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Covid-19 Impact on Faculty Research Productivity

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The response of academic institutions to Covid-19 impacted faculty in numerous ways including teaching, service, and research productivity. Thus, this research seeks to determine the United States (US). Construction faculty perceptions of Covid-19 impacts to their research. This research targeted group was US academic institutions members of the Associated Schools of Construction (ASC) grouped according to their Carnegie Institutional Classification. It was hypothesized that research of faculty in doctoral universities with very high research activity (R1) according to the Carnegie Classification would be more broadly impacted. To evaluate this hypothesis, a non-experimental correlational research approach was implemented using an online survey instrument to collect data. The data collected correspond to 109 construction educators within the US. The elements considered to impact faculty research in this study include: average teaching load, online learning environment (OLE) impact on research and service, factors affecting research productivity, overall institutional support and support to OLE. Based on the data analysis, it was determined that differences in the institutions' Carnegie Classification does not have an effect on the faculty perceptions of Covid-19 impacts, as faculty from all types of classifications indicated comparable impacts on research, service and teaching.

Key Words: Covid-19 Construction Education, Covid-19 Construction Research

Introduction and Background

The United States (US) Centers for Disease Control (CDC) provided recommended guidelines to mitigate the risk of transmitting Covid-19 including hygiene, social distancing, and others (CDC, 2020). To mitigate the risk of transmitting Covid -19, higher education systems globally followed the CDC recommendation and transitioned to electronic or Online Learning Environment (OLE) (Munoz-Najar et al., 2022). In the US, this transition occurred in March or April 2020 (Langar et al., 2022a).

Pre-pandemic researchers described how online construction education can be delivered effectively and successfully (Ahmed et al., 2016; Kelting et al., 2016). Some construction programs were already delivering construction courses via OLE. Existing research indicates a significant proportion of

construction educators had limited experience with online content delivery pre-Covid (Langar et al.,2022a). Furthermore, OLE delivery has also shown to present more challenges to academic integrity (Tabas et al., 2012). OLE is particularly challenging for construction education, because courses are typically delivered via experimental laboratory exercises, hands-on experiments, project-based courses, and computer labs. These types of courses are considered more challenging to deliver with OLE versus face-to-face delivery (Adhikari et al., 2021a). Faculty may expect to invest more time in OLE content delivery (Alungbe et al., 2010; Shea et al., 2005) than face-to-face teaching (Schmidt et al., 2013). In addition to the time to development and delivery content, other factors can impact faculty such as: administrative support, (Han et al., 2018), previous experience with an OLE (Clemson et al., 2022), organizational, technological, social, and personal factors (Iwu et al., 2022). Online construction is also challenging to students. Student perceive online education to require additional time and reduce interaction with faculty and peer students (Kinney et al., 2012).

Prior research has identified the research impacts of OLE transition on educator productivity. For example, Clemson et al. (2022) identified research productivity as impacted among the pharmacy faculty in research-intensive colleges. Langar et al. (2021) studied the impact of OLE on construction educators and found improvements in teaching with OLE while a declining in overall productivity. The most common concerns impacting faculty during Covid-19 Pandemic included 1) limited interaction with the students, 2) background noise while participating in virtual meetings, 3) internet issues, 4) too many conference calls, 5) virtual meetings, and 6) limited work and life separation (Langar et al., 2022b). Further, Langar et al. (2021) found that tenured or tenure-track educators were spending less time on research, whereas “non-tenured” spent more time developing and delivering content, resulting in a productivity decline in both research and content delivery. While some research indicates the benefits of working from home (especially during the pandemic), the consensus is that a significant proportion of educators realize research productivity being impacted (Clemson et al., 2022; Iwu et. al., 2022; UCLA 2021; Langar et al. 2021).

At the time of this writing, there were one hundred forty-two 4-year construction programs and nine 2-year construction programs who were members of the Associated Schools of Construction (ASC) (ASC 2022a). However, as schools choose to self-select into or out of membership, the total membership varies. The ASC includes seven regions within the United States and Canada and one international region (ASC 2022b).

