The Future of Engineering Education
2024 Annual Conference & Exposition
Oregon Convention Center
Portland, OR . June 23 - 26, 2024
ASEE
Paper ID #41120

Fostering Student Ownership and Active Learning through Student-Led Group Lectures in a Civil Engineering Materials Course

Dr. Shenghua Wu, University of South Alabama

Dr. Shenghua Wu is currently an Associate Professor in the Department of Civil, Coastal, and Environmental Engineering at the University of South Alabama. His research areas include civil engineering materials characterization, pavement performance evaluation and modeling, design, and maintenance, multidisciplinary approach to address complex engineering issues, as well as STEM education. He is the Director for the Solid Waste Sustainability Hub, Gulf Coast Center for Addressing Microplastic Pollution (GC-CAM), and the founding faculty advisor for the Society of Sustainable Engineering. He teaches a mixture of undergraduate and graduate engineering courses. Dr. Wu is a committee member for Transportation Research Board (TRB) AJE35 and AKM 90, a member of American Society of Civil Engineer (ASCE), American Society for Testing and Materials (ASTM), and Academy of Pavement Science and Engineering (APSE), as well as an editorial member for Journal of Testing and Evaluation and International Journal of Pavement Research and Technology. He serves panel member for several NCHRP and ACRP projects. He is also a registered professional engineer in Alabama and LEED AP.

Basant Bhatt, University of South Alabama

Fostering Student Ownership and Active Learning through Student-Led Group Lectures in a Civil Engineering Materials Course

Abstract
The Civil Engineering Materials course is an introductory course for junior civil engineering students to explore a variety of materials, including aggregates, cement, concrete, asphalt, wood, and steel. Traditional teaching methods often involve top-down lectures delivered solely by instructors. While instructors possess significant expertise, there is a growing recognition of the importance of making the course engaging and captivating, especially since it serves as students' initial exposure to civil engineering disciplines. This study introduces a blended teaching approach, in which students are actively involved in delivering lectures on selected topics, rather than relying solely on the instructor. Pre-class and post-class surveys were administered to the student presenters to gauge their perceptions on delivering team lectures. The surveys also aimed to assess whether their knowledge improved, their roles in team presentations, and their development of effective presentation skills. Additionally, audience feedback on the group presentations was collected and it was observed that the majority of students reported an increase in their knowledge after lecture delivery. This not only developed a sense of student ownership in the learning process but also promoted an engaging and participative learning environment in the class. Thus, this case study provides insights into fostering greater student ownership of course materials and promoting active learning in subject matter content.
Keywords: Student-led group lectures, active learning, student ownership

1. Introduction

Civil engineering, as defined by the American Society of Civil Engineering (ASCE), involves the application of knowledge in mathematical and physical sciences acquired through education and practical experience. This knowledge is utilized judiciously to develop cost-effective methods for harnessing natural materials and forces, contributing to the continual betterment of humanity [1]. In the realm of civil engineering, a comprehensive understanding of various materials is essential for developmental projects. This understanding encompasses the origins, formations, physical attributes, mechanical properties, and decay behavior of materials, forming a fundamental knowledge base. Proficiency in the materials used in civil engineering is crucial for tasks such as selection, processing, utilization, ongoing maintenance, and eventual recycling [2]. For aspiring civil engineers aiming to excel in their profession, a thorough understanding of civil engineering materials is imperative. Specialized courses like Civil Engineering Materials (CEM) play a pivotal role in imparting this knowledge. CEM course is designed to equip students with the skills needed to address contemporary engineering challenges. By offering a comprehensive overview and in-depth insights into materials essential for both academic study and future professional endeavors, the CEM course prepares students to meet the diverse demands they will face in their careers [3].

The concept of ownership in learning encompasses crucial aspects, such as a profound sense of connection, active participation, and personal investment in the educational journey [4]. Establishing this sense of ownership is useful for enhancing students' learning potential and fostering success in various educational settings [5]. To truly internalize ownership, students must grasp specific learning objectives and possess clear, well-defined targets, acting as guiding posts delineating expected performance standards crucial for nurturing ownership [6]. Ownership comprises a spectrum of essential components, including motivation, engagement, goal setting, self-direction, self-efficacy, self-confidence, metacognition, self-monitoring, and persistence [5]. However, the conventional teacher-led lecture approach often hinders student engagement, failing to instill a profound sense of ownership in the learning process. To cultivate ownership, students need active involvement, feeling connected and personally invested in their learning experiences, rather than solely being passive recipients of knowledge disseminated by instructors [7]. The integration of active learning methodologies within Science, Technology, Engineering, and Mathematics (STEM) college courses has proven profoundly advantageous, evidenced by enhancements in student academic performance, increased retention rates, and a reduction in achievement disparities among diverse student groups [8]. This pedagogical shift is pivotal as it not only addresses academic prowess but also nurtures critical skills like autonomy and adept goal-setting [6]. Educational institutions have begun integrating active learning approaches into their pedagogical frameworks. For instance, the Worcester Polytechnic Institute strategically incorporated various active learning techniques within lectures, evaluating student performance and attitudes. This approach significantly amplified academic achievements and cultivated a more favorable attitude among students toward the subject matter [9].

Undergraduate education faces substantial challenges, notably observed in expansive university lecture classes [10, 11]. These challenges stem from increasing class sizes that make it progressively arduous for college instructors to motivate students for class preparation and participation in discussions. To address this issue, integrating student-led group lecture deliveries into the curriculum has been proposed as a potential solution in this study. The importance of student engagement, especially within group interactions, is instrumental in cultivating essential skills crucial for academic success and holistic development [10]. This emphasis on active student involvement spurred further investigation, which explored the impact of student-led discussion groups [12]. A positive correlation was revealed between student-led discussions and enhanced academic performance, suggesting the potential efficacy of collaborative learning in university settings. Moreover, student feedback validated the value of student-led approaches, emphasizing their role not only in academic growth but also in fostering profound interpersonal connections and collaborative friendships among peers [12]. Similarly, the implementation of student-led seminars for first-year undergraduate medical students further validated the effectiveness of such seminars in fostering self-directed, active, and peer-driven learning experiences, concurrently nurturing attributes like teamwork and effective communication skills [13]. Additionally, participation in collaborative teamwork transforms students from passive participants to active contributors as they interact and collaborate with fellow learners concerning the subject matter [14]. These collective scholarly endeavors substantiate the promise of student-led methodologies in reshaping university lecture dynamics, emphasizing their broader impact on holistic student development through collaborative, engaging, and student-centered learning approaches.

The study explores the effectiveness of a novel strategy, student-led group lecture delivery, in engaging students and inspiring exploration within the CEM course. This active learning approach is implemented in the junior-level course CE315 CEM, aiming to provide valuable insights into effective teaching methodologies. The overall objective is to evaluate the efficacy of student-led lecture delivery as an active learning strategy in comprehending CEM, with a focus on cultivating an engaging and participative learning ambiance. The study addresses specific questions through pre-class and post-class surveys: (1) Can student-led group lectures encourage active student participation, transitioning them from passive recipients to active contributors in an educator-like role? (2) Can student-led group lectures empower students by involving them in creating and presenting lectures within a collaborative group setting, fostering a sense of ownership and responsibility for their learning process? (3) How do factors such as race and gender affect students' teamwork, collaboration, learning experience, and knowledge gain?

2. Methodology

2.1 Student Participants

The research was conducted among students enrolled in the Department of Civil, Coastal, and Environmental Engineering at the University of South Alabama, specifically within the framework of the course CE315 during the Fall semester of 2023. This course offers students a comprehensive understanding of the fundamental engineering properties inherent in crucial materials used across civil engineering projects, encompassing steel, concrete, asphalt, and timber. Students not only gain expertise in selecting and applying these materials effectively but also learn to consider their specific characteristics, strengths, and limitations in diverse construction contexts. In this course, there were 35 enrolled students representing various ethnic backgrounds, with the majority being Caucasian. The student composition consisted of both junior and senior-level students, with a higher count of male students compared to females. A classroom survey was conducted after the students had presented their topic to gather demographic insights from the presenters, and these findings are summarized in **Table 1**.

Table 1. Demographic Information of Participants

Categories	Attributes	No.	Percentage
College Level	First-year	0	0
	Sophomore	0	0
	Junior	22	68.8%
	Senior	10	31.3%
	Graduate	0	0
Gender	Male	25	78.1%
	Female	6	18.8%
	Non-binary/Third gender	1	3.1%
	Prefer not to say	0	0
	Other (Please specify)	0	0
Ethnicity	Asian	0	0
	African American	6	18.8%
	Caucasian/Caucasian	24	75.0%
	Hispanic/Latino	1	3.1%
	Native American/Indigenous	0	0
	Pacific Islander	1	3.1%
	Mixed/Multiracial	0	0
Topic	Aggregate	11	34.4%
	Concrete	5	15.6%
	Asphalt	4	12.5%

	Wood	5	15.6%
	Polymer	5	15.6%
	Steel	2	6.3%

The dataset encompasses a total of 32 presenters, showcasing a notable representation from those at the junior academic level (68.8%), while seniors constitute a significant portion as well (31.3%). Regarding gender distribution, the dataset leans predominantly towards male respondents, encompassing 78.1% of the sample, with females accounting for 18.8%. Additionally, a small but noteworthy percentage identified themselves as non-binary or third gender (3.1%). Diversity in ethnic backgrounds was apparent within the respondent pool. The majority identified themselves as Caucasian or Caucasian (75.0%), followed by a presence of African American individuals (18.8%). Moreover, smaller participants identified as Hispanic/Latino (3.1%) and Pacific Islander (3.1%). The students delivered the presentation in groups on various civil engineering material topics. Among the topics presented, "Aggregate" stands out, with presentations delivered by 34.38% of the students. Following closely behind, "Concrete", "Wood", and "Polymer" were presented by an equal proportion of students, each accounting for 15.6% of the presentations. "Asphalt" attracted presentations from 12.5% of the students, while "Steel" had the lowest representation, with only 6.3% of students delivering presentations. **Figure 1** depicts the overall data collection and analysis methodology utilized in this study.

