

Collaborations between industry and academia for future workforce development: construction practitioners' perspective

Collaboration:
practitioners'
perspective

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Abstract

Purpose – There is a growing mismatch between the skill demands of the industry and the offerings of academia. One way of reducing this mismatch is by improving collaborations between practitioners and instructors using web-networking platforms. However, it is important to understand practitioners' considerations while collaborating with instructors. Therefore, this study identified these considerations in order to infer inputs for the design of the graphical user interface (GUI) of a web-based platform for connecting instructors and practitioners.

Design/methodology/approach – A mixed method was adopted through a survey and focus group. A survey was used to capture practitioners' considerations while collaborating with instructors for student development, and a focus group helped uncover an in-depth understanding of the study phenomena. The data were analyzed using descriptive and inferential statistics and thematic analysis.

Findings – The results show the willingness of practitioners to collaborate with instructors for student development, the ways by which practitioners are willing to meet instructors' course-support needs and their considerations in deciding to do so. Slight differences were observed between the results of the survey and the focus group regarding the ranking of the practitioners' considerations. The study highlighted demographic differences in practitioners' considerations when deciding on meeting instructors' course-support needs. The results provide a basis to deduce the GUI inputs of web-networking platforms for connecting instructors and practitioners.

Originality/value – This study revealed practitioners' design needs and GUI inputs to facilitate the design of web-networking platforms for connecting instructors and practitioners. This study also contributes to user interface design principles, theories on individual differences and practitioners' involvement in student professional development.

Keywords Academia, Construction practitioner, Construction industry, Instructor, Skill gap, Web-based platform, Workforce development collaborations

Paper type Research paper



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1. Introduction

Research and industry reports have shown that new construction graduates are not meeting the expectations of employers in terms of balance between new knowledge and skills which the industry requires (NASEM, 2016; Christo-Baker *et al.*, 2017). This has been attributed to the continuous change in the industry which has necessitated new skill and competence requirements (Ahmed *et al.*, 2014). The industry requires graduates to possess critical thinking skills, problem-solving skills and practical knowledge that are applicable in the workplace (Chandrasekaran *et al.*, 2015). According to Ahn *et al.* (2012) and Ahmed *et al.* (2014), the industry also requires construction graduates with competence in ethical issues, communication and interpersonal relationships skills, knowledge of health and safety regulations, ability to understand contract documents, listening ability and time management skills. To attain these skills, practitioners' involvement in construction education has been deemed necessary (Gentili, 2015). These expose students to their communities of practice (CoPs) under the supervision of instructors who can guide the interactions to ensure that they complement and align with the curriculum (Anderson and Mourgues, 2014; Olayiwola *et al.*, 2023). However, connecting instructors with practitioners for participation in academic pedagogical effort is challenging. Common challenges include institutional gaps, unfamiliarity of terrain (Tartari and Salter, 2015), mutual misunderstanding of expectations (Bruneel *et al.*, 2010), limited access to practitioners (Chandrasekaran *et al.*, 2015), reluctance of practitioners (Sharma and Sriraman, 2012), misalignment of supports from practitioners (Peters and Lucietto, 2016), poor coordination (Kaymaz and Eryigit, 2011) and lack of dedicated interface for such collaborations (Rizvi and Aggarwal, 2005).

Web-based networking platforms offer opportunities to dynamically connect instructors and practitioners or match instructors with practitioners who can contribute to student development. To develop such platforms, usage research is important to understand end-users' behavioral and attitudinal characteristics from which inputs for graphical user interfaces (GUIs) can be deduced (Gould and Lewis, 1985; Hartson and Pyla, 2012). However, users' design needs and inputs for the GUI of such web-based networking platform have not been formalized in literature. In other words, there is a need to understand the considerations of practitioners when collaborating with instructors to prepare students for the workplace. This understanding would be vital to harmonize two different communities in the same effort, circumvent long-term barriers in industry-academia collaborations and ultimately provide inputs for the design of GUI of web-based platforms to connect instructors and practitioners for future workforce development.

Few studies that have considered workforce development in industry-academia collaborations have been from instructors' and/or students' perspectives (Chandrasekaran *et al.*, 2015; Eiris and Gheisari, 2018; Eiris Pereira and Gheisari, 2019; Carbone *et al.*, 2020). Effort is lacking in assessing the corresponding perspective of practitioners. This gap motivated Anderson and Mourgues (2014) to prepare an account of industry participation in construction capstone courses from practitioners' perspective. This gap in knowledge could be responsible for the lingering challenges and shortcomings of harmonizing instructors and practitioners in workforce development collaborations. In addition, it is possible that the dynamic nature of the construction industry, as well as individual differences motivated by demographic characteristics (Hammer, 2011; Beins, 2017) could influence networking of instructors and practitioners. Therefore, this study aims to answer the following research questions:

- RQ1. What are practitioners' considerations when collaborating with instructors for student development?
- RQ2. How do these considerations vary across demographic characteristics of practitioners?

Answers to these questions would help to uncover users' design needs and inputs for GUIs of web-based platforms for connecting instructors and practitioners. This would also ensure that potential end-users are well-understood and the web platform design process is user-driven (Gould and Lewis, 1985; Hartson and Pyla, 2012). This study would advance knowledge on user requirements for networking practitioners and instructors in workforce development efforts. This study also contributes to user interface design principles, theories on individual differences and practitioners' involvement in student professional development.

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2. Literature review

2.1 The need for collaboration between practitioners and instructors

Construction-related disciplines are practice-based but it is usually challenging for instructors to cover practical aspects of the curriculum (Gunhan, 2015). Hence, to provide students with practical experience various involvements of practitioners are required (Ahn *et al.*, 2012; Anderson and Mourgues, 2014). Practitioners and instructors differ in various ways, for example instructors focus on disciplinary principles while practitioners emphasize competence for specific applications (Bozoglu, 2016). Despite these differences, both parties have overlapping and complementary contributions in future workforce development (Rizvi and Aggarwal, 2005) to deal with the current skill gaps and mismatches (Afonso *et al.*, 2012). These differences could be harnessed through collaborative efforts to achieve balance between theory and practice in preparing students for the industry. Therefore, direct collaborations between instructors and practitioners are necessary to ensure effective participation of practitioners in instructors' pedagogical efforts. This is important because both instructors and practitioners need to work closely together to ensure maximal impact on students (Anderson and Mourgues, 2014; Lu and Jacobs, 2022). Practitioners can make this impact by meeting instructors' course-support needs (see Table 1) such as guest lectures, site visits, workshops, laboratory sessions and seminars (Abudayyeh *et al.*, 2000; Bozoglu, 2016; Ofori-Boadu *et al.*, 2017) and mentors and judges for students' term projects and capstones (Edward Back and Sanders, 1998). These instructors' course-support needs provide avenues for practitioners to collaborate with instructors for direct and complementary contributions in course offerings (Olayiwola *et al.*, 2023). These collaborations expose students to their CoPs, current industry trends and professional networks (Chandrasekaran *et al.*, 2015; Lu and Jacobs, 2022). Practitioners can help students connect academic knowledge to practical relevance in the workplace and how they acquire and apply their expertise. Students could garner insights regarding career options, skills required in the industry and how success in

