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Assessing Collaboration Skill Development in Active Learning Spaces Using an Alumni Survey: A Case Study

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To what extent do active learning spaces foster students' development of collaboration skills, a set of highly sought-after competencies in today's workforce? This case study highlights the novel use of a survey specifically designed for recent alumni to attempt to identify and quantify important attributes of these learning environments responsible for enhancing collaboration skill development. Results from the survey inform various campus stakeholders by providing valuable information for improvement across a range of physical, technological, and pedagogical attributes of these learning spaces.

Overview and Rationale

Soft skills, those non-technical competencies associated with one's personality, attitude and ability to effectively interact with others, are increasingly valued in the workforce (Steward et al., 2016). According to the National Association for Colleges and Employers (Job Outlook, 2018), today's employers highly rank the ability to work in teams (i.e., collaboration skills) as one of several essential soft skills that graduates need for successful employment. Higher education institutions have adopted evidence-based pedagogical approaches that foster collaboration and other soft skills such as leadership, problem solving ability, and effective oral communication. To facilitate these pedagogies, campus planners have reconceptualized learning spaces from traditional "row and column" classrooms to more innovative physical environments that enable collaboration through affordances such as flexible furniture and digital/analog technologies. But what is the evidence to support that these non-traditional physical spaces, often called active learning spaces, are effective in developing collaboration skills and increasing career-readiness in graduates? This case study addressed this critical question by assessing perceived development of collaboration skills with relation to the physical, pedagogical, and technological attributes of active learning spaces by formulating and implementing a recent-alumni survey and analyzing responses.

What prompted this study was that although current students are often targeted in these types of assessment surveys (e.g., Mui et al., 2019; Weber-Scott et al., 2013) or interviews (e.g., Rands and Gansemer-Topf, 2017), alumni have largely been overlooked due to many factors including the daunting nature of contacting them and the historically low response rates from this cohort (e.g., Cabrera et al., 2005). However, alumni feedback as former end-users of active learning spaces may build further evidence to support links between learning spaces and career ready, soft skills development, and identify areas for improvement.

Goals and Approach of Case Study

There is a growing interest in examining the relationship between active learning spaces and development of soft skills. The overall goals of this case study were to evaluate the gains, and identify any weaknesses, in collaboration skill development of students who experienced part of their undergraduate or graduate learning within our campus' active learning spaces (termed Nexus Learning Hubs) and to pinpoint the factors contributing to them. These data would be helpful in further assessing our current active learning spaces as well as guiding the planning and design of future spaces on our campus.

To meet our goals, the case study's approach was to design an alumni survey to assess perceived impact of use of our campus' active learning spaces in collaborative skills development. Although many such studies rely on reflections from current students/faculty during or shortly after their use of learning spaces (e.g., Mahat and Imms, 2021; Weber-Scott et al., 2013), the unique contribution of this case study is that it gathered perceived impact of learning spaces on development of collaborative skills from individuals having recently experienced collaborative experiences in their career settings beyond academia (that is, alumni).

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Why Focus on Alumni?

Artino et al. (2014), who developed a seven-step process for designing high-quality questionnaires, state that surveys are good for gathering data about abstract ideas or concepts that are otherwise difficult to quantify, such as opinions, attitudes, behaviors and beliefs. For this case study, an alumni-specific survey was created and employed to quantify and qualify important attributes of active learning spaces that may foster collaboration skills. One may ask "why alumni?". Our campus has spent much time and effort using assessment tools such as ethnographic observations, pre- and post-surveys, and students and instructors' reflective journals to evaluate potential gains in outcomes of our current students using active learning spaces compared to more traditional learning spaces. One day the adage "you don't know what you don't know" made us realize that impacts of learning may take time to sink in for students, perhaps beyond their life as a student. Faculty members often hear alumni relaying their undergraduate *ah-ha* moments to them years after graduation. Time for reflection and appreciation of their learning experiences at college, prompted by working in the "real-world", may instigate deeper reflections and sometimes epiphanies. In this case study, we wanted to capture those more seasoned and well-reflected comments with regard to their experiences in active learning spaces. Simply put, if our institution's real-world approaches to teaching and learning were to be fully appreciated, our students would need to fully appreciate the real world first.

