/. Last accessed on April 13, 2021.
11. Rebecca Reck, R.S. Sreenivas, Michael Loui. “Evaluating the Effectiveness of an Affordable and Portable Laboratory Kit for an Introductory Control Systems Course,” Journal of Advances in Engineering Education. Fall 2019.
12. Wayne Community College, “Open Computer Lab,” https://www.waynecc.edu/open-computer-lab/. Last accessed on April 13, 2021.
13. Rogers State University, “Computer Labs,” https://www.rsu.edu/academics/academic-resources/computer-labs/. Last accessed on April 13, 2021.