S/ N	Instructors' course-support needs that practitioners can meet	Source
1	Guest lectures	Jacobs <i>et al.</i> (2022) and Lu and Jacob (2022)
2	Site visits	Civjan (2020), Eiris Pereira and Gheisari (2019) and Gunhan (2015)
3	Seminars	Jacobs <i>et al.</i> (2022) and Gentelli (2015)
4	Laboratory sessions	Nikolic <i>et al.</i> (2011) and Bozoglu (2016)
5	Judge/mentor/sponsor for term/capstone projects	Edward Back and Sanders (1998) and Anderson and Mourgues (2014)
6	Workshops	Chandrasekaran <i>et al.</i> (2015), Ofori-Boadu <i>et al.</i> (2017) and Lu and Jacob (2022)

Source(s): Tables are authors' own creation

Table 1.
Instructors' course-
support needs that
practitioners can meet

the industry is dependent on soft skills such as communication and networking (Abudayyeh *et al.*, 2000). However, access to practitioners is a challenge for many instructors (Chandrasekaran *et al.*, 2015).

2.2 Existing efforts to connect industry and academia

There are several frameworks and arrangements to connect industry and academia. Several institutions leveraged on-campus recruitment, continuous professional development education (Abudayyeh *et al.*, 2000), technology transfer offices and industrial liaison offices (Bruneel *et al.*, 2010) to foster industry-academia collaborations. Also, curriculum development, fundraising, career fairs, internship programs (Abudayyeh *et al.*, 2000; Lu and Jacobs, 2022), research and development, consultation, training (Kaymaz and Eryigit, 2011) and industry advisory board (Abudayyeh *et al.*, 2000) are current efforts to ensure collaborations between industry and academia. However, these collaborations usually occur at departmental and institutional levels and usually do not have student development as primary focus (Chandrasekaran *et al.*, 2015; Carbone *et al.*, 2020). To ensure focus on student development, beyond institutional-level arrangements, collaborations between instructors and practitioners are necessary to ensure direct participation of practitioners in instructors' pedagogical efforts (Anderson and Mourgues, 2014; Jacobs *et al.*, 2022) through several avenues (See Table 1). However, innovative means to connect instructors and practitioners seem non-existent.

Since the advent of web 2.0, web-based platforms have been used to facilitate dynamic collaboration and interaction between individuals and communities (Wellman, 2004; Vlachopoulos and Makri, 2019). Many instructors rely on social media to connect with practitioners. However, such connection is usually limited to personal contact and professional associations (Gruzd *et al.*, 2012; Lu and Jacobs, 2022). Hence, instructors with limited contact and small social capital are disadvantaged. Web-based platforms have been used in other domains, for example, Garrot-Lavoué (2011) presented a web-based platform to facilitate knowledge sharing among tutoring CoPs. Mackey and Evans (2011) also leveraged web-based platform for tutors' professional training by connecting CoP with learners. Pavon-Marino and Izquierdo-Zaragoza (2015) developed a web-based platform to address the gap between industry and academia in the process of technology transfer. Given the potential of the web and its current application in other domains, web-based platforms could be used to connect instructors and practitioners for student development. However, in construction education domain, there seems to be no web-based platform to facilitate collaborations between instructors and practitioners for student development.

2.3 Practitioners' considerations when collaborating with instructors for student development

To leverage web-based platforms in connecting instructors and practitioners, scholars (Gould and Lewis, 1985; Hasani *et al.*, 2020) in user interface design have provided guidelines to facilitate the design and development of such interfaces. The first step in such a process is to conduct usage research to understand the end-user of the proposed system. The outcome of the usage research is to provide designers with information from which the users' design needs and GUI inputs of user interfaces can be deduced (Hartson and Pyla, 2012). This approach has been adjudged a means to uphold user-centered design principles and human factor principles in the design of user interfaces (Grimes *et al.*, 1986; Hasani *et al.*, 2020). However, users' design needs and inputs for the GUI of a web-based networking platform to connect instructors and practitioners seems unavailable in literature. Therefore, there is need to examine the consideration of practitioners when collaborating with instructors for student development.

Practitioners work in different organizational contexts from instructors (Jacobs *et al.*, 2022), hence collaborations to meet instructors' course-support needs necessitate understanding the considerations of practitioners in those instances. As shown in Table 2, these considerations could be institutional, instructor, student, or specific course-support related (Abudayyeh *et al.*, 2000; Anderson and Mourgues, 2014; Gunhan, 2015; Eiris Pereira and Gheisari, 2019; Civjan, 2020; Seifan *et al.*, 2020; Jacobs *et al.*, 2022; Lu and Jacobs, 2022). For instance, time is a crucial factor that practitioners consider in industry-academia collaborations due to their busy schedules (Abudayyeh *et al.*, 2000; Anderson and Mourgues, 2014). Collaborations that involve bringing practitioners into the classroom (i.e. guest