Defining the Soft Skill of Collaboration

Hard skills, as opposed to soft skills, may be more easily measured in current students through tests, projects, and other summative assessment tools. Because our university, like many others, values development of soft skills to increase career-readiness, we wanted to assess, through surveying alumni, how the soft skill of collaboration was fostered in learning spaces that were specifically designed for collaborative teaching and learning. To date, we found no published alumni survey that relates soft skill development to attributes of learning spaces. Thus, this case study began with constructing a survey that would attempt to address the attributes of learning spaces important to development of collaboration skills.

To prompt survey respondents to fully appreciate what we meant by collaboration skills, we first defined the term "collaboration" through five abilities that we felt encapsulated the meaning of collaboration in our learning spaces (Table 1) and ultimately included them on each page of the electronic survey distributed to alumni. By doing this, we hoped to homogenize respondents' interpretations of the term collaboration, rather than leaving it for them to define.

Table 1. Collaboration within our learning spaces was defined for alumni survey responders to include five abilities.
Communicate effectively, respectfully and productively with peers and instructor
Manage conflict and build consensus as a team
Listen with empathy to understand and value the views of all
Recognize that collaboration leads to better outcomes
Think differently through sharing of knowledge and approaches

Screening Alumni for the Survey

In order to assess the impact of learning spaces on development of collaboration skills, we sought three necessary criteria in alumni respondents. The first being that it was essential that respondents had some experience in the 'real-world' (i.e., they were employed shortly after graduation) in order to more accurately reflect upon their acquisition of career-relevant collaboration skills within our active learning spaces as a student. Secondly, alumni that recalled having courses in our campus' active learning spaces, as well as our more traditional spaces were needed to differentiate those attributes which were responsible for fostering collaboration skills. Prompted by visuals of our small set of active learning spaces, alumni were asked to recall how many courses they had in these spaces; those recalling never to have had classes in those spaces were not allowed to continue with the survey. Finally, only those who graduated just two to three years ago were targeted through e-mail requests to take the survey with the assumption that alumni recalling recent experiences of some duration will have more accurate reflections.

Defining Active Learning Spaces that Optimize Collaboration

At this point, some readers may be wondering what spaces that foster collaboration skills actually look like. While very effective, collaborative spaces such as studios, laboratories, and maker spaces, were not included in this case study. Rather, classrooms that had been overhauled from their traditional 'row and column' configurations to active learning spaces, or were intentionally designed and implemented to foster active and collaborative learning, are operationally defined as active learning spaces for this case study.

Figure 1. Examples of Thomas Jefferson University's (East Falls campus) Active Learning Spaces (termed Nexus Learning Hubs).

Although our university has prototyped different versions of these environments (Figure 1), the common features of all these learning spaces remain constant. These are:

- comfortable and flexible (movable) furnishings that afford multiple configurations to optimize student-student and student-instructor interactions;
- spaces that maximize working space per student and capitalize on sufficient space between collaborative groups;
- an abundance of white-boarded surfaces allowing for analog creation and presentation of content and ideas; and
- mindful implementation of digital technologies that allow co-creation and sharing of ideas and/or content.

On our campus these spaces, although relatively few in number compared to more traditional classrooms, are well-known (and designated as "Nexus Learning Hubs") and highly sought-after by faculty who value learner-centered teaching and learning pedagogies.

Designing and Implementing the Survey

As no known assessment tool exists to survey alumni with respect to learning space attributes and collaboration skill development, our challenge in this case study was to first design one. A web-based survey composed of a mix of open-ended and fixed response (i.e., multiple choice) questions was created. After receiving institutional review board (IRB) approval, we subsequently deployed it in the spring semester of 2019. The survey was partitioned into 6 sections with questions targeting specifics in each (See Appendix for Table 2). As predicted by those who have implemented alumni surveys previously on our campus, the response rate was relatively low (10%; n=49), despite the promise of a chance to win one of several gift cards. Regardless, the responses were valuable in their own right through capturing shared opinions and insights.

Highlights of Survey Responses

Two survey questions (IIIQ1 and VQ5), though worded slightly differently, asked alumni to indicate the extent to which their experiences with Jefferson' Nexus Learning Hubs developed their collaboration skills. The responses to these two questions were consistent and reaffirmed that approximately 85% of alumni respondents perceived that their experiences as students in active learning spaces developed, to varying degrees, collaboration skills.

