

Students Talk: The Experience of Advanced Technology Students at Two-Year Colleges during COVID-19

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Abstract

There have been many questions and concerns raised by educators about how advanced technology students will adapt to remote learning during the COVID era. What will technician students' academic engagement and persistence be like, and how will online learning affect their educational outcomes? What do technician students like about remote learning and what do they find challenging? What does online learning mean for hands-on applied and experiential learning, which are hallmarks of technical education programs? This paper explores pilot state-level survey data from advanced technology students at two-year colleges. Five primary areas covered in the survey include enrollment status, access to technology, experience using a Learning Management System and learning online, impact on applied and experiential learning, and students' background information.

Key findings include decreased interaction between peers, increased reliance on instructors, and a significant decline in experiential learning such as labs, group projects, demonstrations, problem-based learning, and service-learning. The majority of students report feeling worried about making progress toward their degree, and about half worried about completing the semester. Two benefits students identified was having access to course materials all the time through the LMS and the flexibility of remote learning. Findings also show that technician students are quite diverse by way of age, partner status, having a family, race-ethnicity, employment status, and educational background. About one-third of students who responded are women.

This paper concludes with several recommendations about the application of these research findings to address challenges technician students face learning online, including specific actions that instructors and programs can pursue to help retain students and provide support to facilitate completion of degree programs.

Background

During a “virtual” Spring 2020 meeting of a state-wide Engineering Technology forum, participants expressed concern about technician students’ experience in moving to remote instruction due to COVID-19. Based on early reports from community college partners, the transition had been challenging, and some faculty indicated students had even considering withdrawing from their programs. As one instructor explained: “They have given up. [Students] feel they can’t do this online without support.” There was interest in further discussion of this topic due to both the uncertainty related to the return of in-person instruction as we previously knew it and the perceived need to improve student comfort and confidence in online learning. To help inform that discussion, we created a small pilot survey to collect some initial feedback from technician students state-wide about their online experience and aim to share our findings in this report.

The literature also identifies concern for both the well-being and academic success of students at two-year colleges at the institutional level and documents variegated results. One study [1] compares full-time enrollment between Summer 2019 and Summer 2020 and finds that there was a disproportionate decrease in enrollment for male and traditional-aged students, and a total of 57.7% percentage decrease in engineering technology enrollment during this period. On the other hand, another survey [2] showed that students were mostly enrolled in online and hybrid courses during the Fall of 2020, and the vast majority state that their courses met or exceeded their expectations. In addition, when asked which instructional method they would prefer in the future, 25% chose traditional face-to-face classes, 45% chose online classes, and 30% chose hybrid classes [2] further illustrating student satisfaction with e-learning. A third report [3] reveals severe financial constraints impacting students: “The student... was frantic. Her parents, she told college administrators, had lost their jobs because of COVID-19, and the family was down to crackers and bottle of water. She didn’t see how she could continue her studies when they couldn’t even count on their next meal.” These small college-level studies illustrate the disparate impact of COVID-19 on students at two-year colleges. For some institutions, there is concern for significant decline in enrollment, while others experienced high degrees of student satisfaction with online and hybrid learning, and yet other programs are focused on providing essential supports for students who are fighting to survive.