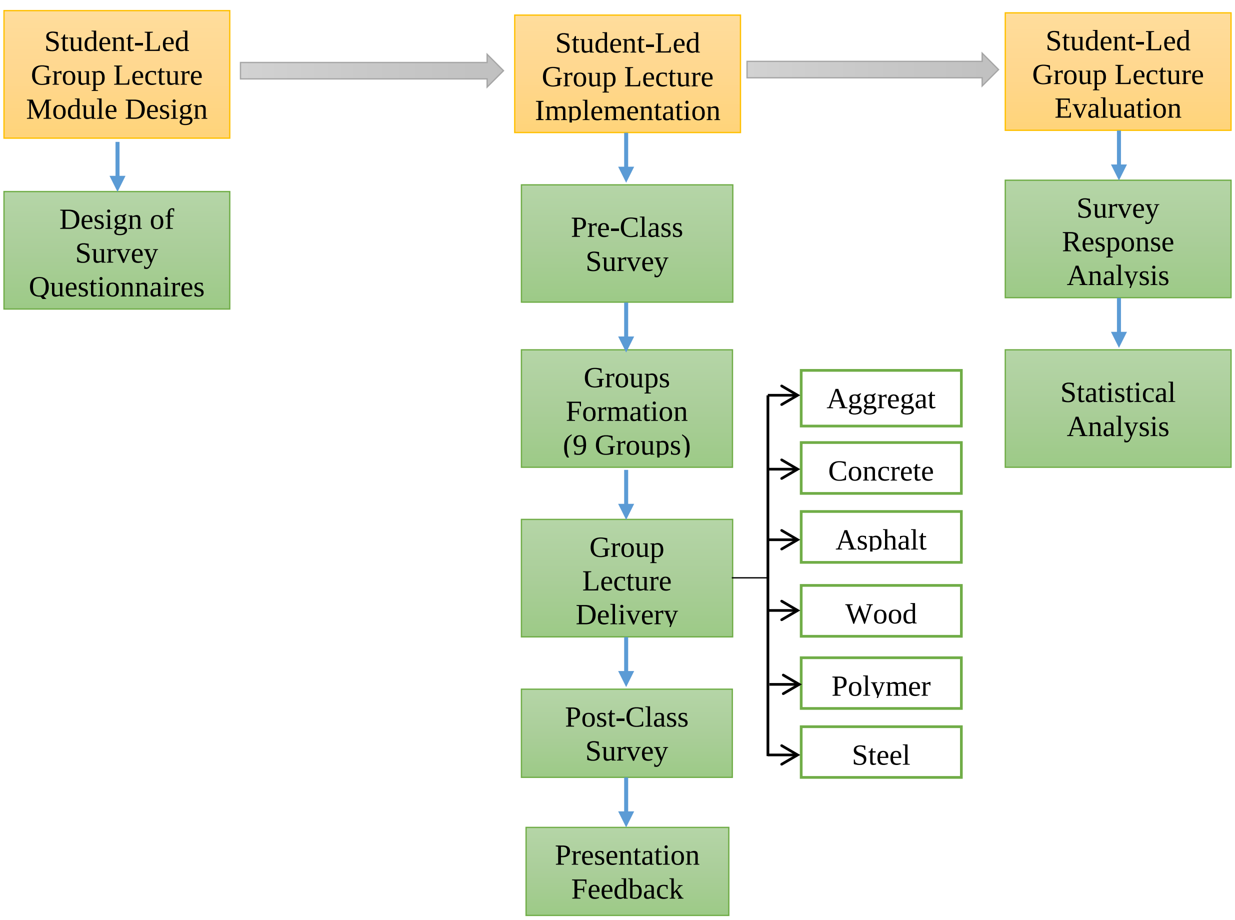

Figure 1. Flowchart of student-led group lecture module.

2.2 Data Collection

To gain insights into students' perceptions regarding group work and lecture delivery, a descriptive survey was conducted for data collection. The process consisted of two distinct phases: a pre-class survey and a post-class survey. These surveys were developed by the principal investigator, who also serves as the course instructor. They were meticulously crafted based on a thorough review of relevant literature on active learning strategies and student engagement, as well as the instructor's past teaching experience. Subsequently, the surveys obtained approval from the Institutional Review Board (IRB). Following this, printed questionnaires were distributed to students during class sessions, and their responses were recorded in an Excel spreadsheet for subsequent analysis.

2.2.1 Pre-Class Survey

In the pre-class survey (Appendix A1) of the CEM course, all enrolled students participated by providing their responses. The survey consisted of eight questions, encompassing four Likert-type queries, three multiple-choice inquiries, and one open-ended prompt. Within the Likert-type questions, three assessed the student's level of comfort in delivering lectures, while one sought agreement or disagreement with the statement regarding lecture delivery's role in enhancing comprehension of specific topics. The multiple-choice questions aimed to gauge students' perceptions regarding their learning style and the factors influencing class effectiveness. Additionally, an open-ended query was included to elucidate the primary concerns students encounter when delivering lectures. All responses to these inquiries were gathered on the same day, preceding any lecture presentations. It was during this stage of the survey that students became aware they would be required to deliver a lecture in future classes. Additionally, on the same survey sheet, students were presented with the 'consent to participate' documents. These documents outlined the survey's objectives and emphasized their voluntary participation. Consequently, students were included in the survey only after providing their consent to participate.

2.2.2 Lecture Delivery Preparation, Evaluation, and Feedback

Before delivering their group lectures, students received comprehensive guidelines along with a list of key topics and learning objectives relevant to their assigned CEM material. Additionally, students were introduced to supplementary resources, such as Google Scholar and university library databases, to facilitate access to pertinent information and enhance the accuracy of their content delivery. Furthermore, the instructor provided valuable tips and strategies for effective presentation delivery, empowering students to optimize their presentation skills.

Following the delivery of the lectures, both the instructor and students engaged in a question-and-answer session to address any inquiries. Subsequently, any significant inaccuracies or gaps in the presented material were noted and addressed by the instructor, offering insights for improvement. Similarly, listeners or non-presenters also provided feedback to the presenting group, including their responses on whether attending the group's lecture improved their understanding of the material. This feedback was gathered through a series of questions presented to them (Appendix A2).

2.2.3 Post-Class Survey

In the post-class survey (Appendix A3), students were initially divided into nine groups and tasked with delivering a lecture on a topic related to CEM. Three groups provided a lecture on the topic of aggregate, two groups on the topic of concrete, and the rest of the groups presented on one of the remaining topics. Subsequent to their presentations, each presenter received a post-class survey questionnaire consisting of fifteen questions. This questionnaire encompassed four Likert-type queries, two multiple-choice inquiries, three open-ended prompts, and five background information questions. The Likert-type questions aimed to gauge respondents' degree to which they liked it or did not like it, felt yes or no, perceived improvements or no improvement, and comfort or discomfort levels based on provided statements. Correspondingly, one of the multiple-choice questions sought insights into the roles students assumed within their teams, while another question mirrored a multiple-choice query from the pre-survey questionnaire, addressing the crucial factors for an effective lecture. Within the background information section, three questions were introduced to ascertain the participants' demographic information related to college level, gender, and ethnicity. The remaining two questions solicited information about participants' inclination to share experiences and requested their email addresses for future contact purposes.

2.3 Data Analysis

The data obtained from the survey was analyzed using Excel and Python software. The gathered data was first methodically input into Excel spreadsheets for analysis. The pre-survey data was arranged based on the questionnaire paper that was gathered, and the post-survey questionnaire replies were first recorded based on the lecture groups. The responses to the provided questions were later combined based on the category of demographic data during data analysis. Open-ended questions were examined and presented in accordance with the primary idea that the students wanted to convey, while percentage responses to all questions—Likert-type and multiple-choice—were then computed and displayed graphically. Only individual responses were presented in an orderly fashion; responses from multiple students were merged.

Subsequently, in addition to graphical representation, statistical analyses were performed concerning responses to ordinal data-type questions, specifically Likert-type and multiple-choice inquiries. A two-tailed paired student t-test was employed across various groupings, including group, gender, ethnicity, and school level, aiming to ascertain the p-value for comparative examination. The t-test compared pre-class and post-class responses to analogous questions from both survey questionnaires. Moreover, post-class survey data underwent t-tests based on gender (male and female), ethnicity (Caucasian/White and African American), and school level (junior and senior). For the calculations, a significance level of 5% (0.05) was selected. If the resultant p-value fell below this threshold, it indicated a statistically significant outcome. This signified a substantial disparity in responses among the analyzed categories, thereby leading to the rejection of the null hypothesis.

3. Results and Discussions

3.1 Pre-Class Survey

In the survey conducted prior to the class, a series of questions were posed, including inquiries about their preferred learning methods and their primary concerns while delivering presentations. All students registered for the CEM course, totaling 35 participants, took part in the survey.

3.1.1 Method of Learning and Type of Learners

In the pre-survey questionnaire, the initial question posed to the students was, "Which methods below can help you learn engineering concepts better? (Rank, multiple options)." The findings of this question are illustrated in **Table 2**. To understand the table, consider the response to a student's ranking: A>D>C>E>B. This indicates that the student's preference order is A (attending lecture) as the top choice, followed by D (participating in the instructor's course design), then C (doing homework), then E (joining a study group), and lastly, the least favored option for this student was B (watching short instructional videos). Therefore, when reviewing the table, the entry for attending lectures being chosen as the 1^{st} rank by 17 signifies that those 17 students preferred attending lectures the most. Additionally, 11 students considered attending lectures as their second preferred method of learning. Furthermore, "doing homework" was ranked 1^{st} by only 5 students, while 10 students ranked "doing homework" as their 3^{rd} preferred method of learning.

Table 2. Ranking for Method of Learning

Option	Learning Method	Rank				
		1^{st}	2^{nd}	3^{rd}	4^{th}	5^{th}
A	Attending lectures	17	11	3	3	1
B	Watching short instructional videos	5	8	11	4	7
C	Doing homework	5	7	10	4	9
D	Participating in the instructor's course design	3	7	4	15	6
E	Joining a study group	5	2	7	9	12

With the information presented in the above table alone, determining the overall ranking of the learning methods preferred by students in this survey is challenging. To make it more discernible, each rank is associated with a quantitative number from 5 to 1. Specifically, rank 1^{st} is assigned with the value 5, Rank 2^{nd} receives 4, Rank 3^{rd} is designated 3, Rank 4^{th} is given 2, and Rank 5^{th} is attributed a value of 1. Subsequently, each numerical value in Table 2 is multiplied by its corresponding assigned rank value, resulting in the formation of **Table 3**. This allows us to quantitatively rank the preferred learning methods, with higher values indicating greater preference among students. Examining Table 2 reveals that "attending lectures" accumulates the highest total points of 145, followed by "Watching short instructional videos", "doing homework", "participating in the instructor's course design", and "joining a study group".