But what was fostering those perceived developments in collaboration skills? Active learning spaces, such as our Nexus Learning Hubs, were mindfully designed to coalesce space, active/collaborative pedagogies, and technology to ideally result in a potential sweet spot aimed to optimize teaching and learning experiences that embrace collaboration amongst students and instructors. To quantify the relative importance of these three potential forcing functions in the students' experience, two questions (IIIQ2 and IIIQ3), sought alumni perceptions of what fostered development of their collaboration skills during their experiences with the active learning environments. The first question asked alumni what instructors in active learning spaces did to develop students' collaboration skills.

Responses identified that instructors mostly used group activities and projects, team-based learning approaches, and collaborative group discussions to develop collaboration skills. For example, one respondent wrote "We worked more in teams and collaboratively as opposed to as individuals completing our own work". Other responses highlighted the instructor's use of space's physical attributes, such as the movable chairs, table configurations in groups of four, and the use of personal and large whiteboards. There was a noticeable lack of comments about the use of digital technology by instructors which we have consistently observed in past assessments.

To gain insight into the non-instructor attributes of the spaces that allowed collaboration skills to be developed, alumni were asked what in particular (with examples), apart from their instructor, allowed collaboration skills to be developed in Nexus Learning Hubs differently from how they were developed in traditional 'row and column' classrooms (IIIQ3). Responses about physical objects were rich in detail, similar to those of students polled through past surveys. The lower density of furniture, furniture configuration and orientation, and ability to connect with fellow students through those configurations rose high on the list of space attributes. For example, one alumni respondent wrote:

> "It's easier to get to know and work with colleagues when you're facing them and have the ability to communicate/ work with them face-to-face. We could easily pass our notes or drawings back and forth as opposed to have to slide them down them down the row."

Another response echoed the recognition of a greater ability to connect by responding:

> "Feeling of connection with the other students in your group of tables and in turn, feeling more comfortable to talk and be more open to discuss and learn."

Alumni consistently pointed to layout or configuration of furniture in non-traditional formats as a positive attribute allowing greater collaboration. Similarly, Beyers et al. (2014) found that particular configurations of furniture in their active learning spaces had a measurable effect on how students perceived their learning experiences and their engagement levels within these spaces.

To counter the previous question referring to space attributes other than the instructor that benefited collaboration skill development, alumni were asked what in particular (provide examples) hindered the development of collaboration skills in Nexus Learning Hubs as opposed to traditional 'row and column' classrooms? (IIIQ4) One fifth of respondents listed 'none'. A relatively large number of responses (second after no hindrances) listed technology problems such as digital technology not working all the time, improper placement of monitors, or lack of other digital technologies such as personal monitors (despite the fact that we have a requirement on our campus that every student have a laptop). The third most prevalent comments focused on physical space attributes (e.g., furniture configuration) and the potential for distraction. One alumnus wrote:

> "You're facing your colleagues so it's easier to avoid the professor's attention since you're not facing them directly."

Interestingly, another respondent mentioned the potential distracting quality of the decentralized nature of the furniture configuration, but they acknowledged the perceived benefit by responding:

> "I think at times this set up may have fostered a little bit of distraction amongst the class, such as if friends were sitting next to each other they would get off of the topic of the class, but overall is was the perfect set up for the goals we were trying to accomplish from the class."

In addition to furniture configuration, some responses surfaced several other potentially distracting qualities of these spaces. As our campus' active learning spaces embrace the notion that these spaces should be visible from the exterior, to some degree, some alumni found that this was distracting. As well, colors of furniture and accent walls were mentioned as being distracting. These comments are helpful to keep in mind when designing these spaces. In a previous publication (Ashley et al., 2020), we have summarized the importance of recognizing students' neurodiversity, or sensory processing differences, when designing active learning spaces. A well-intentioned colorful accent wall or flooring choice, for example, may represent a challenge for students who are over-responsive to sensory information within that learning space, ultimately diminishing the cognitive resources they need to optimize learning.

