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Preparedness and Perceptions of Construction Faculty to Online Learning Environment (OLE) amid Exogenous Circumstances Transition

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This study examines the perceptions and preparedness of construction faculty in the USA regarding the transition to Online Learning Environments (OLE) in response to exogenous disruptions such as pandemics, natural disasters, and extreme weather events using an online survey method. The survey instrument collected respondent (construction faculty) demographics and perceptions about the current state of OLE implementation should another transition be imposed by exogenous circumstances, like influenza, volcanos, wildfires, and other events. These exogenous circumstances can be happening in one location or worldwide. Descriptive statistics were used to describe demographics and construction courses unsuitable for OLE. A comparison to 2020 data was made to determine changes in OLE implementation post-pandemic, which found laboratory courses, computer labs, and studio-type courses. The current findings highlight specific instructional challenges related to course types. The laboratory type courses continue to be identified as being the most difficult to offer online. Guidance is provided for universities seeking to strengthen faculty resilience and instructional adaptability in the face of future disruptions.

Keywords: Construction Online Learning, Construction Education, Educator, Online Learning Education, Educator Perceptions

Introduction

Exogenous disruptions (both natural and man-made), such as extreme weather, volcanic activity, and wildfires, can force educational institutions to transition from in-person to Online Learning Environment (OLE) rapidly. These exogenous circumstances are not limited to climatic changes but can also disease outbreaks and university closures dues to utility issues or even sports. To assess the preparedness of construction education educators and their perceptions of such transitions, an online survey instrument was disseminated to determine the state of readiness for university construction programs and their educators. The online survey instrument elicited data on US Construction educator demographics and perceptions regarding their capacity and ability to adapt in response to an exogenous circumstance that required immediate transition to OLE. Demographic variables encompassed educator rank, instructional role, and modality of course delivery. Educator perceptions highlighted challenges that varied according to course type and were further impacted by infrastructural constraints, individual circumstances, and unanticipated conditions.

While significant research has been conducted during and immediately after the pandemic transition, most education-domain research has focused on students and their outcomes and perceptions (West et al. 2022, Watson et al. 2023). At the same time, some research has been conducted from the educators' perspective, both within the US and globally, in the Architecture, Engineering, and Construction (AEC) educational domain area (Langar et al. 2022a, Langar et al. 2022b, Mosier et al. 2023), there is a high likelihood that their perceptions could change. Even before the pandemic, there was little research that focused on educator perceptions (Wu et al. 2013) and effective OLE teaching strategies (Ancan Bastias et al. 2021, Brown et al. 2023, Donham et al. 2022), even though they are integral and vital stakeholders of the higher education ecosystem.

To determine the existing state of online construction education, an online survey instrument was disseminated in 2020, which identified construction courses perceived to be challenging to deliver in an online environment (Adhikari et al. 2021a). This study builds on prior research by examining educator experiences and preparedness in construction education specifically identifying challenges and strategies for effective online delivery.

Point of Departure

While extensive research has explored student experiences with online learning during the COVID-19 pandemic (Suryawinata et al. 2020, Asadpour 2021, Ismael 2023), relatively little attention has been given to the perspectives of educators. (Brown et al. 2023, Donham et al. 2023). This study addresses that gap by focusing on educator experiences and strategies used during the pandemic and examining their continued relevance in the post-pandemic era toward long-term strategies for resilience in construction education. Construction educators were surveyed and participated in focused groups to identify what lessons were learned during the pandemic. Importantly, the study also investigates which strategies remain in use and how they contribute to building resilience in construction education.

The COVID-19 pandemic necessitated a rapid shift to OLE in construction education, prompting educators to adopt new tools and approaches quickly. By evaluating the effectiveness of the strategies adopted by construction educators in the US from 2020 to the present, this research identifies lessons learned and best practices that can enhance the preparedness and adaptability of construction education programs for future disruptions.

