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# Bridging the Engagement Gap: Student Perspectives on Connection, Relevance, and Instructor Competence in Classrooms

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# Bridging the Engagement Gap: Student Perspectives on Connection, Relevance, and Instructor Competence in Classrooms


## abstract

Teaching in higher education provides challenges with keeping the focus and attention of the students in the classroom. The growing gap between the changing generations of students and the traditional "sage on stage" educators created a need to examine the pedagogical practices used within the classroom. The purpose of this study was to examine how to improve student engagement in undergraduate STEM classrooms. The study collected quantitative survey data from participants which included 275 students from eight different classrooms at two different universities—each with different student demographics and funding streams. The data were analyzed by using statistical methods against a Student Engagement Core (SEC) model. The results revealed that there was significant dissonance between how students perceived their engagement and what instructors did in the classrooms. The students expressed a desire for a strong connection with their instructors in a classroom environment that emphasized the application of theory to practice, hands-on learning, and a variety of teaching methods. The students also valued opportunities for peer learning and intellectual discussions. In addition, students wanted instructors to gather formative feedback.


## introduction

Undergraduate students in higher education attend classes during the academic term and engage with their classmates and instructors to explore concepts through participation in discussions and problem solving. Student engagement in the classroom is critical to improving the retention of historically underrepresented students [12], and numerous initiatives have been attempted within STEM fields [18, 21]. The pandemic shook the core of the education system [17], and for many the classroom became a strange place. The enduring effects of the pandemic seem to have diminished students' interest, energy, and focus within the classroom. Although teaching is always a matter of expertise in discipline and pedagogy, the challenges of teaching have been magnified by the pandemic and its aftermath [25]. One of the emerging areas of concern is that of decreasing student focus and engagement in course materials. Research has shown that poor engagement results in low scores on assignments and quizzes, affecting the mastery of concepts in the course [9, 15]. The rise of a generation of students dependent on the phone, who are often distracted, addicted to technology, and face growing mental health challenges, presents a significant obstacle to keeping students engaged in the classroom [10].

### generation Z students

Engagement is critical for learning; Classroom engagement has been affected by the aftereffects of the pandemic, and existing classroom instructional practices have failed to meet the needs and dispositions of Generation Z students [6]. The generational divide shaped by historical events in the U.S. were described and the characteristics of Generation Z, born between 1995 and 2010 have been outlined [23].

Since 2020, Generation Z has made up one-third of the population and is described as empathetic, open, responsible, and determined [23]. However, growing up with constant access to technology has led to a shorter attention span among many in this generation [23]. As a result, finding new ways to engage this hyper-connected generation remains an ongoing challenge for higher education instructors who are not part of Generation Z. A 2022 qualitative study indicated that students prioritized their personal lives over academic work and further assessment on how to understand and meet their needs was warranted [11]. Prior to the pandemic, a study was conducted to get the STEM faculty perceptions on student engagement and found that STEM academics predominantly define student engagement through observable behaviors like attendance and participation, while giving much less attention to cognitive and emotional dimensions [20]. They also noted a general sense of limited agency among instructors to influence engagement, alongside uncertainty about whether responsibility for fostering engagement lies with individual faculty or institutional structures [20]. A recent study on attendance and engagement among engineering students suggested that creative thinking must be included for student engagement and topics beyond the classroom must be incorporated [26]. Another study focused on student engagement in blended learning, which is the use of technology to build synchronous and asynchronous elements of student involvement into the instruction, and found that timely and positive instructor feedback, high situational interest, and self-regulation increased student engagement [27].

current study and student engagement core model

The current study examined data from eight classrooms out of two differently-sized universities (using pseudonyms), Midwestern University (MWU) and West Coast University (WCU) using a Student Engagement Core (SEC) model [3]. West Coast University (WCU) is a public, medium size, urban and minority-serving campus. With fewer than 5,000 students, it is one of the campuses of a larger R1 university in its state. Midwestern University (MWU) is a private, Catholic, higher education institution with around 11,000 students.

We collected data from undergraduate students enrolled in Physics, Mathematics, Computer Science, and Engineering classes at the two universities. By including a variety of STEM classrooms in data collection allowed for a more holistic view of student engagement across varied instructional contexts. We aimed to discover comparative insights with the differences in course structure, content delivery, and student experiences between STEM disciplines.