Pilot Study

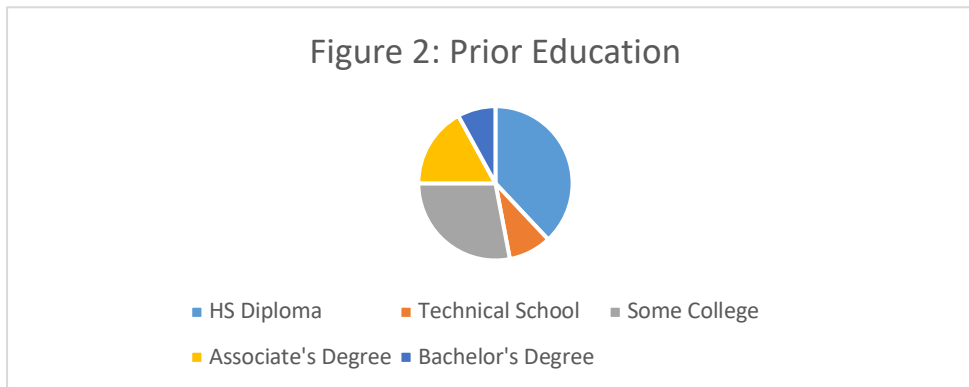
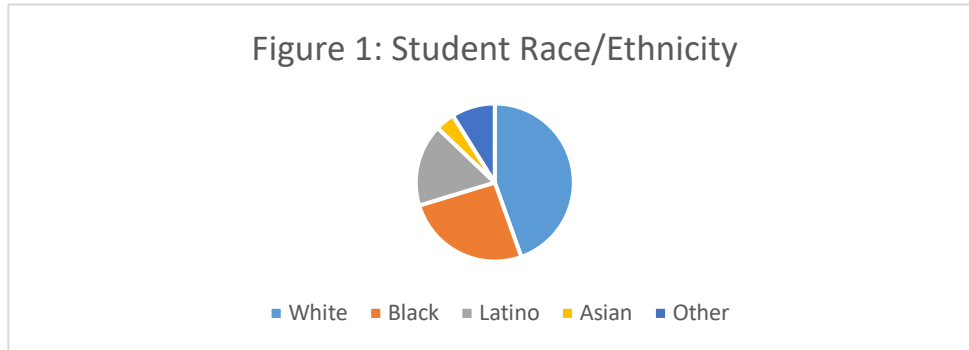
The primary objective of this pilot study is to examine educational challenges and opportunities posed by the COVID-19 pandemic for students in advanced technology programs at two-year colleges in order to provide feedback and recommendations to advanced technology programs. The survey asked students questions about the following topics: 1) their enrollment status, 2) access to technology, 3) experience using an LMS, 4) impact on applied and experiential learning, 5) what they liked as well as found challenging about learning online, and 6) background information. A state-wide group of two-year college faculty members electronically distributed the survey to students in their programs during the late Spring through early Fall of 2020, resulting in a sample size of 55 students. Please see Appendix A for the full Student Questionnaire. We administered the survey through Qualtrics and analyzed the data using descriptive statistics.

Findings

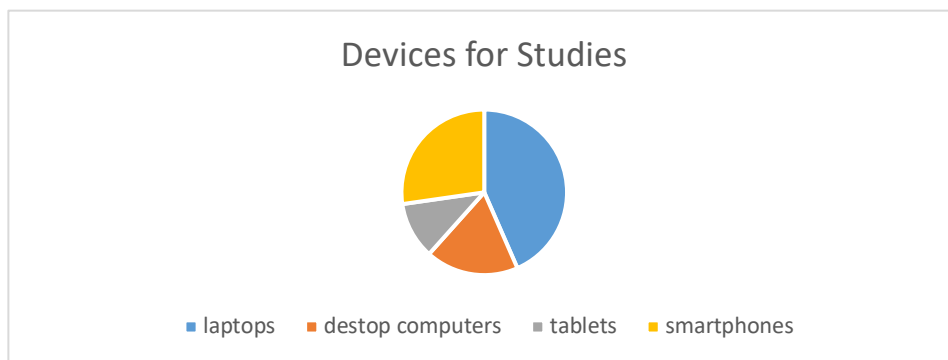
During the Summer and Fall of 2020, 55 students took the survey, who are enrolled in advanced manufacturing and engineering technology programs, 55% full-time and 45% part-time, and 70% are seeking degrees and 30% enrolled in certificate programs. The students who completed the survey are similar to students at two-year colleges in being quite diverse by way of age, partner status, having a family, race-ethnicity, employment status, and educational background. For example, in this pilot survey sample, 43% of students are traditional-aged and 57% non-traditional-aged; students identify as 45% White, 26% Black, 17% Hispanic, 4% Asian, and 9% Other; 66% are Single, 22% are Partnered/Married, and 11% are Divorced; and 21% care for children, 5% care for elderly, 7% care for siblings. In terms of employment, 25% currently work part-time, 12% currently work full-time; in addition, 32% were employed prior to COVID-19, and another third were not working before COVID-19 or at present. Students' prior educational experience also varied with 38% with a High School Diploma, 9% with credentials from a Technical School, 28% have Some College, 17% have completed Associate's Degree, and 8% with Bachelor's Degree. About one-quarter (27%) of students who responded are women, 11% are military reserves/veterans, and some students also reported learning disabilities and chronic illness.