1. Northeast: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, West Virginia
2. Southeast: Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee. Virginia
3. Great Lakes: Illinois, Indiana, Kentucky, Michigan, Ohio, Wisconsin
4. North Central: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
5. South Central: Arkansas, Louisiana, Oklahoma, Texas
6. Rocky Mountain: Alaska, Arizona, Colorado, Idaho, Montana Nevada, New Mexico, Utah, Wyoming
7. Far West: California, Hawaii, Oregon, Washington
8. International (not included in this study): Asia, Australia, Canada, England, Europe

This paper focuses on US institutions members of the ASC ranked through the Carnegie Classification of Institutions of Higher Education, indicating the level of research and the highest level of degree attainment, either Baccalaureate, Master, or Doctoral degrees (2022). Four-year Construction degrees may be in Engineering, Engineering Technology, or Construction Management programs. Within those programs, Baccalaureate, Master, or Doctoral degrees may be available. This research determines US Construction faculty perceptions of Covid-19 based on their Institution

Carnegie Classification for research.

Methodology

The study used an online survey method to collect data using Qualtrics. A survey was selected for its ability to identify trends among the educators with regard to the OLE transition (Gable 1994). It was determined to conduct the survey online as most of the US population has access to the internet (Sheehan 2001) and online method provided the best value especially during the Covid-19 pandemic. All email information about the construction educators was collected online from publicly available information sets and email listservs such as the Associated Schools of Construction and the American Society of Engineering Education. The developed online instrument had various question types which included; multiple-choice, Likert scale, and both short and long essay-type questions. The survey instrument was validated for reliability and grammatical errors through pilot testing and the pilot tested instrument was emailed in the summer of 2020. Educators were also sent reminders and the survey was closed in about two months after its launch.

The overall survey was distributed to 1,883 Architecture, Engineering and Construction (AEC) faculty members via email. However, this study has a more narrow focus limiting it to construction educators only. The parameter used to identify construction educators was their self-identification as teaching construction course work or teaching in a construction program, department, or college.

Results

The study received 179 complete responses from (AEC) educators. To answer the research question, the first set of filters included affiliation with construction programs, which include Engineering, Engineering Technology, and Construction Management. After the application of this filter, the N was reduced to 121. Another set of filters, i.e., availability of university name (institutional affiliation) was applied which brough the final respondent number to 109. Out of 109 respondents, 103 respondents were identified to be affiliated with institutions that were ASC members and the remainder were from non-ASC Schools.

The number of ASC member institutions, the number of institutions represented by responded and the number of individual respondents can be seen in Figure 1 (organized by the ASC regions). There were some ASC regions which had a greater number of individual respondents. This might be attributed in part to the fact that those regions have some programs with a large number of faculty members and that the authors represent schools from Region 2 and Region 5 (which might increase the likelihood of their colleagues to response to the survey). The individual respondents were then grouped by their institutional affiliation (focus of this research). This grouping is also delineated in figure 1, where respondents are identified by member schools, based on institutional respondents (number of institutions responding), and individual respondents. It is evident when comparing institutional respondents and individual respondents that there are multiple respondents from individual institutions (figure 1).

