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Perceptions of university students on cognitive learning activities in classrooms

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Abstract

This pilot study seeks to measure students' perceptions of injected cognitive learning activities used to promote an enriching learning experience. A sample of 30 students (n=30) spanning the disciplines of Information Technology (IT) and Business at a state university in the southeastern United States were exposed to embedded cognitive features in the classroom to reduce stress and anxiety while promoting cognitive awareness. The class was offered to Business and IT students. The added treatments included engagement activities, walking lectures, classroom yoga, outside-of-class events, music, guest speakers, and active learning exercises. The pilot study follows recommendations on how to use small populations for making statistical analysis in pilot studies for non-generalization conclusions, and to form feasibility and exploratory future larger studies. Following the completion of the classes, students were surveyed to gain insight into their opinions of the treatments and to determine whether there are statistically significant differences among various student demographics. The embedded cognitive learning activities were reported to be helpful by 86.6% of the students while 83.4% reported an increased ability to learn. Male students reported a higher receptiveness to the cognitive learning activities relative to female counterparts, and IT students reported a higher receptiveness to cognitive learning activities than their business student counterparts.

Keywords: cognitive learning, class stress reduction, cognitive teaching practices, cognitive aids in classrooms, anxiety reduction, embedded features

Introduction

Gladwell's bestselling book "Outliers" portrays stories of successful individuals and discusses factors to their success like educational differences, cultural upbringings, and family or genetic differences. The scholar also notes how Noble Prize winners have come from elite universities and public universities or colleges because divergence testing considerations on opportunity potential is a greater indicator of success than intelligence testing as a means for college acceptance (Gladwell, 2008, p. 89). It is from this premise that universities that offer cognitive learning considerations can generate greater potential learning outcomes in their students. As an example, in Spangler (2019) the students that noticed an embedded librarian's face in their online course shells and used the librarian's services to understand how to find literature pieces for research papers rated the students' success at 80% versus those that did not utilize services. This finding was found consistently in research models on embedded librarians and embedded tutors in courses whereby cognitive learning practices are utilized. In this study cognitive

learning is considered from the scholar Susan Hrach's perspective of a means to "placing oneself in unfamiliar positions and remaining open to new ideas that may be unpleasant" to spark curiosity and develop new habits (Hrach, 2021, pp. 161-163).

Literature

Effects of Anxiety in Classrooms

In many cases, students and faculty become so accustomed to observing "the way things are done" in the classroom thus creating a culture or status quo. While this educational status quo can be extremely beneficial by contributing to an increased sense of self-efficacy for students and educators alike, it can also create a norm whose inhabitants are highly resistant to change (Xi-Hui & Tu, 2024). This mindset is problematic when it is noted that the adoption of new technology can be used to increase analysis of results, accumulation of relevant data for research, and even contribute to the removal of spatial and temporal barriers experienced by students living in rural areas or with increased demands placed on available time, and improved methods of content delivery (Luan & Teo, 2009; Ormerod & Rosewell, 2009; and Schulte, 2010). This is further exacerbated by the observed time for adoption of evolving technology entering the classroom taking longer than the observed technology entering the related industry by a factor of two (Murray, 2008).

In the past few years, many students and educators experienced a disruption in the status quo of life, work and school caused by the spread and threat associated with COVID-19. The resulting pandemic caused disruptions in many areas of daily life around the world including the transaction of education and social interaction. This disruption led to an increase in anxiety, a drop in educational self-efficacy, and a reduction in social interaction among students and faculty (Xi-Hui& Tu, 2024). The effect of a reduction in self-efficacy can be observed by a reduction in critical thinking skills, an increase in academic procrastination, and a reduction in cognition (Liline, et al., 2024; Xi-Hui & Tu, 2024).