While open ended questions provide rich details that can feed back into the assessment and refinement of these spaces, more quantitative data addressing the relative importance of space, pedagogy, and technology were garnered through ranking questions. A pre-survey administered to alumni and current students surfaced seven attributes that were reported to be important in developing collaboration skills (Table 3). These were binned into three

broad categories: pedagogical, physical space, and technological attributes. The seven attributes were incorporated on the alumni survey where respondents were asked to sequentially rank them in an attempt to quantify their perceived relative importance through the ranking the 1st, 2nd and 3rd most important attributes of Nexus Learning Hubs in the development of collaboration skills (IVQ1-3). Attributes that were physical space related dominated the importance in perceived development of collaboration skills, while pedagogical methods, and the instructors themselves, surfaced as the second most important attribute. Technology, largely digital (interactive whiteboards, computers, monitors) consistently ranked as third most important. Although the sample size is low, this points to the perception that space and its physical affordances were most important in developing collaboration skills.

To further engage the reflective process on how learning spaces may have potentially developed collaboration skills, alumni were asked to describe their current workspace environment with respect to its ability to foster collaboration (VQ1). Workspaces and their descriptions varied considerably though around 40% of the responses pointed to a lack of collaboration opportunities because of cubicles, isolated desks or closed offices. The remaining responses described varied spaces like retail, open offices, labs and clinics. Alumni were then asked, "What specific aspects of your workplace environments emulate (look like and function as) Nexus Learning Hubs?" While 21% responded that their current workspace did not look anything like the active learning spaces they experienced on our campus, the remaining mentioned the furnishings and configurations were conducive to collaboration and enhancing teamwork abilities. Alumni were then asked how have their collaboration skills changed, or not, from their undergraduate/graduate experiences to their current workplace (VQ4). The responses varied considerably (selected responses in Table 4) but many exemplified a reflective process that was only afforded by having been a student in addition to having several years of career experience. This reiterates the importance of including alumni voices in assessment methods to more fully capture all end users of these learning spaces.

The final question asked alumni to suggest how to improve development of collaboration skills within Nexus Learning Hubs (VIQ1). Responses that focused on pedagogies and the instructors utilizing them ranked highest in these open-ended comments (40%). Responses focused on pedagogical suggestions such as "I think the space is fine but it's what the professors do to utilize the space is what's important", "find more ways to collaborate that aren't the traditional group projects or class discussions", "find more creative ways to keep people engaged", and "I would suggest creating projects or more assignments that involve interaction between the entire class instead of just groups within the class." These comments surfaced the need for more pedagogical faculty development and/or other faculty support structures for those teaching in these spaces. A campus' faculty affairs and/or center for teaching and learning could enhance training for faculty.

Based on this survey's comments, and our past assessments revealing the need for enhanced pedagogical development for faculty members, we have created more and varied opportunities such as:

- developing faculty learning communities (e.g., Cox, 2004; Ashley et al., 2020),
- piloting a mentoring model that assigns a seasoned "space and pedagogy" faculty mentor with those faculty new to teaching in these spaces, and
- creating a suite of campus-customized 'how to' videos comprising successful strategies for intentional and effective teaching and learning in these spaces.

Table 3. Summary of pedagogical, space, and technology attributes that pre-survey respondents listed as a factor in the development of collaboration skills.

Pedagogical Attributes	Physical Space Attributes	Technology (Digital and Analog) Attributes
Instructor's teaching and facilitating style	Orientation of furniture (being able to face other people and engage in discussion)	Digital technology (computers, wall-mounted monitors, projectors)
The assignments / group projects	The space between furniture allowed for easy movement throughout the room	Whiteboards and white-boarded surfaces
	Room aesthetics and comfort level (color/type of furniture, accent walls, flooring choices, etc.)	

Table 4. Selected alumni responses to the open question "How have your collaboration skills changed, or not, from your undergraduate/graduate experiences to your current workplace? Explain."
"I think I understand the value of what should be collaborative vs. what should be individual much better now that I am working full time. In college we had to collaborate on everything, but in the real world there are certain things that are better done alone."
"I'm more comfortable with working with and sharing ideas with my colleagues in a shared space now and am not uncomfortable when sitting face to face in an office meeting."
"They have decreased. In the real world we are so focused on ourselves and our own ideas. I feel like the college experience allowed us to express a more connective experience that seems to lack after graduating."
"I had much better collaboration in undergrad than I do in my current position. Partially because of the environment and partially because of my boss's lack of willingness to listen to my ideas."
"Collaboration skills were improved from education, but had nothing to do with the nexus rooms. I learned how to work in a group from my major's curriculum and studio culture."

