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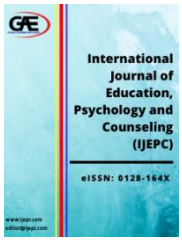

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AN EMPIRICAL STUDY ON UNDERGRADUATE STUDENT ENGAGEMENT UNDER THE FLIPPED CLASSROOM MODEL

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Abstract:

The flipped classroom offers many positive educational outcomes. Student engagement is an important indicator for assessing the quality of education in higher education and is a key factor in the success of curriculum reform. For this reason, assessing student engagement in the flipped classroom has always been a high priority. **Purpose:** The main purpose of this research is to use the Flipped Learning Student Engagement Scale to measure student engagement in the flipped classroom at a China university. The scale includes four engagement sub-scales, namely behavioral engagement, peer-relationship (emotional engagement- I), relationship with the faculty member (emotional engagement- II), and cognitive engagement, with 21 items in total. The scale has good stability, internal consistency, model fit, and constructs validity. **Methods:** Data were elicited via a survey approach and analysed quantitatively to support the investigation. The researcher selected a random sample of 507 university students from Long Dong University, Gansu Province, China. **Results:** The students reported that the overall engagement was generally good. Emotional engagement was significantly higher than behavioral and cognitive engagement. There were significant differences in students' levels of student engagement in terms of college, flipped learning experience, preferred course mode, type of preparation before the flipped classroom, and level of information technology. **Conclusion:** The research will provide a basis for evaluating and improving the current state of flipped learning engagement and optimizing student support services.

Keywords:

Student Engagement; Flipped Classroom; MOOCs; Flipped Learning Student Engagement Scale

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Introduction

The flipped classroom offers many positive educational outcomes (Kong, 2015; Mok, 2014). For example, higher student engagement (Bormann, 2014; Hung, 2015), higher academic achievement and satisfaction (Missildine *et al.*, 2013), maximizing student time to achieve course objectives (Hung, 2015), more excited, engaged, satisfied (Butt, 2014; Davies *et al.*, 2013), better autonomy, motivation, self-efficacy (DeLozier & Rhodes, 2017), more opportunities for collaborative learning (Strayer, 2012), more proficient in using problem-solving skills (Mason *et al.*, 2013), more personalized learner (Davies *et al.*, 2013), more opportunities to develop higher order thinking (Hung, 2015; Lai & Hwang, 2016), deeper learning (Hung, 2015), strategies for better planning and use of study time (DeLozier & Rhodes, 2017).

A large literature indicates that student engagement is positively correlated with academic achievement and the development of higher-order competencies (Pascarella *et al.*, 2010), is a key factor in addressing issues such as student burnout, isolation, and dropout (Fredricks *et al.*, 2004). In addition, student engagement is an important indicator for assessing the quality of education in higher education (Kuh, 2003), and is a key factor in the success of curriculum reform (Guthrie *et al.*, 2000). For this reason, assessing student engagement has always been a high priority.

Despite the widespread adoption of flipped classroom teaching in higher education, the context of student engagement research over the past decade has remained focused on the traditional classroom, with only a few studies discussing the impact on student engagement in the context of flipped classrooms and MOOCs (Kim *et al.*, 2019; Lo & Hew, 2021). Some studies have used student engagement as a meta-concept to compare the difference before and after the implementation of the flipped classroom (McLaughlin *et al.*, 2014), without examining the impact of the three interrelated dimensions of student behavioral engagement, cognitive engagement, and emotional engagement on the flipped classroom. Based on the limitations of theoretical and practical research on student engagement of university students in the flipped classroom, the objective of this study is: What are the students' perceptions of the level of student engagement in the flipped classroom?

Literature Review

Flipped Classroom

Students believe that flipped English classes facilitate language learner engagement (Lianab & Jiab, 2021). Flipped classroom improves pharmacy students' classroom engagement (Bashir & Hamid, 2022). In K-12 and higher education settings, flipped classrooms increase some aspects of behavioral engagement (e.g., interaction and attention/engagement), emotional engagement (e.g., course satisfaction), and cognitive engagement (e.g., understanding of mathematics) (Lo & Hew, 2021).

The flipped classroom approach promotes student engagement, especially student behavioral engagement (Chen *et al.*, 2016). In summary, most researchers have explored student perceptions in the flipped classroom on a small scale (Bishop & Verleger, 2013). Through qualitative and quantitative data analysis, these studies believe that flipped classrooms can promote student engagement. In addition, some studies have compared student engagement as a meta-concept before and after flipped classroom implementation (McLaughlin *et al.*, 2014),

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or compared student engagement in flipped classrooms to traditional classrooms (Fulton, 2012).

Student Engagement

The school and classroom engagement scales for primary and secondary school students make up a large proportion of the various types of student engagement scales, both nationally and internationally. For example, the National Student Engagement Centre in 2006 (Pascarella *et al.*, 2010) developed The Student School Engagement Survey (SSES), Meece and his research team members developed The School Engagement Measure (SEM-MacArthur Network) (Meece *et al.*, 1988), Miller et al. and his research team members developed Attitudes Toward Mathematics Survey (ATM) (Miller *et al.*, 1996), Appleton and his research team members developed Student Engagement Instrument (SEI) (Appleton *et al.*, 2006), and Fredricks and his research team members developed the School Engagement Measure (SEM) (Fredricks *et al.*, 2005), which is the classical scale that is more often cited. Fredricks makes it clear that student engagement is a meaningful combination of three dimensions - behavioral, emotional, and cognitive - and that measures of student engagement should examine all three dimensions simultaneously.