Table 3. Points of Method of Learning based on Ranking

Option	Learning Method	Rank					Total
		1st	2nd	3rd	4th	5th	
A	Attending lectures	85	44	9	6	1	145
B	Watching short instructional videos	25	32	33	8	7	105
C	Doing homework	25	28	30	8	9	100
D	Participating in the instructor's course design	15	28	12	30	6	91
E	Joining a study group	25	8	21	18	12	84

Similarly, another question related to the type of learner was "What type of learner do you think you are?". In response to this question, students had to choose one of the options from eight different types of learners. According to the survey results, a significant proportion of students (42%) identified as visual learners, followed by analytical learners (16%) and a nearly equal number of social learners (15%), as depicted in **Figure 2**. Additionally, only 2% of students indicated a preference for learning by doing it themselves.

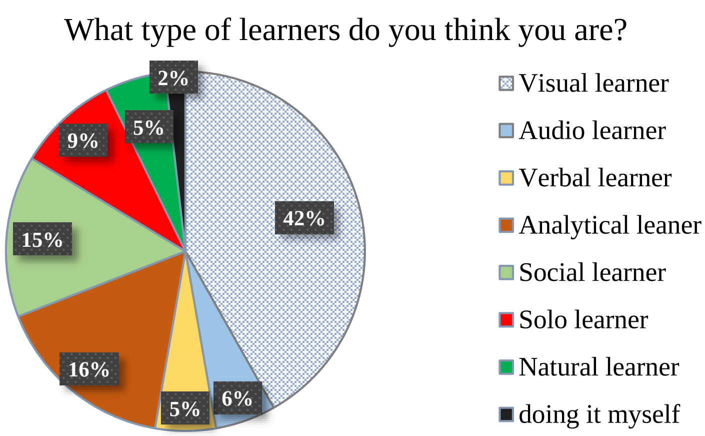

Figure 2. Different types of learners for all participants.

3.1.2 Student Confidence in Lecture Delivery

Students were surveyed to gauge their perceptions about delivering presentations in front of the classroom before the commencement of this CEM course. Within this category, three distinct different questions were posed: students were asked about their confidence levels when delivering lectures individually, in a team, and when provided with ample time for preparation. The responses are presented in **Figure 3**, revealing that a significant portion of students (34%) expressed uncertainty about presenting alone, with another majority (37%) reporting either discomfort or discomfort at all. When asked about presenting in a team, the majority of students (43%) reported feeling comfortable, and a significant portion (60%) expressed being either comfortable or very comfortable delivering lectures in this context. Similarly, when students are provided with sufficient time to prepare for their lecture, an overwhelming majority (83%) feel comfortable delivering the presentation.

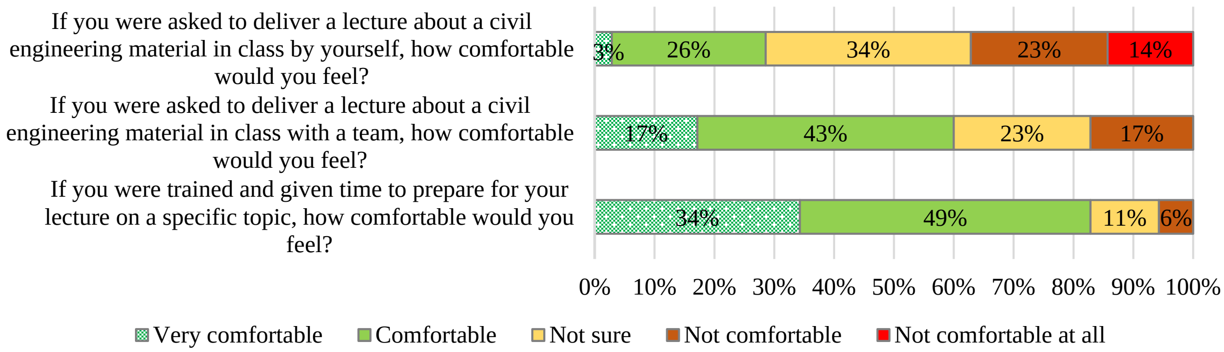

Figure 3. Student confidence in presentation delivery, based on different scenarios.

3.1.3 Effective Teaching Technique

Within this topic, two questions were included. One of the initial questions asked was, "In your opinion, what is the most important factor for an effective lecture?". Students were required to select one option out of five that the lecturer could do for an effective lecture. The results, as shown in **Figure 4**, indicate that the majority of students (54.3%) believe that the instructor should make the class engaging and interesting. Following this, some students (20%) expressed that the instructor should be adequately prepared for the lecture for an effective lecture. Moreover, an equal number of students (11.4%) opined that the instructor should be able to inspire students' critical thinking and ensure active listening among students, rather than being absent-minded in the class. Additionally, a single student (2.9%) felt that incorporating interactive elements or small games in the class could enhance the effectiveness of a lecture for students.

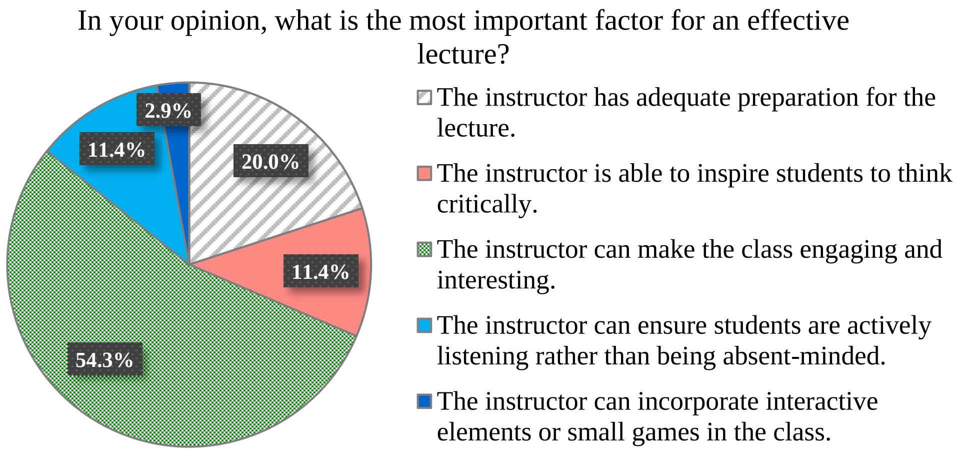

Figure 4. Students' opinions on what makes an effective lecture.

Another question posed to the students was, "How much do you agree with the statement that "asking students to deliver a lecture can help them learn better about that specific topic?". The responses, as presented in **Figure 5**, reveal that a majority of students (42.9%) agree that requiring students to deliver a lecture can enhance their learning compared to traditional methods. Conversely, an equal number of students (17.1%) hold different opinions, expressing strong agreement, neutrality, or disagreement with the statement. However, a small percentage (5.7%) strongly disagrees that delivering lectures by students themselves would contribute to better learning. It was found that students selecting the "strongly disagree" option are often those who either feel uncomfortable or are uncertain about their confidence in delivering lectures, especially if presented in a team or given time to prepare.

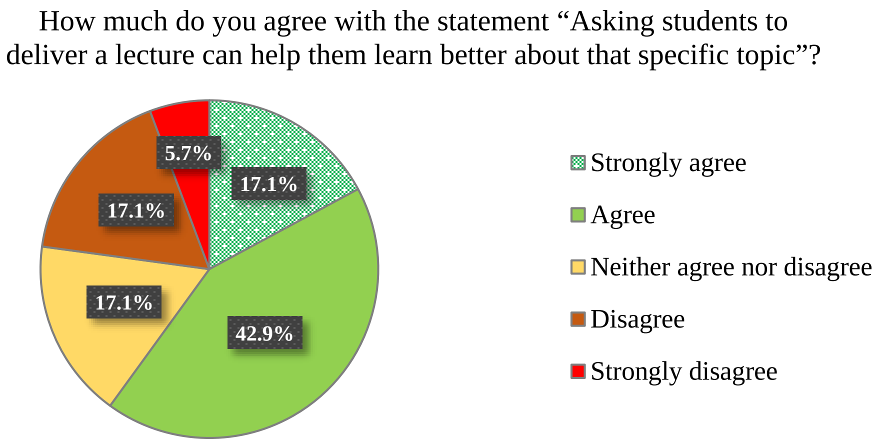

Figure 5. Students' opinions on whether delivering lectures helps to learn better.

3.1.4 Open-Ended Questions

Before students were assigned a specific topic for their lectures, an open-ended question was included in the pre-class survey questionnaire. The question, "What is your primary concern when delivering a lecture about a civil engineering topic in class?" elicited responses from the students, and **Table 4** organizes the overall responses. The majority of students expressed concerns about their lecture delivery, except five students who either mentioned "no concern" or left the question unanswered. Among the respondents, some shared similar concerns; for instance, 30% expressed worries about lacking sufficient knowledge on the topic to deliver a lecture. Additionally, another group of students (20%) admitted either disliking public speaking or feeling nervous when standing in front of the class. Similarly, 16.7% expressed concerns about preparation for the presentation, indicating apprehension about not being adequately prepared to deliver a lecture that attendees would understand.

Table 4. Students' Concerns Regarding Lecture Delivery

No.	Concern
1	Feeling inadequately prepared before delivering the lecture
2	Worries about the duration of the lecture not being sufficient to explain concepts effectively
3	Concerns about maintaining listener interest throughout the lecture
4	Worries about time management and the ability to finish the lecture on time
5	Making sure to explain information clearly for everyone to understand
6	Ensuring a comprehensive understanding of the material being lectured
7	Anxiety about addressing student questions or explaining topics lacking deep knowledge

8	Experiencing anxiety, nervousness, or skipping ideas during the presentation due to public speaking discomfort
9	Worries about not being engaging enough with the audience
10	Concerns about lacking sufficient information on the lecture topic
11	Disliking public speaking

3.2 Pre and Post-Survey Results

A set of common questions was initially posed to the entire class, and similarly, after students had delivered their group presentations. The aim was to observe any changes in the students' responses before and after delivering a lecture on CEM in front of the class. In these sections, three questions were identical, allowing for a comparison to observe the shift in responses.