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Practitioners' considerations	Source
<i>Institution-related</i>	
Type of institution	Redd (1998) and Zaharia and Kaburakis (2016)
Location/proximity of the institution	Alebaikan (2016), Jacobs <i>et al.</i> (2022) and Lu and Jacobs (2022)
<i>Instructor-related</i>	
Gender	Tartari and Salter (2015)
Ethnicity	Tartari and Salter (2015)
Physical disabilities	Baker <i>et al.</i> (2012) and Rothstein (2015)
<i>Student-related</i>	
Number of students or class size	Carbone <i>et al.</i> (2020) and Civjan (2020)
Students' academic level	Carbone <i>et al.</i> (2020) and Lu and Jacobs (2022)
Students' department or program of study (e.g. building construction, civil engineering)	Alebaikan (2016) and Carbone <i>et al.</i> (2020)
Gender proportion of students	Ford <i>et al.</i> (2008) and Angel (2016)
Ethnic diversity of students	Ford <i>et al.</i> (2008) and Angel (2016)
Safety equipment needed by the students	Gunhan (2015) and Civjan (2020)
Physical disabilities of students	Elleven <i>et al.</i> (2006) and Seifan <i>et al.</i> (2020)
<i>Specific course-support-related</i>	
Type of course-support required (e.g. guest lecture, seminar, workshop, site visit)	Lu and Jacobs (2022)
When the course-support is needed (i.e. date/time)	Abudayyeh <i>et al.</i> (2000) and Anderson and Mourgues (2014)
Duration of the course-support (e.g. length of lecture or site visit)	Anderson and Mourgues (2014) and Gunhan (2015)
Number/frequency of the course-support (e.g. number of site visits)	Civjan (2020)
Topic requiring course-support	Alebaikan (2016) and Lu and Jacobs (2022)
Learning objective and expected student outcomes	Abudayyeh <i>et al.</i> (2000), Civjan (2020) and Lu and Jacob (2022)
Need for pre-visits by the instructor (e.g. pre-visit to the site or pre-meeting with the industry practitioner/company)	Civjan (2020)
Specific demonstrations/visual representation required	Gunhan (2015)
Need to visit the office trailer/site office (e.g. for discussion of designs and project schedule)	Gunhan (2015) and Civjan (2020)
Size of industry-support team required by the instructor (e.g. number of guest speakers)	Gunhan (2015) and Civjan (2020)
Source(s): Tables are authors' own creation	

Table 2.
Summary of
practitioners'
considerations when
collaborating with
instructors for future
workforce
development

speakers) require proper coordination regarding the time to be present, duration and focus of the presentation as well as appropriate background information about the students that the invited practitioners are to speak to [Abudayyeh et al. \(2000\)](#). Although virtual and remote options are being explored, location/proximity of institutions to practitioners is an important consideration in bringing practitioners into the classroom due to the need to be at their workplaces ([Jacobs et al., 2022](#)).

In providing course-support such as site visits that require students to leave the classroom, practitioners need to consider physical disabilities of students ([Seifan et al., 2020](#)), safety concerns ([Gunhan, 2015](#)), nature of the construction site ([Eiris Pereira and Gheisari, 2019](#)), class size, duration or time commitment required, required visual demonstration, as well as expectation of instructors in terms of learning objectives ([Civjan, 2020](#)). This is crucial because construction sites could be very busy, congested and often inaccessible ([Eiris and Gheisari, 2018](#)). Schedule, logistics, frequency of visit as well as date of visit are vital considerations for practitioners ([Civjan 2020](#)). Also, the need for pre-visit by instructors and students' visit to site trailer for demonstrations of project visualization and software are considerations for practitioners prior to site visit ([Gunhan, 2015; Civjan 2020](#)). In addition, a glance at diversity, equity and inclusion is also significant because the construction industry is still perceived as lagging in these areas ([Sang and Powell, 2013](#)). For example, there is evidence of discrimination and restrictions for women, people with disabilities and people from traditionally minoritized populations in the construction industry ([Hickey and Cui, 2020; Karakhan et al., 2021](#)). Moreover, given the current effort to promote diversity, equity and inclusion in the construction industry ([Karakhan et al., 2021](#)), it would be fascinating to examine whether parameters such as gender, ethnicity and physical disabilities of instructors and students would part of practitioners' considerations when collaborating with instructors for student development. These are some of the intricacies that have not been holistically assessed in collaborations between practitioners and instructors.

2.4 Theoretical underpinning

Several theories have alluded to various potential contributions of industry to education as well as ways by which practitioners could be involved in student development. These theories include situated learning theory ([Lave and Wenger, 1991](#)), experiential learning theory ([Kolb, 1981, 1984](#)) and competence-based learning theory ([Sanchez and Ruiz, 2008](#)). The convergence of these theories is in the concept of communities of practice (CoP) by [Wenger \(1999\)](#). [Wenger \(1999\)](#) explained CoP to be a group of practitioners of a profession with mutual engagement, shared repertoire and joint enterprise. Other theories lean heavily on this concept to postulate that students learn better and could be more effectively prepared for the workplace through inputs from members of their CoP, interaction with work practice and workplace of their CoP. For example, situated learning theory explains learning as a situated activity which takes place through a social process where learners learn knowledgeable skills as they participate in a CoP. While explaining experiential learning theory, [Kolb \(1984\)](#) emphasized that learning is a process that transcends the achievement of behavioral learning outcomes. The theory considered learning as a process wherein ideas and thoughts are not static and unchangeable but are developed, shaped and modified by experience. Experiential learning theory emphasized the role of experience in the learning process. Students' interactions with their CoP offer experiential learning opportunities ([Chandrasekaran et al., 2015](#)). In addition, competence-based theory aimed at achieving coherence in integrating theory and practice, by providing actual representation of the workplace to facilitate students' adaptability to work practice and transition to the workforce ([Gonczi, 1999; Bernikova, 2017](#)). Competence-based learning theory advocated for joint

efforts of industry and academia in determining the direction of professional education (Sanchez and Ruiz, 2008).

These theories have been the benchmarks for several teaching methods and curricula content to facilitate practitioners' involvement in workforce development (Sanchez and Ruiz, 2008; Perera *et al.*, 2017; Eiris Pereira and Gheisari, 2019). However, innovative means to facilitate practitioners' involvement in student development remain a subject of inquiry. This study proposed that practitioners' involvement can be facilitated by web-based platforms that dynamically connect and give instructors access to practitioners. Keeping with human factors principles in user-interface design and user-centered design principles, prior to the design of such web-based platform, usage research is necessary to understand potential end-users and their work context for which the platform is to be designed (Gould and Lewis, 1985; Hartson and Pyla, 2012). However, the purpose of usage research is not to ask users what they want in design but to deduce users' design needs from the results obtained (Hartson and Pyla, 2012). This led to asking the first research question: What are practitioners' considerations when collaborating with instructors for student development? In addition, the dynamic nature of the construction industry (Gao *et al.*, 2013), as well as individual differences motivated by demographic characteristics (Beins, 2017; Hammer, 2011) informed the second research question, which is: How do these considerations vary across demographic characteristics of practitioners? This is crucial to better understand research findings by revealing the limit of generalizability, similarities and differences within the study population regarding the same phenomenon (Beins, 2017; Hammer, 2011). The findings would provide a basis to deduce the GUI inputs of a web-networking platform to connect instructors and practitioners.