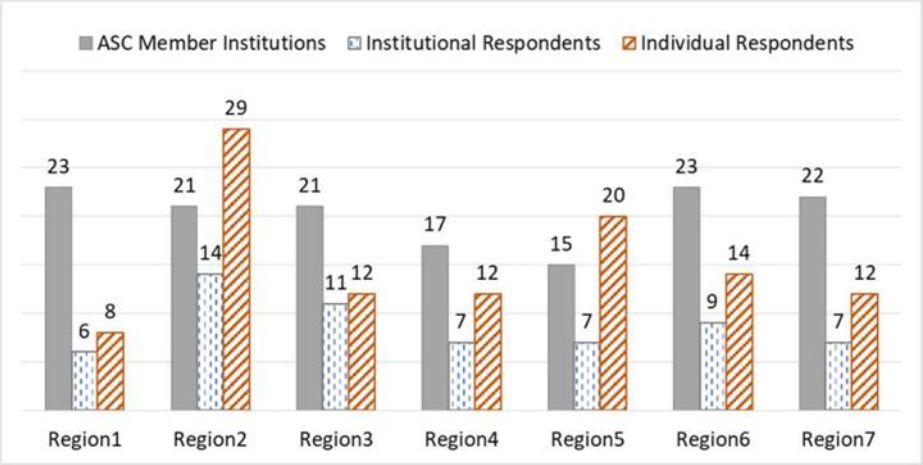

Figure 1: Distribution of US ASC Member School Respondents by Region

When considering relationships to research, thirty-seven (33.9%) respondents from land grant universities and seventy-two (66.1%) respondents represent non-land grant institutions. To further identify research requirements, the Carnegie Classification of universities was used. Of the respondents, fifty-five (50.5%) respondents were affiliated with doctoral universities with very high research activity (R1 institutions), twenty-three (21.1%) with doctoral universities with high research activity (R2 institutions), and the remaining thirty-one (28.4%) work for unclassified institutions. Respondents were asked to "select the areas that have been impacted by the transition to the online learning environment," and the options for research and service were given. Respondents could select more than one response or leave it blank. Thirty-eight (34.9%) respondents identified "research" as impacted, while forty-two (38.5%) identified "service." Overall, fifty-eight (53.2%) respondents identified research and/or service as impacted (figure 2).

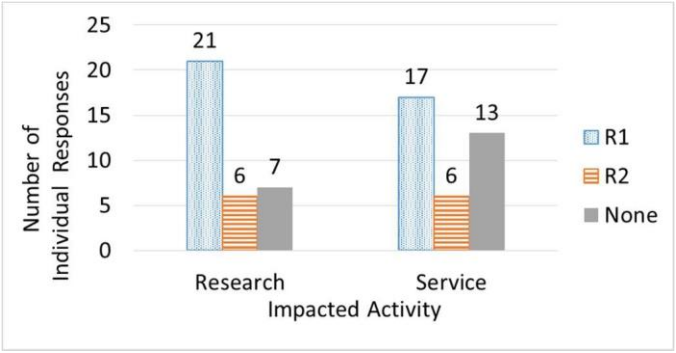

Figure 2: Respondent identifying Research/Service impacts by the transition to OLE

When considering the Carnegie Classification, twenty-one respondents from R1 institutions, six respondents from R2 institutions, and seven from non-classified institutions identified research was impacted. Similarly, seventeen respondents from R1 institutions, six from R2 institutions, and thirteen from non-classified institutions identified service was impacted. It is somewhat expected that a larger percentage of respondents from R1 institutions had impacts on research (38%), than those from R2 (26%), or non-classified institutions (23%). Conversely, it would be expected that there would be a more significant percentage of those from non-classified institutions who had service impacted (42%),

versus those from R1 institutions (31%) (figure 2).

Teaching Load

When considering the annual average amount of teaching (in credit hours) by Carnegie Classification, respondents from institutions classified as R1 (53) have an average annual teaching load of 13.0 semester credit hours with a standard deviation of 5.6, with a minimum load of 2 and maximum load of 30. While respondents from R2 institutions (23) have an average annual teaching load of 15.9 semester hours with a standard deviation of 6.4, with a minimum load of 3 and a maximum load of 30. Lastly, respondents from institutions not classified (31) have an average annual teaching load in semester credit hours of 15.1 hours with a standard deviation of 6.89, with a minimum teaching load of 3 and a maximum of 27 hours annually. Two respondents from R1 institutions left this value blank and were not included in the percentage calculation. While two respondents from R1 institutions indicated they were adjuncts working part-time or three hours annually, if these faculty are removed, the change is minimal. Similarly, we could consider those teaching ten or more hours per year with R1: 37 of 51 (72.5%). It is evident that a majority of the construction faculty respondents across classifications teach 12 or more credit hours per year (figure 3).