The SEC model used in this study situates student engagement in the classroom as a co-constructed phenomenon and speaks to a “desire to affect teacher practice” which made the model apt for this study [3]. The model shown in Figure 1 recognizes the importance of the relationships between students, the student-to-teacher relationships, the relevance of content to students, and the teacher’s competence to foster student engagement. The emphasis on positive relationships between faculty and students as a factor in student engagement, hypothesized by Snijders et al. [24], framed our study, which focused on the relationships between students and faculty in current STEM classrooms. Research has shown that student-to-student relationships enhance the classroom environment and promote student engagement [2]. The significance of student interactions, particularly in online learning environments, has also been recognized [16].

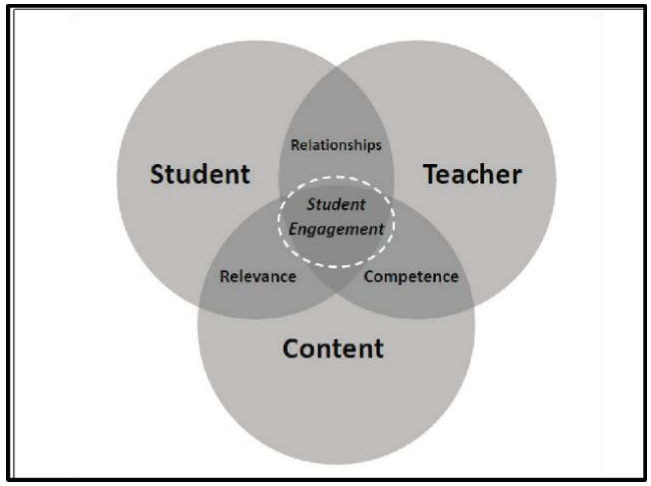

Figure 1: Student Engagement Core Model from Bundick et al. (2014).

Furthermore, the seminal work on the concept of cooperative learning, has been integral to understanding how collaboration influences student outcomes [14]. In a similar vein, another framework is presented aimed at enhancing STEM pedagogical competence, encouraging educators to build relevance, incorporate communication and leadership skills, and focus on practice-oriented pedagogy to stay aligned with evolving fields [22]. In addition, a systematic literature review underscored the importance of interpersonal skills and collaborative teacher development programs in fostering pedagogical competence [19]. As classrooms have shifted post-pandemic, there is a pressing need to assess the ecological context of post-pandemic teaching and learning, particularly after three years of remote instruction, to understand the new pedagogical practices instructors are implementing and how students are experiencing these changes.

## research question

The research question that guided this study was: What were the undergraduate student perceptions of classroom engagement related to the three SEC model constructs: student-to-teacher relationships, relevancy of curriculum content, and instructor competence?

## methods

Quantitative data was collected using an online Qualtrics survey based on the three areas of SEC model. The survey was administered in eight classrooms, four at each corresponding site. Prior to administering the survey, a consent form was read and distributed to all the students in the classroom. A generated QR code was displayed, along with a web URL, allowing students to complete the survey using their mobile devices or computers. The course number was prepopulated on the Qualtrics survey so that the students could select their corresponding course. The institutional research board approvals were obtained from MWU and WCU prior to data collection.

## data collection

We began recruiting instructors at MWU and WCU who teach STEM classes by sending emails. We entered their classrooms and administered the survey in the last 15 minutes of their classroom sessions to improve response rate. A total of 339 students were invited to participate in the survey, of which 275 completed the questionnaire, resulting in a response rate of 81%. In Table 1, detailed demographic information for the 275 participants is provided.