School environments have long been a stressful adventure for students since the first day riding a bus to kindergarten or heading off to college. The unknown school environments and perceived threats are two areas of predisposed anxiety for any student at any age. Anxiety at any level can impede a student's cognitive ability to achieve success and can "interfere with the attentional resources needed for memory tasks" (Cecillon et al., 2024, p. 2). Executive cognitive functions can be hindered by anxiety-inducing areas or actions inside of classrooms, which students are often attempting to fend off to achieve academic success. Scholarly studies have uncovered links between performance and proficiency in information management and retention. The cognitive beliefs in a student can manifest and influence their self-efficacy and attitudes about their chances for success. A study of 292 French students by the University of Grenoble-Alpes found individual students attempted to understand if emotional regulation strategies and metacognitive beliefs impact academic achievement and can be mediated through anxiety reduction. The researchers' found anxiety was strongly correlated with executive functioning problems and behavioral manifestations of performance and "plays a negative role in academic achievement" (p. 14).

Impacts of physical environments in classrooms

Students learn from four different frames: interactions with content, other people (can include teachers and peers), self (through self-regulation), and practice of tasks like problem-solving, which can include utilizing multimedia sources, graphics, and text resources. But ultimately, students face learning overload. To help

reduce the load, cognitive learning activities have been created to aid in understanding academic learning outcomes. Methods include fostering and creating social learning and development environments to develop confidence and motivation, which can include collaborative learning and student-teacher dialogues in a Socratic methodology. It has also become a complex problem to integrate around other stress factors and not be a contributor to students' anxiety and loss of higher-order thinking (Wang, 2024).

In a study of 548 higher education mathematics students on motivation and academic performance, it was determined that faculty must create environments to support positive student behavior and stress reductions. Particularly, strategies that engage a student's curiosity like changing learning environments, utilizing technology, and self-regulated learning through actions of flipped classrooms or corporative learning can have significant windfalls in academic achievement, self-efficacy, or self-satisfaction towards learning. The researchers' hypothesis notes that curiosity and self-concept are directly related to academic performance whereby they found curiosity in learning methods or actions is directly related to the practices of utilizing cognitive learning strategies. Overall, cognitive learning strategies have a positive influence on academic performance and students' satisfaction with learning (Wild & Neef, 2023). This is similarly noted in the effects of utilizing visual arts and art activities to increase the academic performance of students in a large-scale study of 1624 Chinese students in Deer et al. (2024). The researchers note extracurricular art activities especially outside of school periods have a positive effect on students' cognitive learning actions, which can include music, theatre, drawing, painting photography, scouts, or other activities in and out of the classroom. The researchers explain that students engaged in artistic cognitive actions often reached higher achievement and psychological well-being effects versus their counterparts playing video games had no sustainable advantages. Overall, the study pointed out constancies with past U.S. studies that note students engaged in arts and music (in courses with art pedagogy additives) raise their academic performances and similarities to the results of a study in Kenya that affirms art engagement in academics raises students' confidence and increases proactive self-expression and overall success (Deer et al., 2024).

Classroom dynamics and pedagogy changes

Academic success is often arrived at by unique or different pedagogical teaching methods that inspire or motivate students cognitively and emotionally. The result of this motivation is a perceived increase in self-efficacy on the part of the student. In a mixed methodology study on 116 English language and skills students, researchers discovered students valued course learning activities that offer cognitive experiences and help them to develop confidence, independence, and self-reliance. Particularly students found that active learning practices considered were beneficial to their academic success. Students noted that flipped classroom styles of active learning mechanics that engage their cognitive abilities foster greater achievement. Students also noted that the activities and strategies in the courses made the course more "helpful and enjoyable" and allowed for deeper interpersonal critical thinking abilities (Gasmi & Al Nadabi, 2023, p. 1228). Overall, the researchers noted the broader implications of active learning and Socratic learning structures in classes motivated students to learn. Similarly uncovered by Owusu-Agyeman and Moroeroe (2023), the quality of instruction between teachers and students can create a meaningful relationship and aid in cognitive changes toward students having greater motivational outcomes for academic success (p. 42).