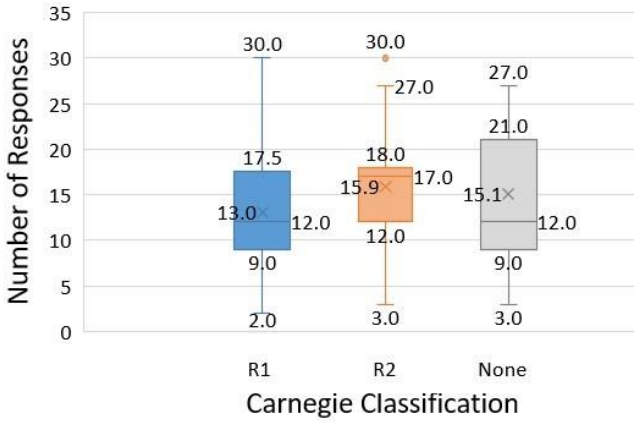

Figure 3: Respondents by Carnegie Classification versus Teaching Load in Hours

Research productivity

When faculty surveyed were asked, “Which of the following statements can be attributed to the impact on productivity?” A variety of answers were provided for them; including 1) I spend more time developing content for the classes, 2) I spend more time delivering the class content, 3) I spend more time in the mandatory training, 4) I spend less time on research, 5) I do not have access to lab equipment that would allow me to conduct research, 6) I do not have access to resources, 7) I do not have access to research equipment, 8) I am unable to interact with my graduate students, and 9) My interactions with students conducting research with me is reduced. There was an option to provide an answer. Five statements of the nine statements above reflect research, with the key impacts underlined (table 1).

Table 1:
Research Productivity Impact by Carnegie Classification

Impact (based on statements above)	R1	R2	None
Research	16	5	8
Lab Equipment	5	1	4
Research Equipment	4	1	3
Graduate Students	5	3	1
Students	8	3	5

About a quarter of respondents reported spending less time on research during the pandemic R1: 16 of 55 (29.1%), R2: 5 of 23 (21.7%), and unclassified 8 of 31 (25.8%). Respondents also reported reduced time interacting with students conducting research R1: 8 of 55 (14.5%) R2: 3 of 23 (13.0%) and unclassified 5 of 31 (16.1%). While these are not large groups, this question allowed faculty to choose which impacts they felt. Respondents could choose multiple impacts, and not all faculty identified the same impacts. Interestingly, the percentages of respondents reporting research impacts is higher in R1 and non-classified institutions than those in R2 institutions.

Institutional Support

A comparison of the Carnegie Classification was made based on the faculty perception of institutional support. Respondents from institutions classified as R1 (53) indicated an average of 71.13 (Somewhat Good), a standard deviation of 24.09, a low value of 9, and a high value of 100. While respondents from institutions classified as R2 (23) indicated an average level of support of 73.30 (Somewhat Good), a standard deviation of 23.34, a low value of 20, and a high value of 100. Lastly, respondents from schools not classified (31) responded with an average of 72 (Somewhat Good), a standard deviation of 21.54, a low value of 20, with the highest being reported as 100. Based on this results it can be inferred that the Carnegie Classification did not generally affect the faculty perception of institutional support (during Covid-19)

Faculty surveyed were also asked, “Before January 2020, did the University offer resources that improved the delivery of content in an online medium?” Many universities offer internal educational support for faculty, including seminars, tutorials, and conferences which cover topics like Online Learning Environment (OLE). The majority of respondents from all classifications of universities indicated some level of resources for OLE prior to Covid-19 (table 2). Responses were quite different when asked if their Program/Department/College (Program) offered resources for OLE delivery. However, the largest group still responded in the affirmative (table 3). Based on the difference between the responses to these two questions, it can be inferred that most institutions (regardless of Carnegie Mellon Classification) assign OLE resources at the institutional level rather than the individual academic units.