A comparison of the two universities in terms of STEM students' ages, gender, ethnicity, year in college

Table 1: Demographics of Students from the Survey (n = 275)

| University | N | Classroom Pseudonym | n | Gender | N | Ethnicity | N |
|---|---|---|---|---|---|---|---|
| MWU | 140 | WING210 | 51 | Male | 192 | White | 164 |
| WCU | 135 | TOWER209 | 38 | Female | 58 | Asian | 31 |
| | | ANNEX301 | 16 | Non-binary/Third gender | 4 | Black or African American | 22 |
| | | QUAD110 | 35 | Prefer not to say | 2 | Multiracial | 19 |
| | | HALL310 | 47 | Missing | 19 | Hispanic | 9 |
| | | ARENA315 | 40 | | | American Indian or Alaska Native | 1 |
| | | NEST201 | 13 | | | Native Hawaiian or Pacific Islander | 1 |
| | | HUB110 | 35 | | | Prefer not to say | 8 |
| | | | | | | Missing | 19 |

and employment is shown in Table 2. The data indicated that WCU enrolled a racially and age diverse student population, while MWU primarily served white students of traditional college age. The student population sample at MWU was younger with a mean of 19.20 years (SD = 1.14) whereas the student population sample at WCU was slightly older with a mean of 22.84 years (SD = 5.09). The data indicated that WCU serves predominantly transfer students with a higher percentage of juniors and seniors. It also reflected the non-traditional nature of WCU students, many of whom worked full- or part-time as they attended classes.

Table 2: Comparison of Student Participant Demographics between MWU (n=140) and WCU (n=135)

| Characteristic | MWU | WCU | Characteristic | MWU | WCU | Characteristic | MWU | WCU |
|---|---|---|---|---|---|---|---|---|
| Age | | | Ethnicity** | | | Student Year | | |
| Min | 18 | 18 | White | 84% | 45% | Freshmen | 42% | 1% |
| Max | 24 | 39 | Asian | 1% | 25% | Sophomore | 30% | 24% |
| Mean | 19.20 | 22.84 | Black or African American | 8% | 10% | Junior | 21% | 50% |
| SD | 1.14 | 5.09 | Multiracial | 4% | 11% | Senior | 8% | 24% |
| Gender | | | Hispanic/Latino | 19% | 24% | Fifth year | 0% | 2% |
| Male | 71% | 81% | | | | Employment | | |
| Female | 28% | 17% | | | | Full-time | 0% | 8% |
| Non-binary/Third gender | 2% | 2% | | | | Part-time | 16% | 41% |

*Note: Percentages may not add up to 100% due to rounding. **Not all ethnicities are shown when not present at both universities.*

## survey format and questions

Participants who completed the survey answered a questionnaire with 35 items which can be seen in Table 3. We constructed the survey items from the three constructs of the SEC model: Instructor-to-Student relationships, Relevance of Course Content, and Instructor Competence, and a demographics section. Each item used a five-point Likert scale that ranged from 1 (definitely false), 2 (probably false), 3 (neither true nor false), 4 (probably true) to 5 (definitely true).

## quantitative analysis

*reliability of the student survey.* Reliability of the three SEC constructs was measured, and each construct resulted in Cronbach alpha coefficient, $\alpha > 0.70$. Negatively worded survey items were reverse coded such that responses were re-coded as follows: 5→1, 4→2, 3→3, 2→4, 1→5.
Reliability estimates and number of items for each construct can be found in Table 3. It was observed that when the two items from the Instructor Competence construct: *My instructor encourages competitive learning with a focus on high-achieving students* and *The course content is moderately challenging*—were excluded, the reliability increased to 0.79. Furthermore, these two items were found to have a weak correlation with their proposed factors, as indicated by the factor analysis.

*validity of the student survey.* To assess the validity of the survey constructs, we performed factor analysis on the pooled student survey data from both MWU and WCU to examine the alignment of items to the three SEC constructs: Instructor-to-Student Relationships, Relevance of Content, and Instructor Competence. Principal Axis Factoring was used with the rotation method: Promax with Kaiser Normalization. The solutions for two, three, and four factors were examined. The three-factor solution seemed optimal, with 32 out of 35 items showing a correlation of at least 0.28 or higher. This suggested a reasonable level of factorability. The n value, minimum, maximum, SD, communality, and means for each item are shown in Table 3. Initial eigenvalues indicated that the first three factors explained 27%, 7%, and 6% of the variance, respectively. Figure 2 shows the scree plot with the eigenvalues associated with each factor. As previously stated, two items did not correlate during the factor analysis, and notably,
these were the same two items that resulted in a lower reliability score. There was a considerable overlap of nine items between the two constructs: Instructor-to-Student Relationships and Instructor Competence and overlap of one item between the two constructs: Instructor-to-Student Relationships and Relevance of Course Content. Although the factor analysis revealed an overlap of items between the three constructs, the stability of the reliability ratings was sufficient to support basing the findings on the theoretical framework.