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3. Methodology

3.1 Data collection

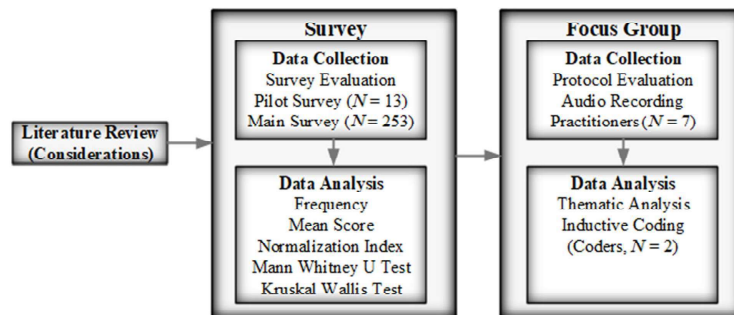
3.1.1 Survey instrument. To ensure triangulation, a mixed method approach was adopted for this study using survey and focus group (Love *et al.*, 2002). This approach is deemed suitable in usage research to understand end-users of proposed systems (Gould and Lewis, 1985; Hartson and Pyla, 2012). A survey with well-structured and close-ended questions was used for quantitative data collection. A pilot survey was conducted with thirteen (13) practitioners. Based on prior relevant extensive experience, an external evaluator was chosen to evaluate the data collection instrument before and after the pilot survey. The results of the pilot survey as well as the feedback from the evaluator were used to improve the survey. A Cronbach Alpha of 0.94 underscored the internal consistency of the survey (Taber, 2018). The survey instrument used was divided into two parts. The participants were asked to profile themselves and their organization in the first part of the survey. The participants were also asked to indicate whether their organization has policies or practices to support academic effort in developing the future workforce and whether they personally have experience interacting with students, e.g. hosting, mentoring, or and supervising students. The second part of the survey was divided into two sections. The first section contained a list of course-support needs of instructors (Table 1) which participants were asked to indicate their willingness to meet. The second section provided a list of practitioners' considerations when deciding on meeting instructors' course-support needs (Table 2). The participants were asked to rank each of these on a 5-point Likert scale (e.g. 1: Not Important and 5: Very Important). The survey was launched online via QuestionPro. The survey was randomly administered to construction industry practitioners across the United States of America (USA). The survey took about 7 min to complete. A total of 253 participants completed the survey instrument. About 72% of the respondents were from

the Southeastern region of the USA. The survey was conducted between November 2022 and February 2023. The responses to the survey provided primary data for analysis. At the end of the survey, practitioners who were willing to participate in the focus group were asked to provide their contact details. An overview of the methodology is shown in [Figure 1](#). The study was approved by the Institutional Review Board at XXX University (IRB# AB-CDE).

3.1.2 Focus group. Focus group was used to validate the results of the survey, secure qualitative feedback and provide better understanding of the study phenomena. Out of the survey participants who expressed their willingness to participate in the focus group, only seven (7) practitioners had a common availability to participate in the focus group. The participants include a senior manager, project engineer, construction manager, virtual construction manager, executive project manager, chief executive officer and project superintendent with different gender identity, varying levels of experience and different types of construction organizations. The objectives of the study guided the questions for the focus group. The questions were tailored after the pattern of the survey results. The participants were presented with the visual representations of the survey results and were asked open-ended questions to identify any surprising pattern or ranking in the results, provide feedback on why some considerations rank high or low as well as share their experiences in relation to each question and section of the survey results. Finally, the participants were asked to mention other things that they would consider which are not provided in the survey and why they would consider such to be important. The protocol was assessed by three instructors ($n = 3$) with at least five (5) years of faculty experience. Thereafter, an external evaluator also examined the protocol in two rounds. The participants were sent the talking points and consent information before the slated day for the focus group. The focus group was held virtually for about 1 h and was audio/video recorded via an institutional Zoom account. All participants gave their consent to participate in the study. The recordings were de-identified, transcribed and analyzed.

3.2 Data analysis

The data collected via survey was analyzed using descriptive and inferential statistics. Mean Normalization Index (MNI) was used to determine the critical factors. MNI gives a quantitative comparison of the mean score (MS) of a factor with both the maximum and minimum value in a given set. MNI ranges from 0 to 1, any factor with $MNI \geq 0.5$ is considered a critical factor ([Nnaji and Karakhan, 2020](#)). The formula is shown below.



Source(s): Author's own creation

Figure 1.
Overview of
methodology

$$MNI = \frac{(\text{actual value} - \text{minimum value})}{(\text{maximum value} - \text{minimum value})}$$

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The normality of the data set was examined using Shapiro–Wilk Test (SPW). All SPW values were <0.05 which show the non-normality of the data. Hence, non-parametric tests such as Mann–Whitney U and Kruskal Wallis were used to examine the significant differences in the responses of the participants across different demographics. A p -value <0.05 was considered significant. A post hoc test was conducted where a significant difference was observed. Microsoft Excel and Statistical Package for Social Science (v.20) were used for quantitative data analyses. The thematic analysis of the qualitative data from the focus group was conducted using Nvivo 11. Inductive coding was used to group related themes. The reliability of the codes was verified with an inter-rater reliability test by two different researchers ($n = 2$) using Cohen-kappa coefficient. About 98.41% agreement was achieved between the two coders and the Cohen-kappa coefficient was 0.66 which indicates substantial agreement.

4. Results

4.1 Survey

4.1.1 Participants' demographics. A total of 253 responses were used for analysis. The demographics of the respondents as shown in Table 3 revealed that they were diverse practitioners from different organizations, with different expertise and sufficient knowledge and experience to provide reliable data for the study.

4.1.2 Organizations with policies/practices to support academia in workforce development efforts. The participants were asked to indicate whether their organization has policies or practices to support academia in workforce development efforts. The result is shown in Figure 2. More than 72% of respondents indicated that their organizations have policies/practices to support academia in workforce development efforts. Only about 17% of respondents indicated that they do not know whether such policies/practices exist in their organizations. A smaller percentage (11%) of the respondents indicated that their organizations have no policies/practices to support academia in workforce development efforts.

