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TEACHER EFFICACY AND INTENTIONALLY DESIGNED LEARNING SPACES

VLK|ARCHITECTS

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Dear Reader,

Our partnership with The University of Texas at Tyler continues to develop, providing insightful information to direct our practice of architecture. Teacher efficacy is interesting to me, as those who perceive themselves as difference makers have the ability to instill a strong sense of the same in their students. Beliefs that guide students to learn at deep levels, accept challenges, and think at the most critical levels make strong classroom teachers.

Because teachers' perceptions are so valuable in our work, we wanted to understand the reasons why they chose to teach at a STEAM-specialized campus. We wanted to know if our designed spaces made a difference in their teaching, and if their own behaviors differed from their previous behaviors in their comprehensive high school. Interestingly, the outcomes of this research centered around the behaviors and actions of students, based on teachers' experiences.

To provide balance, we chose to also include the campus leader's perceptions, which affirmed the opinions of the teachers. In many cases, his interview provided reasoning behind their actions. I found it fascinating!

Enjoy!

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Teacher Efficacy and Intentionally Designed Learning Spaces

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For students to experience and achieve deep learning, they must have the opportunity to understand and attach meaning to new content (Wilson Smith & Colby, 2007). Student experiences essential for deep learning require purposeful planning, and teachers who have the capacity to engage in conversation and connect with colleagues to design lessons that promote student agency (Wilson Smith & Colby, 2007). Teachers must possess the capacity, resources, and space to facilitate opportunities that result in deep learning. Teachers at a new Science Technology, Engineering, Arts, and Mathematics (STEAM) school in the suburbs of the south-central United States work in intentionally designed spaces. Through a mixed methods study, the STEAM center teachers' self-efficacy was surveyed; subsequently, through individual interviews, researchers explored the teachers' perceptions of changes in their efficacy upon moving to the center. In this manuscript, the authors report on the changes in the teachers' self-efficacy that were statistically significant, and the themes that emerged during the interviews.

Theoretical Perspective

Collective teacher efficacy has a significant positive impact on student achievement (Bandura, 1993; Tschannen-Moran & Barr, 2004). Tschannen-Moran & Barr (2004) define collective teacher efficacy as the impact teachers in a school have on students beyond the impact home life and communities have on the student learning. At the school where this study was

conducted, the administrator is committed to building collective capacity by facilitating teacher collaboration and cross-curricular integration. The administrator's efforts align with studies that have shown that schools where teachers work collaboratively provide a productive work environment, resulting in a positive impact on teachers' efficacy, and ultimately in teaching and learning (Tschannen-Moran & Barr, 2004).

As recognized throughout the literature, collective teacher efficacy is grounded on social cognitive theory. Social cognitive theory suggests that learning is driven by three interrelated factors – context, individual characteristics, and social context. (Schunk, 2020). Self-efficacy is a person's perceptions of his or her own ability to perform a task and solve a problem (Bandura, 1997). Moreover, social cognitive theory contends that teachers' perceptions of the organization where they work, and of themselves, influence their decisions. Hence, high levels of collective teacher efficacy result in highly effective schools where teachers have elevated expectations for students, and students reach high academic standards (Bandura, 1997). Likewise, teachers who facilitate learning opportunities where students are actively engaged and self-regulate their behavior promote student agency and increased students' sense of efficacy (Oliveras-Ortiz et al., 2020; Williams, 2017).

The literature also offers evidence that purposefully designed spaces contribute to increased student engagement (Oliveras-Ortiz et al., 2018, 2019, 2020, 2021; Thomas et al., 2019). The researchers acknowledge the importance teachers place on areas for collaboration for both themselves and students (Oliveras-Ortiz et al., 2018, 2019, 2021). Instructional materials, as part of educational design, were also found to be important aspects of the teaching and learning process when trying to engage learners at higher levels (Oliveras-Ortiz et al., 2018, 2019, 2021).

Literature Review

Students' feelings about their learning environments impact their willingness to authentically engage in the learning process (Oliveras-Ortiz et al., 2018, 2019, 2021; Thomas et al., 2019). However, active student engagement is dependent upon teachers' efficacy to design learning experience that promote a productive deep learning (Dart et al., 2000, Karagiannopoulou & Christodoulides, 2005; Nijhuis, et al., 2008; Yerdelen-Damar & Aydin, 2015) and a positive, supportive school culture that promotes risk-taking and student-centered learning (Hughes & Pickeral, 2013). Moreover, Zandvliet (2014) purports that space contributes to pedagogy and can influence student achievement.