Method

The survey employed an online survey method to assess construction educators' perceptions of preparedness and adaptability in response to exogenous circumstances. The survey instrument was hosted on Qualtrics because of numerous reasons such as: a) previous instances where it has been used for educational research; b) previous experience of the research team with the tool; c) access to the tool at no cost. The developed survey had approximately 20 questions which were multiple-choice, Likert-scale, and open-ended. Additionally, the instrument was designed in a way that allowed respondents to optionally provide contact information to participate in follow-up focus groups, which aimed to explore instructional strategies and resilience within the construction education in greater depth.

After the development of the online instrument, information about the population was compiled. The population of the study was the Construction educators within the US, and construction educators whose institutions are members of the Associated Schools of Construction (ASC). ASC was selected because it is a professional organization that has been in existence for nearly 60 years, with a

significant membership of construction educators (ASC 2025). In addition, an Institutional Research Board (IRB) approval was sought from XXX University. Reliance agreements were established for the additional university partners. After obtaining all necessary approvals from the university IRB, the survey instrument was distributed.

The survey was emailed to over 1,000 email addresses available through the Associated School of Construction (ASC) membership list. Two reminder emails were sent to the population (Construction Educators). The study received 93 respondents. After removing respondents who were considered non-qualified based on their lack of pandemic OLE teaching experience, the response rate was n=83. Respondents were considered non-qualified if they did not consent (5) or did not have experience in online construction education (5). Qualitative responses to the question “What courses in the construction program cannot be taught using the Online Learning Environment (OLE)?” were analyzed using thematic coding to identify instructional challenges and trends (Braun and Clarke 2006). While course descriptions vary, there are many courses which are required in all construction programs due to accreditation requirements through ACCE and ABET.

Results

Demographics and Analysis of Quantitative Data

The survey results reveal a highly experienced and varied group of construction educators. Of the 83 valid respondents, 94% are actively teaching in the field. A majority (69%) hold doctoral degrees, and 37% have over 20 years of teaching experience, indicating a strong foundation for adapting to online instruction. The survey question "How do you self-identify?" received responses from a total of 83 participants. Out of these, 67% (56 respondents) identified as Male, 30% (25 respondents) identified as Female, 1% (1 respondent) identified as Transgender, and 1% (1 respondent) preferred not to answer. This diverse demographic profile provides a broad perspective on the experiences and strategies of educators in construction education during the post-pandemic period.

The survey question which queries the "*Highest level of educational attainment*" received responses from a total of 83 participants. Out of these, 69% (57 respondents) indicated a Doctoral degree, followed by 29% (24 respondents) having a Master's degree, and 1% (1 respondent) a Bachelor's degree, with another 1% (1 respondent) preferring not to answer. This high level of educational attainment among respondents indicates a well-qualified group of educators, providing valuable insights into the strategies and experiences in construction education during the post-pandemic period.

The survey question "*Which of the following describes you the best?*" received responses from a total of 83 participants (Figure 1). Out of these, 70% (58 respondents) identified as White/Caucasian, making it the largest demographic group. Other significant groups include Black/African American (2%), East Asian (2%), South Asian (4%), and Hispanic or Latino or Spanish Origin (5%). Additionally, 4% of respondents identified as having two or more ethnic identities, and 5% preferred not to answer. The respondent demographic profile provides a broad perspective on the experiences and strategies of educators in construction education. The "Other" category in the survey includes responses from participants who identified as “Viking”. This breakdown underscores the diversity within the respondent group.

