Visioning Together: A Tool for Successful Co-Creation of Learning Environments

Michelle Chavey and Mackenzie Cox

Introduction

Across the United States, many public-school construction projects are brought to completion each year, impacting more than 56 million children and adults as the fields of architecture and education unite (School Planning and Management, 2019). Through this process, designers' and educators' backgrounds are brought together, exposing vast differences in experiences, understandings, and areas of expertise. My 19-year career as an architect has been spent at Hollis + Miller Architects, a firm specializing in learning environment design. During this time, I have experienced first-hand the challenges in communication and understanding as educators and designers engage in conversations about student learning experiences and potential opportunities for space to be used as a supportive tool for high-quality instruction. Layering my practitioner experience with my interests as an educational researcher, this study explores the application of a new belief-based visioning tool for educators and designers embarking on the process of co-creating new learning environments.

Through a case study framework focused on a middle school to be newly designed and built, this study pilots the new visioning tool, allowing for a better understanding of the obstacles and opportunities experienced by designers and educators when they come together to co-create. In doing so, this work can help to develop a more purposeful connection between the fields of education and architecture during the co-creation process and after the new school opens for students and staff. By creating a more purposeful process of connecting professionals within these different realms, this exploration can inform and shape future work between designers and educators in the creation of new learning environments. Additionally, while this work focuses on the tool's utility in the co-creation process, the study offers valuable insights that extend beyond this scenario. The visioning tool and lessons learned from its implementation can be applied broadly across the education field.

Background: Co-Creating Learning Environments and Relevant Literature

Literature on the interplay of architecture and the learning experience mostly exists in post-occupancy evaluations that focus on how learning outcomes are affected by the built environment (Marx et al., 1999; Scott-Webber et al., 2013). Studies such as these emphasize the effects of space rather than a proactive approach of leveraging educators' and designers' expertise to support impactful learning experiences from the outset. As such, this research lens typically does not extend into the influence of space on the successful implementation of new ideas and continued execution over time.

The lack of literature addressing this topic has been noted by several scholars including Moore and Lackney (1994), who lean on their positions as architectural professionals to make an early plea to consider how the design of learning environments can influence performance. They propose a holistic model of theoretical relationships which aims to interconnect independent

factors, mediational factors, and educational outcomes from empirical evidence and hypothesized relationships. Despite the authors' backgrounds in architecture, the model extends into elements beyond space. Their model provides a succinct representation of consideration for spatial elements, such as school organization, and social environment elements, such as instructional strategies, that can be considered to interact and impact learning outcomes. However, they also share that future research may investigate the complexity of behaviors and attitudes as a layer of consideration.

Likewise, Clark (2002) calls for future research to take a more holistic approach to the factors that impact achievement by saying, "The physical setting needs to be examined alongside the pedagogical, psychological, and social variables that act together as a whole to shape the context in which learning takes place" (2002, p.12). Through a participatory approach, Clark believes this will occur, advocating for a better understanding of student outlooks, developing resources to aid educators in utilizing the built environment as part of the learning experience, and a better understanding by architects of pedagogy and learning requirements. This view directly connects to the research void this study seeks to fill, as belief-based visioning can be leveraged through co-creation to build a common understanding of the newly created space and the learning experiences that space will support.

Woolner et al. (2018) are a select few who speak to the potential of physical change impacting structural changes and school culture, or the underlying pattern of values, beliefs, and ideals that have been jointly shaped over time (Deal & Peterson, 1990). This underlying belief system is developed through the hard work of purposeful communities of educators within the school environment (Deal & Petersen, 2016; Gislason, 2010; Goodwin et al., 2016). Purposeful communities (Goodwin et al., 2016) are made up of educators with high expectations for learning that work to leverage everyone's strengths to achieve a jointly created purpose. Educators in these purposeful communities bring diverse perspectives on learning experiences, yet as they connect with designers to create new learning environments, differences in backgrounds and expertise may present challenges in communication and with developing broader understandings during design.