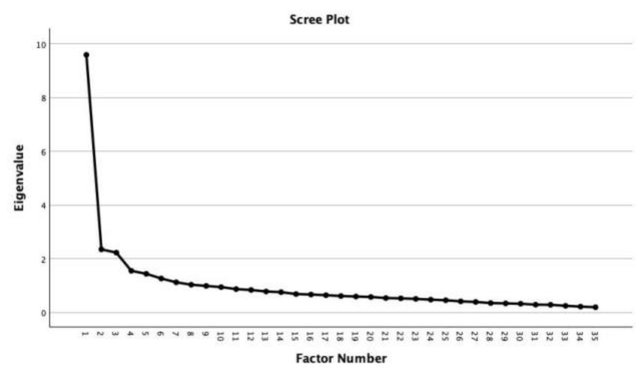


Figure 2: Scree Plot Displaying the Eigenvalues Associated with Each Factor.

## results

The following themes were extrapolated from the quantitative data by analyzing the items with the top two or three highest and the two lowest means across the three SEC constructs. We used items with higher means, including reverse-coded items and those with lower means to identify areas for improvement within each corresponding SEC construct.

*theme: create connection with instructor*

Based on quantitative data within the SEC construct for Instructor-to-Student Relationships, the two items that showed lower means as shown in Table 3 were consistent with the theme that students were seeking connection with the instructors beyond the classroom content. These items were: My instructor wants to know or shows interest about my life outside of classroom ($M = 2.99$, $SD = 1.07$, $N = 267$) and My instructor provides emotional support to me ($M = 3.17$, $SD = 0.96$, $N = 267$).

*theme: build relevance to content*

Within the SEC construct for Relevance of Course Content, the items with the highest or lowest means shown in Table 3 were convergent with the finding that relevance to content is important based on student perspectives. The three items that showed higher and lower means above 4.0 and below 3.0 were convergent with the qualitative data from the same study (not included here) that the instructors need to provide clarity of goals and use real-life examples. The item with the lowest mean was: My instructor provides me choices in activities or work assigned (Ex: an assignment can be solved by writing or a video or you pick a problem of your own interest for a project) ($M = 2.53$, $SD = 1.26$, $N = 265$). The two items with the highest mean were: I think that the course content is important for my future career ($M = 4.29$, $SD = 0.93$, $N = 265$) and My instructor does not explain the importance of the concepts as to why they are relevant or important ($M = 4.13$, $SD = 0.94$, $N = 265$). These two findings reveal an incongruity: while students perceive the course content as important, they do not sense the same level of emphasis or value being communicated by their instructor.

*theme: seek feedback*

Within the SEC construct for Instructor Competence, based on the quantitative results shown in Table 3, the two items with lower means: My instructor invites feedback about their teaching from me ($M = 3.67$, $SD = 1.02$, $N = 267$) and My instructor uses lectures as the only method of teaching ($M = 3.52$, $SD = 1.41$, $N = 256$), indicate the instructor-centered teaching practices still prevalent in the classroom, although the relatively high variation as indicated by a $SD>1.0$ demonstrates that there are a variety of instructional approaches used even in this relatively small sample of classrooms.

*theme: encourage peer learning*

Within the SEC construct for Instructor Competence, based on the results shown in Table 3, the items with the lowest mean and highest mean (reverse coded) indicate the need to foster peer learning. The items: My instructor encourages competitive learning with a focus on high-achieving students ($M = 3.18$, $SD = 1.20$, $N = 256$) and My instructor does not encourage students to learn from each other ($M = 4.61$, $SD = 0.70$, $N = 256$).

## discussion

The findings from the quantitative data analysis emphasized the lack of adaptation of the instruction to the new generations of students. The results showed the continued presence of lecture-heavy instruction and lack of peer learning in the classrooms. The need to engage students differently by providing peer learning opportunities, building practice-oriented learning, and building connection with each student has been reiterated from the findings of this study. A systematic review analyzed research from 2000 to 2022 to assess the role and evolution of lectures in university teaching [4]. It finds that while traditional, lecture-based teaching remains common, incorporating active-learning strategies such as student interaction, technology tools, and lecture capture significantly enhances student engagement. The authors conclude that hybrid approaches blending expert instruction with interactive elements offer the most effective path forward for modern higher education.