Though these faculty development strategies have worked for our campus, other approaches from other institutions exist. For example, the Mosaic program at Indiana University uses four guiding principles to structure faculty development experiences to a cohort of Mosaic Fellows (Birdwell and Uttamchandani, 2019). Other academic institutions have created more formalized faculty development structures, such as, requiring faculty to be involved in training/coaching sessions highlighting active pedagogies and space utilization prior to assigning them an active learning spaces and/or requiring faculty to submit pedagogical proposals to vie for the scheduling of their classes in these spaces. A "one size fits all" approach to faculty development and support was not ideal for us; a model consisting of various options proved to be more valuable.

Suggestions on improvements with technology followed pedagogy in the "perceived improvements needed" open ended question (VIQ1), with 18% of respondents focusing their comments on technology related issues. Again, some comments such as "fix the tech" and "the monitors need to always operate, sometimes they didn't" focused on digital technology not always working, indicating more reliable digital technologies are needed and/or a need for technology assistance for the instructor/students right when it is needed (i.e., during class time). Other comments centered on the accessibility of technology. One respondent wrote "I would suggest having more ease of use for the technological aspects" while another suggested "larger smart boards for presentation/more technology in the room." Over the past several years of using various assessment tools (e.g., ethnographic observations, student and instructor surveys of use, instructors' journals, etc.), the abundance of analog technologies, specifically white-boarded surfaces, ranked much higher in importance than digital technologies such as monitors, computers, and interactive whiteboards.

Often "less is more" with regard to digital technologies for some of these spaces in the minds of students. For our institution, this insight has been instrumental to various campus stakeholders such as, the office of information technology and our campus planners. This has allowed us to convert more traditional learning spaces into active learning spaces because of the cost reduction in not needing to use extensive digital technologies in every room. As we continue to prototype what our idea of an active learning space entails, for many of our future active learning spaces, a simple projection system with a good audio system suffices compared to a suite of digital technologies such as interactive white boards and multiple monitors.

The third most prevalent type of improvement suggested by respondents (14%) (VIQ1) centered on physical attributes of the space, such as furniture, lighting, room temperature, and general aesthetics. Recall that in the ranking questions, space was considered the major factor in development of collaboration skills. The fact that there were the fewest comments about space as a hindrance substantiates the earlier high ranking of physical space attributes as the most effective suite of attributes to foster collaborative skill development.

Take Home Messages

This case study's survey was helpful in building further evidence that our campus' active learning spaces do indeed foster collaboration skills as perceived from alumni. Additionally, the survey results provided insight into identifying a number of important factors to further consider when both designing and using these spaces. According to alumni respondents from our institution:

- the majority of alumni who responded (<84%) perceived (to varying degrees) that our campus' active learning spaces enhanced the development of their collaboration skills as students;
- physical space attributes (e.g., furniture, furniture configuration/arrangement, aesthetics) ranked highest

for fostering collaboration skills (over pedagogical and technological attributes);
- additional faculty pedagogical professional development and/or other faculty supports should be considered to further develop mindful and effective collaborative pedagogies within these spaces; and
- analog technologies (namely the abundance of white-boarded surfaces) were valued by respondents while digital technologies (e.g., computers, wall-mounted monitors, projectors) often resulted in frustration, pointing to the need for additional institutional support strategies to offset these struggles.

Case Study Limitations

While the use of an alumni survey proved to be insightful and will drive further improvements to our active learning spaces, there are obvious limitations to these uses. One limitation is that responses are self-reported perceptions of one's acquisition of skills and may not represent actual skill acquisition. Steward et al. (2016) reported that the majority of college graduates are confident in their soft skills competencies, the same set of competencies that employers feel graduates fall short of possessing. One way to build more power to this survey may be to concurrently survey alumni's employers regarding the collaboration skills of their employees.

Another confounding issue when using alumni surveys may be the "halo effect" (e.g., Pike, 1993) where alumni's responses may be an artifact in which the assessment of a few items "halo's" the entire evaluation. For example, alumni who had a very favorable experience as an undergraduate student, may give more positive comments about their institution on any survey related to their experiences at their alma mater.