Self-efficacy is one's ability to perform a task and solve a problem; furthermore, it is one's beliefs about one's capacity to perform a task and solve the problem (Bandura, 1997). Feelings of effectiveness are crucial for teachers to feel confident in their vocation, making daily decisions about how to best facilitate instruction. Furthermore, Collective Teacher Efficacy is defined as the impact teachers in a school have on students beyond the impact home life and communities have on the student learning (Tschannen-Moran & Barr, 2004). A teacher's efficacy is impacted by a variety of factors, including a supportive work environment often defined as school culture (Cohen et al, 2009).

A school's culture encompasses the norms, expectations, and overall environment that can facilitate or hinder collaboration, risk-taking, and high expectations (Hughes & Pickeral, 2013; Thapa, 2013). A positive, supporting school culture that promotes collaboration and risk-taking, has a positive impact on teachers' effectiveness and student learning (Hughes & Pickeral, 2013). A culture implies a community that is "not merely a variety of associative ties which holds persons together in diverse ways, but an organization of all elements by an integrated

principle" (Dewey, 1954, p. 38). Accessibility to adequate resources is a critical factor in the establishment of a positive school culture as it diminishes frustration and increases productivity (Lockheed, 1991).

Instructional materials are critical components of the teaching and learning process. The curriculum cannot be easily implemented without the acceptable instructional resources (Lockheed, 1991). Classroom design, and the materials both teachers and students can access, contribute to "teaching and learning efficiency" (Oliveras-Ortiz et al., 2018, p. 26). Teachers who have access to adequate instructional materials and spaces suited for teaching have higher levels of confidence, effectiveness, and productivity (Lockheed, 1991).

Methodology

Participants and Setting

The school where this study was conducted was purposefully selected as the research site for multiple reasons: (1) the building's curricular focused on STEAM content and the rigor intrinsically required in these courses; (2) the fact that teachers were not selected to move from the comprehensive high school to the STEAM school but rather the subject areas were chosen to be taught in the new school, which automatically resulted in the transfer of the teachers to the new building; (3) the architects' desire to explore the use of the spaces as designed; and (4) for the award-winning design of the building where the center is housed. The team's research agenda closely aligned to each of the criteria and provided the researchers with a unique opportunity to explore issues of teacher efficacy in newly designed learning spaces.

The participants of the study were purposefully selected given their employment at the newly designed school where the research team was interested in conducting the study, and the school administrator was willing to also be a part of the study. Twenty-five teachers and the

campus administrator at a new STEAM center in a large suburban district in the south-central United States were asked to participate in the study. After the 25 teachers (100% participation) completed the survey, they were asked to volunteer to be a part of the second phase of the study, a semi-structured interview. The interviews were conducted via Zoom, a video conferencing platform. Eight teachers were interviewed, three males and five females. The last phase of data collection was the administrator's interview. The administrator agreed and participated in a Zoom-conducted interview.

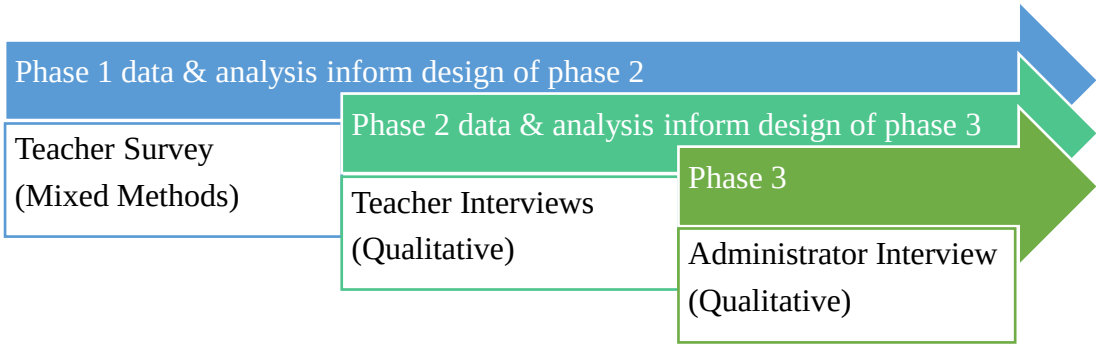
Design

Teaching in purposefully designed content specific spaces in the first full academic year in the new building was a unique experience bounded by time and the people in the space. The case was complicated by the COVID-19 global pandemic. In an effort to develop an understanding of the educators that work within these spaces, their efficacy, and their instructional decisions, a case study was conducted. The collection of data from multiple sources facilitated the in-depth analysis of the case (Creswell, 2014) and triangulation of the data. Triangulation was purposefully sought in an effort to determine convergence or divergence of the quantitative and qualitative data (Creswell, 2014) and to strengthen the study's reliability and validity (Merriam, 1988).