4.1.3 Practitioners' experience in interacting with students. The respondents were also asked to indicate whether they have prior experience interacting with students such as through mentoring, coaching, or hosting students. As shown in Figure 2, roughly 87% of the respondents had the experience.

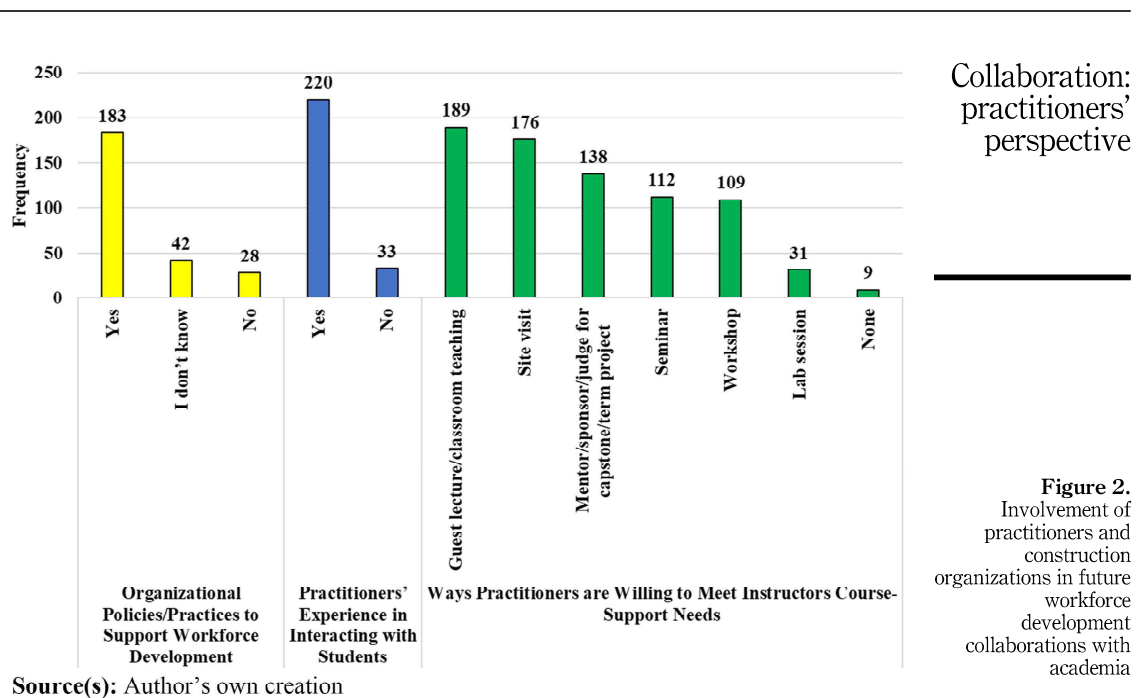
4.1.4 Instructors' course-support needs that practitioners are willing to meet. The participants were presented with a list of instructors' course-support needs and were asked to indicate the ones they are willing to meet. The participants were also allowed to suggest other course-support needs that are not listed in the survey. The result is shown in Figure 2. Guest lecture/classroom teaching has the highest frequency, followed by site visit and mentor/sponsor/judge for capstone/term project. These were selected by more than 50% of the respondents. This shows that practitioners preferred these avenues in supporting academic pedagogical efforts. Seminar, workshop and laboratory sessions ranked fourth, fifth and sixth respectively, which indicated that they were less preferred by practitioners. Although seminar and workshop ranked fourth and fifth respectively, it is noteworthy that more than 40% of the respondents indicated their willingness to provide the course-supports. There was no difference in the frequency rankings of the course-support between male and female practitioners, except for seminars and workshops whose rankings were interchanged. Only nine (9) respondents indicated that they are not willing to meet any of these course-support needs, mainly due to time constraints. Internship opportunities and student competition team coaching were additional support mentioned by the participants. However, these are not directly related to instructors' course offerings.

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Demographics	Frequency	%
<i>Type of organization</i>		
Residential building construction firm	14	5.5
Commercial/non-residential construction firm	114	44.9
Federal/heavy construction firm	29	11.4
Transportation and highway construction firm	16	6.3
Mechanical, electrical and plumbing (MEP) firm	6	2.4
Special trade contracting firm	9	3.5
Design firms	26	10.2
Design-build firm	11	4.3
Others	28	11.0
<i>Size of organization</i>		
Less than 10 employees	3	1.2
10–19 employees	7	2.8
20–49 employees	26	10.2
50–99 employees	23	9.1
100–249 employees	32	12.6
250–499 employees	44	17.3
500–999 employees	22	8.7
1,000+ employees	96	37.8
<i>Gender</i>		
Male	189	74.4
Female	64	25.2
<i>Ethnicity</i>		
American Indian or Alaska native	1	0.4
Asian	17	6.7
Black or African American	12	4.7
Hispanic or Latinx	11	4.3
White/Caucasian	204	80.3
Multiracial	4	1.6
Others	4	1.6
<i>Cumulative years of experience</i>		
1–5 years	90	35.4
6–10 years	50	19.7
11–15 years	26	10.2
Above 15 years	87	34.4
<i>Position/job role</i>		
President/CEO	14	5.5
Vice president	31	12.2
Senior manager	44	17.3
Estimator	8	3.1
Project manager	47	18.5
Field/project engineer	36	14.2
Engineer (civil/structural/mechanical/electrical)	22	8.7
Superintendent	12	4.7
Architect	3	1.2
Inspector	1	0.4
Others	35	13.8

Table 3.
Demographics of the
respondents

Source(s): Tables are authors' own creation



4.1.5 Considerations of practitioners in workforce development collaborations with instructors. The respondents were presented with a list of twenty-two (22) considerations and were asked to rank the level of importance they would ascribe to each when deciding to meet instructors' course-support needs. The considerations were in four categories, namely, institution-related, instructor-related, students-related and specific course-support related. The result presented in Table 4 shows the MS, MNI and ranking of the practitioners' considerations. The item with the highest MS (MS = 3.63) is "When the course-support is needed", while "gender of instructor" has the lowest MS (MS = 1.60). These items also have the highest and lowest MNI respectively. Only fourteen (14) items in the list of practitioners' considerations have MNI ≥ 0.5 , hence they are considered critical. These critical considerations are: "when the course support is needed", "location/proximity of the institution", "learning objective/expected student outcomes", "frequency of the course-support", "topic requiring course-support", "duration of course support", "students' department or program of study", "type of course-support required", "specific demonstrations/visual representation required", "need to visit the office trailer/site office", "safety equipment needed by the students", "need for pre-visits by the instructor", "size of industry-support team required by the instructor", and "students' academic level". The respondents provided other considerations including: "instructor's work and academic experience", "the current status of project in correlation to students learning curriculum", "type of jobsite (what is being constructed)", "ease of attendance versus the number of valuable interactions", "opportunity to share information about the company", "paperwork requirements" and "faculty culture".