3.2.1 Important Factor for an Effective Lecture

To gauge students' opinions on what makes a lecture effective, a common question "In your opinion, what is the most important factor for an effective lecture?" was included in both the pre and post-surveys. The analyzed responses to this question are presented in **Figure 6**.

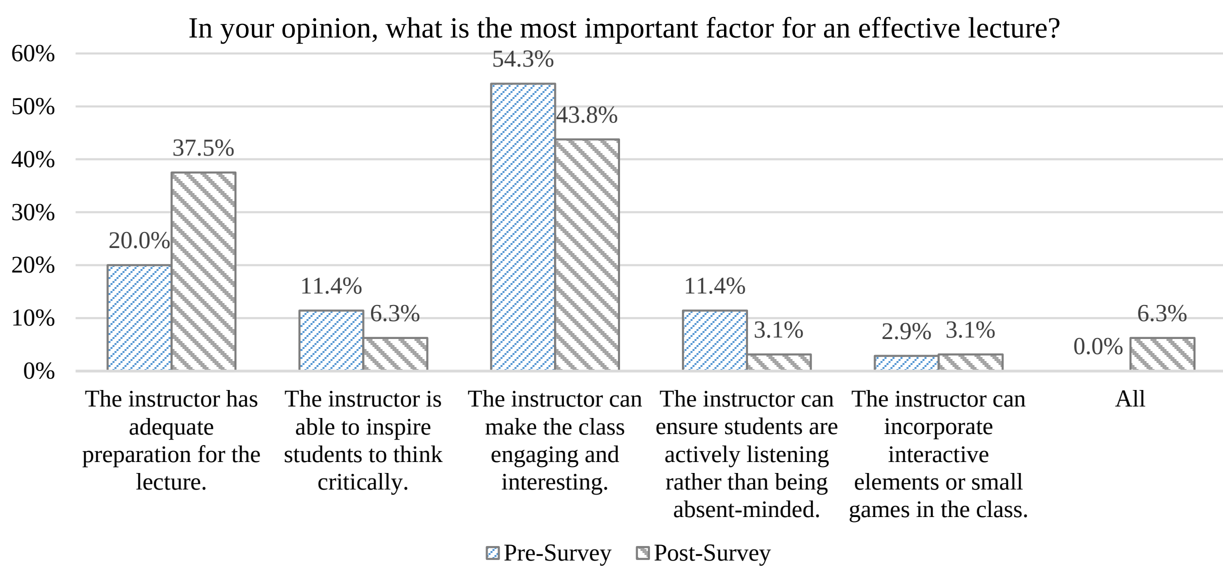

Figure 6. Pre and post-survey responses on important factors for an effective lecture.

It was observed that in both surveys, the factor considered most crucial was making the class engaging and interesting, with 54.3% of students in the pre-survey and 43.8% in the post-survey. This indicates a decrease of 10.5%, potentially attributed to some students not participating in the post-survey or marking all options. Concerns raised in the pre-class survey about challenges in delivering lectures might indicate difficulties students faced in preparation. This experience could have shifted the focus from making the class engaging to prioritizing adequate preparation. Another notable shift was seen in students who initially considered adequate preparation as the most important factor—20.0% in the pre-survey to 37.5% in the post-survey, a significant increase of 17.5%.

In the pre-survey, an equal number of students (11.4%) favored the factors “instructors inspiring critical thinking” and “ensuring active listening”. However, these proportions decreased to 6.3% and 3.1%, respectively, in the post-survey. An interesting observation was that initially, no students selected all options as major factors, but in the post-survey, a couple of students (6.3%) marked all options, considering each given factor equally important.

Following statistical analysis, no significant difference in students’ opinions between the pre and post-surveys was observed, as indicated by a student t-test yielding a p-value of 0.749 which was greater than the assumed 0.05 value of rejecting the null hypothesis of no significant difference. This lack of significance may be attributed to the majority of students selecting the same option in both the pre- and post-class surveys. Specifically, “The instructor can make the class engaging and interesting” emerged as the most chosen factor for an effective lecture in both the pre- and post-class surveys. Similarly, the other two options received consistent rankings in selection frequency in both the pre- and post-class surveys. Consequently, considering the preference for attending lectures and visual learning, it is apparent that students heavily rely on the instructor’s teaching approach. A key takeaway from students’ perceptions is the expectation for instructors to be well-prepared on lecture topics and to find ways to make classes engaging and interesting for the students.

3.2.2 Confidence in Lecture Delivery

Another question was to understand how comfortable students feel when delivering a lecture about CEM. For this, in the pre-survey questionnaire, the question “If you were asked to deliver a lecture about CEM in class by yourself, how comfortable would you feel?” was asked, while in the post-survey questionnaire, “If you were requested to deliver a topic about CEM now, how comfortable would you be?” was asked. The analysis of the response is presented in **Figure 7**.

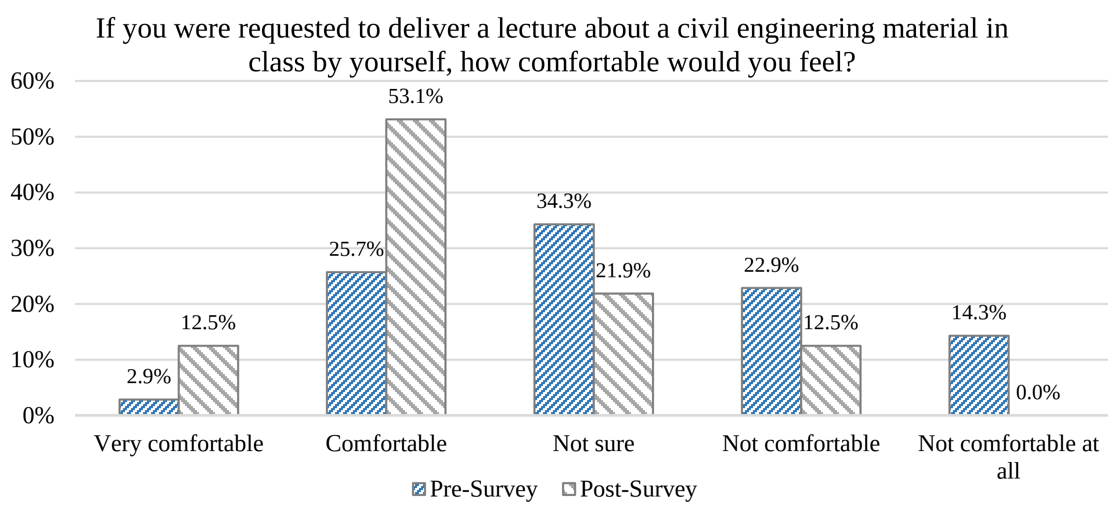

Figure 7. Pre and post-survey response on confidence to deliver a lecture.

Observing the graph reveals an increase in the proportion of students feeling either comfortable or very comfortable, accompanied by a decrease in other response options. As seen, the percentage of students feeling “very comfortable” surged from 2.94% to 12.5%, marking an increment of over four times. Similarly, the proportion of students feeling comfortable in delivering lectures doubled, rising from 25.7% to 53.1%. Simultaneously, the percentage of students feeling “not sure” decreased by 12.4%, while those feeling uncomfortable decreased by 10.4%. A significant shift was observed, as the percentage of students declaring they were ‘not comfortable at all’ in the pre-survey (14.3%) dropped to zero after delivering the lecture on the topic of CEM. This indicates an improvement in students’ comfort levels in delivering a lecture. However, despite the observed positive change in comfort levels, our statistical analysis yielded a p-value of 0.830 from the t-test, indicating no significant difference in the overall responses. This finding is consistent with the assumed significance level of 0.05, suggesting that the null hypothesis of no significant difference cannot be rejected. One possible explanation for this lack of significance may be attributed to the relatively small sample size, which could limit the test’s power to detect true differences. Although minor fluctuations were noted in the percentage distributions between the two surveys, these changes did not attain statistical significance, implying that any shifts in comfort levels were not substantial.

3.3 Group Lecture Participants Survey Results

Nine groups participated in the presentations, delivering lectures on six different CEM topics. The survey was conducted for both presenters and audiences during the group presentation lectures. Various types of questions were asked, and the obtained responses are detailed below.

3.3.1 Team Based Lecture

To gauge students’ perceptions of team-based lectures, the question “How do you feel about the idea of students delivering a team lecture on a specific civil engineering material?” was posed. **Figure 8** illustrates the analyzed responses based on different categories for this question. The majority of students (46.9%) selected the option “I like it”, followed by “I don’t like it” (28.1%). Female students exhibited a higher overall liking for this concept (83.4%) compared to male students (52%). With a p-value of 0.112, it shows no significant difference in opinion between male and female students. African American students expressed a higher liking for this concept overall, with a proportion of 66.9%, compared to Caucasian students, with a p-value of 0.163. Examining the student level, 70% of senior-level students liked this concept, while junior-level students were equally divided, expressing liking, not liking, or uncertainty about it. But with a p-value of 0.251, it shows no significant difference in their opinion. Regarding students delivering lectures on different topics, those presenting on asphalt predominantly liked this concept (75%), followed by aggregate (63.6%), and then students delivering lectures on other topics.