As the fields of education and architecture are brought together to design learning spaces, purposeful effort is required from both sides to create connections and a genuine understanding of shared ideas and goals. Researchers have brought attention to the concept of participatory design, where those who will be impacted by the design of an object or experience are involved in creating and implementing ideas (Björgvinsson et al., 2012; Spinuzzi, 2005). Furthering this participatory concept, terms like co-creation and co-design also present a process of collective creativity where the diverse backgrounds of participants are leveraged for mutual benefit (Holmlid et al., 2015; Lee et al., 2018; Prahalad & Ramaswamy, 2004; Sanders & Stappers, 2008). A successful co-creation approach acknowledges the gap in common backgrounds and works to bring out the best ideas from each stakeholder involved in the creative process. The designer is no longer the sole expert. Instead, the individuals who will use the designed product or space are guided to share their ideas, experiences, and future vision. In the case of co-creating learning environments, educators and administrators are leveraged as experts who bring their knowledge of education to design discussions.

The design process for a new school project can take anywhere from six to 12 months to complete. Another 14 to 20 months can pass as construction occurs, resulting in a nearly two-year gap between the decisions made early in the process to the first time a teacher utilizes the new space. This gap in time can leave behind fuzzy memories about the specific decisions made, and more importantly, why they were made. By taking a participatory approach and exploring opportunities to establish visions for learning experiences before the design process begins, the proposed visioning tool serves two purposes. First, the visioning tool can influence physical space design as educators reference these concepts in discussions with designers about individual spaces. Additionally, it can be leveraged as part of continued conversations about learning across the building during the long gap between design and daily use. The visioning tool can become part of the school's story and act as an essential tool when the new facility opens, refamiliarizing those involved in the co-creation process with the decisions made and the opportunities that now can be leveraged in the physical space. Knowing that communities of educators can shift each year as individuals leave and join the organization, telling the story of the learning approach can also be a means to orient new team members.

Methodology

As both a practicing architect and a researcher, I had the unique opportunity to leverage my firm's ongoing project work as a component of this research, which was conducted as a qualitative participatory evaluative case study (Lapan, 2003) focused on a singular case: a select portion of a collaborative design process for the new Oakwood Middle School (Oakwood MS), located in the Shady Bend School District. Data were collected through interviews, focus group discussions, documentation, and observations of the design process during regularly scheduled co-creation meetings. In keeping with a qualitative approach and case study design, all four collection methods leveraged the researcher as a critical influencer of the instruments (Creswell, 2018). All interviews, focus group discussions, and design process observations were digitally recorded in audio and video format via Google Meet. The names of the school, the district, interviewees, and focus group participants have all been anonymized for publication.

The belief-based visioning tool was designed to facilitate conversation, and ultimately consensus, surrounding how education should be experienced by students and teachers. Implementation of the tool began with an initial work session in which teachers completed a visioning exercise. During this exercise, teachers reflected on their personal observations of engaging learning experiences and explored their own beliefs about critical elements of success. Then, they broke into small interdisciplinary groups to share and discuss before reconvening as a large group to synthesize their thoughts into Learning Belief Statements. These statements summarize the beliefs teachers share about the experience of learning from the perspectives of staff and students. The statements were then used as a guidepost in subsequent co-creation meetings and throughout the design process.

In addition to the implementation of the tool, this research included interviews and focus groups with teachers, as well as with Hollis + Miller project team members. Interviews were conducted using a formal semi-structured approach, incorporating descriptive, specific grand tour, and structural style questions (Bhattacharya, 2017; Spradley, 1979). The interviewees included the Oakwood MS principal, four Oakwood MS teachers, four Hollis + Miller design team members,

and five Shady Bend School District-level administrators. Throughout the interviews, space was provided for general discussion to evolve as I explored the participants' experiences. The two focus group discussions, one with educators (n=5) and one with designers (n=8), were approached with this same flexibility while utilizing a discussion guide to keep the conversation on track during the allotted time (Guest et al., 2013). With data collection occurring as part of a typical co-creation process at Hollis + Miller, it allowed for critical moments of observation of dialogue between educators and designers. Throughout this research, I was an active participant through my practitioner role, directly facilitating the belief-based visioning activity and participating in early co-creation meetings as the Learning Belief Statements were further explored. The analysis process began at the onset of data collection, and my professional experience in design served as a baseline of reference during the process of observation for sensemaking. Using NVivo software to both store and analyze the data, I took a multistep approach to analysis, beginning with in vivo coding, followed by mind mapping, and a second cycle of coding focused on the theories explored within the mind maps.