Given the research questions and the purpose of the study, the case study was conducted using an explanatory sequential mixed methods approach (Creswell, 2014) to facilitate the deep examination of the perceptions of self-efficacy in new learning spaces. An explanatory sequential mixed methods study begins with the quantitative data collection and analysis, followed by the qualitative data collection and analysis to facilitate the interpretation of the quantitative data, and identify convergence or divergence between the different sources of

information (Creswell, 2014). The instruments were developed as the research evolved, in alignment with one of the three models of mixed methods research (Creswell, 2014), in an effort to seek additional information for clarification of the first phase of the data analysis. The survey data, including quantitative data, and the first set of qualitative data were collected, analyzed, and subsequently used to guide the development of two qualitative instruments used in phases two and three of the study. Refer to Figure 1 for a visual representation of the design of the study.

Figure 1. Explanatory Sequential Mixed Methods Design



Quantitative Data

To conduct a reliable and valid study, the team sought and received written approval to use the Teacher's Sense of Efficacy Scale (Tschannen-Moran & Woolfolk Hoy, 2001), a well-respected, reliable, and validated quantitative instrument. Teachers employed at the newly designed STEAM center were asked to complete the long version of the scale, found in Table 1. Teachers were then asked to rate the differences in their sense of self-efficacy compared to their sense of efficacy while working at a previous school. Out of the 24 indicators in the Teacher's Sense of Efficacy Scale, the participants were asked to rate the difference in efficacy of 13 constructs. The compared constructs were purposefully selected to focus on teaching and learning, excluding constructs related to discipline and classroom

management. The abridged scale used for comparison of perceptions can be found in Table 2.

Qualitative Data

As part of the survey, the participants were asked to explain their reasoning for indicating specific constructs that were either slightly or extremely different since moving to the STEAM center. They were asked to justify why they believed their perception of their sense of efficacy had changed. Once the survey was conducted, the team analyzed the quantitative and qualitative data and developed phase two of the study, which included the use of the semi-structured instrument for teacher interviews with the goal of delving deeper into the items that were statistically significantly different. The participants' responses to the open-ended questions were also analyzed and used to guide the development of the teacher interview questions (Appendix A). Once the teachers' interviews were conducted and the data analyzed, the team developed an interview instrument for the third phase of the study, the administrator's interview (Appendix B).

The administrator's questions focused on seeking clarification and validation of the data collected in phases one and two, targeting the three constructs that were statistically significantly different, and the teachers' interview data. The researchers were seeking to validate the teachers' opinions as shared during the open-ended questions and interviews. Therefore, the administrator was asked to provide examples of teachers' actions to determine the validity and reliability of the teachers' answers.

Data Analysis

To begin, the researchers calculated item level descriptive statistics for the Teachers' Sense of Efficacy Scale to evaluate participants' confidence in their teaching ability regardless of

teaching context. Next, the researchers calculated item level descriptive statistics for the abridged version of the Teacher's Sense of Efficacy Scale that was used to determine the overall impact of the novel learning space on the respondent's teaching efficacy. Finally, the researchers examined if participants demonstrated statistically significant changes in teaching efficacy following their move to the intentionally designed learning space by subjecting responses to the abridged version of the Teacher's Sense of Efficacy Scale to a series of one-sample t-tests. The one-sample t-test is an inferential procedure used to determine if an obtained mean value is statistically different from a test value of theoretical or practical importance. In the current investigation, participants responses to individual questionnaire items were compared to the midpoint of the response scale (i.e., 5) as this value indicates "no change in opinion" following exposure to the novel learning environment. Prior to the analyses, we evaluated the normality of responses provided for each item using the Kolmogorov-Smirnov test (Goodman, 1954). The overall size of tested effects was evaluated using Cohen's *d* values, a statistic that indicates the magnitude of difference between two values in standard deviation units (Lakens, 2013). Consistent with past research, negligible, small, moderate, and large effects were determined using the following criteria: negligible effect, $d < .20$, small effect $d = .20 - .49$; moderate effect $d = .50 - .79$; and large effect $d > .80$ (Cohen, 1992). All quantitative analyses were conducting using JAMOVI – an open-source statistical package (The JAMOVI Project, 2021).

Qualitative Data Analysis

The answers to the open-ended questions on the survey were analyzed and coded separately by the two researchers with keen attention to the three constructs that were statistically significantly different, and the two constructs that were marginally significant as determined by the one-sample t-test. The purpose of the analysis was to gain a deeper understanding of the

reasoning behind the differences reported in the levels of efficacy since moving to a new school, and to identify themes that emerged in the qualitative data. The researchers then analyzed and coded the interview data focused on the identification of convergence or divergence between the survey and the interview data. During the analysis of phase three data, the researchers focused on the identification of convergence or divergence between the teachers' responses and the administrator's answers to determine the validity of the teachers' claims and perceptions.