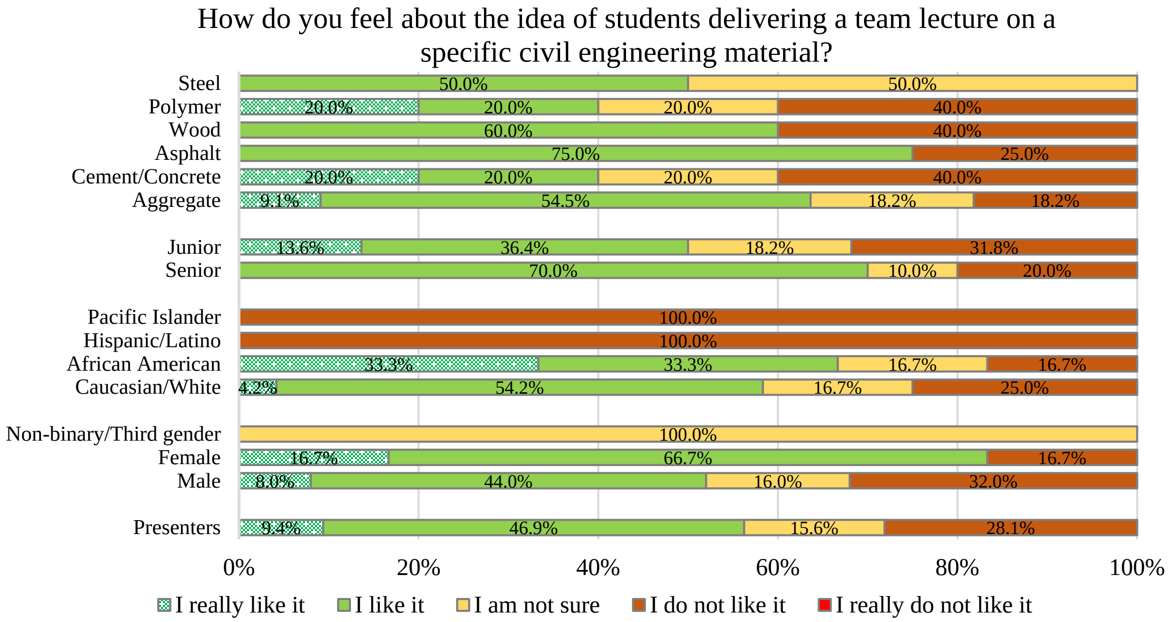

Figure 8. Students' opinion on lecture delivery.

3.3.2 Improvement in Knowledge of Course Materials

To assess students' knowledge of materials, the question "After delivering the lecture, do you feel that your knowledge of the material has improved?" was posed. **Figure 9** illustrates the analyzed responses based on different categories for this question.

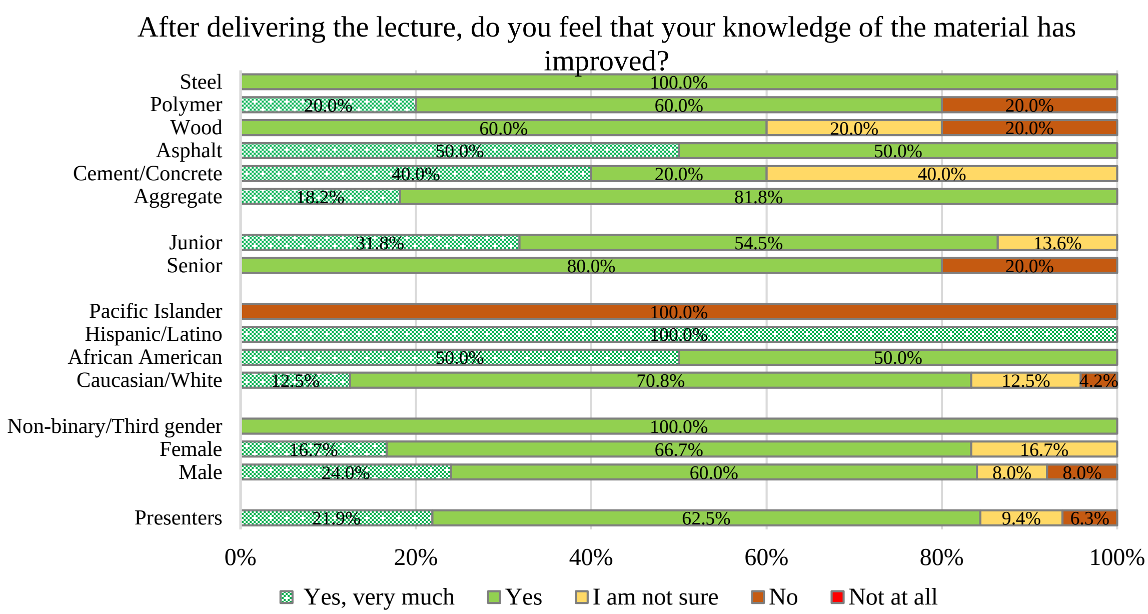

Figure 9. Students' opinion on knowledge improvement or not.

The majority of students (62.5%) selected the option "yes", followed by "yes, very much" (21.9%). A similar proportion of female (83.4%) and male (84%) students felt that their knowledge had improved, with a p-value of 0.209 indicating no significant difference between genders. Similarly, a greater proportion of Caucasian students (83.3%) agreed with the improvement in their knowledge, while all (100%) of the African American students felt a kind of improvement in their knowledge after the lecture delivery. However, a p-value of 0.292 suggested no significant difference among these ethnic students. Among the student levels, 86.3% of junior-level students felt an increase in their knowledge, while 80.0% of senior-level students indicated knowledge improvement by selecting either “yes” or “yes, very much”. However, 20% of senior-level students chose the option “No”, expressing no improvement in their knowledge after the lecture delivery. With a p-value of 0.411, it shows no significant difference in the response in terms of college level. Regarding students delivering lectures on different topics, most students reported an improvement in their knowledge of the material to some extent. However, one student from the lecture topics on wood and polymer did not feel an improvement in their knowledge.

3.3.3 Reason for Knowledge Improvement

After determining whether students observed an improvement in their knowledge following the lecture, the actual reasons they felt contributed to the knowledge improvement were explored. To gather this information, the question “Please provide the reasons for your response above: (Open-ended question)” was posed. The responses from students, categorized by the level of knowledge improvement, are presented in **Table 5**. The analysis of the responses revealed that a significant number of students who reported any level of improvement in their knowledge attributed it to the necessity of spending more time researching and understanding the topic before presenting it in front of the class. Similarly, some students expressed concerns about focusing more on their presentation segment. Additionally, the abundance of available information and the utilization of only limited information in the presentation left them uncertain about any knowledge enhancement regarding the material. Consequently, a student reported no improvement in knowledge, citing that he was already familiar with most of the information related to the lecture topic.

Table 5. Reason for Improvement in Knowledge

Improvement	Reason
Yes, very much	Deep dive into the material so you can present it.
	The additional research needed to present made me learn it better.
	Now understand all the steps of the mix design volumetric method.
	Had to study the presentation to be ready for it.
	Spent more time learning the material.
	The presentation helped provide a more detailed explanation of my previous knowledge.
Yes	It improved in the areas I spent the most time researching.
	Studied beforehand, because had to own info to pass on to other students.
	Had to do extensive research to better understand the material.
	Had to learn the material to teach it to others.
	Took more time to learn the subject.

	Learned more giving the lecture than listening.
	Looked over the material more so that a fluent presentation and students' questions could be answered.
	Focused more while presenting in front of the class.
	Our group had to dive into the material to ensure we knew what we were talking about.
	Understand the material slightly more than if it were taught by others.
	Studied the lecture last night.
	Learned a lot about steel production and the iron-carbon diagram.
I am not sure	I Didn't feel like I understood the topic because the slides were limited. There is so much information online, that it was overwhelming, and that didn't mix well with the thought of having to give the lecture.
	More worried about a portion of my lecture and therefore couldn't focus on the others.
	Focused more on presenting and less on learning info.
No	Felt like I already knew most of the stuff about woodwork in the slides.

Overall, this highlights the significance of student ownership in the learning process, as evidenced by students' active engagement in research, preparation, and presentation of lecture material. This also underscores the importance of thorough preparation and in-depth research in facilitating meaningful learning experiences. Moreover, by taking ownership of the information and presenting it to others, students not only enhance their understanding but also contribute to the learning of their peers, emphasizing the collaborative nature of effective learning environments.

3.3.4 Role in a Team

Another question related to their role in a team was, "When working in a team to prepare for the lecture, which role best describes your contribution?" **Figure 10** illustrates the analyzed responses of students based on different categories for this question. The majority of students (56.3%) selected the option "I am one of the leaders, responsible for completing my tasks and supporting others when needed." In response to this question, a double proportion of female students (16.1%) considered themselves the main leader in a group compared to male students. Only one male student identified as a passive follower. Similarly, almost twice as many African American students (16.7%) saw themselves as the main leader compared to Caucasian students (8.3%). However, a greater proportion of Caucasian students (58.3%) viewed themselves as one of the leaders, completing their tasks and assisting others when needed. Fifty percent of African American students considered themselves active followers, ensuring they completed their tasks on time.

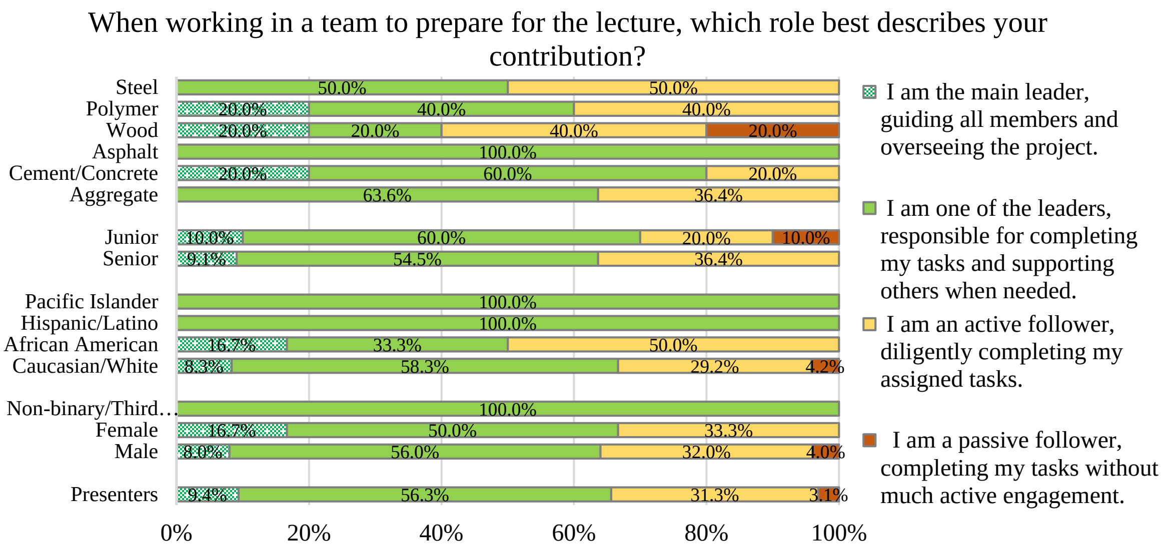

Figure 10. Students' opinion on their role in a team.