Table 1: Student Background

Characteristic	Percent (%) of Sample
Enrolled Full-time	55
Enrolled Part-time	45
Degree-Seeking	70
Certificate Program	30
Traditional-Aged	43
Non-Traditional-Aged	57
White	45
Black	26
Hispanic	17
Asian	4
Other	9
Single	66
Partnered/Married	22
Divorced	11
Care for Child	21
Care for Elderly Relative	5
Care for Sibling	7
Work Part-Time Currently	25
Work Full-Time Currently	12
Worked before COVID-19 and Unemployed Now	32
Unemployed before COVID and Now	31
HS Diploma	38
Technical School	9
Some College	28
Associate's Degree	17
Bachelor's Degree	8
Women	27
Military Reserves/Veteran	11



Almost all students (96%) use a Learning Management System for remote learning. Students also use a variety of devices for their studies: 43% use laptops, 18% use desktop computers, 11% use tablets, and 27% use smartphones. The majority of students (85%) say internet connectivity at home is often/always reliable and 91% are often/always able to access courses remotely.



Comparing LMS usage prior to COVID to now, students more often/always read emails (+12%) and write emails (+12%), message their instructor more (+6%), but talk with classmates much less (-18%). In terms of applied learning, students report a significant decline in labs (-52%), group projects (-27%), demonstrations (-21%), and problem-based learning (-8%). Though some faculty

shared involvement in volunteer efforts to create PPE/medical equipment at the ET Forum, students in this survey report a decline in service-learning opportunities (-16%), as well as an 31% decrease in internships, co-ops, and apprenticeships. There were two areas of active/experiential learning where students reported modest increase online: remote access labs (+3%) and simulations (+6%).

Table 2: Change in LMS Usage Prior to COVID-19 and Now

Action	Percentage Change
Read Emails	+ 12
Write Emails	+ 12
Message Instructor	+ 6
Talk with Classmates	- 18

Table 3: Change in Applied and Experiential Learning Opportunities

Activity	Percentage Change
Labs	- 52
Group Projects	- 27
Demonstrations	- 21
Problem-Based Learning	- 8
Service-Learning	- 16
Internships/Co-Ops/Apprenticeships	- 31
Remote Access Labs	+ 3
Simulations	+ 6

More than half of all students in the sample report feeling worried about making progress toward their degree (58%) and 42% said they were worried about completing their courses for the term. While students felt having access to course materials all the time worked well for them and appreciated the flexibility of online learning, they also felt the greatest challenge was not being able to learn in a hands-on way and trying to learn independently. In order to overcome obstacles in online learning, students report relying heavily on instructors.

Discussion

These preliminary findings from the pilot study raise several important considerations for advanced technology programs:

1. Students have diverse racial-ethnic backgrounds and the majority are non-traditional-aged, a little more than one-quarter are women, about a third have caregiving responsibilities, and fewer students are working. The pandemic has disproportionately impacted minority communities, older adults, caregivers juggling multiple roles, and created unprecedented levels of unemployment. Programs should be aware that their student body may be adversely and disproportionately affected by COVID-19.
2. The majority of students are degree-seeking and more than half are enrolled full-time. These results indicate that programs may want to prepare for an increase in full-time enrollment and degree-seeking, especially as employment options may remain bleak for displaced workers from industries that may not bounce back, causing a need to re-skill (e.g. hospitality, personal services, restaurants, etc).
3. Survey results show that students have varied prior educational experience ranging from high school diplomas, technical school, some college, to associate's and bachelor's degrees, and therefore likely have varied experience with education technology, working in an LMS, and learning online. An initial technology assessment at the beginning of the term could be helpful for instructors to identify students' online learning experience and the individual support they may or may not need.
4. Students in this sample have devices and connectivity to participate in remote learning, but almost one-third report using a smartphone for their studies, which may produce a limited interface for viewing/completing assignments and course materials. As instructors and programs adapt traditional face-to-face courses to remote formats, it may be important to incorporate the likelihood that students will be viewing course materials on their smartphones. Materials conveyed through an app may be desirable.
5. Students are communicating more through reading and writing, rather than verbal interactions. They are also participating in group projects and hands-on learning less. Open-ended survey questions and comments revealed that feeling isolated made learning harder for students. Programs may want to explore ways to create a sense of community online and foster increased