Limitations

While data triangulation was achieved by utilizing three sources of data; the design and data have limitations given the context of a qualitative study, the nature of teacher responses, and the sample size. One hundred percent of teachers at the research site participated in this study decreasing the chance of misrepresentation of the faculty's views. However, the views of a sample size of 25 might not be representative of the general teacher population, which limits the generalizability of the findings as the sample might not be representative of the views of the general teacher population (Salkind, 2010). Moreover, as is the case with qualitative research, the generalization of the findings is discouraged as the data is specific to the research site (Creswell, 2014). Furthermore, the study relied on individual teachers' perceptions of their own capacity and skills, which may result in biased responses and might be impacted by the participants' ability to articulate their responses (Creswell, 2014).

Findings

Descriptive Statistics

A review of descriptive information for the Teacher's Sense of Efficacy Scale indicates the mean value for each item was above the midpoint of the response scale. This pattern of results suggests that participants involved in the current study are relatively confident in their

ability to deliver content, motivate students, and manage the classroom environment. Mean and standard deviation values for the Teacher's Sense of Efficacy Scale are presented in Table 1. Descriptive information for the abridged Teacher's Sense of Efficacy Scale revealed that participants' responses were slightly above the midpoint of the response scale suggesting the move to the newly designed learning space had a modest impact on perceptions of teaching efficacy. Mean and standard deviation values for the abridged Teacher's Sense of Efficacy Scale are presented in Table 2.

One Sample T-Tests

A series of one-sample t-tests were conducted to evaluate the influence of the novel learning environment on participants' teaching efficacy. Prior to the analyses, we assessed the normality of responses provided to the abridged version of the Teacher's Sense of Efficacy Scale. The results of our preliminary analyses indicated that all data points were normally distributed (*Ds* > .05). The results of the primary analyses indicated that participants reported statistically significant improvements in their ability to help students value learning, foster student creativity, and provide appropriate challenges for high-ability students. Examination of effect size estimates for these comparisons indicate that participants experienced a moderate improvement in their ability to successfully complete these teaching behaviors. Our results further indicated that participants did not report any statistically significant changes in their ability to engage in the remaining behaviors assessed by the abridged version of the Teacher's Sense of Efficacy Scale. The results of the one-sample t-tests are presented in Table 3.

Qualitative Data Findings

Teacher Data

After the statistical analysis for the efficacy scales and the perceived differences in the teachers' sense of efficacy, the open-ended questions through which teachers were asked to explain the reported differences were analyzed. As the survey was an online survey and teachers were not inclined to provide in-depth written responses, follow-up questions were generated to provide teachers the opportunity to elaborate during the teacher interviews. Upon analyzing the open-ended and interview responses, two themes emerged as the main reasons for teachers' perception that their efficacy related to fostering student creativity, challenging very capable students, and helping students value learning had increased since moving to the STEAM center. Teachers consistently reported that the spaces, instructional resources, and the campus culture and collaborative environment have had a positive impact on their efficacy.

School Culture. Teachers consistently communicated that creativity is promoted and innovation is expected. A teacher explained, "We are only limited by our own imagination or creativity in terms of what we want to try". Another teacher expressed the uniqueness of the school and its culture by stating, "The STEAM Center is a special place. Being here, there is a certain amount of synergy that is unique and different from the high school". A third participant concurred and spoke about the environment that the administrator established from the inauguration of the school. The teacher said, "It's an atmosphere where you're encouraged to work together, you're given the green light to try anything and failure is not an option; failure is kind of an expectation, meaning that don't be afraid to fail". Moreover, a teacher shared that prior to moving to the new STEAM center, he was feeling burnt-out. He expressed a newfound joy and shared, "I call this place my calm blue ocean".

Spaces and Instructional Resources. The school administrator's leadership in establishing a positive school culture was greatly appreciated and easily recognized by the

faculty. Similarly, teachers credited the intentionally of the school design for their increased efficacy to challenge students, foster creativity, and facilitate learning experiences that enhance students' value of their learning. A teacher shared, "The STEAM Center facilities and set up provides more opportunities to differentiate projects, giving a great platform for advanced or independent projects". While another teacher said, **"**We have so many different, in the maker space, so many different options there and then even items outside, where we can go. It allows those students that have already met a certain level of learning to push their learning beyond".