There is likely difficulty in separating out acquired competencies such as collaboration skill development between experiences in active learning spaces versus other learning experiences in their undergraduate time at the institution (Pascarella, 2001). For example, at our institution, we have a general education curriculum that hones soft skill competencies, including collaboration, in courses within students' majors and in their general education core courses and co-curricular experiences. These courses often take place in more traditional learning spaces, or through off-campus experiences such as study away and internships. Quantifying the relative importance of these other experiences versus soft skill development in active learning spaces may be daunting, if not impossible.

Final Thoughts

While this case study focused on our campus' active learning spaces, the alumni survey developed from this study can be used, knowing the limitations described above, at other institutions as an assessment tool. Institutions may easily use this survey to explore or verify those active learning space attributes important in fostering collaboration, or, with minor adaptations and changes, other soft skills. However, assessment of learning spaces ought to be a multipronged approach. By coupling the results of this survey with other assessment tools such as current student pre- and post-occupancy surveys, real-time ethnographic observations of students and instructors, current students and alumni interviews, and faculty surveys and/or journals, a more complete evaluation of the role of these spaces and their affordances in enhancing collaborative skill development may evolve. Too often, campus planners and other stakeholders feel the need to "design, build, and move on" to the next learning space on their campuses. More prudent perhaps, based on analysis of this case and other studies, would be adopting a best practice "design, build, and assess" approach to amass as much predictive evidence as possible to support the notion that mindfully designed and implemented active learning spaces foster and enhance student learning outcomes.

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References

Artino Jr., A.R., La Rochelle, J.S., Dezee, K.J., & Gehlbach, H. (2014) Developing Questionnaires for Educational Research: AMEE Guide No. 87. *Medical Teacher*. 36(6). 463-474. https://doi.org/10.3109/0142159X.2014.889814

Ashley, J., Frostén, S., & Klemens, J. (2020) Challenging "If You Build It, They Will Come": Success of Active Learning is About More Than the Space. *Planning for Higher Education Journal*. 48(2). 25-35. https://www.scup.org/resource/challenging-if-you-build-it-they-will-come/

Ashley, J., Potvin, M.C., Chabot, M., Beach, C., Montemerlo, S., & Anez, M. (2020). Considering Students' Neurodiversity: The Next Imperative When Designing Active Learning Environments. *Learning by Design Magazine*. Spring 2020. 8-11. https://pubs.royle.com/publication/?m=31173&i=654595&p=10

Birdwell, T., & Uttamchandani, S. (2019). Learning to Teach in Space: Design Principles for Faculty Development in Active Learning Classrooms. *Journal of Learning Spaces*. 8(1). 19-27. http://libjournal.uncg.edu/jls/article/view/1768/1340

Byers, T., Imms, W., & Hartnell-Young. E. (2014). Making the Case for Space: The Effect of Learning Space on Teaching and Learning. *Curriculum and Teaching*. *29*(1). 5-19. https://doi.org/10.7459/ct/29.1.02

Cabrera, A. F., Weerts, D. J., & Zulick, B. J. (2005). Making an impact with alumni surveys. In D.J. Weerts & J. Vidal. (Eds.), *Enhancing alumni research: European and American perspectives* (pp. 5-17). New Directions for Institutional Research. No. 126, San Francisco: Jossey-Bass. https://doi.org/10.1002/ir.144

Job Outlook 2018, National Association of Colleges and Employers. https://www.naceweb.org/store/2017/job-outlook-2018/

Mahat, M., & Imms, W. (2021) The Space Design and Use Survey: Establishing a Reliable Measure of Educators' Perceptions of the Use of Learning Environments. *The Australian Educational Researcher*. 48. 145–164. https://doi.org/10.1007/s13384-020-00382-z

Mui, M.L.S, Carpio, G.A.C., & Ong, C.M. (2019). Evaluation of Engagement in Learning Within Active Learning Classrooms: Does Novelty Make a Difference? *Journal of Learning Spaces*. 8(2). 1-11. http://libjournal.uncg.edu/jls/article/view/1768/1340

Pascarella, E. (2001). Identifying Excellence in Undergraduate Education Are We Even Close? *Change (New Rochelle, N.Y.)*. *33*(3). 18–23. https://doi.org/10.1080/00091380109601796