In the area of student-to-teacher relationships, the lack of connection and individual interest in the student was highlighted. A study explored how students in higher education experience both authentic connection and alienation in their relationships, using story completion and interviews. They find that meaningful connections enhance support and belonging, while feelings of disconnection highlight the emotional costs of inauthentic or failed interactions [8].

In the area of relevancy to content, the lack of connection between theory and practice was reiterated where instructors continue to use lectures as the only method of teaching. Although students thought that the content was important to their careers, the importance of the content was not clarified by the instructors or the instructors assumed that the students understood the importance. Two studies explore strategies to enhance students' sense of belonging in computer science education [1, 13]. The first study introduces a real-world approach to motivate students during the first class of a computer science course by leveraging everyday objects to build interactive systems, aiming to demonstrate the practical applications of programming concepts in real-world contexts [1]. The second study examines the impact of collaborative learning on students' sense of belonging, finding that increased collaboration leads to a stronger sense of belonging, particularly benefiting women [13]. Together, these studies highlight the importance of engaging students through practical, real-world applications and collaborative learning environments to foster a sense of belonging and motivation in computer science education.

In the area of instructor competence, there is an opportunity to improve the pedagogical practices in the classrooms through the incorporation of active learning practices and seeking formative feedback on instruction. The programs and schools must provide and encourage faculty development opportunities that incorporate active learning and building connection with the students to improve student engagement in the classroom. A study measured undergraduate computing students' sense of belonging across three courses that consistently used collaborative learning activities over multiple semesters [7]. It found that collaborative learning significantly increased students' sense of belonging—improving by 15% for women and 11% for men—suggesting these benefits extend beyond introductory courses and sustained implementation fosters inclusive environments.

## limitations

Student engagement in the classroom has traditionally been assessed at the institutional level and within specific pedagogical contexts, based on findings from the literature. Unlike previous research, this study is focused on the post-pandemic period, highlighting the need to assess student engagement that emerged from remote learning environments in higher education, particularly in the classrooms. The timing and context of this study makes it unique, situational, and limited in its application to future research. Furthermore, methodological limitations existed in this study. The study utilized a small sample size, and classrooms were selected based on convenience, depending on their availability. This impacts the generalizability of this study. Self-selected instructors' classrooms were used to conduct student surveys. Self-selection bias, in which the high-performing instructors volunteered to participate, might have skewed the results of this study [5]. There was also a possibility of response bias with the student surveys; students may have answered to make themselves or their instructor look favorable [5].

## conclusion

Our own classroom student engagement troubles post-pandemic necessitated this study to understand how we can do better in our classrooms. We measured student engagement using the SEC model by developing a survey instrument based on the three SEC model constructs. The broader approach of our study supports the identification of both shared and discipline-specific barriers to student engagement, necessitating the development of more inclusive and effective teaching strategies across all high-stress, high-stakes STEM courses. The SEC survey instrument can be used by instructors or departments to measure student engagement within their classrooms. With dwindling undergraduate enrollments, there is an emergent need to connect with the students, realize the importance of connecting theory to practice as well as fostering peer learning to improve interpersonal skills among students in the increasingly technologically connected generations.

Table 3: Reliability and Descriptive Statistics of Survey Items in the Three SEC Constructs