Principal Data

After interviewing the teachers, the researchers had the opportunity to interview the principal to validate the teachers' perceptions. When asked about the three efficacy scale items that were statistically significantly different and the themes that emerged from the teachers' interviews, the researchers asked the principal to provide examples to corroborate the teachers' perceptions. While acknowledging his role, the principal also indicated the role teachers have had in creating a culture of collaboration and innovation. He explained,

> The culture and climate we created; I think it starts there. Again, I think it starts with the teachers feeling comfortable with being able to step outside the box and try some new things, and so I think, again, giving them that permission to do, you know, we still have high expectations, and we expect our kids to learn at high levels. We do tell them we do expect those things. We expect you to teach the curriculum, but you can do it outside the box. You can do it- be creative.

Furthermore, he acknowledged the importance of the teachers' content and pedagogical foundation when he said,

> We have people over here, as far as our teachers, that are passionate; they are passionate about their content. I mean, it's easy to talk to any one of them about their content; you can just see them light up and get so excited about it….they are all open to good instructional pedagogy, and they are open to creating and fostering engaging learning, and what we know is that if you have, you can have a student in there that's not interested in your content, but if you have strong pedagogy and good instructional practices and you have, you provide student choice in some of your lesson design, those things can go a long way to changing the perception a student may have about your content.

The principal also recognized the teachers' role in the successful use of spaces as intentionally designed by stating,

> They (*The teachers*) do a really great job of letting that passion they have for their content kind of bleed out into their instruction. I do think with some of the unique spaces we have in this facility, I think that also helps students get excited and get interested in what they are doing.

The teachers' passion and creativity and his leadership have resulted in a learning environment where students seek to spend time even when they are not scheduled to attend classes at the STEAM center. "Students feel it is a privilege to be here and they just hang out with their friends, and some of their friends don't have class here." The principal also explained the importance of modeling expectations for a culture of collaboration and innovation to thrive. He indicated that,

> To foster creativity with our teachers is providing opportunities for them to actually be creative, so we've had sessions in the makerspace, where we've done a training session in

the maker space, and we just have these materials laid out and we let them create something.

Implications

The researchers found an increased level of self-reported efficacy related to certain behaviors. The findings led the researchers to conclude that the increase in sense of efficacy is due to the deliberate culture and beliefs shared by all teachers regardless of their content specialization areas. Specific aspects of the expected culture were communicated upon hire and continued as the norms once the building opened. Specifically, the campus administrator clearly defined how he projected failure: in himself, the staff, and the students. He expected failure and encouraged it. His behavior and expectations are important because without experiencing failure during the implementation of new instructional methodologies, improvement and growth would be unlikely. The campus administrator expected tenacity to sustain change and innovation. Teachers' shared experiences illustrate the teachers' tenacity as they implemented new instructional approaches, such as projects requiring the engineering design process, and redesigned prior lessons to challenge students, promote creativity, and enhance students' perceived value of learning.

A strong sense of self-efficacy and confidence provide the catalyst to do something new. Having the freedom to use personal judgment to make instructional decisions continued to build confidence, which leads to significant levels of efficacy. The participants in this study exuded confidence. The three significant changes teachers reported revealed their efficacy increase

related to how they perceive their ability to enhance students' perceptions of the value of their learning, student creativity, and challenge very capable students.

Valuing Learning

Teachers shared their perceived ability to support students' value learning as stated by one of the participants: "We are able to support a variety of learning styles to help students value learning." Teachers believed they could change students' perceptions about the value of the academic content due to the school culture and the available resources. Because teachers felt comfortable, they perceived a greater opportunity to support a variety of different student learning styles, which heightened students' respect for learning. Enhancing students' perception of the value of their education experiences go beyond the students' intrinsic motivation; the culture of the school ought to provide for innovative opportunities where students leverage their strengths and interests while feeling challenged by the learning tasks. Moreover, students who feel a sense of belonging in the school demonstrate a higher interest in their learning as perceived by teachers and the administrator at the STEAM center.

Fostering Student Creativity

The teachers in this study consistently identified aspects of the learning environment as reasons why they felt confident in both lesson design and execution. For example, materials that helped to foster creativity were greatly valued. Giving teachers and students access to materials that may be considered non-traditional helps facilitate projects that allow students to be creative in ways that enables innovation beyond the teacher's expectations. Teachers reported their willingness to allow students autonomy in their thinking about expected outcomes, which also allowed for projects, demonstrations, and presentations that were considered creative.

Opportunities to foster creativity occurred in places like the makerspace, “We’ve had sessions in the makerspace … and we just have these materials laid out and we let them create something”.

Creativity is important as students mature and are expected to join society as part of the workforce. In alignment with the existing literature, teachers at the STEAM center, who exhibited high levels of self-efficacy, were more willing to allow students to approach learning and demonstrate mastery in a way that is personal and unconventional. Open-ended, student-driven learning opportunities provide students with the determination to take ownership of the learning and think differently, which suggest their successes will transfer to adulthood, preparing them for college and/or careers.