Findings

Educator Reflections on the Visioning Experience. Understanding the perceptions of educators who participated in the belief-based visioning work session was paramount to evaluating the utility of the tool. The teachers who continued through the full co-creation process provided their thoughts about the visioning experience through individual interviews.

Reflection and Connection. This research revealed that the opportunity to reflect and consider what learning should look and feel like is often not presented to teachers and building leaders. As we worked together to develop the work session and associated tools, Sam, the Oakwood MS principal, commented several times on this being a unique opportunity for him and his staff. He shared that for all the professional learning typically done in public school districts, reflection on the fundamental elements of the experiences they're working to create is never the focus. Each of the educators interviewed who participated in the experience shared similar sentiments. Lisa, a classroom teacher, complimented the inclusion of the visioning exercise, saying, "I don't think I practice [reflecting on my beliefs] enough, so the opportunity to do that, I thought was a positive experience." Echoing Lisa's view but expanding on the opportunity, Jane shared:

> It really kind of forced me to think about…what's important to me, what do we value in education. As a teacher, why am I here? Why do the students care about what I'm doing, and how can a facility or building kind of facilitate all of that?

It wasn't only the chance to look inward that teachers appreciated, but also the opportunity to connect with an interdisciplinary group of their peers. Lisa shared that it was important and interesting to hear what her colleagues had to say, explaining:

> I thought it opened up a lot of perspectives that I wouldn't have thought of. I had a music teacher in there and a librarian and a Read 180 teacher. So, it gave me different... I think the whole conversation was eye-opening because I don't think we would have thought of those things had we not been able to discuss them, like if we were just discussing in our content area.

Laura recognized the tendency to get comfortable with close peers who might come to the experience with similar thoughts already in place. She explained in her interview, "When we're together in our little bubble with the people that we're always with, we tend to be focused on just us, and not the building as a whole."

Pushing beyond their grade levels or areas of expertise also revealed similarities that might not have been assumed. Noah found the experience to be eye-opening, sharing:

> It was interesting, especially in those early discussions when we talked about things that we felt we needed, and we felt the students needed, that even though I'm [an elective teacher], we had a counselor and we had an English teacher, a science teacher, that we all had similar thoughts on that, and the result is the same for everybody. We all want the same kind of stuff.

Overall, the experience was a welcomed opportunity to look inward, and one that is not often presented to classroom teachers or building administrators. The teachers also recognized the value of involving the perspectives of their peers across the building as opposed to prioritizing only one viewpoint through the design process.

Shouldn't We be Talking About Architecture? A focus on learning, not architecture, was purposeful for the formation of the Learning Belief Statements. The visioning work session intentionally did not include any reference to facilities. There was only a brief explanation of why we were asking staff to participate and how their opinions might be leveraged for the continued development of the teaching and learning culture at Oakwood MS, including that it would inform decision-making during the future design steps. After the visioning session was complete, it was found that every teacher who continued to participate as part of the co-creation team initially struggled to see a connection between the discussion about learning and the co-creation process. Lisa captured her surprise in an interview, sharing:

> I'm having a hard time seeing the correlation... I get we need to know our beliefs of what we want learning to look like and how we want staff and students to feel in the environment, but when I was asked to be on the design team, I was like, 'Yes, alright!' because I had the creative process in mind, like picking out furniture, coloring, designing, traffic flow, all the aesthetics, essentially. And so, I had no idea that it would be so much reflection on what we thought about learning. It's been an interesting experience for me.