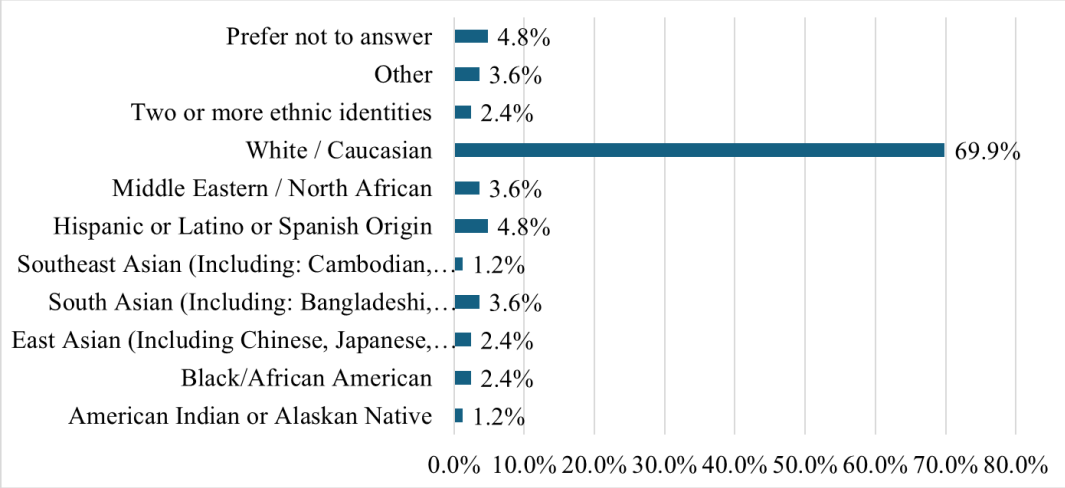

Figure 1. Ethnic Identity Distribution of Survey Respondents (n=83)

The survey queried respondents "*Academic Rank*" and received responses from a total of 83 participants. Out of these, 29% (24 respondents) identified as Professors, making it the largest group. This was followed by Associate Professors responses rate at 24% (20 respondents) and Assistant Professors at 16% (13 respondents). Other significant groups include Clinical Professors or Professors of Practice (4%), Instructors or Lecturers (16%), and Part-time or Adjunct Faculty (8%) (Figure 2).

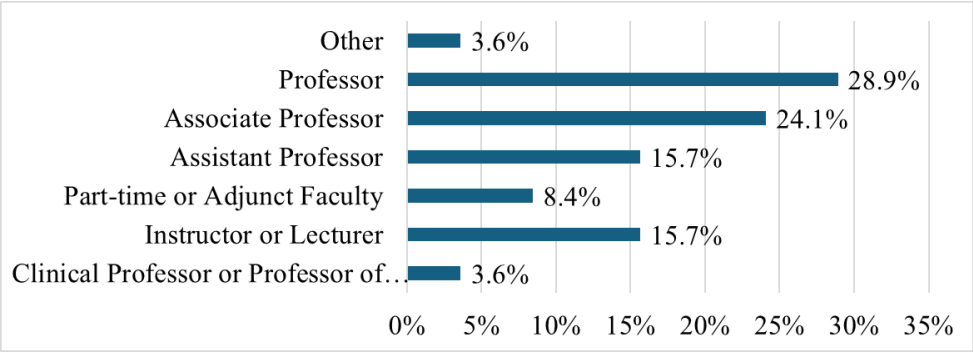

Figure 2. Distribution of Academic Ranks Among Survey Respondents (n=83)

The survey question "*Have you had any family care responsibilities during the past three years?*" received responses from a total of 83 participants. Out of these, 47% (39 respondents) indicated having dependent children, 17% (14 respondents) indicated having elder care responsibilities, and 41% (34 respondents) indicated having no family care responsibilities. The significance of these results lies in the insight they provide into the additional pressures faced by educators during and after the pandemic. Understanding the extent of family care responsibilities is crucial for developing support systems and policies that can help educators manage their dual roles effectively.

The survey queried respondents "*Position type in the current institution*" received responses from a total of 83 participants. Out of these, 52% (43 respondents) identified as Tenured faculty, making it the largest group. Other significant groups include Tenure-track teaching-focused faculty (6%), Tenure-track research-focused faculty (2%), Tenure-track balanced faculty (8%), Full-time non-

tenure-track faculty (20%), and Part-time or adjunct faculty (10%), as shown in Figure 3. These results lie in understanding the varied professional roles and job security levels among educators. Tenured faculty, who make up the majority, likely have more stability and resources to adapt to changes, while non-tenure-track and adjunct faculty may face more challenges due to less job security and support.