verbal communication through videoconferencing both for class purposes and for informal socializing.

6. The majority of students are worried about their academic progress. Programs may need to spend more time with students revisiting their academic plans and provide assurances for pathways to completion, counseling them for academic success, and coordinating academic resources such as tutoring and mentoring to facilitate confidence in completion.

Next Steps

The next steps for this project include administering a survey with instructors (planned for May 2021). We ask instructors many of the same questions we asked students to gain their perspective. Please see Appendix B for the full Instructor Questionnaire. While the analysis presented in this paper provides a glimpse into the student experience in technical programs at two-year colleges during the pandemic, equally important is to gain insights from instructors. We aim to bring the experiences of these two vital stakeholder groups together to explore and identify ways that findings from these surveys may be applied to improve retention and completion of degree programs at two-year colleges during this unprecedented time.

APPENDIX A: STUDENT QUESTIONNAIRE

Name of College: _____

Enrollment Status: Full-time / Part-time

Major/Program: Engineering Technology / Advanced Manufacturing / Other

Anticipated credential from this program: Certificate / Degree / Other

Do you have internet connectivity at home? Yes / No

If Yes, is your internet connectivity at home reliable? Never / Sometimes / Often / Always

What kind of devices do you have at home to use for your studies (check all that apply): none / laptop / desktop computer / tablet / smartphone / other _____

Can you access your courses remotely on the device(s) you have at home? Never / Sometimes / Often / Always

Does your program use a Learning Management System like Blackboard, Canvas, Scholar, etc? Yes / No

IF YES: Engagement with Learning Management System (e.g. Blackboard, Canvas, Scholar, etc)

	BEFORE COVID-19	NOW
Message Instructor	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Read Class Emails	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Write Emails to Class	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Read discussion posts	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Post to forums	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
View content lectures	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Access class documents	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Take quizzes & tests	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Submit Assignments	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Submit Projects	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always

Applied and Experiential Learning

	BEFORE COVID-19	NOW
Demonstrations	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Hands-On Labs	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Problem-Based Activity	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Group Projects	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Simulations	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Remote Access Labs	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Internships	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Co-Ops	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Service Learning	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Apprenticeships	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always

What aspects of remote learning work well for you? (short answer)

What are your greatest challenges with remote learning? (short answer)

Were you able to overcome challenges to remote learning? Yes / No

Please explain: (short answer)

Are you worried about completing your courses this term? Yes / No

Are you worried about making progress towards your degree? Yes / No

Before COVID-19, how sure were you about completing your degree? Very Sure / Somewhat Sure / Not Sure

How sure do you feel NOW about completing your degree? Very Sure / Somewhat Sure / Not Sure

Employment Status before COVID-19: Not Applicable / Full-time / Part-time / Other _____

Employed in Field: Yes / No

Describe your job: _____

Current Employment Status NOW: Not Applicable / Full-time / Part-time / Other

Employed in Field: Yes / No

Describe your job: _____

Age: 18-24 / 25-34 / 35-44 / 45-54 / 55-64 / 65-74 / 75-84

Gender: Male / Female / Non-Gender Conforming

Race: Black / White / Asian / Pacific Islander / American Indian / Middle Eastern /
Other _____