Lisa was not alone in her thoughts. Noah's interview revealed:

> I had a hard time trying to relate why we were doing that to meet our process, or our goal. I thought, 'Well, this is neat, this is good stuff to talk about, but how is this connecting to the actual building?'

After seeing how the Learning Belief Statements were used in the co-creation process, Noah's suggestion was to be more upfront with the staff during the visioning exercise, sharing exactly how their thoughts and opinions would be used.

In an effort to discourage teachers from only sharing commentary about the physical space, the introduction to the visioning exercise intentionally left out such an explicit connection between the Learning Belief Statements and their ability to shape space. In his interview, Noah confirmed that this was a thoughtful precaution, saying, "So, it's actually exactly what you were worried about, because that's what my perception is, 'They're here to talk about the building; this is what we need to do.' So, I would have been trying to make these things into what you need as opposed to just answering the questions and thinking about that externally." This suggests that in fact a degree of distance is valuable between a discussion about learning and its practical application to the built environment. However, some connection should be shared with teachers in the work session to allow them to better understand the relevance of their discussion to the design process.

Providing Adequate Time and Format. Following the initial work session and visioning activity, numerous participants expressed having felt rushed. Jane shared with me, "The only suggestion I would have maybe would just be more time, maybe more time in advance to review the material, or to sit and process those questions and those statements to really give it some thought." Noah was straightforward with his response when asked how he would have felt about completing the individual reflection worksheet as a packet ahead of time, saying, "I would say that would create more time and a better experience." However, he contradicted himself when he also shared:

> Our teachers only have one planning time of 45 minutes, and the school I left to come here had two. So, it's pretty easy to put more on the plate and say, 'Hey, do this,' and in this building, it's hard to put more on when they really don't have a lot of time. They would be doing it on their own, or on that protected time, like early release professional development. I would have to weave that in, which means something's gotta give.

Across the teacher group generally, there was more support for the extra ask of time. Jane shared in her interview, "I love the idea of homework ahead of time. I think that'd be great." From Jane's perspective, three days was a comfortable amount of time to ensure the worksheet remained top-of-mind without feeling like a burden. Lisa also noted how this shifted approach would benefit the outcome of the exercise, saying, "That would have been beneficial, and maybe a truer reflection or a deeper reflection of what our thinking was." While members of the Oakwood MS staff agreed that it would be beneficial to provide additional time to complete the exercise before the work session, this may not be the case in every building. How teacher time is allocated can be a tense subject in many buildings, so this element should be customizable to the circumstance. This will also allow the principal to set the tone for the experience as one that is supportive of them and respectful of their time.

In addition to time constraints, the work session was impacted by the need to connect virtually, rather than meeting in person. In describing the related challenges, Lisa shared, "I feel it would have been more beneficial in-person and had a different type of activity, like sometimes you use the stickers and dots [to share]." Laura, who also led a small group during the work session, shared another level of frustration with trying to keep her peers engaged, saying, "[A fellow teacher] was probably working on something else at the time. We were virtual, so I don't know what else he was doing."

The educators enjoyed the belief-based visioning experience overall, especially the opportunity to personally reflect and to hear the voices of their peers with whom they don't often get to connect. The process and associated tools brought positive impact, but variables of time and connectivity were a hinderance. Providing the individual reflection packets ahead of time as homework would allow more time for small and large group dialogue and connection. The educators confirmed that, when possible, bringing everyone together in person would better support collaboration and important dialogue.

Designer Perspectives on the Visioning Tool. The implementation of the belief-based visioning tool shifted Hollis + Miller's design process, impacting each of the designers in a unique way. Their reflections captured both the struggle of introducing a new design tool and the awareness it provided to the co-creation experience overall. A better understanding of the designer perspectives will allow principals and educators to lead with empathy as they implement the tool in future work, whether it be related to design or within the education field.