A slight variation in the proportion of senior-level and junior-level students' opinions on their role in a team was observed. Regarding students delivering lectures on different topics, all students delivering lectures on the topic of asphalt see themselves as one of the leaders. In contrast, one student from the lecture topics on cement/concrete, wood, and polymer considered themselves the main leader of the team, guiding all other members and overseeing the project.

As a result of their roles, questions regarding their contribution to the team lecture were posed. Specifically, they were asked, "When working in a team for this lecture delivery, what percentage of contribution do you feel you made to the team's presentation success? Please place a value from 0% to 100%." This question aimed to prompt participants to reflect and assess their personal impact on the team's overall success in delivering the lecture. **Table 6** presents the average percentage contribution provided by the students based on their roles in a team.

Table 6. Average Contribution to the Team's Presentation

Group	I am the main leader, guiding all members and overseeing the project.	I am one of the leaders, responsible for completing my tasks and supporting others when needed.	I am an active follower, diligently completing my assigned tasks.	I am a passive follower, completing my tasks without much active engagement.	Junior Level vs Senior Level
Aggregate	0	31.7%	29.4%	0	29.2%: 45.0%
Concrete	20%	36.7%	25.0%	0	35.0%: 33.0%
Asphalt	0	26.2%	0	0	25.0%: 30.0%
Wood	99%	25.0%	40.8%	10%	58.3%: 44.7%
Polymer	100%	14.1%	94.9%	0	100%: 40%
Steel	0	40.0%	30.0%	0	35%: 0

Analyzing the table, it is evident that students, despite having different roles in a team, provided similar percentage contributions to the team's presentation. On average, students who considered themselves as one of the leaders had an average contribution of 31.7%, while those identifying as active followers had an average contribution of 29.4%. Senior-level students demonstrated a higher contribution than junior-level students in this overall group, with average percentage contributions of 45% and 29.2%, respectively.

Examining specific groups, the Concrete group saw higher contributions (36.7%) from students considering themselves as one of the leaders, and junior and senior-level students had similar percentage contributions of 35.0% and 33.0%, respectively. In the Wood group, diverse perceptions of roles were observed, leading to variations in percentage contributions. A senior-level student identifying as a main leader claimed a 99% contribution, while a junior-level student seeing themselves as an active follower felt they provided 100%. However, another student with the role of an active follower contributed only 16.67%, resulting in an overall average contribution of 40.83%. In the Polymer group, a junior-level student perceiving themselves as the main leader claimed a 100% contribution, and students identifying as active followers reported an average contribution of 94.8%, with one junior-level student at 100% and a senior-level student at 90%. The overall contribution was 100% by senior-level students and 40.0% by junior-level students. For the Steel group, comprising only junior-level students, a similar contribution to the success of the presentation was reported. One student considering themselves as one of the leaders claimed a 40% contribution, while another, identifying as an active follower, reported a 30% contribution.

3.3.5 Relationship with the Teammates

As the students were required to present lectures as a team, they found themselves in the position of constant interaction, preparing presentations together. Prior to this class, most students were unfamiliar with each other. The question 'After working in a team, how do you perceive your relationship with teammates?' aimed to assess if students were successful in building new connections through teamwork. The findings, depicted in **Figure 11**, reveal that a significant majority (81.2%) reported an improvement or significant improvement in their relationships with teammates.

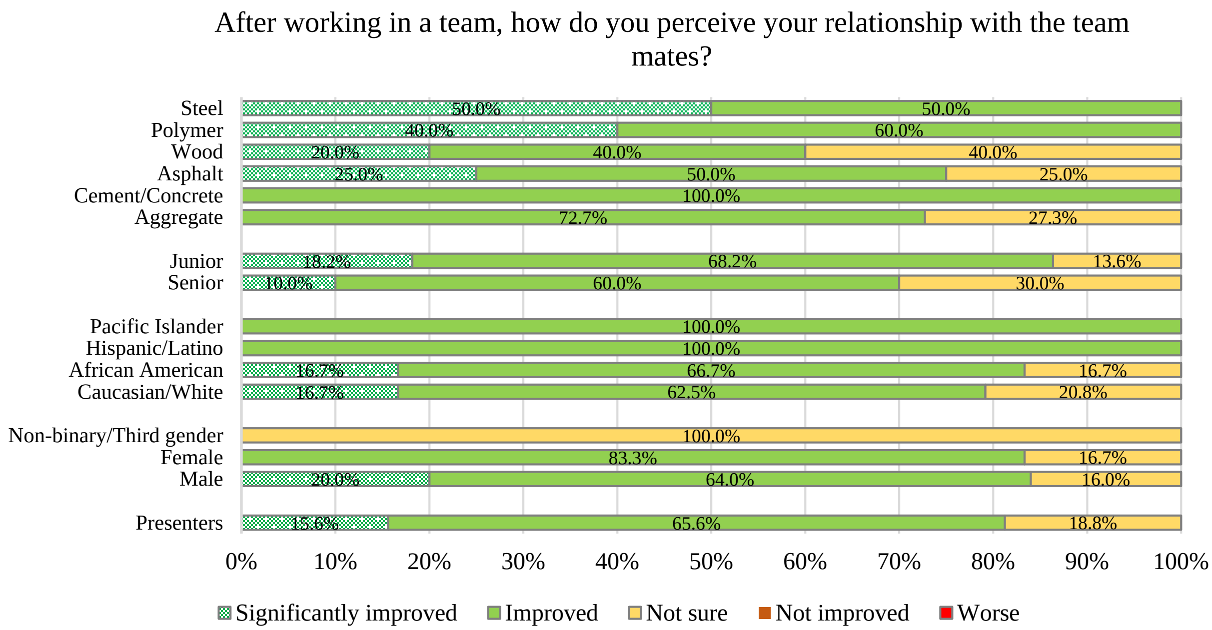

Figure 11. Students' relationship with their teammates.

An interesting observation emerges when comparing the perceptions of male and female students. While 20% of male students reported a significant improvement in relationships, no female students indicated significant improvement. Non-binary students expressed uncertainty about improvement. However, a p-value of 0.254 suggested no statistically significant difference between male and female students' relationship improvement with their teammates. Similarly, both African American and Caucasian students reported a comparable proportion of significant improvement in relationships. However, a greater percentage of Caucasian students (20.8%) than African American students (16.7%) were uncertain about the perceived improvement, with a p-value of 0.241.

Examining the perceptions of junior-level and senior-level students, a higher proportion of junior-level students (86.4%) reported either improved or significantly improved relationships, compared to 70% of senior-level students. Additionally, 30% of senior-level students were uncertain about the improvement in their relationships with teammates, of which a p-value of 0.446 was observed, suggesting no statistically significant difference among the college-level students. Considering the groups delivering lectures on different topics, all students in the cement/concrete group perceived an 'improved' relationship with their teammates. Similarly, groups delivering lectures on polymer and steel reported either an improved or significantly improved relationship. In contrast, 40% of students in the wood group expressed uncertainty about the improved relationship with their teammates.

3.3.6 Confidence in Delivering Lecture

Initially, students' comfort with delivering lectures in this class might be influenced by their prior presentation experiences in other classes. To explore this aspect, the question "If you were requested to deliver a topic about CEM now, how comfortable would you be?" was introduced after students had delivered a lecture in this class. **Figure 12** illustrates the analyzed responses, with the majority of students (53.1%) reporting feeling comfortable, and 21.9% still expressing uncertainty about confidently presenting in front of the class.

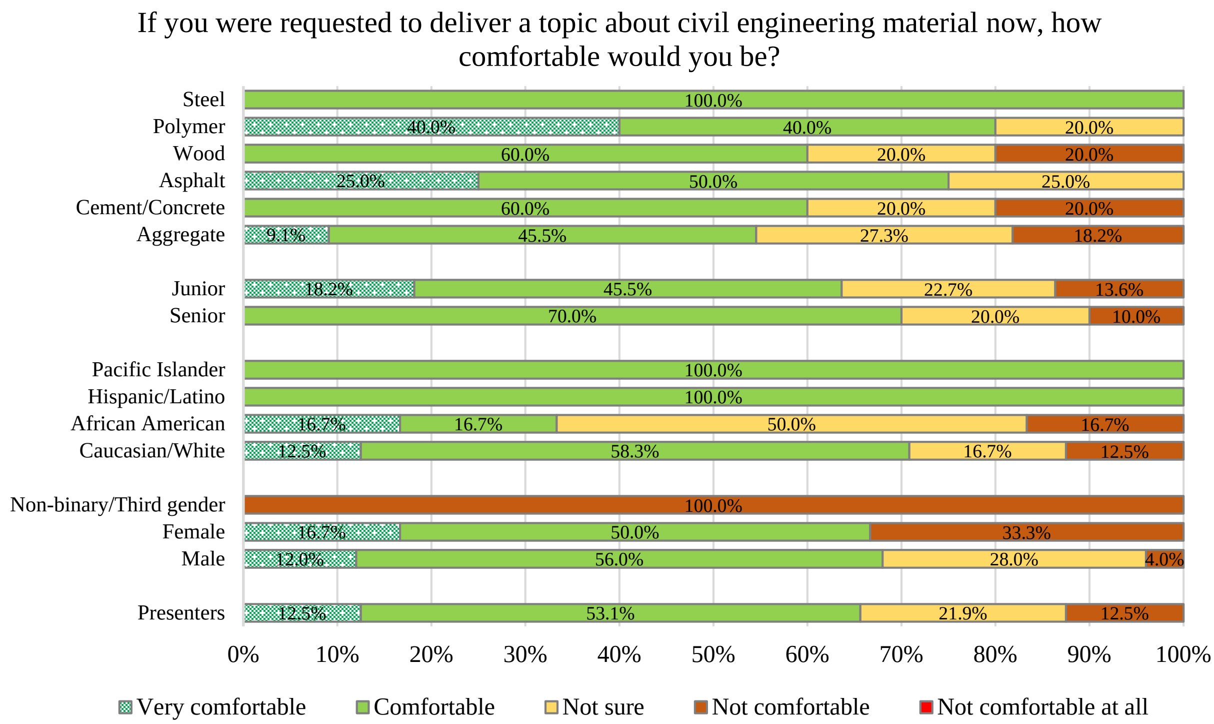

Figure 12. Students' confidence in delivering lectures after presenting on their topic.