Challenging Very Capable Students

Collaboration among teachers increased their perceived ability to challenge students in ways they had not been able to do at previous schools. Opportunities existed where students extended their learning outside of their assigned content by also collaborating and working with teachers of other subjects. Exposing students to content and related activities increased their knowledge and allowed teachers to extend their learning opportunities outside of their own areas of expertise. The makerspace and the extensive materials that exist in that space allowed students to explore and test their own comfort levels while challenging themselves.

When aiming to challenge students, teachers need to be willing to look outside their own classrooms and content area to increase the rigor and relevance of the learning experiences. Moreover, school leaders must allow teachers to be creative and explore unconventional ways to challenge students. The findings of this study, in alignment with previous studies, indicate that schools where teachers feel supported and safe to take risks experience result in higher levels of student-driven rigorous learning.

School Culture

The quantitative data illustrated the changes in teachers' self-efficacy. The qualitative data shed light on the importance of leadership and a positive school culture for teachers and students to thrive. Expectations for a deliberate culture that combines risk-taking and collaboration across curricula was established prior to the opening of the newly designed building. Acceptance of this culture led to profound examples of ownership of academic content, building spaces, and provided materials for both teachers and students that contribute to positive feelings and specific examples of success. "My calm blue ocean," spoke volumes as to the comfort felt at the campus. Connectedness between different academic contents was evident, and the admiration that teachers have for one another was apparent.

Conclusions

When allowed to thrive in an environment of trust and high expectations, teachers in a newly designed STEAM school owned the authority to take risks and realized the unexpected. They experienced increased self-efficacy because of the culture and the environment that work together under the leadership of an effective, trusting administrator who possesses the ability to influence greatness. When given the right circumstances in both environment and leadership, the participants in this study revealed the extensive opportunity for increased impact on students' learning and success.

References

Bandura, A. (1993). Perceived self-efficacy in cognitive development and functioning. Educational Psychologist, 28, 117–148.

Bandura, A. (1997). Self-efficacy: The exercise of control. New York: W.H. Freeman.

Cohen, J. (1992). A power primer. *Psychological Bulletin, 112,* 155 – 159.

Cohen, J., McCabe, E. M., Michelli, N.M., & Pickeral, T. (2009). School climate: Research, policy, teacher education and practice. *Teacher College Record, 111*(1), 180-213. www.tcrecord.org/Content.asp?ContentId=15220.

Creswell, J. W. (2014). *Research design: Qualitative, quantitative, and mixed methods approaches.* (4th ed.) SAGE Publications. Kindle Edition.

Dart, B. C., Burnett, P. C., Purdie, N., Boulton-Lewis, G., Campbell, J., & Smith, D. (2000). Students' conceptions of learning, the classroom environment, and approaches to learning. The Journal of Educational Research, 93(4), 262-270.

Dewey, J. (1954). The public and its problems. Athens: Swallow Press.

Goodman, L. A. (1954). Kolmogorov-Smirnov tests for psychological research. *Psychological Bulletin, 51*(2), 160–168. https://doi.org/10.1037/h0060275

Hughes, W.H. & Pickeral, T. (2013). *School climate and shared leadership.* National School Climate Center. https://schoolclimate.org/wp-content/uploads/2021/05/sc-brief-leadership.pdf

Karagiannopoulou, E., & Christodoulides, P. (2005). The impact of Greek university students' perceptions of their learning environment on approaches to studying and academic outcomes. International Journal of Educational Research, 43(6), 329-350. doi:10.1016/j.ijer.2006.05.00

Lakens, D. (2013). Calculating and reporting effect sizes to facilitate cumulative science: a practical primer for t-tests and ANOVAs. *Frontiers in psychology*, *4*, 863.

Lockheed, M.E. (1991). Improving primary education in developing countries. London: Oxford University Press.

Merriam, S. B. (1998). *Qualitative research and case study applications in education.* Jossey-Bass.

Nijhuis, J., Segers, M., & Gijselaers, W. (2008). The extent of variability in learning strategies and students' perceptions of the learning environment. Learning and Instruction, 18(2), 121-134. doi:10.1016/j.learninstruc.2007.01.009

Oliveras-Ortiz, Y., Bouillion, D. E., & Asbury, L. (2018). Research Paper Commissioned by VLK Architects. *The impact of learning environments on student engagement* Houston, TX: VLK Architects. https://vlkarchitects.com/insights/research-impact-learning-environments-student-engagement

Oliveras-Ortiz, Y., Bouillion, D. E., & Asbury, L. (2019). Research Paper Commissioned by VLK Architects. *Listening to high school students: Purposefully designed spaces and the impact on students' engagement in learning.* Houston, TX: VLK Architects. https://vlkarchitects.com/assets/img/02_Original-Research-Digital.pdf