Managing New Information Flows. The Hollis + Miller team was eager to take on the process changes accompanied by the new belief-based visioning tool, but it didn't come without challenges. With the focus of early design phases shifting away from individual spaces and the activities they would facilitate, an onslaught of information came instead from the dialogue driven by the Learning Belief Statements. The designers were not entirely prepared for this shift, and they struggled to sort out the high-quality information they would need in later design phases. From the perspective of her support role for the team, Rachel shared, "I actually feel like we've got more information before [we normally would], and the team doesn't know what to do with it." The resource roles watched the team struggle to realize that the information they were receiving was beyond the simple programming components to which they were accustomed. Rachel explained further:

> We have a lot of information, more than I thought we would, as I look back through all of the surveys and the comments that they've given us. And so, I think what's interesting is the team is struggling... Most teams struggle with how to connect the way that the owners give us the information to what we need to apply it to. And I'm seeing that both in the way that we did it, and also in the old way too actually. They're giving it to us, and people are like, 'No, just tell me the answer.' And it's like, 'Well, they told you the answer.'

Molly realized that as a project resource, it was within her responsibility to help the team make sense of the information they had when they became frustrated at points in the co-creation process, explaining:

> I think the team struggled to tie [the information] back at times and remember what they had. I think that was the key thing, when we think about what we're doing, how are we reminding and bringing it to the forefront and building upon it?

For the design team, this new approach included a different type of information coming to them early in the design process. Although it required notable adjustments to the way designers have historically processed input from co-creators, they saw value in this increased emphasis on dialogue and the way it contributed to design outcomes.

Dialogue's Value in Design. Designers appreciated that the visioning tool and its related dialogue was driven by curiosity, allowing them to hear the words of the educators themselves. Rachel shared the benefit of the new approach:

> What the tool has done is really not the tool, it's about what has it caused us to do. It's caused us to have a conversation and be able to pull people into a conversation easier than the other tools have.

From her position of working daily on the project as she connected with the client and shaped the design, Leah had similar thoughts:

> I think the fact that we approached it differently and it was with different people in the room… It wasn't high-level district people; it was educators and staff. I think that has helped us set, it's just given it a different course in that I feel like it's more useful, where [other tools] felt kind of awkward working through that with them. And at the end of the day, we got a lot of information out of them.

As a project lead, Olivia shared similar commentary in her interview, explaining:

> I think the support that the tool has given us with those Learning Belief Statements, it's like, 'No guys, everybody remember this is what we're doing,' and it was allowed to be this expectation of something bigger than just my daily, 'Oh, I go to this room and that's what my room's gonna look like.'

Molly felt the tool's success was because it was the educator's words from the start that made it easier to leverage throughout the process, as opposed to generic wording from a website. In her opinion, it is not just the influence on this project that has proven the tool to be beneficial to Hollis + Miller, but it is also the opportunity beyond this singular experience that is significant. She explained how the shift to dialogue and curiosity with this project has impacted how she supports other teams through her resource role. "Ever since Shady Bend, we've started to talk way more about experience and the learning experiences that we're creating. And I feel the teams are definitely getting better information in general, more impactful information for what they're looking for." The effectiveness of this tool for designers can be seen in this team's ability to connect with educators and the resource role's influence in supporting this dialogue-based approach to ripple out across the design firm.

Discussion and Recommendations for Practice

This research focused on evaluating a belief-based visioning tool for Oakwood MS teachers and developing an understanding of how the resulting Learning Belief Statements impacted the co-creation process to design a new middle school. Commentary in interviews and focus groups with teachers and designers emphasized the tool's merit and its positive reception among Oakwood educators, as well as several modifications that might be made to improve future versions. Considering these insights in conjunction reveals the primary components of a successful belief-based visioning tool:

1. *Time for personal reflection:* While there is significant value for teachers in the very act of reflecting on their practice and personal philosophy, they will reap this reward more fully when they are able to do so in their own time and at their own pace. By taking a similar approach to the visioning experience to what teachers do to "flip" the classroom, an introductory video describing the intent of the visioning effort, along with a physical worksheet packet could be accessed by teaching staff prior to the work session. Principals should look to the needs and culture of their staff to determine an appropriate way of providing time for this exercise.