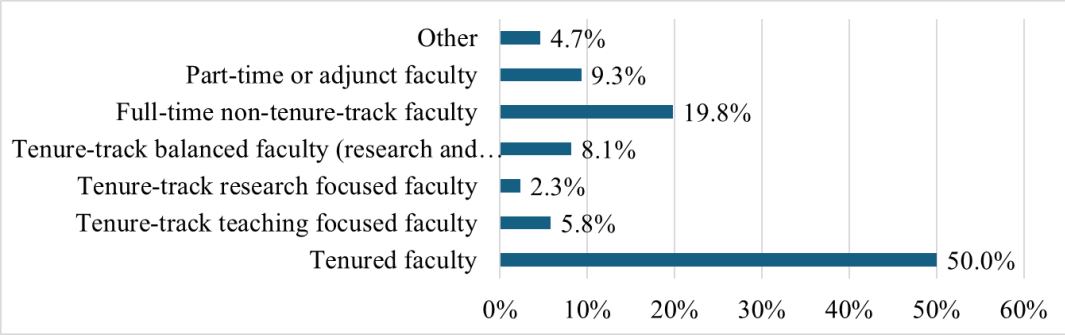

Figure 3. Respondent Position Types (n=83)

The survey queried educator "*Total teaching experience*" received responses from a total of 83 participants. Out of these, 7% (6 respondents) have 2 to 4 years of teaching experience, 22% (18 respondents) have 5 to 9 years, 17% (14 respondents) have 10 to 14 years, 17% (14 respondents) have 15 to 19 years, and 37% (31 respondents) have more than 20 years of teaching experience as shown in Figure 4. These results express the varied levels of expertise and roles among educators in construction education. The high percentage of respondents with more than 20 years of experience indicates a wealth of knowledge and adaptability, which is crucial for understanding the effectiveness of online teaching strategies during the pandemic. Additionally, the presence of educators with less experience highlights the need for ongoing support and professional development to ensure that all educator members can effectively contribute to building resilience in construction education.

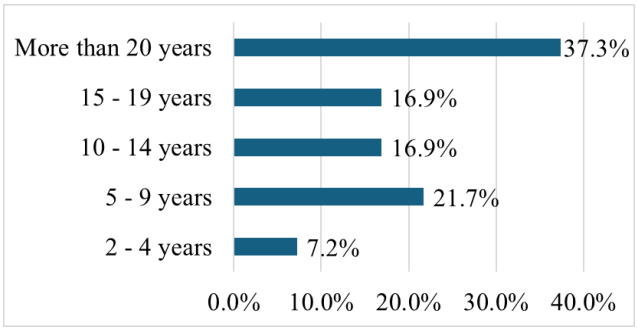

Figure 4. Total Teaching Experience of Survey Respondents (n=83)

Analysis of Perceptions and Qualitative Results

The survey question "*During the pandemic, when did you teach online?*" which received responses from a total of 83 participants. Out of these, 1.2% (1 respondent) did not teach online at all, 83.1% (69 respondents) taught online during Spring 2020, 79.5% (66 respondents) during Fall 2020, 69.9% (58 respondents) during Spring 2021, 42.2% (35 respondents) during Fall 2021, and 41.0% (34 respondents) taught online after Fall 2021 (Figure 5). The significance of these results reflects the understanding the adaptability and resilience of construction educators teaching during the pandemic.

The high percentages of respondents teaching online during multiple periods indicate a widespread and sustained effort to continue education despite the challenges posed by the pandemic. This information is crucial for identifying effective strategies and practices that can be used to enhance the resilience of construction education programs in the face of future disruptions.