| Survey Item | Cronbach Alpha | No of items | N | Min | Max | Mean | SD | Communality |
|---|---|---|---|---|---|---|---|---|
| Construct: **Instructor-to-Student Relationships** | 0.88 | 14 | | | | | | |
| …My instructor cares about me | | | 273 | 1 | 5 | 4.39 | 0.78 | 0.50 |
| …My instructor provides extra course content support when needed | | | 273 | 1 | 5 | 4.33 | 0.78 | 0.30 |
| …My instructor provides emotional support to me | | | 273 | 1 | 5 | 3.17 | 0.97 | 0.36 |
| …My instructor provides me help when needed | | | 267 | 1 | 5 | 4.52 | 0.82 | 0.34 |
| …My instructor takes the time to explain difficult concepts to me | | | 267 | 1 | 5 | 4.32 | 0.85 | 0.56 |
| …My instructor is appreciative of me | | | 267 | 1 | 5 | 3.62 | 0.84 | 0.40 |
| …My instructor invites feedback about their teaching from me | | | 267 | 1 | 5 | 3.67 | 1.02 | 0.35 |
| …My instructor wants to know or shows interest about my life outside of classroom | | | 267 | 1 | 5 | 2.99 | 1.07 | 0.42 |
| …My instructor uses humor in the classroom to connect with students | | | 267 | 1 | 5 | 3.99 | 1.23 | 0.37 |
| …My instructor does not communicate well with me | | | 273 | 1 | 5 | 4.14 | 1.14 | 0.25 |
| …My instructor does not listen to me | | | 267 | 1 | 5 | 4.48 | 0.83 | 0.44 |
| …My instructor does not care to know me | | | 267 | 1 | 5 | 3.93 | 0.92 | 0.36 |
| …My instructor does not know my name | | | 267 | 1 | 5 | 3.84 | 1.25 | 0.16 |
| …My instructor does not provide extra support even when I am struggling | | | 267 | 1 | 5 | 4.30 | 0.85 | 0.37 |
| Construct: **Relevance of Course Content** | 0.74 | 10 | | | | | | |
| …I am interested in the course content | | | 265 | 1 | 5 | 4.11 | 0.97 | 0.54 |
| …I think that the course content is important for my future career | | | 265 | 1 | 5 | 4.29 | 0.93 | 0.45 |
| …My instructor asks me about my skills or interests or goals using a course pre-survey or through questioning in class | | | 265 | 1 | 5 | 2.86 | 1.25 | 0.32 |
| …My instructor incorporated in-class activities make me curious or are interesting to me | | | 265 | 1 | 5 | 3.65 | 1.18 | 0.52 |
| …My instructor's use of learning materials or speakers increases my interest in the content | | | 265 | 1 | 5 | 3.74 | 1.01 | 0.46 |
| …My instructor provides me choices in activities or work assigned (Ex: an assignment can be solved by writing or a video or you pick a problem of your own interest for a project) | | | 265 | 1 | 5 | 2.53 | 1.26 | 0.30 |
| …I feel that I cannot relate to the course content | | | 265 | 1 | 5 | 3.72 | 1.10 | 0.34 |
| …The content of this course is not relevant to my personal or professional interests | | | 265 | 1 | 5 | 3.97 | 1.12 | 0.41 |
| …My instructor's use of humor or anecdotes does not increase my interest in the content | | | 265 | 1 | 5 | 3.73 | 1.11 | 0.15 |
| …My instructor does not explain the importance of the concepts as to why they are relevant or important | | | 265 | 1 | 5 | 4.13 | 0.94 | 0.30 |
| Construct: **Instructor Competence** | 0.71 | 11 | | | | | | |
| …My instructor does not encourage students to learn from each other | | | 256 | 1 | 5 | 4.61 | 0.70 | 0.30 |
| …My instructor uses lectures as the only method of teaching | | | 256 | 1 | 5 | 3.52 | 1.41 | 0.27 |
| …My instructor encourages competitive learning with a focus on high-achieving students | | | 256 | 1 | 5 | 3.18 | 1.20 | 0.13 |
| …My instructor does not have high expectations for the students | | | 256 | 1 | 5 | 4.15 | 0.85 | 0.14 |
| …I often do not know what I am expected to know or be able to do in this course | | | 256 | 1 | 5 | 3.82 | 1.13 | 0.41 |
| …My instructor does not communicate expectations clearly | | | 256 | 1 | 5 | 4.21 | 0.90 | 0.53 |
| …My instructor does not take their profession seriously | | | 256 | 1 | 5 | 4.74 | 0.66 | 0.24 |
| …My instructor connects with me through their teaching and classroom skills | | | 256 | 1 | 5 | 3.93 | 0.92 | 0.55 |
| …The course content is moderately challenging | | | 256 | 1 | 5 | 4.16 | 1.01 | 0.02 |
| …My instructor provides constructive feedback on assigned work | | | 256 | 1 | 5 | 3.93 | 1.03 | 0.30 |
| …My instructor uses a variety of teaching methods | | | 256 | 1 | 5 | 3.64 | 1.16 | 0.53 |

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