   Introductory information should include a general description of how the teachers' reflections will contribute to the design process. A flipped work session approach will provide individuals with more time to reflect, record their thoughts, and keep these relevant topics top of mind in the days before the staff gather to collaborate. These teachers will then come to the small and large group portions of the work session ready to share and discuss with their peers.

2. *Interdisciplinary collaboration:* Another great asset to the visioning activity is the opportunity for teachers to collaborate beyond their usual grade level or subject matter groupings. If the personal reflection component is shifted to teachers' personal time, additional time should be allotted for the small group discussions, giving interdisciplinary teams of educators the chance to move beyond simply reporting their personal statements, and to the large group discussion, providing the opportunity for small groups to discuss their ideas through their own voices. When possible, this collaboration should occur in person rather than in a virtual format.

3. *Synthesized deliverable:* Following the individual reflection and group visioning activity, the information should be synthesized in a digestible way, through something like Hollis + Miller's Learning Belief Statements. These synthesized statements can then act as an important guidepost as co-creation continues, ensuring that designers and educators remain on the same page by offering shared language to describe the goals toward which they are working.

Further Impact. While this study examines a belief-based visioning tool as it relates to the co-creation design process, the lessons learned may be extended past this particular scenario. A version of this tool would be valuable to school communities undergoing change processes unrelated to the design of their physical space, or even as an exercise completed periodically to engage teachers and recalibrate the school community's shared vision. This value is most evident in the appreciation teachers held for the rare opportunity to reflect on their practice as well as the broad application of the Learning Belief Statements that Oakwood MS's principal undertook.

Teachers consistently shared their pleasant surprise at having the chance to think about their own beliefs about their teaching practice. Providing this opportunity more often could have a positive impact on employee morale as teachers feel that their thoughts are valued. In an age in which teacher retention is so challenging and important, this could be especially valuable as it reconnects teachers to their sense of purpose and fulfillment within the profession, potentially preventing burn-out (Loonstra et al., 2009).

At the school-wide level, the Learning Belief Statements can be utilized far beyond the design process. Sam, the principal of Oakwood MS, took it upon himself to extend the value of the belief-based visioning process by using the statements to guide discussions at the administrative level. A similar approach could be taken across a school community in the same way a district's mission statement often intends to, however this version is specific to a school and co-created by staff members who will be more likely to buy in to their own language and beliefs rather than that of the district. By establishing a cohesive understanding of educators' varied beliefs about learning, building and district leaders can then work together to help connect the dots between building-level learning beliefs and district-wide mission, vision, and values, encouraging educators to see their own voice in the district's mission, and to understand how they impact the bigger picture through their actions in the classroom every day. In this way, a purposeful community is formed that extends from the educators and principal to include district-level leadership.

The successful implementation of this new visioning tool is an encouraging step in an emergent field that combines education and architectural design. Building on existing work from scholars and practitioners across both fields, this belief-based visioning tool provides a new instrument for designers to facilitate successful co-creation with educators when designing new learning spaces. These new spaces, designed with educational visioning in mind, will hopefully be more effective in supporting student needs and educators' aspirations. In a forthcoming report, further research builds on the practice of post-occupancy evaluation to examine how educators make use of the space and the Learning Belief Statements after moving into the new Oakwood Middle School facility.

References

Bhattacharya, K. (2017). *Fundamentals of qualitative research: A practical guide*. Routledge. https://doi.org/10.4324/9781315231747

Björgvinsson, E., Ehn, P., Hillgren, P.-A. (2012). Design things and design thinking: Contemporary participatory design challenges. *Design Issues, 28*(3), 101-116. https://doi.org/10.1162/DESI_a_00165

Clark, H. (2002). *Building education: The role of the physical environment in enhancing teaching and research.* Institute of Education.

Creswell, J. W., & Poth. C. N. (2018). *Qualitative inquiry and research design: Choosing among five approaches* (4th ed.). Sage Publications.

Deal, T. E., & Petersen, K. D. (1990). *The principal's role in shaping school culture.* U.S. Department of Education.