4.2 Comparison of practitioners' considerations in workforce development collaboration based on demographic differences

The participants' responses to the extent to which the considerations are important were compared across demographic differences (e.g. gender, cumulative years of experience and ethnicity), to uncover variations in their responses.

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	Practitioners' considerations	Mean score	S.D.	MNI	In-group ranking	Overall ranking
Table 4. Analysis of practitioners' considerations when collaborating with academia for future workforce development	<i>Institution-related</i>					
	Location/proximity of the institution	3.60	1.063	0.98*	1	2
	Type of institution	2.20	1.297	0.30	2	16
	<i>Instructor-related</i>					
	Physical disabilities	1.64	1.107	0.02	1	20
	Ethnicity	1.61	1.141	0.01	2	21
	Gender	1.60	1.125	0.00	3	22
	<i>Students-related</i>					
	Students' department or program of study	3.37	1.305	0.87*	1	7
	Safety equipment needed by the students	3.03	1.540	0.70*	2	11
	Students' academic level	2.64	1.242	0.51*	3	14
	Number of students or class size	2.49	1.249	0.43	4	15
	Physical disabilities of students	1.99	1.247	0.19	5	17
	Ethnic diversity of students	1.93	1.313	0.16	6	18
	Gender proportion of students	1.67	1.140	0.04	7	19
	<i>Specific course-support related</i>					
	When the course-support is needed	3.63	0.990	1.00*	1	1
	Learning objective/expected student outcomes	3.59	1.049	0.98*	2	3
	Frequency of the course-support	3.58	1.076	0.97*	3	4
	Topic requiring course-support	3.55	1.089	0.96*	4	5
	Duration of the course-support	3.49	1.060	0.93*	5	6
	Type of course-support required	3.29	1.195	0.83*	6	8
	Specific demonstrations/visual representation required	3.26	1.117	0.82*	7	9
	Need to visit the office trailer/site office	3.03	1.206	0.70*	8	10
	Need for pre-visits by the instructor	2.98	1.185	0.68*	9	12
	Size of industry-support team required by the instructor	2.98	1.197	0.68*	10	13
	Note(s): NB: "*" = MNI ≥ 0.5 , S.D.: Standard deviation					
	Source(s): Tables are authors' own creation					

4.2.1 Gender. The responses of male and female practitioners were compared. The results showed significant differences (p -value < 0.05) regarding eleven (11) considerations, representing 50% of the total items. These considerations are type of institution, gender, ethnicity and physical disabilities of instructor, number of student/class size, student academic level, students' department/program of study, gender proportion of students, ethnic diversity of students, physical disabilities of students and frequency of course-support. Female practitioners ascribed a higher level of importance to these considerations than their male colleagues.

4.2.2 Cumulative years of experience. Comparison of the responses of the participants across years of experience revealed significant differences (p -value < 0.05) in nine (9) considerations. The considerations include gender, ethnicity and physical disabilities of instructors, students' academic level, gender proportion of students, the ethnic diversity of students, specific demonstrations/visual representation required, need to visit the office trailer/site office and size of industry-support team required by the instructor. The study showed that practitioners with 11–15 years of experience ascribed higher importance to the size of the industry-support team required by the instructor. Whereas practitioners with 1–5 years of experience attached higher importance to the gender and ethnicity of instructors, students'

academic level, gender proportion of students and ethnic diversity of students. While those with 6–10 years of experience attached greater importance to the physical disabilities of instructors, specific demonstrations/visual representation required, need to visit the office trailer/site office. For gender, ethnicity, physical disabilities of instructor and specific demonstrations/visual representation required, significant differences were found between the responses of practitioners with 1–5 years of experience and those with above 15 years of experience as well as between those with 6–10 years of experience and those with above 15 years of experience. For students' academic level, gender proportion of students and ethnic diversity of students, practitioners with 1–5 years of experience and those with above 15 years of experience differ significantly in their responses. For the need to visit the office trailer/site office, significant differences were found between the responses of practitioners with 6–10 years of experience and those with above 15 years of experience.

4.2.3 Ethnicity. Responses of the participants were compared across the ethnic groups (i.e. Asians, Black/African American, Hispanic/Latinx and White/Caucasian). Other ethnic groups had negligible numbers. Significant differences (p -value < 0.05) were found for six (6) considerations when the responses of practitioners were compared. These include when the course-support is needed, topic requiring course-support, learning objectives/expected student outcomes, specific demonstration/visual representation required, need to visit office trailer/site office and size of industry support team required by instructor. Black/African American practitioners attached greater importance to all these considerations than other ethnic groups. White/Caucasian practitioners and Black/African American practitioners differ significantly in their responses regarding all the six considerations. Black/African American practitioners and Hispanic/Latinx practitioners differ significantly in their responses to when the course-support is needed and specific demonstration/visual representation required. Asian practitioners and White/Caucasian practitioners only differ significantly in their responses to the need to visit the office trailer/site office which Asian practitioners attach greater importance to.

4.3 Focus group

The participants were visually presented with the results from the survey and corresponding open-ended questions were asked for each section of the results. The findings are presented in this section in a similar order.

4.3.1 Course-support needs of instructors that practitioners are willing to meet. The participants agreed on the ranking of the course-support needs of instructors that practitioners are willing to meet (Figure 2). The participants noted that time requirement is the major parameter that separates the low-ranking ones from the high-ranking ones. In addition, the top-rank course supports were considered an effective way to give back, mentor students and provide visual learning experience: “... those three seem to be the most logical, for how we can help share back to the students who are coming to fill our roles as we move out of the workforce ...”. “... companies like to conduct site visit, because it provides good visual learning experience to ... students ... classroom teaching can be productive mentoring too. But I think the bottom factors become more time intensive, which makes companies shy away from them.” In addition to the benefits for students, the participants alluded to the mutually beneficial nature of these collaborations by mentioning the benefits to construction organizations as well: “Site visits are good for showcasing the work that the company does so every practitioner would be interested in exposing the students to that. It's the same with guest lectures and classroom teaching.” However, practitioners who are looking towards a career in academia after their time in the industry might be more willing to provide the low-ranking course-support needs. “... I think people who are local or involved, or looking toward academics might be more likely to do seminars, workshops, or lab sessions”. The participants

considered their previous experiences in providing course-support to be encouraging and rewarding: "... *the professors were very easy to work with ... and I really felt like the students got a lot out of it, and I think we did, too ... it was a win-win for both groups*". One-to-one mentorship opportunities for students as well as events to better expose students to diverse opportunities and new trends in the construction industry were provided as additional course-support that practitioners would be willing to provide.