Oliveras-Ortiz, Y., Bouillion, D. E., & Asbury, L. (2020). Research Paper Commissioned by VLK Architects. *Teachers' instructional decisions and student agency in new purposefully designed learning spaces.* Houston, TX: VLK Architects. https://vlkarchitects.com/insights/teachers-instructional-decisions-and-student-agency-in-new-purposefully-designed-learning-spaces

Oliveras-Ortiz, Y., Bouillion, D. E., & Asbury, L. (2021). Learning spaces matter: Student engagement in new learning environments. *Journal of Education, 201*(3), 174-182. http://dx.doi.org/10.1177/0022057420908062

Salkind, N. J. (2010). *Encyclopedia of research design*. SAGE Publications, Inc. https://dx-doi-org.ezproxy.uttyler.edu/10.4135/9781412961288.n396

Schunk, D. L. (2020). *Learning theories: An educational perspective.* (8th ed.). Pearson.

Thapa, A. (2013). *School climate research.* National School Climate Center. https://schoolclimate.org/wp-content/uploads/2021/05/sc-brief-research.pdf

Thomas, C. L., Pavlechko, G. M., & Cassady, J. C. (2019). An examination of the mediating role of learning space design on the relation between instructor effectiveness and student engagement. *Learning Environments Research, 22*, 117-131. https://doi.org/10.1007/s10984-018-9270-4

The JAMOVI Project (2021). *jamovi* (Version 1.6) [Computer Software]. Retrieved from https://www.jamovi.org

Tschannen-Moran, T. & Barr, M. (2004) Fostering Student Learning: The Relationship of Collective Teacher Efficacy and Student Achievement, Leadership and Policy in Schools, 3:3, 189-209, DOI: 10.1080/15700760490503706

Tschannen-Moran, M., & Woolfolk Hoy, A. (2001). Teacher efficacy: Capturing an elusive construct. *Teaching and teacher education, 17*(7), 783-805.

Williams, P. (2017). Student agency for powerful learning. *Knowledge Quest, 45*(4), 8-15.

Wilson Smith, T., & Colby, S. A. (2007). Teaching for deep learning. *The Clearing House 80*(5), 205-210.

Yerdelen-Damar, S., & Aydın, S. (2015). Relations of approaches to learning with perceptions of learning environment and goal orientations. *Education Science, 40*(179), 269-293. https://pdfs.semanticscholar.org/9967/1d19eb2db5d466aaa8e5ee55e6da7b00684c.pdf

Zandvliet, D. B., (2014). PLACES and SPACES: Case studies in the evaluation of post-secondary, place-based learning environments. *Studies in Educational Evaluation (41)*, 18-28. https://doi.org/10.1016/j.stueduc.2013.09.011.

Table 1
Descriptive Statistics for Teacher's Sense of Efficacy Items

Items	Mean	SD
1. How much can you do to get through to the most difficult students?	7.08	1.34
2. How much can you do to help your students think critically?	7.60	1.37
3. How much can you do to control disruptive behavior in the classroom?	7.73	1.13
4. How much can you do to motivate students who show low interest in school work?	6.56	1.37
5. To what extent can you make your expectations clear about student behavior?	8.00	1.08
6. How much can you do to get students to believe they can do well in school work?	7.43	.99
7. How well can you respond to difficult questions from your students?	7.56	1.16
8. How well can you establish routines to keep activities running smoothly?	7.65	1.30
9. How much can you do to help your students value learning?	7.17	1.61
10. How much can you gauge student comprehension of what you have taught?	7.34	1.07
11. To what extent can you craft good questions for your students?	7.47	1.27
12. How much can you do to foster student creativity?	7.34	1.26
13. How much can you do to get children to follow classroom rules?	7.73	.91
14. How much can you do to improve the understanding of a student who is failing?	7.39	1.11
15. How much can you do to calm a student who is disruptive or noisy?	7.21	.99
16. How well can you establish a classroom management system with each group of students?	7.87	1.05
17. How much can you do to adjust your lessons to the proper level for individual students?	7.21	1.31
18. How much can you use a variety of assessment strategies?	7.04	1.87
19. How well can you keep a few problem students form ruining an entire lesson?	7.56	1.37
20. To what extent can you provide an alternative explanation or example when students are confused?	8.08	.94
21. How well can you respond to defiant students?	7.39	1.23
22. How much can you assist families in helping their children do well in school?	6.69	1.49
23. How well can you implement alternative strategies in your classroom?	7.30	1.32
24. How well can you provide appropriate challenges for very capable students?	7.60	1.23