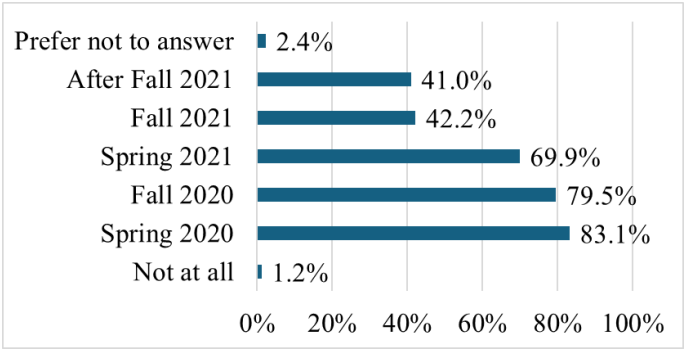

Figure 5. Respondent Online Teaching Status during the pandemic (n=83)

The survey results (Figure 6) reveal a spectrum of perceptions regarding online teaching post-COVID based on 83 participants. A significant portion, 29% (24 respondents), experienced a slight positive shift in their views, suggesting that some educators have found benefits or improvements in online teaching methods. Meanwhile, 24% (20 respondents) reported no change, indicating a stable perception of online teaching, neither better nor worse than before. On the other hand, 21% (19 respondents) of respondents experienced a slight negative change, and 13% (11 respondents) noted a strong negative change, highlighting ongoing challenges or dissatisfaction with online teaching. Only a small group, 11% (9 respondents), reported a strong positive change, showing that a few educators have had a very favorable experience with online teaching post-pandemic. These varied responses underscore the importance of understanding individual experiences and perceptions to provide targeted support and resources. Addressing the specific needs and concerns of educators can help improve the overall effectiveness and acceptance of online teaching in the post-pandemic era.

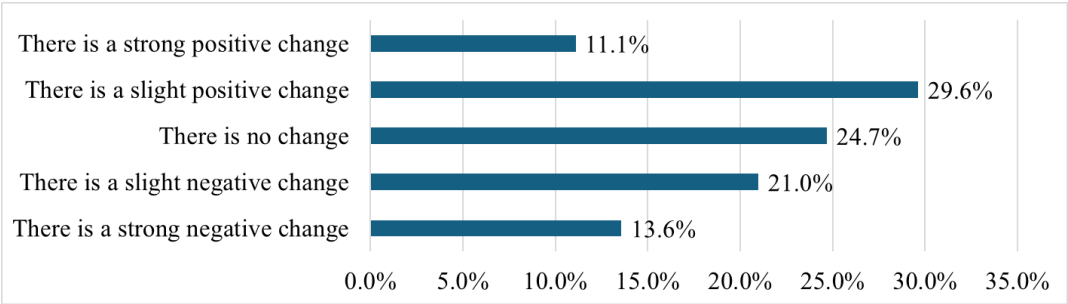

Figure 6. Changes in Perceptions About Teaching Online Post-Covid (n=81)

This high percentage of respondents involved in construction education underscores the relevance and importance of the survey in understanding the experiences and strategies of educators in this field during the post-pandemic period. Converting the responses into a 1-5 Likert Scale with Strong Negative Change = 1, and Strong Positive Change = 5, the mean score is a 3.03, or slightly above “No Change”. The data suggests that while the strategies adopted during the pandemic were effective,

there are continuing areas for improvement, particularly in addressing infrastructure, software, and personal time constraints.

In response to the open-ended survey question "*What courses in the construction program cannot be taught in construction programs using the Online Learning Environment (OLE)*?" respondents were able to provide unique responses without a prompt (Figure 7). The only indicator is that the initial population is construction educators. Therefore, it is expected that the responses will be focused on construction education. Responses were not required for this query, and participants could provide multiple responses. Courses mentioned by fewer than two respondents were excluded from the analysis.