4.3.2 Institution-related considerations. The participants agreed with the ranking of the items (Table 4): "*These 2 are the main ones for us*". However, the MS of location/proximity was expected to be higher because of its great impact on practitioners' consideration when deciding on meeting instructors' course-support needs: "*I would have thought location and proximity would have a far greater impact*". Although the opportunity afforded by the Internet for virtual participation was acknowledged, great importance was still attached to in-person learning. The participants further reinforced this, for example: "... *everybody covered the location and proximity because you have the capability and the time to help out in the institutions that are local to you*". The importance of dealing with the local community where companies work and operate was also emphasized: "*location is always a key thing, because you're trying to deal with the local community that you're working in ...*". Practitioners considered the type of institution to be important when deciding on meeting instructors' course-support needs depending on their plan to recruit from the institution as well as previous interaction with the institution "... *where we're recruiting from ... also where we have alumni from influences our decisions both for type of institution and the location*". Additional institution-related considerations such as whether the institution is their alma mater, plan to recruit from the institution as well as reputation of the institution in producing high quality graduates were provided: "... *what type of institution makes sense, if it's your Alma mater if you have some prior connections with it ...*", "... *if you want to hire from there ...*", "*Also, the reputation of the institution could be something that could be included*".

4.3.3 Instructor-related considerations. The participants agreed with the low-ranking of all instructor-related considerations (Table 4) because these do not influence their decision in meeting instructors' course-support needs. This is attributed to practitioners' commitment to the ongoing effort to increase the participation of under-represented groups in the construction industry: "... *because ... one of the things we're trying to do nowadays is increase our under-represented groups*". The physical disabilities of instructors was only considered relevant in the case of site visit due to challenges associated with accessing job sites: "... *when you start thinking about the construction sites and the access*" issues, physical disabilities is a consideration'. Instructors' industry experience was provided as an additional consideration.

4.3.4 Student-related considerations. The participants agreed with the overall ranking of the survey results (Table 4). The participants noted that low-ranking items: ethnic diversity and gender proportion of the students, are not major considerations when deciding on meeting instructors' course-support needs: "*the other two I don't find relevant to my decision making whether or not I'm going to support the University*". This is in support of the current drive to promote diversity in the construction industry: "... *we want the groups of people that are coming to the site to be as diverse or inclusive as possible ...*". The high-ranking considerations were considered very important because they reflect how practitioners can ensure the suitability of their contributions and offerings in their interaction with students in any given context: "... *I think what you can bring to the table ... would really depend on those three ... and I think those are high, because ... based on what topic you can talk about if it doesn't fit with the particular department or program of study, as well as the students' academic level, you would not be able to provide much value ...*". The relevance of class size, safety equipment needed by the students as well as physical disabilities of students are only

in the case of site visits: *“safety equipment wouldn’t have been at the top of my list . . . If you’re bringing them to a site, then it will definitely be important with the physical disabilities . . .”* Student academic level was also expected to be higher in the ranking because students in their final and penultimate semesters usually seem more interested in the industry: *“I think students’ academic level being probably in the last 2 years of their program, makes them a little bit more focused on wanting to think about a career . . . and a little bit more interested in the industry and seeing what’s going on.”* How familiar and comfortable practitioners are with the topic they are expected to speak on was provided as an additional student-related consideration.

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4.3.5 Specific course-support-related considerations. The participants considered all the considerations to be important and very impactful in their decision to provide course support to instructors (Table 4). This was corroborated with their agreement with the survey results which show only slight differences in the MS of the items: *“ . . . being that they’re all within . . . very small margin . . . everyone is saying those top items are all almost equally important to them”*. The primary emphasis on the underlying reason for the survey results was on the level of effort and time required. This is because practitioners still have to fulfill their obligations in their place of work in addition to providing course-support: *“ . . . the level of effort is the biggest factor for me . . . and the timing . . . because I’m . . . still involved in a very time critical industry, and need to be at work”*. The need for clear communication of expectations from instructors and students before practitioners’ engagement in course-support was highlighted by the participants: *“ . . . it’s always good to understand . . . what are the expectations from the academic institution and maybe even from the students”*. Other specific course-support-related considerations provided include, for example, in the case of site visits, project status and project type. Financial support required in the form of a sponsor for students’ bus trips to site could also impact practitioners’ considerations. In addition, the concern whether provision of course-support to instructors would be purely volunteering or there would be some form of financial compensation was identified to be important for some practitioners depending on where they are in their career.

5. Discussion

The study showed that a large percentage of construction organizations have policies/practices to support academia in workforce development efforts. In turn, most of the practitioners are more willing to support instructors as guest lecturers, facilitators of site visits and as mentors/judges/sponsors for capstone projects/term projects. The results of this study reinforce previous studies (Anderson and Mourgues, 2014; Lu and Jacobs, 2022) that have shown that individual practitioners as well as construction organizations are willing to collaborate with instructors for future workforce development. This is crucial because instructors need to secure the interest and willingness of practitioners to provide the required course-support prior to engagement (Lu and Jacobs, 2022). Furthermore, a considerable proportion (more than 40%) of the practitioners also indicated their willingness to facilitate workshops and seminars sessions for instructors to aid students’ preparedness for the industry. The frequency at which instructors request these course-supports as well as flexibility afforded through technologies (such as Zoom and Microsoft Teams) for virtual participation could have been responsible for the high-ranking of the course-supports. For example, since the outbreak of COVID-19 pandemic, virtual guest lectures and site visits are increasingly being used to expose students to the construction industry (Jacobs *et al.*, 2022; Lu and Jacobs, 2022). The formalized course-supports could serve as a basis for instructors to initiate collaborations with practitioners via networking platforms. These instructors’ course-support needs can be placed forefront in the design of the GUI of a web-based platform for connecting instructors and practitioners because practitioners have shown great interest in meeting them.