Teachers who promote classroom bonding activities and cognitive learning actions create an environment of compassion. Students in courses with cognitive asserted compassionate learning activities and bonding activities regard their teachers as more caring for a student's success. This feeling of compassion and regard toward a student's overall academic well-being and success also creates a connectedness to the classroom and institution. The survey of 224 Southwestern university students demonstrated that teacher affection for

students such as providing guidance, concern about their welfare, and support for their goals positively predicted student engagement in a classroom (Waldbuesser & Raalte, 2022, p. 14). Likewise, Owusu-Agyeman and Moroeroe (2023) concluded according to the social constructivism theory that learners construct knowledge through active learning process. The researchers questioned how interjecting into classes social rituals and symbolic behaviors practices such as learning about students' backgrounds and creating social groups or teams in courses as pedagogy changes creates a social connection between teachers and students and overall behavioral changes. The overall experience in research on 27 faculty members and 51 students described both sides achieving greater cognitive dimensions of student engagement, motivation, and greater classroom culture. The conceptual models of enhanced student learning experiences–especially in low-socioeconomic background students and first-year students–were found to have greater competencies and cognitive development with stronger positive learning experiences. One participant responded that teachers who "initiate conversations… and accommodate the differing opinions of students" are appreciated more by students" (43).

Movement and bodies affect learning

In *Minding Bodies*, Hrach (2021) relied on cognitive science research that examines the importance of the body, movement, and the environment to the learning process. The researcher notes that physical movement increases one's ability to focus attention longer, increases executive functions, and memory. Prior research recognizes the benefits of physical activity for anxiety and depression, concentration, creativity, and focus (pp. 200-201). Hrach suggests that college professors consider how to change the classroom experience to incorporate more movement, preferably outside. As an example, simple stretching exercises can help students find a sense of calm at the start of class or regain focus during a lecture. These simple exercises, as well as going outside the classroom, can take the brain out of autopilot mode. This cognitive and physical treatment offers students a break from the routine. The author suggests informing students that the treatment activities are designed to improve brain function and retention of information.

Hrach also recognizes that our physical space and physical sensations such as sights, sounds, and touch enhance learning. Hrach recommends seeking out activities that embrace the senses in our classrooms. Sound activities, such as listening to classical music, can improve a student's focus. Similarly, incorporating the natural environment, such as natural light, air, and sound, can reduce stress, enhance cognitive functioning, and positively impact a student's mood. Hrach concludes her analysis by stating, "We know that brains are deeply embodied, that bodies are deeply interconnected, and that an ecosystem model– not an assembly line– best represents the dynamic interplay that produces human learning" (p. 174). With this mindset, the author recommends that higher education faculty recognize the impact of the physical classroom space on learning, take classes outside whenever possible, and incorporate sensory and movement experiences into the class activities.

This pilot study aims to understand the perceptions and attitudes of students towards the embedded cognitive learning activities when placed by faculty members in a classroom. Furthermore, the researchers seek to discover if the cognitive treatments in classrooms motivates students, reduces anxiety and stress in face-to-face classes. Overall, the pilot study seeks to understand if students perceived the cognitive practices as helpful and reducing stress factors. Additionally, the researchers investigate groups based on demographic factors, such as gender or major. Specifically, the research will seek to answer the following questions:

RQ1: Do students perceive the cognitive practices as helpful in increasing focus to reduce stress or anxiety?

RQ2: Does gender affect students' perceptions of the cognitive enhanced learning activities?

RQ3: Does academic major or area of study have an impact on students' perceptions of the cognitive enhanced learning activities?

Methodology

Participants

A convenience sample consisting of students at enrolled at a small public university located within the southeastern United States during the fall 2023 and spring 2024 semesters was utilized as part of this study. The sample consisted of undergraduate students from the University's School of Business and School of Computing. Thirty usable surveys were completed.

Instrumentation

The instrument for this pilot study consisted of 47 questions. For the purposes of this paper, the researchers will focus on Questions 1–13, to limit the breadth of this discussion and focus only on cognitive treatments. Questions 1–6 were used to retrieve demographic information. Questions 7–13 utilized a seven-point Likert scale which ranged from (1) "completely disagree" to (7) "completely agree" to measure student perceptions of the cognitive learning activities. The instrument was adopted and adapted with approval from the scholars in Spangler & Shah (2022).