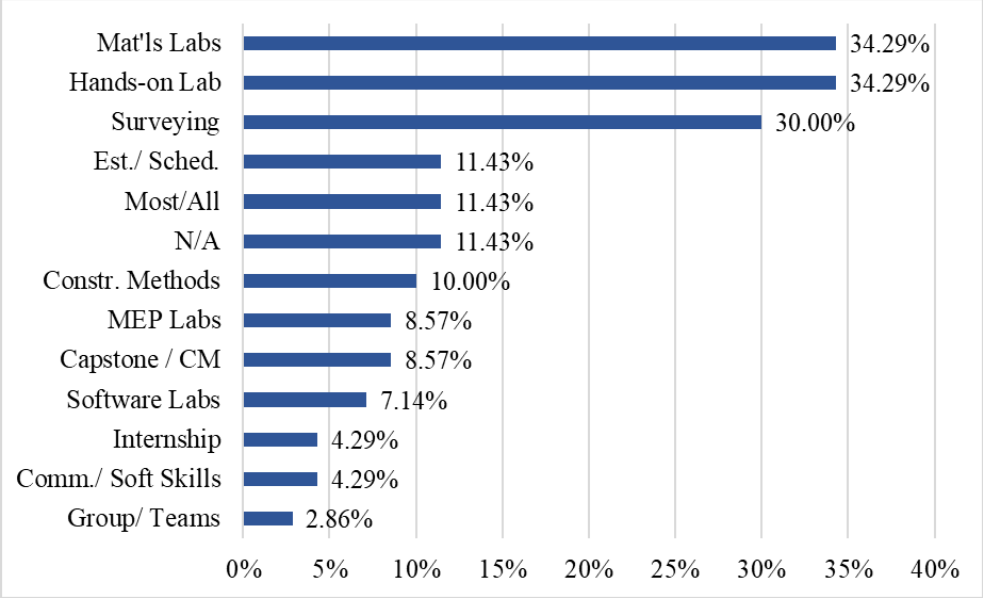

Figure 7: Current construction courses unsuitable for OLE (n=70)

In this updated study, open-ended survey responses were compared with the earlier findings to assess any shifts in perception. Responses containing the term "hands-on" were categorized separately from those referencing specific lab-based courses, such as soils or concrete. These courses, while inherently hands-on, were also grouped under the broader category of materials (Mat'ls) labs, potentially resulting in overlap across classifications. Using typical coursework typologies for determining responses coding was performed. For example, the response "Materials are more difficult without the hands-on components. Computer labs can be a challenge with the students' need to access specialized software" provides two types of construction courses "Materials" and "Computer labs." Further, the "hands-on" portion would also be counted. While it is not a separate course, it is an important concept or code. So three unique responses would be identified from this response.

Notably, the response "Not Applicable" or "N/A" appeared with the same frequency as "Most/All," indicating a wide range of views. With 8 respondents indicating that no courses are unsuitable for OLE or "None" as their response, it is apparent that of the respondent group that there are educators who are comfortable in OLE, which indicates a resilience or adaptation under adverse conditions.