Examining gender differences, approximately 33.3% of female students indicated they were not comfortable delivering a topic on CEM, compared to only 4% of male students. Conversely, 66.7% of female students reported being either comfortable or very comfortable, while 68% of male students opted for these options. With a p-value of 0.184, it was observed that there is no statistically significant difference between males and females, in feeling confidence in lecture delivery. Regarding racial differences, 70.8% of Caucasian students responded as being comfortable or significantly comfortable, while only 33.4% of African American students shared the same sentiment. Additionally, 50% of African American students expressed uncertainty about lecture delivery, suggesting that Caucasian students may feel more confident. However, a p-value of 0.179 showed no significant difference based on ethnicity.

Analyzing comfort levels based on academic standing, 18.2% of junior-level students strongly felt comfortable with lecture delivery, while no senior-level students reported the same level of comfort. However, when considering the combined responses for comfort, the proportion of senior-level students is slightly higher. Nevertheless, a p-value of 0.284 indicates that there is no statistically significant difference in the responses of students based on college level. Considering students delivering lectures on different topics, 40% of students in the polymers group reported being significantly comfortable with delivering lectures, the highest compared to other group topics. All students in the steel group felt comfortable with the lecture delivery.

Conversely, a similar proportion of students from the steel (20%), cement/concrete (20%), and aggregate (18.2%) groups still felt uncomfortable delivering a lecture in front of the classroom.

3.3.7 Factors for an Effective Lecture

In the survey, respondents were asked, “In your opinion, what is the most important factor for an effective lecture?” The key factors included adequate preparation for the lecture, the ability to inspire critical thinking, making the class engaging and interesting, ensuring active student participation, and incorporating interactive elements or small games. The response analysis is summarized in **Figure 13**.

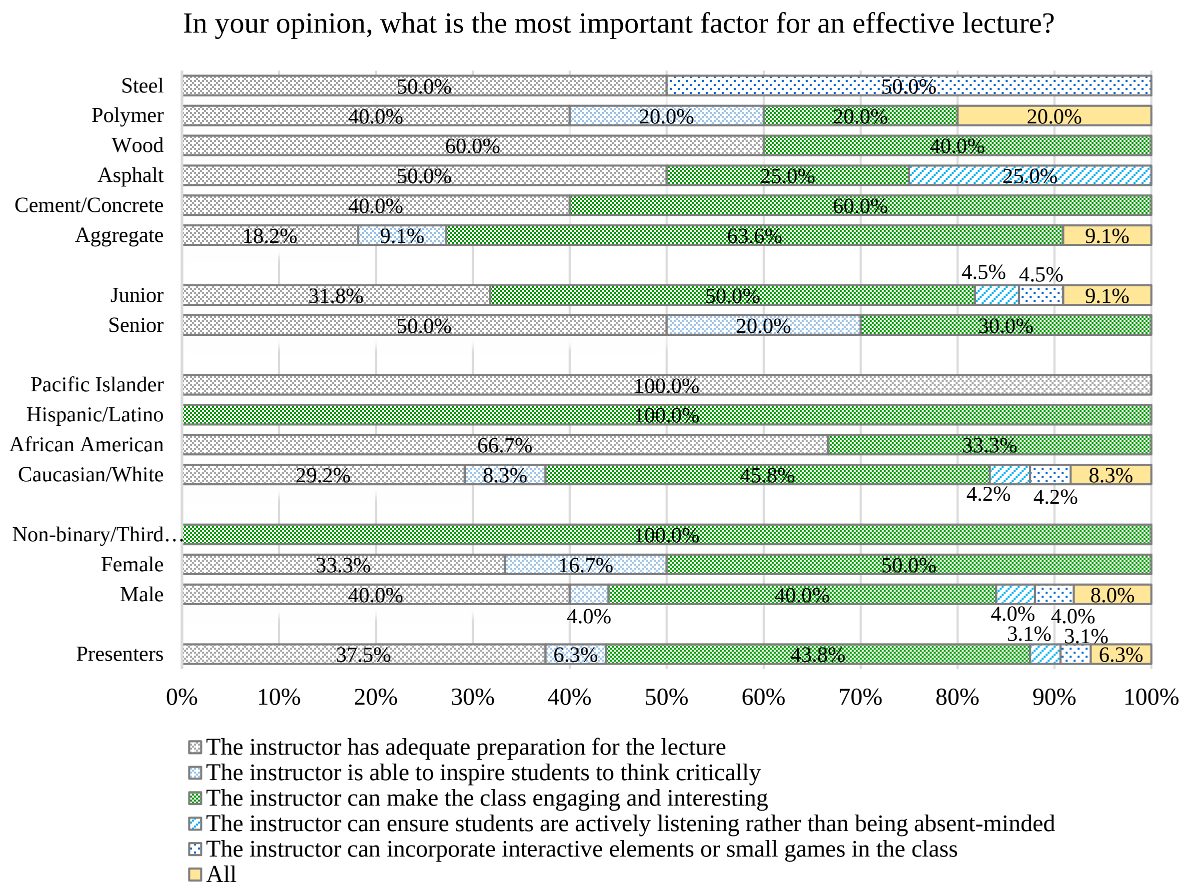

Figure 13. Students’ opinions on important factors for an effective lecture.

A significant proportion of presenters (43.8%) believe that making the class engaging and interesting is crucial for an effective lecture, while another substantial group (37.5%) emphasizes the importance of instructors having adequate preparation. This suggests that lecturers should be well-prepared before delivering a lecture, and they should find engaging ways to involve students in the topic conversation. Notably, an equal number of male students (40%) responded to both adequate preparation and making the class engaging and interesting, while the majority of female students (50%) and all non-binary students (100%) leaned towards the latter. Only two male students (8.0%) considered all five factors for an effective lecture. Considering male and female a p-value of 0.130 was observed which suggested no statistically significant difference in the opinion of male and female respondents. Among ethnic groups, most Caucasian students (45.8%) favored making the class engaging and interesting, with some (8.3%) indicating that all five factors contribute to an effective lecture. In contrast, the majority of African Americans (66.7%) highlighted the importance of adequate preparation. However, a p-value of 0.128 indicated there is no significant difference in opinion between African American and Caucasian students. Additionally, while 50% of senior-level students considered adequate preparation, an equal proportion of junior-level students (50%) emphasized making the class engaging and interesting. Some junior-level students (9.1%) chose all five factors, however, with a p-value of 0.138, statistically no significant difference is observed for the senior and junior-level students. Looking at students delivering lectures on different topics, a divergence in responses is evident. Students from the Steel group (50%) considered incorporating interactive elements or small games, while students from other groups did not. In conclusion, there is a difference in opinions on the most important factor for an effective lecture, but overall, making the class engaging and interesting and adequate preparation by the lecturer are deemed major factors.

3.3.8 Non-Presenters' Perceived Knowledge Enhancement

As the part of group lecture evaluation process non-presenters or listeners, students were asked to provide feedback on knowledge improvement. Particularly, the question "After attending this group's lecture, do you feel that your knowledge of the TOPIC material has improved?" was asked and an overall response was analyzed. **Figure 14** represents the combined response analysis of all the students who attended different group lecture deliveries.

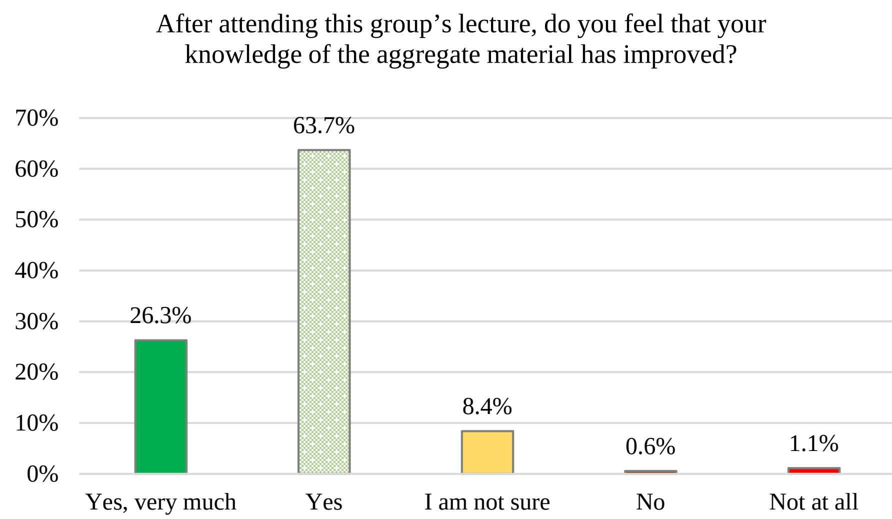

Figure 14. Non-presenting students' responses on knowledge improvement after attending students' lecture delivery.

It was observed that a majority of respondents (63.7%) reported feeling that their understanding of the aggregate material had improved to some extent after attending the lecture. A notable proportion (26.3%) indicated a significant improvement in their knowledge, while a smaller percentage expressed uncertainty (8.4%) about the extent of their learning. Minimal responses indicated no perceived improvement (0.6%) or a lack thereof (1.1%). Overall, the findings underscore the beneficial influence of group lectures in augmenting students' comprehension across a diverse spectrum of material types.

4. Conclusions

This study aimed to assess the effectiveness of a student-led group lecture delivery strategy in a junior civil engineering class, intending to promote students' ownership of learning and active engagement. The process involved conducting a pre-class survey for CEM-registered students, followed by each student-led group delivering one lecture throughout the semester. Post-class surveys were then conducted, and responses were analyzed. The key findings are summarized below.