Procedures

The IRB approved pilot study was administered through an online Google Forms instrument after course completion. Students were administered the voluntary online survey instrument through email and the university's learning management system BrightSpace (D2L). There was no obligation for participants to engage in the survey instrument. Students could stop at any time and no identifying material was captured by the Google Forms instrument.

To understand the data, the researchers utilized Google's Forms frequency tabulations and table outputs. Thereafter, the researchers utilized the SPSS statistical analysis instrument. The pilot study follows recommendations on the utilizing small populations to make statistical analysis for non-generalizable conclusions, to form feasibility and exploratory informative studies, and to understand the potential need for future larger studies through its inference potential as noted in a study on research constructs in a National Science Foundation publication (Teresi, et al., 2022). In this pilot study, SPSS software is employed to analyze the data by performing analysis using the independent variables Gender and Major. In this study two independent variables were included: gender and school association. The seven dependent variables were: engagement activity, walking lectures, events, yoga, music, speakers, and active learning.

Results

All 30 students agreed to voluntarily consent to participate in the pilot study before starting. Of the participants, there were (N=19; 63.3%) male, (N=10; 33.3%) female, and (N=1; 3.3%) preferred to not disclose their gender identity. Most of the participants were between 21–25 years old (N=12; 40%) or 18–20 years old (N=11; 36.7%), while some noted 26–31 years old (N=5; 16.7%) and the remaining 32–39 years old (N=2; 6.7%). Interestingly noted, (N=17; 56.7%) remarked they had 1–3 family members who have attended college and (N=9; 30%) had 3–8 family members who have attended college while one person had 9–15 (N=1; 3.3%) family members who have attended college and two had 16–20 (N=2; 6.7%)

family members who had attended college and only one person noted that they were the only person in their family to ever attend college. Twenty-eight participants remarked they have had no learning assistance while only two students noted they are receiving some sort of learning aid. Most of the students were equally in either Management (N=8; 26.7%) or Accounting (N=8; 26.7%). The remainder of the business student participants were five marketing majors (n=5; 16.7%) and three were general business students (n=3; 10%). The rest of the participants were in the information technology field studies (n=4), and one (n=1) prefers to not answer, and the last stated "other" (n=1).

Regarding Research Question 1, the results indicate that overall, most of the participants (60%) completely agreed (Figure 1) that the engagement activities in the courses were helpful to their learning experience and course success (60% completely agree, 23.3% highly agree, 3.3% somewhat agree, 6.7% neutral, 6.7% somewhat disagree).

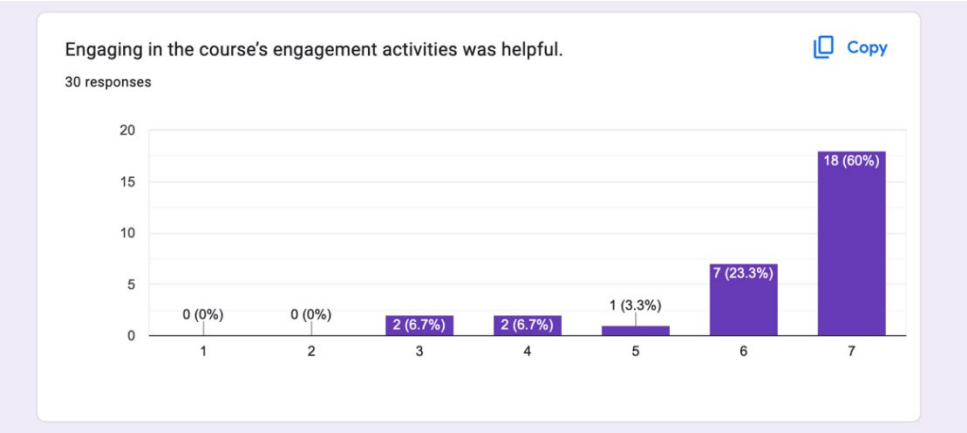

Figure 1: Engaging in the courses' engagement activities was helpful.

Additionally, the results demonstrated students report increased ability and motivation (Figure 2) to learn (70% overall accept) like the hands-on activities or walking lectures and outside lectures.