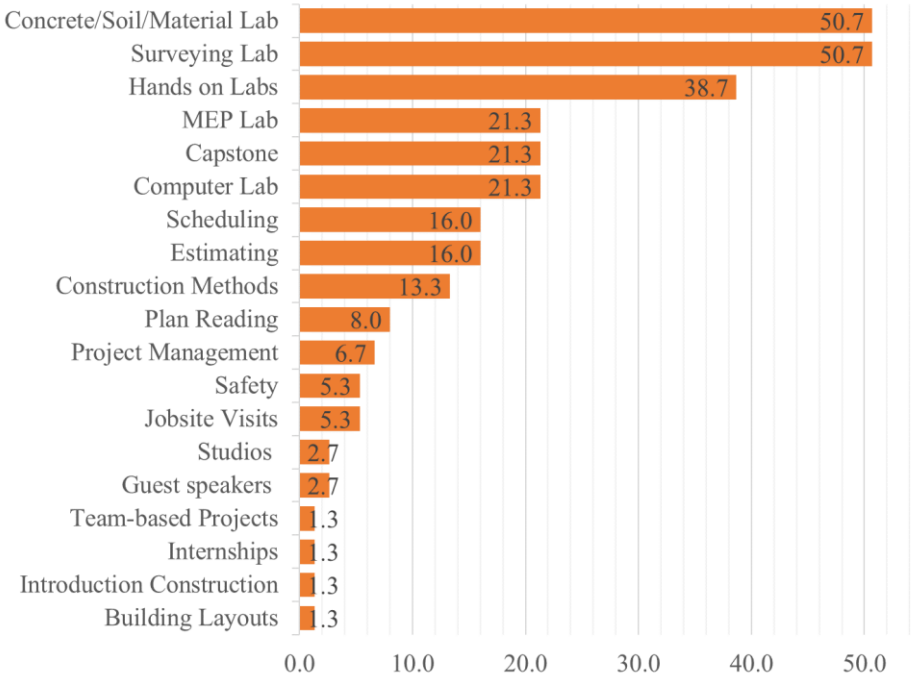

Figure 8: 2020 Responses to which construction courses cannot be offered online (n=75) (Adapted from Adhikari et al. 2021a)

Previous research identified specific construction courses that were considered unsuitable for online delivery based on educator perceptions (Adhikari et al. 2021a). Despite some changes, educators continue to express strong concerns about the feasibility of delivering many hands-on and laboratory-based courses through online learning environments (OLE). It should be noted that this is not a longitudinal study, but rather two surveys of construction educators at two different points in time, or cross-sectional studies. Comparing responses of the 2020 and 2024 surveys, a smaller percentage of educators now consider surveying and materials labs unsuitable for OLE, suggesting a modest shift in comfort levels and adaptability following the forced transition to online instruction during the pandemic.

In the initial pandemic survey, internships only received one response. However, that has risen slightly. This may be due to the initial responses happening during the pandemic or the number of programs which require internships (Moore & Plugge 2008, Adhikari et al. 2021b). Capstone and team-based projects also received more responses than the initial survey. This may also be due in part to the differing circumstances. During the Covid-19 pandemic all courses were forced online. However, there are still courses which faculty do not believe are suited for OLE.

Conclusions

The survey respondents represent a diverse cross-section of construction educators, varying in gender, ethnicity, academic rank, and teaching experience. Notably, 37% have over 20 years of teaching experience, which contributed to their adaptability during the rapid shift to online learning prompted by the COVID-19 pandemic. However, perceptions of online teaching post-COVID are mixed, with 11% reporting strong positive change, 29% reporting a slight positive change and 24% reporting no

change, while 21% experienced a slight negative change and 13% a strong negative change. Changes in Perceptions About Teaching Online were slightly above "No Change," which suggests that while the strategies adopted during the pandemic were effective, there are continuing areas for improvement which include infrastructure, software, and personal time constraints. The data suggests that the strategies adopted during the pandemic were effective in maintaining educational delivery, as evidenced by the high engagement and adaptability of educators.

The concerns from the initial pandemic transition still exist, especially concerns about hands-on learning and delivering laboratory courses online. Although concerns about delivering most courses in online learning environments (OLE) have diminished since the initial transition, concerns remain. This underscores the need for continued investment in infrastructure, technology, and instructional support to enhance the delivery of practical components in construction education. Ultimately, the lessons learned during the pandemic have laid a foundation for more resilient educational practices. These may be seen most clearly in the small group of educators who indicated that there are not any construction courses which are unsuitable for OLE. Outside of the pandemic, some changes in perceptions are evident. Construction educators indicated more confidence in delivering lab courses online. Construction educator concerns may be changing with concerns about capstone and teamwork courses online. Further research is therefore needed to identify and disseminate best practices for OLE in construction education, ensuring institutions and educators are better prepared for future disruptions.

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