To meet instructors' course-support needs, practitioners would consider when the course-support is needed, location, learning objectives, frequency, topic, duration, students' department, type of course-support, need for visual representation, site requirement, safety equipment, pre-visits, size of industry team and student academic level as the critical considerations. However, the results of the focus group differ slightly from the results of the survey. For instance, the focus group results show that some low-ranking considerations (with MNI <0.5) such as the number of students in class or class size, physical disabilities of students and instructor would be important considerations in case of site visits due to the nature of construction jobsites. [Eiris Pereira and Gheisari \(2019\)](#) corroborated these considerations as major barriers to site visits. Furthermore, time requirement was identified as a major consideration influencing the course-support needs of instructors that practitioners are willing to provide. This finding agrees with [Jacobs *et al.* \(2022\)](#) who noted that meeting instructors' course-support needs is an additional commitment because practitioners still need to fulfill their obligations in their workplaces. In addition to time requirement, the focus group results further show that practitioners who are local to an institution and those who are willing to transit into academia after their time in the industry might be more willing to meet the low-ranking course-support needs of instructors. This agrees with [Lu and Jacobs \(2022\)](#) who noted that industry-academia workforce development collaborations could be opportunities for practitioners to prepare for transition into academia after their days in the industry.

Also, the results from the focus group show that although type of institution has a low-rank in the survey results, when practitioners have intentions to recruit, this might influence their decision on the type of institution they collaborate with to meet instructor's course-support needs. This is quite expected because [Chandrasekaran *et al.* \(2015\)](#) showed that recruitment purpose is one of the motives of industry when collaborating with academia. Other low-ranking considerations which were also validated in the focus group were primarily connected to gender and ethnicity of students and instructors. This implies the commitment of practitioners to promote diversity, equity and inclusion in the construction industry through better representation of different genders and people from traditionally minoritized groups. This is important because diversification of the workforce is one of the strategies to confront the current labor supply deficit in the industry ([Karakhan *et al.*, 2021](#)). The critical considerations identified as well as the insights provided by these findings would help to deduce and design the GUI inputs of web-networking platforms for connecting instructors and practitioners.

Further analysis of the survey data reveals no difference in how male and female practitioners intend to collaborate with instructors to provide course-supports. This could suggest that despite the low level of gender diversity in the construction industry, there is no gender difference in the ways practitioners are willing to meet instructors' course-support needs. In contrast, [Tartari and Salter \(2015\)](#) noted that lack of peers in the industry affects the way female instructors collaborate with practitioners. In the same vein, based on gender, significant differences were observed in eleven (11) considerations that practitioners would consider while deciding to meet instructors' course-support needs. It is noteworthy that female practitioners attached greater importance to these considerations than their male counterparts. Most of these considerations relate to diversity and inclusion such as gender, ethnicity and physical disabilities of instructors, gender proportion of students, ethnic diversity of students and physical disabilities of students. Low representation of female in the construction industry and in construction-related academic programs ([Tartari and Salter, 2015](#); [Karakhan *et al.*, 2021](#)) could have influenced the opinion of female practitioners. This shows differences in the considerations of male and female practitioners' when collaborating with instructors for workforce development. The results contribute to gender differences in the experience/perception of women in male-dominated industries who have been identified

to have less social capital than their male counterparts (Tartari and Salter, 2015). Therefore, these results could be leveraged to enhance practitioners' participation in construction education. Significant variations were also observed in the responses of the instructors based on their years of experience and ethnicity. This reinforces the "universalism" assumption (Beins, 2017; Hammer, 2011) which advocated for the need to examine demographic differences because the same phenomenon of interest may differ across different demographics. The variations could help adapt the GUI of web-based networking platforms to suit users' (i.e. instructors and practitioners) individual characteristics.

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Overall, practitioners' considerations when deciding on collaborating with instructors to meet their course-support needs as uncovered by this study provides a basis to deduce the design needs of practitioners as well as inputs for GUI of a web-based platform to connect both parties. This agrees with Hartson and Pyla (2012) who noted that end-users are not designers and they often do not know what they want or need, hence design needs and GUI inputs should be inferred by understanding their behavioral and attitudinal characteristics. The dynamism in the practitioners' considerations as well as the demographic differences reveal the need to ensure adaptive user-interfaces of web-platforms to suit users' preferences. This study helps to ensure that users' inputs are incorporated early into the design process to facilitate the development of a system that is useful, easy and pleasant to use (Gould and Lewis, 1985).

6. Conclusion, limitations and future research

Practitioners' participation in construction education is a way to address the mismatches between industry requirements and academia offerings. This participation can be improved via web-based networking or matching of practitioners with instructors who can meet their course-support needs. This study makes an effort to establish the GUI input requirements for facilitating these collaborations by assessing practitioners' considerations when deciding on meeting instructors' course-support needs. This study contributes to theories that advocate for practitioners' involvement in student professional development by uncovering the considerations that influence those collaborations from practitioners' perspective. The results of the study also contribute to individual differences theories by revealing the demographic similarities and variations in practitioners' considerations in workforce development collaborations with academia. The study shows that practitioners are willing to collaborate with instructors for student development, hence relevant stakeholders need to develop innovative means to achieve these collaborations. The considerations of practitioners identified in this study could be leveraged to guide the development of programs and initiatives that facilitate these collaborations, ensuring they are productive and mutually beneficial. The demographic differences in practitioners' considerations in workforce development collaborations with instructors could inform targeted approaches to engage different demographic groups more effectively. The findings are important for designers of web-networking platforms for instructors and practitioners in creating a system that meets users' needs and offer personalized experience rather than just the conventional one-sizes-fits-all. The study implies that ongoing efforts should be made to strengthen industry-academia collaborations. This requires regularly assessing and adapting collaboration strategies to meet the evolving needs of both parties.

This study has some limitations which future research could address. For example, other indirect ways (e.g. internships, summer jobs and co-ops) by which practitioners could complement instructors' classroom effort could be investigated. Subsequent studies could further investigate the underlying reasons for the demographic variations in practitioners' considerations. Also, organization-related considerations that could influence practitioners' willingness to meet instructors' course-support needs could be the subject of further research. In addition, a similar study is required to identify instructors' considerations while collaborating with practitioners for student development.

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