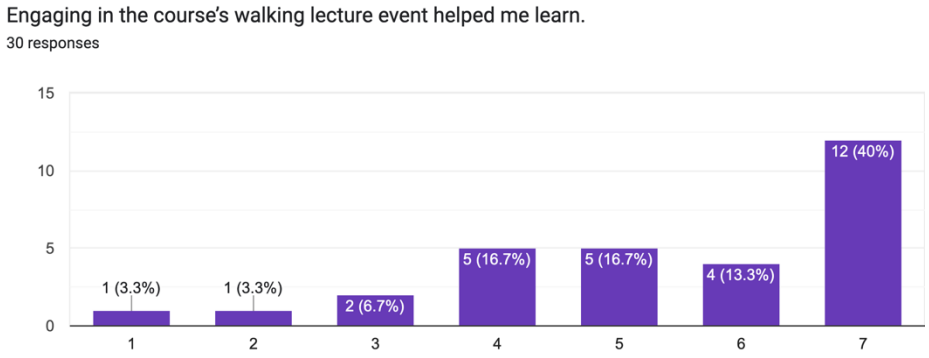

Figure 2: The course's walking and outside lectures increased students' motivation to learn.

Participants agreed the walking lectures were helpful with only four students finding them not agreeable (40% completely agree, 13.3% highly agree, 16.7% somewhat agree, 16.7% neutral, 6.7% somewhat disagree, 3.3% highly disagree, 3.3% completely disagree). Nearly similar findings were demonstrated with the outside-of-the-classroom events (Figure 3) like viewing a technology museum of artifacts (43.4%

completely agree, 10% highly agree, 10% somewhat agree, 20% neutral, 10% somewhat disagree, 3.3% highly disagree, 3.3% completely disagree).

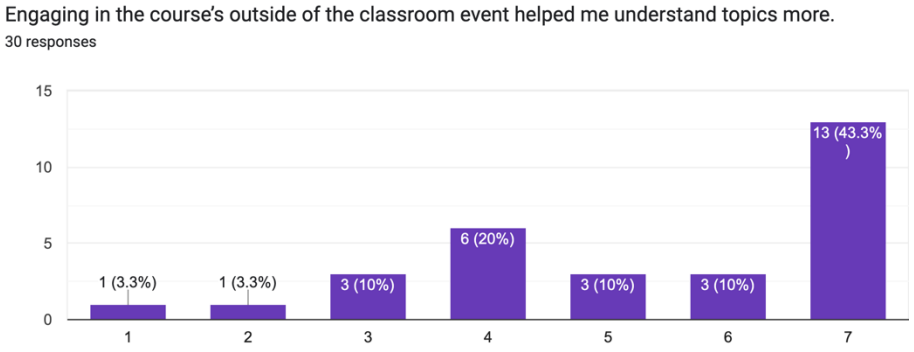

Figure 3: The course's outside-of-the-classroom events helped students understand lectures.

When students were asked to participate in a chair yoga exercise to reduce stress and help with engagement in the courses, neutral results were uncovered (23.3% completely agree, 13.3% highly agree, 3.3% somewhat agree, 33.3% neutral, 3.3% somewhat disagree, 3.3% highly disagree, 20% completely disagree). Utilizing music in the classrooms did find more student overall approval (33.3% completely agree, 10% highly agree, 10% somewhat agree, 26.7% neutral, 10% highly disagree, and 10% completely disagree).

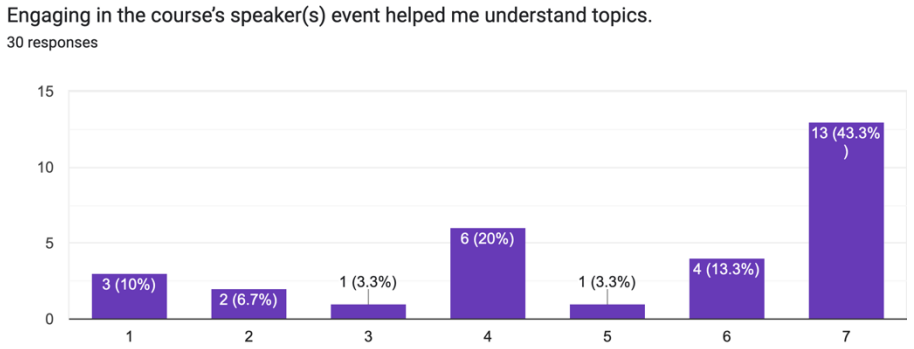

Figure 4: **The course's speakers' events helped students to understand topics and lectures.**