Pike, G.R. (1993). The Relationship Between Perceived Learning and Satisfaction with College: An Alternative View. *Research in Higher Education* 34. 23-40. https://doi.org/10.1007/BF00991861

Rands, M.L., & Gansemer-Topf, A.M. (2017). The Room Itself Is Active: How Classroom Design Impacts Student Engagement. *Journal of Learning Spaces*. 6(1). 26-33. http://libjournal.uncg.edu/jls/article/view/1768/1340

Stewart, C., Wall, A., & Marciniec, S. (2016). Mixed Signals: Do College Graduates Have the Soft Skills That Employers Want? *Competition Forum; Indiana*. 14(2). 276-281.

Weber-Scott, L., Strickland, A., & Kapitula, L.R. (2013). Built Environments Impact Behaviors: Results of an Active Learning Post-Occupancy Evaluation. *Planning for Higher Education Journal*. 42(1). https://www.scup.org/resource/built-environments-impact-behaviors/

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Appendix

Table 2. Alumni survey of active learning spaces (Nexus Learning Hubs) in developing collaboration skills.

Section and Survey Questions	Response Options
Section I. Preliminary Question	
IQ1: Do you agree to participate in this study under these terms and conditions? (conditions stated)	Yes / No
Section II. Background Questions	
IIQ1: Did you attend PhilaU/Jefferson as an undergraduate or graduate student?	Undergraduate / Graduate
IIQ2: What was your major?	Open ended
IIQ3: Are you currently employed in a position related to the major you studied?	Yes / No
IIQ4: Approximately how many courses did you have in Nexus Learning Hubs during your undergraduate/graduate experience? (refer to the photos above)	1-2 / 3-5 / 6-8 / More than 8 / None
Section III. Nexus Learning Hubs + Collaboration Skills	
IIIQ1: To what degree do you agree with the statement "Nexus Learning Hubs developed my collaboration skills in ways not provided in traditional "row and column" classrooms"?	Fully agree / Somewhat agree / Neutral / Somewhat disagree
IIIQ2: In the courses you had in Nexus Learning Hubs, what approaches did your instructor(s) use to develop collaboration skills?	Fully Disagree Open ended
IIIQ3: Apart from your instructor, what in particular (provide examples) allowed collaboration skills to be developed in Nexus Learning Hubs differently from how they were developed in traditional 'row and column' classrooms?	Open ended
IIIQ4: Apart from your instructor, what in particular (provide examples) hindered development of collaboration skills in Nexus Learning Hubs as opposed to traditional "row and column" classrooms?	Open ended
Section IV. Ranking Attributes That Developed Collaboration Skills	
IVQ1: In your opinion, which was the most important attribute of Nexus Learning Hubs in developing your collaboration skills (pick only one)?	See Table 3 for Response Options (Attributes)
IVQ2: In your opinion, which was the second most important attribute of Nexus Learning Hubs in developing your collaboration skills (pick only	See Table 3 for Response Options (Attributes)

one)? IVQ3: In your opinion, which was the third most important attribute of Nexus Learning Hubs in developing your collaboration skills (pick only one)?	 See Table 3 for Response Options (Attributes)
Section V. Final Reflections VQ1: Describe your current workspace environment with respect to its ability to foster collaboration? VQ2: To what degree do Nexus Learning Hubs emulate (look like and function as) your current collaborative environments at your workplace. VQ3: What specific aspects of your workplace environments emulate (look like and function as) Nexus Learning Hubs? VQ4: How have your collaboration skills changed, or not, from your undergraduate/graduate experiences to your current workplace? Explain. VQ5: Do you think your experiences in Nexus Learning Hubs developed your collaboration skills?	 Open ended Not at all / A bit / To some degree / To a large degree / Entirely Open ended Open ended Not at all / A bit / To some degree / To a large degree / Entirely
VI. Closing Question VIQ1: If you could improve on the development of collaboration skills within Nexus Learning Hubs, what would you suggest doing? Please explain.	 Open ended
VII. Optional Drawing E-mail Entry To be eligible to win 1 of 4 $50 gift cards to be randomly drawn on April 22nd, please provide your email (the results of this study will remain confidential). If you are selected, we will email you that day to notify you.	 Optional email entry