Deal, T.E., & Petersen, K. D. (2016). *Shaping school culture* (3rd ed.) Jossey-Bass. http://dx.doi.org/10.1002/9781119210214

Gislason, N. (2010). Architectural design and the learning environment: A framework for school design research. *Learning Environments Research, 13*(2), 127. https://doi.org/10.1007/s10984-010-9071-x

Goodwin, B., Cameron, G., & Hein, H. (2016). *Balanced leadership for powerful learning: Tools for achieving success in your school.* McREL International.

Guest, G., Namey, E. E., & Mitchell, M. L. (2013). *Collecting qualitative data: A field manual for applied research.* SAGE Publications. https://doi.org/10.4135/9781506374680

Holmlid, S., Mattelmäki, T., Visserm F. S., & Vaajakallio, K. (2015). Co-creative practices in service innovation. In R. Agarwal, W. Selen, G. Roos, & R. Green (Eds.), *The handbook of service innovation* (pp. 545-574). Springer London. https://doi.org/10.1007/978-1-4471-6590-3_25

Lapan, S. D. (2003). Evaluation studies. In K. B. deMarrais & S. D. Lapan (Eds.), *Foundations for Research: Methods of inquiry in education and the social sciences* (pp. 235-248). Taylor & Francis. https://doi.org/10.4324/9781410609373

Lee, J.-J., Jaatinen, M., Salmi, A., Mattelmäki, T., Smeds, R., & Holopainen, M. (2018). Design choices framework for co-creation projects. *International Journal of Design, 12*(2), 15-31.

Loonstra, B., Brouwers, A., & Tomic, W. (2009). Feelings of existential fulfilment and burnout among secondary school teachers. *Teaching and teacher education, 25*(5), 752-757. https://doi.org/10.1016/j.tate.2009.01.002

Marx, A., Fuhrer, U., & Hartig, T. (1999). Effects of classroom seating arrangements on children's question-asking. *Learning Environments Research, 2*(3), 249-263. https://doi.org/10.1023/A:1009901922191

Moore, G. T., & Lackney, J. A. (1994). *Educational facilities for the twenty-first century: Research analysis and design patterns*. Center for Architecture and Urban Planning Research, University of Wisconsin – Milwaukee. http://digital.library.wisc.edu/1793/89948

Prahalad, C. K., & Ramaswamy, V. (2004). Co-creation experiences: The next practice in value creation. *Journal of Interactive Marketing, 18*(3), 5-14. https://doi.org/10.1002/dir.20015

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *CoDesign, 4*(1), 5-18. https://doi.org/10.1080/15710880701875068

School Planning and Management (2019). *2019 Facilities and construction brief.* https://spaces4learning.com/Research/2019/01/Facilities-Construction-Brief.aspx?tc=assetpg&tc=page0

Scott-Webber, L., Strickland, A., & Kapitula, L. R. (2013). Built environments impact behaviors: Results of an active learning post-occupancy evaluation. *Planning for Higher Education, 42*(1), 28-39.

Spinuzzi, C. (2005). The methodology of participatory design. *Technical Communication, 52*(2), 163.

Spradley, J. P. (1979). *The ethnographic interview.* Waveland Press, Inc. https://doi.org/10.4135/9781483381411.n168

Woolner, P., Thomas, U., & Tiplady, L. (2018). Structural change from physical foundations: The role of the environment in enacting school change. *Journal of Educational Change, 19*(2), 223-242. https://doi.org/10.1007/s10833-018-9317-4

Michelle Chavey (mchavey@hollisandmiller.com) is President of Hollis + Miller Architects and oversees firm-wide research efforts. Combining a background in design with a doctorate in educational leadership from Kansas State University, her work explores how new learning environments drive organizational change and support educational transformation.

Mackenzie Cox (mcox@hollisandmiller.com) is a researcher at Hollis + Miller Architects. Drawing from a background in social research, she leverages both qualitative and quantitative

methods to build a deeper understanding of organizational contexts and provide actionable insights to educators and designers alike.