The use of professional speakers' events (Figure 4) found a slightly higher acceptance rate (59.9% overall accepted) by the participants (43.3% completely agree, 13.3% highly agree, 3.3% somewhat agree, 20% neutral, 3.3% somewhat disagree, 6.7% highly disagree, and 10% completely disagree). Lastly, the participants noted the course's hands-on activities increased their motivation and abilities to learn (Figure 5) (66.7% completely agree, 10% highly agree, 6.7% somewhat agree, 10% neutral, 3.3% somewhat disagree, and 3.3% highly disagree).

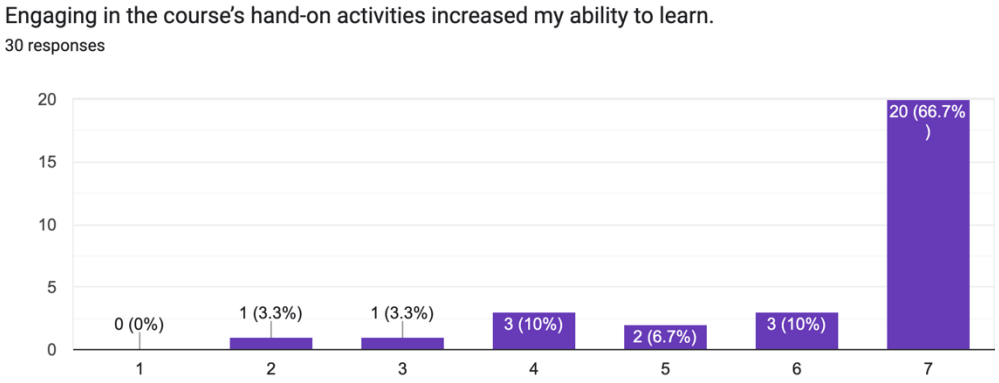

Figure 5: The course's hands-on classroom events increased students' ability to learn.

Statistical analysis

To answer Research Question 2 and 3, a series of one–way ANOVA tests was conducted to compare the effect of the independent variable on student perceptions of the cognitive learning activities. In regard to Research Question 2, the results indicate there was only a significant difference at the 0.05 level (F (Gender, Engagement Activities) = 8.841, p= 0.001) in the case of gender with the use of General Engagement Activities. Male students reported a higher receptiveness to the embedment of engagement activities. It is worth noting that the comparison of means for Gender and Active Learning were very close to the cutoff value of p <= 0.05 (F (Gender, Active Learning) = 3.339, p=0.051). The descriptive results are observed in Table 1. The groups are identified as 0 – male, 1 – female, and 5 – other. Any comparisons with a resulting significance of p <= 0.05 were considered to indicate a significant difference in the means compared. Based on a 95% confidence interval, the researchers were not able to conclude that there was a significant difference in the comparisons between Gender and the variables walking lectures, classroom yoga, outside of class events, music, guest speakers, and active learning.

Table 1: Descriptive statistics of independent variable of gender

Variable	Mean	SD	N
General Engagement Activity			
Male	6.68	.478	19
Female	5.70	1.567	10
Other	3.00	.	1
Walking Lecture			
Male	5.37	1.707	19
Female	5.70	1.703	10
Other	3.00	.	1
Event			
Male	5.26	1.881	19
Female	5.80	1.398	10
Other	2.00	.	1
Yoga			
Male	4.21	2.200	19
Female	4.80	1.989	10
Other	1.00	.	1
Music			
Male	4.63	2.140	19
Female	5.40	1.838	10
Other	2.00	.	1