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Table 2

By Carnegie Classification, (before January 2020) did the University offer resources that improved the delivery of content in an online medium?

Response	R1		R2	None	
Yes	44	(83.0%)	17(74.0%)	23	(74.2%)
No	3	(5.7%)	3(13.0%)	5	(16.1%)
No Knowledge	6	(11.3%)	3(13.0%)	3	(9.7%)

Responses were quite different when asked if their Program/Department/College (Program) offered resources for OLE delivery. However, the largest group still responded in the affirmative (table 3).

Table 3

By Carnegie Classification, (before January 2020), did the Program/Department/College offer resources that improved the delivery of content in an online medium?

Response	R1		R2	None	
Yes	25	(47.2%)	12(52.2%)	16	(51.6%)
No	21	(39.6%)	8(34.8%)	4	(12.9%)
No Knowledge	7	(13.2%)	3(13.0%)	11	(35.5%)

There is a substantial difference when considering the change in the perception of University support to Program support. The percent change from University support to Program support was determined (table 4). While all Carnegie Classifications had a large perception change from University support to Program support, R1 institutions showed the largest percent change. It is also interesting to note that respondents from institutions not classified (None) had the highest change to “No Knowledge” about their Program and the smallest percent change to “No.” This is a concern which is easily remedied within individual Programs.

Table 4

By Carnegie Classification, Percent Change in Perception of Support from University to Program/Department/College

Response	R1	R2	None
Yes	43.2%	29.4%	30.4%
No	600.0%	166.7%	20.0%
No Knowledge	16.7%	0.0%	266.7%

While all Carnegie Classifications had a large perception change from University support to Program support, R1 institutions showed the largest percent change. It is also interesting to note that respondents from schools not classified (None) had the highest change to “No Knowledge” about their Program and the smallest percent change to “No.” This is a concern which is easily remedied within individual Programs.

Conclusions

US construction faculty were surveyed to determine their perceptions of Covid-19 impacts to their research. The most of the faculty were affiliated with an institutions members of the Associated Schools of Construction (ASC). The faculty responses were compared on the basis of the Carnegie Classification. The result of the research indicates that there were no significant differences perception of Covid-19 impacts among faculty from R1, R2 and unclassified programs. This most probably due to the nature of study as the responders where using their own personal impression of the Covid-19 situation in relation to the situation prior to Covid-19.

One hundred and nine faculty responses were included in this study from all of the seven ASC Regions in the U.S. Fifty one percent of the responses were from associated with R1 institutions, twenty one percent of the responses were from faculty associated with R2 institution, and twenty eight percent of the responses were from faculty associated with unclassified institutions.

The average teaching load for faculty from all institutions was over 13 credit hours annually, which considering a traditional 3-hour course, is equivalent to an average of over four courses per year. Similarly, the Carnegie Classification did not appear to impact the number of credit hours taught by construction faculty. This is by itself also an interesting finding as R1 institutions are believed to have lower teaching load to compensate for the higher research expectation. This finding could be attributed that the construction discipline is still primarily seen as teaching programs and therefore requiring construction faculty to have a higher teaching load that their counterpart in the research institutions.

Faculty spending less time on research was the number one reason for research productivity impact, followed by the challenges that the faculty had to interact with students conducting research. This is an important finding, as faculty research activities are impacted even in situations not as extreme as Covid-19. It is not uncommon that faculty are assigned additional duties throughout the academic year which in turns reduces faculty time to work on research activities. Furthermore, sometimes faculty are not able to establish a regular meeting schedule with the student conducting research with them. Unfortunately, both of these situations, while detrimental to construction faculty research, are not unique to Covid-19. Thus, construction faculty and administrators should be mindful and more disciplined to maintain research productivity.

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