Table 2

Descriptive Statistics for the Abridged Teacher's Sense of Efficacy Scale

Items	Mean	Sd
1. How much can you do to help your students think critically?	6.13	2.66
2. How much can you do to motivate students who show low interest in schoolwork?	5.90	2.70
3. How much can you do to get students to believe they can do well in schoolwork?	5.63	2.92
4. How well can you respond to difficult questions from your students?	5.54	3.00
5. How much can you do to help your students value learning?	6.18	2.55
6. How much can you gauge student comprehension of what you have taught?	5.72	3.05
7. To what extent can you craft good questions for your students?	5.63	2.96
8. How much can you do to foster student creativity?	6.45	2.52
9. How much can you do to improve the understanding of a student who is failing?	5.13	3.01
10. How much can you do to adjust your lessons to the proper level for individual students?	5.86	2.78
11. How much can you use a variety of assessment strategies?	6.09	2.84
12. To what extent can you provide an alternative explanation or example when students are confused?	5.77	3.14
13. How well can you provide appropriate challenges for very capable students?	6.72	2.69

Table 3

One Sample T-Test Results Investigating the Impact of the Novel Learning Environment on Perceptions of Teaching Efficacy

Items	*t*	*df*	*p*	*Cohens d*
1. How much can you do to help your students think critically?	2.00	21	.05	.42
2. How much can you do to motivate students who show low interest in schoolwork?	1.57	21	.13	.33
3. How much can you do to get students to believe they can do well in schoolwork?	1.02	21	.31	.21
4. How well can you respond to difficult questions from your students?	.85	21	.40	.18
5. How much can you do to help your students value learning?	2.16	21	.04	.46
6. How much can you gauge student comprehension of what you have taught?	1.11	21	.27	.23
7. To what extent can you craft good questions for your students?	1.00	21	.32	.21
8. How much can you do to foster student creativity?	2.70	21	.01	.57
9. How much can you do to improve the understanding of a student who is failing?	.21	21	.83	.04
10. How much can you do to adjust your lessons to the proper level for individual students?	1.45	21	.16	.31
11. How much can you use a variety of assessment strategies?	1.79	21	.08	.38
12. To what extent can you provide an alternative explanation or example when students are confused?	1.15	21	.26	.24
13. How well can you provide appropriate challenges for very capable students?	3.00	21	.007	.64

Note: These inferential procedures compared the mean value of each item on the Abridged Teacher's Sense of Efficacy Scale to a One sample t-test comparing change items to population value of 5 (neither different nor the same)

Appendix A: Teacher Interview Protocol

1. How are the teachers' and students' different at the STEAM center? – Think about actions & attitudes
2. We've been told students have a greater enjoyment and desire to learn. Do you agree with this? Give us some examples of what you've witnessed?
3. The data showed that teachers believe they can foster student creativity more at the STEAM Center. How do students demonstrate creativity?
4. Students are given greater opportunity to self-direct and share their knowledge, give us an example of how and where this occurs.
5. How has teaching at the STEAM Center changed your teaching style?
6. Your planning?
7. A teacher said, "There is a certain amount of synergy that is unique and different [here] from the high school." Do you agree with that statement? If so, why?
8. You indicated that there is a difference in how well you can challenge highly capable students...what does that look like?
9. What do students report about their own engagement?

Appendix B: Administrator Interview Protocol

1. Please start by telling us how is the STEAM Center different (not just physically or logistically) but culturally different than other schools where you have worked?
2. How are teachers at the STEAM Center different?
3. The first step on our study was the efficacy scale where teachers had to rate their efficacy and then rate the level of change in their sense of efficacy since teaching at the ASC. Three differences were statistically significant – items related to the value learning, student creativity and challenging very capable students. Talk to us about how teachers at the STEAM Center help students value learning.
4. The data showed that teachers believe they can foster student creativity more at the STEAM Center. How do teachers foster student creativity? How do you foster teacher creativity?
5. As educators, we know differentiated learning, especially challenging very capable students can be a difficult for teachers. The difference in the teachers' efficacy related to challenging students was statistically significant – **why** do you think teachers feel better prepared or more capable to challenge very capable students?
6. A number of teachers spoke about the students' level of comfort while at the STEAM Center. A few mentioned students go over to the Center during their off periods at the HS or stay after class. Another teacher said that there are "no walking zombies" at your school. These statements imply that the climate & culture of Center is grounded in trust. How have you and the faculty established a culture of trust and comfort for and/or among the students?

7. Another statement that spoke about a culture of trust was, “Failure is expected”. Can you talk to us about what the teacher meant by that?
8. In rural schools, we often hear of teachers’ struggles because of the size of the school, the small faculty – the testimony given by your faculty contradicted this “belief” – how have you created the synergy in a small school community?

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Teacher Efficacy and Intentionally Designed Learning Spaces

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