The analysis of students' responses provided insights into their learning preferences and experiences. A significant number of students identified as visual learners, emphasizing the importance of attending lectures for effective comprehension of engineering concepts. Many students recognized that delivering presentations independently contributed to a better understanding of specific topics. Despite initial hesitations about independent lecture delivery, students reported an increased comfort level when delivering lectures within a team setting. Subsequently, after delivering a lecture, the majority expressed heightened confidence in presenting individually, indicating that group work significantly enhances students' self-assurance—a finding consistent with existing literature. However, statistically no significant difference in opinion among gender, college level, and ethnicity was observed. Additionally, findings from the group lecture participant survey are:

1) Regarding the reception of the implemented technique among students, while female, senior-level, and African American undergraduate students generally demonstrated a higher affinity for team-based lectures, statistical analysis revealed no significant differences in opinion between their demographics, indicating a general acceptance of this pedagogical approach among diverse student populations.
2) While a similar proportion of male and female students, a greater proportion of African American and junior-level students felt an increase in their knowledge after lecture delivery, there were no statistically significant differences among corresponding demographics.
3) Students who actively engaged in researching and preparing their presentation materials reported a greater sense of knowledge improvement, highlighting the importance of student ownership in driving deeper understanding and comprehension of the lecture material.
4) Distinct role preferences were observed, with females favoring organization and coordination, males leaning towards technical tasks and leadership, seniors preferring leadership and decision-making, juniors favoring research and data collection, African American students gravitating towards central leadership, and Caucasian/White students preferring shared leadership or active follower roles.
5) While more males and junior-level students reported significant improvement, with a similar proportion of Caucasians and African Americans on perceived improvement in relationships with teammates, no statistically significant differences were observed within their demographics.
6) While notable differences were observed in self-reported comfort levels among demographic groups, with more females reporting discomfort than males, a larger portion of African

Americans feeling uncertain compared to Caucasians, and juniors expressing slightly less overall comfort than seniors, none of these differences were found to be statistically significant.

7) Despite some variations in opinions based on gender, ethnicity, college level, and lecture topic, statistically no significant difference among the corresponding demographics was observed. However, making the class engaging and interesting, and ensuring adequate preparation by the lecturer emerged as the two most important factors for an effective lecture.

Similarly, the response of non-presenting or listener students also suggests that the group lecture effectively contributed to students' improved understanding of the lecture topic, with a majority expressing a sense of knowledge enhancement. This underscores the value of such instructional methods in facilitating learning and comprehension among students. It is also worth noting that no statistically significant difference in the response among demographics was observed for the question being posed in this survey.

The study, being a pilot project implemented in a single course, prompts recommendations for future research. A longitudinal study could be conducted by applying this method in subsequent years to assess its replicability. Additionally, refining the design of group-led lectures could involve allowing students to choose their topics. Further guidance on crafting effective PowerPoint presentations, delivering engaging lectures, and fostering audience interaction could enhance the overall effectiveness of this teaching approach.

Acknowledgments

The project is funded by the SoTL Institute at the University of South Alabama. We would like to extend our sincere gratitude to Dr. Robin Lasey, Dr. Lisa LaCross, and Dr. S. Raj Chaudhury from the Innovation in Learning Center at the University of South Alabama for their invaluable support in conducting this study. Additionally, we express our appreciation to the civil engineering students who participated in the anonymous survey. This project has been approved by the Institutional Review Board (IRB No. 2084182-1).

References

[1] S. Bhavikatti, *Basic Civil Engineering*. NEW AGE International Publishers, 2019.

[2] M. R. Islam, *Civil Engineering Materials: Introduction and Laboratory Testing*. CRC Press, 2020.

[3] N. Sivakugan, C. T. Gnanendran, R. Tuladhar, and M. B. Kannan, M. B. *Civil Engineering Materials.* Cengage Learning, 2017.

[4] D. L. Volt and M. Damiano-Lantz, "Developing ownership in learning," *Teaching Exceptional Children*, vol. 25, pp. 18-22, 1993.

[5] D. T. Conley and E. M. French, "Student ownership of learning as a key component of college readiness," *American Behavioral Scientist*, vol. 58, pp. 1018-1034, 2014.

[6] P. E. Chan, K. J. Graham-Day, V. A. Ressa, M. T. Peters, and M. Konrad, "Beyond involvement: promoting student ownership of learning in classrooms," *Intervention in School and Clinic*, vol. 50, pp. 105-113, 2014.

[7] J. Scott, "Student ownership of education: Practicing democracy in schools," *Education Canada*, vol. 49(2), pp. 36-38, 2009.

[8] D. A. McConnell, L. Chapman, C. D. Czajka, J. P. Jones, K. D. Ryker, and J. Wiggen, “Instructional utility and learning efficacy of common active learning strategies,“ *Journal of Geoscience Education*, vol. *65,* pp. 604-625, 2017.

[9] J. A. Weir, J. A. Active learning in transportation engineering education. *Worcester Polytechnic Institute*, 2005.

[10] N. R. Maier, “Innovation in education,“ *American Psychologist*, vol. *26,* pp. 722-725, 1971.

[11] K. A. Bentley, P. C. Brewer, and T. V. Eaton, “Motivating students to prepare for class and engage in discussion using the hot seat,“ *Journal of Accounting Education*, vol. 27, pp. 155-167, 2009.

[12] M. J. Diamond, “Improving the undergraduate lecture class by use of student-led discussion groups,“ *American Psychologist*, vol. 27, pp. 978-981, 1972.

[13] K. G. Gomathi, I. A. Shaafie, and M. Venkatramana, M., “Student-led seminars as a teaching-learning method-effectiveness of a modified format,“ *South East Asian J Med Educ*, vol. 8, pp.82-84, 2014.

[14] S. Wu., S. Zha, and S. Mattson, “Integrating team-based learning modules to improve civil engineering students’ technical writing skills,“ *Journal of Civil Engineering Education*, vol.146, 2020.

Appendix A

A1. Pre-Class Survey Questions

1. Which methods below can help you learn engineering concepts better? (Rank, multiple options)

a) Attending lectures
b) Watching short instructional videos
c) Doing homework
d) Participating in the instructor’s course design
e) Joining a study group

Rank: ____ > ____ > _____ > _____ > ____

2. In your opinion, what is the most important factor for an effective lecture?

a) The instructor has adequate preparation for the lecture.
b) The instructor is able to inspire students to think critically.
c) The instructor can make the class engaging and interesting.
d) The instructor can ensure students are actively listening rather than being absent-minded.
e) The instructor can incorporate interactive elements or small games in the class.

3. If you were asked to deliver a lecture about a civil engineering material in class by yourself, how comfortable would you feel?

a) Very comfortable
b) Comfortable
c) Not sure

d) Not comfortable
e) Not comfortable at all

4. If you were asked to deliver a lecture about a civil engineering material in class with a team, how comfortable would you feel?

a) Very comfortable
b) Comfortable
c) Not sure
d) Not comfortable
e) Not comfortable at all

5. If you were trained and given time to prepare for your lecture on a specific topic, how comfortable would you feel?

a) Very comfortable
b) Comfortable
c) Not sure
d) Not comfortable
e) Not comfortable at all

6. How much do you agree with the statement "Asking students to deliver a lecture can help them learn better about that specific topic"?

a) Strongly agree
b) Agree
c) Neither agree nor disagree
d) Disagree
e) Strongly disagree

7. What type of learners do you think you are?

a) Visual learner
b) Audio learner
c) Verbal learner
d) Analytical leaner
e) Social learner
f) Solo learner
g) Natural learner

8. What is your primary concern when delivering a lecture about a civil engineering topic in class? (Open-ended question)

A2. Group Lecture Evaluation

Group Lecture Delivered by: ____

1. How do you like the first group's lecture on the topic?

a) I really like it.
b) I like it.

c) I am not sure.
d) I do not like it.
e) I really do not like it.

2. After attending this group's lecture, do you feel that your knowledge of this material has improved?

a) Yes, very much.
b) Yes.
c) I am not sure.
d) No.
e) Not at all.

3. What do you like most about this group's lecture?

4. What suggestions do you have for the group to improve their lecture?

A3. Post-Class Survey Questions

1. Which topic did your team work on?

a) Aggregate
b) Cement/Concrete
c) Asphalt
d) Steel
e) Polymer
f) Other (Please specify): ___________

2. How do you feel about the idea of students delivering a team lecture on a specific civil engineering material?

a) I really like it.
b) I like it.
c) I am not sure.
d) I do not like it.
e) I really do not like it.

3. After delivering the lecture, do you feel that your knowledge of the material has improved?

a) Yes, very much.
b) Yes.
c) I am not sure.
d) No.
e) Not at all.

Please provide the reasons for your response above: (Open-ended question)

4. When working in a team to prepare for the lecture, which role best describes your contribution?

a) I am the main leader, guiding all members and overseeing the project.
b) I am one of the leaders, responsible for completing my tasks and supporting others when needed.
c) I am an active follower, diligently completing my assigned tasks.
d) I am a passive follower, completing my tasks without much active engagement.

5. When working in a team for this lecture delivery, what percentage of contribution do you feel you made to the team's presentation success? Please place a value from 0% to 100%.

6. What techniques or methods has your team employed to promote student engagement in class? (Open-ended question)

7. After working in a team, how do you perceive your relationship with the teammates?

a) Significantly improved
b) Improved
c) Not sure
d) Not improved
e) Worse

8. If you were requested to deliver a topic about civil engineering material now, how comfortable would you be?

a) Very comfortable.
b) Comfortable.
c) Not sure.
d) Not comfortable.
e) Not comfortable at all.

9. In your opinion, what is the most important factor for an effective lecture?

a) The instructor has adequate preparation for the lecture.
b) The instructor is able to inspire students to think critically.

c) The instructor can make the class engaging and interesting.
d) The instructor can ensure students are actively listening rather than being absent-minded.
e) The instructor can incorporate interactive elements or small games in the class.

Background Information

1. What is your college level?

a) First-year
b) Sophomore
c) Junior
d) Senior
e) Graduate

2. What is your gender?

a) Male
b) Female
c) Non-binary/Third gender
d) Prefer not to say
e) Other (Please specify): __________

3. What is your ethnicity?

a) Asian
b) African American
c) Caucasian/White
d) Hispanic/Latino
e) Native American/Indigenous
f) Pacific Islander
g) Mixed/Multiracial
h) Other (Please specify): __________