Variable	Mean	SD	N
Speakers			
Male	5.21	2.371	19
Female	5.30	1.494	10
Other	2.00	.	1
Active Learning			
Male	6.42	1.261	19
Female	6.00	1.414	10
Other	3.00	.	1

For Research Question 3, the results indicate that there was a significant difference at the 0.05 level (F (Major, Engagement Activities) = 3.094, p= 0.044) in the case of Major and the Use of General Engagement Activities. The descriptive results are seen in Table 2. Any comparisons with a resulting significance of p <= 0.05 were considered to indicate a significant difference in the means compared. Post hoc comparisons using the Tukey HSD test for multiple comparisons with resulting values (p = 0.044, 95% C.I. = [5.58, 7.42]) were conducted. The values seen in Table 3 led the researchers to conclude that IT students reported a higher receptiveness to the embedment of cognitive learning activities. This was based on a positive outcome when calculating the difference of the mean of IT student results less the mean of Business student results. Based on a 95% confidence interval, the researchers were not able to conclude that there was a significant difference in the comparisons between Major and the variables walking lectures, classroom yoga, outside of class events, music, guest speakers, and active learning.

Table 2: Descriptive statistics of dependent variables and independent variable of major

Variable	Mean	SD	N
General Engagement Activity			
School of IT	6.50	.577	4
School of Business	6.29	1.160	24
Other	7.00	.	1
Prefer not to say	3.00	.	1
Walking Lecture			
School of IT	5.75	1.500	4
School of Business	5.42	1.767	24
Other	6.00	.	1
Prefer not to say	3.00	.	1
Event			
School of IT	6.25	.957	4
School of Business	5.38	1.813	24
Other	4.00	.	1
Prefer not to say	2.00	.	1
Yoga			
School of IT	5.00	1.155	4
School of Business	4.33	2.278	24
Other	4.00	.	1
Prefer not to say	1.00	.	1

Variable	Mean	SD	N
Music			
School of IT	5.75	.957	4
School of Business	4.71	2.177	24
Other	6.00	.	1
Prefer not to say	2.00	.	1
Speakers			
School of IT	6.75	.500	4
School of Business	4.92	2.145	24
Other	7.00	.	1
Prefer not to say	2.00	.	1
Active Learning			
School of IT	7.00	.000	4
School of Business	6.17	1.404	24
Other	6.00	.	1
Prefer not to say	3.00	.	1

Table 3: Results of Tukey's HSD test for the groups Major and General Engagement Activities

Major	Mean	SD	N
School of IT	6.50	.577	4
School of Business	6.29	1.160	24
Other	7.00	.	1

Discussion

The purpose of this study was to understand if students would value professors that add cognitive activities to their face-to-face courses and to determine if the two independent variables of gender and major have a significant difference towards the seven dependent variables (General Engagement Activity, Walking Lectures, Outside of Classroom Events, Yoga, Music, Speakers, Active Learning). With 60% of the respondents completely agreeing and accepting that the cognitive activities in classrooms are being useful and "helpful," the researchers find university college students have positive perceptions of the cognitive learning activities added to the face–to–face classes. Because of this finding, the researchers accept Research Question one (RQ1). Additionally, there was a significant difference uncovered with respect to gender with male participants noting (p=.001) that the general cognitive activities offered value. Although there is a small margin of acceptability, it is noteworthy that the greater number of students presented positive attitudes towards the use of cognitive learning aids in face–to–face courses. When adding the positive acceptance areas together, there is over 86% rate in total of approval. The positive notations fall in line with literature like Hrach's (2016) suggestions that college professors should consider how to change the classroom experience to incorporate more movement, preferably outside, or simple stretching exercises that can help students find a sense of calm at the start of class or regain focus during a lecture. The benefits, as Hrach recommends to professors, are developing a variety of classroom activities to take the brain out of autopilot mode, such as going outside to offer a break from the routine and aiding students in recognizing that they may have low energy caused by emotional, social, or physical stresses of regular classroom actions or environments. Because of this finding, the researchers accept Research Question two (RQ2).