Ethnicity: Hispanic / Non-Hispanic / Other _____

Partner Status: Single / Cohabiting / Married / Separated / Divorced / Widowed

Caregiver For: Not Applicable / Children / Elderly Relatives / Siblings / Other

Your Educational Background: HS Diploma or GED / Technical School / Some
College / Associate's Degree / Bachelor's Degree

Military Veteran: Yes / No

Disabilities: Yes / No

Describe: _____

APPENDIX B: INSTRUCTOR QUESTIONNAIRE

Name of College: _____

Program: Engineering Technology / Advanced Manufacturing / Other _____

Credential awarded from this program: Certificate / Degree / Other
_____ (check all that apply)

How long have you been teaching? 1-5 years, 6-10 years, 11-15 years, 16-20 years,
20+ years

Did you have more than three or more years of experience teaching in the
following formats prior to the COVID-19 pandemic?

Online Yes/No

Remote Yes/No

Hybrid Yes/No

What was the format of your courses during the following terms? (check all that
apply)

	Online / Remote	Hybrid	In-Person	N/A (not teaching)
Spring 2020				
Summer 2020				
Fall 2021				
Spring 2021				
Summer 2021				
Fall 2021				

Did you have sufficient internet connectivity for online/remote instruction? Never /
Sometimes / Often / Always

Rate the connectivity you used for online/remote instruction: 1 2 3 4 5 (1 is worst;
5 is best)

What kind of devices did you use for online/remote instruction (check all that
apply): none / college laptop / personal laptop / college desktop computer /
personal desktop computer / college tablet / personal tablet / smartphone / other

Can you access your courses remotely on the device(s) you have at home? Never / Sometimes / Often / Always

Have you had a quiet and undisturbed place to teach from since the pandemic began? Yes/No

Does your program use a Learning Management System like Blackboard, Canvas, Scholar, etc? Yes / No

IF YES: Engagement with Learning Management System (e.g. Blackboard, Canvas, Scholar, etc)

	BEFORE COVID-19	NOW
Message Students	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Write Emails to the Class	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Write Emails to Students	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Facilitate discussn posts	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Post to forums	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Create and post lectures	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Post class documents	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Create quizzes & tests	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Post Assignments	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Post Projects	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Online Submission	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always

IF NO: Communication / Interaction

	BEFORE COVID-19	NOW
Email/Message Students	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Held Virtual Office Hrs	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Create Class Blog	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Create Class Wiki	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Class Social Media	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Talk with Students	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Email/Message Students	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Use Zoom Lectures	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always

Applied and Experiential Learning

	BEFORE COVID-19	NOW
Demonstrations	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Hands-On Labs	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Problem-Based Activity	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Group Projects	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Simulations	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Remote Access Labs	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Internships	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Co-Ops	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Service Learning	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always
Apprenticeships	Never / Sometimes / Often / Always	Never / Sometimes / Often / Always

How did the change to remote course format affect your teaching experience?

Very Positive Effect / Somewhat Positive Effect / No Effect / Somewhat Negative Effect / Very Negative Effect

What aspects of remote teaching work well for you? (short answer)

What are your greatest challenges with remote teaching? (short answer)

Were you able to overcome challenges to remote teaching? Yes / No

Please explain: (short answer)

Have your students been able to complete their courses in the online/remote format? Yes / No

Before COVID-19, how sure were you about students completing your degree?
Very Sure / Somewhat Sure / Not Sure

How sure do you feel NOW about students completing your degree? Very Sure /
Somewhat Sure / Not Sure

Before COVID-19, how sure were you about jobs for your students? Very Sure /
Somewhat Sure / Not Sure

How sure do you feel NOW about jobs for your students? Very Sure / Somewhat
Sure / Not Sure

Age: 18-24 / 25-34 / 35-44 / 45-54 / 55-64 / 65-74 / 75-84 / Prefer not to answer

Gender: Male / Female / Gender Non-Conforming / Prefer not to answer

Race: Black / White / Asian / Pacific Islander / American Indian / Middle Eastern /
Other _____ / Prefer not to answer

Ethnicity: Hispanic / Non-Hispanic / Other _____ / Prefer not to answer

Highest Degree Earned & Discipline: _____