Hrach's (2016) concept of moving and giving students' access to tools, technologies, and social connections shapes their ability to learn further than regular professor lectures. The study's participants noted the courses outside activities had a positive influence on their studies and feelings (63%), but a large amount was neutral (20%) while only 16.6% responded that the outside activities were not helpful. Hrach advocates that professors use available classroom tools or add professional speakers or voices to the course, which participants described similarly again with a constant 59% positive and 20% neutral). Additionally, the hands-on activities that Hrach considers to be focused on touch can help students develop learning skills and increase focus. In this study, the sound activities– such as listening to classical music (53.3% positive accept overall) was reported to improve a student's focus, and the physical actions like chair yoga had a slightly lesser positive effect on learning (39.9% overall acceptance). Participants reflected a higher interest

overall towards the hands–on activities (83.4% positive overall accepted, and 10% neutral), which Hrach suggests can increase a students' engagement in class and focus. Additionally, the participants noted the actions can reduce course anxiety (67% positive acceptance overall and 20% neutral).

Nevertheless, the injected cognitive learning activities were reported to be helpful by 86.6% of the students. While similarly, 83.4% reported an increased ability to learn. And again, it was interesting to discover that male students reported a higher receptiveness to the increased injection of cognitive learning activities relative to female counterparts, and IT students reported a higher receptiveness to cognitive learning injections than their student counterparts. Because of this finding, the researchers accept research Question Three (RQ3). Additionally, the researchers must agree with the overall positive effects that Hrach's considers. In the scholar's book, Hrach notes "our bodies reward learning" under the right conditions, and the effects appears to release endorphins to the brain's pleasure receptors and creates a causation of students' receiving an elevated attitude and sense of motivation towards learning. One participant wrote:

> The hands-on activities helped me engage more in class and oddly enough have more trust in the professor [and helped me] {sic} in seeing them as a human being as well and not [as] {sic} some overwhelming professor.

While a second participant suggested:

> Stretching and yoga were great for the relaxing during lectures and increasing focus. Adding different educational areas boosted my overall perceptions of my major, and how it affects other areas of the workforce and [they] {sic} proved to me a great motivator [action].

Although one participant did note some dissension by voicing an opinion that the in-course actions should focus more on professors creating "personal connections to students" and to "promote higher [personal] attention" and that most of the activities like chair yoga can be learned outside of the classroom from watching YouTube videos. Nevertheless, the participant suggestions ascribe the thoughts of Hrach's lists of six principles in embodied cognition that guide her philosophy for higher education professors to include classroom practices to aid students in understanding that movement can improve the functioning of the brain and overall classroom motivation and educational experiences. Similarly, Sun, et al. (2023) as well as other researchers found the cognitive approach to learning pedagogy enhanced students' engagement in the learning process (Owusu-Agyeman and Moroeroe 2023 & Waldbuesser & Raalte, 2022).

Conclusion

Hrach (2016) recommends seeking out classroom activities that incorporate sensory and movement experiences to improve focus, reduce stress and enhance cognitive function. The literature congruency helps reinforce the researchers' findings of positive student perceptions to the embedded cognitive learning activities. These findings are all related to the literature's discussions that additions of any form of cognitive engagement in a face-to-face classroom can enhance the learning process and doesn't have to be AI-assisted or elaborate forms of gamification to increase motivation (Owusu-Agyeman and Moroeroe, 2023; Sun et al., 2023; & Waldbuesser & Raalte, 2022).

This study's results demonstrated positive student preference towards the added cognitive learning activities in face-to-face classrooms to enhance the learning process. Although, the researchers understand and accept the pilot study's limitations based on the small and limited sample in scale, demographics, and geographical constraints. Additionally, the researchers acknowledge that limited resources and

socioeconomic disparities can have a greater impact on the findings that would not be considered equal in value at universities having greater cultural or funding practicalities.

Understandably, the researchers acknowledge the overall results and findings can't be generalized because of the constraints and state a need for further research in the area based on a cross–population with more diversity and an urban population or national study to be able to generalize findings. In the future the researchers ascribe a need to globalize the study to understand if all students regard the findings equally and if the discussion could lead to pronounced important pedagogical changes to enhance all students' learning experiences.

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