The Student Engagement Scale (SES) developed by Gunuc and Kuzu (2015), is one of the more classic scales for assessing university students' classroom student engagement. In this scale, classroom engagement is divided into three factors: behavioral engagement, cognitive engagement, and emotional engagement, with the emotional factor divided into peer relationships (emotional engagement-I) and relationships with the faculty member (emotional engagement-II) (Gunuc & Kuzu, 2015). Kuh (2001) developed The National Survey of Student Engagement (NSSE), which is an important reference for evaluating college student engagement around the world.

The online student engagement scales are the Online Student Engagement Survey (OSES) was developed by Dixson (2010) and the Distance Student Engagement Scale (DSES) was developed by Sun and Rueda (2012). Based on this, the scale structure of this research is proposed (see Figure 1).

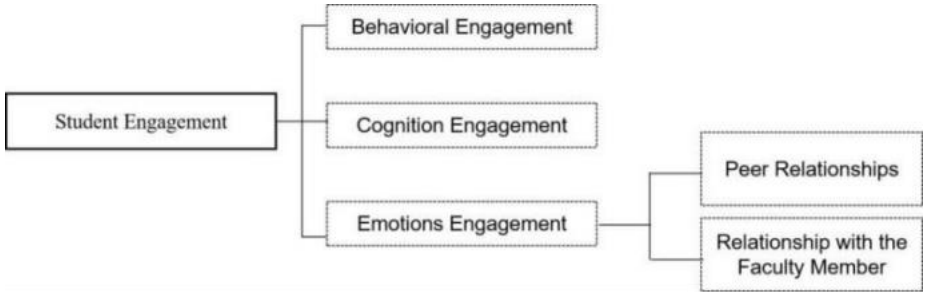

Figure 1: Structure of the Flipped Learning Student Engagement Scale (FLSES)

Methods

This is a quantitative study that uses survey methods to obtain data from students. The online survey was conducted two weeks after the course using the Questionnaire Star online survey platform. A total of 531 students completed the questionnaire survey online and the return rate was 100%.

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Sample

This study followed the principle of random sampling and selected 15 classes, with a total of 531 students, who attended the compulsory "C Programming" course in the spring semester of 2022 at Long Dong University. Random sampling is the most common and rigorous sampling technique (Creswell, 2012), which is purposeful and systematic, ensuring that the selected sample is not biased by the researcher (Ary *et al.*, 2013). 24 students with outliers were excluded, leaving 507. The study data was checked for any mis-entries and the necessary corrections were made based on the student grade table on Long Dong University's Academic Management System, using the student's student number as the link. Quantitative data were analysed using statistical tests via SPSS Version 26. The background information of the selected students is shown in Table 1.

Table 1: Background Information of the Selected Students (N=507)

		No.	%
Gender	Female	280	55.2
	Male	227	44.8
College	Information Engineering	112	22.1
	Mathematics and Statistics	125	24.7
	Chemistry and Chemical Engineering	134	26.4
	Civil Engineering	136	26.8
Experienced Any Flipped Classroom Before	Yes	321	63.3
	No	186	36.7
Preferred Course Delivery Method	Flipped Classroom	277	54.6
	Face-to-Face Courses	173	34.1
	Online Classroom	57	11.2
Type of Preparation Before the Flipped Class	Have Prior Preparation for Each Class	182	35.9
	Preparation Occasionally	292	57.6
	Never Preparation	33	6.5
Technology Skills	Very Unskilled	35	6.9
	Not Proficient	99	19.5
	Neutral	266	52.5
	Proficient	76	15
	Very Proficient	31	6.1

Instrument

The study used the Flipped Learning Student Engagement Scale (FLSES), developed by the researcher, to measure student engagement in the flipped classroom among university students. In relation to the reality of flipped teaching in China, several classic student engagement scales, including OSES (Dixson, 2010), SES (Gunuc & Kuzu, 2015), ATM (Miller *et al.*, 1996), SEM (Fredricks *et al.*, 2004), and DSES (Sun & Rueda, 2012) provide important scale structures and item development references for FLSES.

The scale was divided into 3 dimensions, cognitive engagement (10 items), emotional engagement (7 items), and behavioral engagement (4 items), among which the emotional factors are divided into peer relationship (emotional engagement-Ⅰ, 3 items) and relationship

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with the faculty member (emotional engagement- Ⅱ, 4 items) which is similar to the study by Gunuc and Kuzu (2015). There were 21 items in total, scored using the 5-point Likert format. In four sub-scales of cognitive engagement, peer relationship (emotional engagement-I), relationship with the faculty member (emotional engagement- II), and behavioral engagement the internal consistency coefficients were 0.961, 0.901, 0.926 and 0.926 respectively, above 0.9 (DeVellis & Thorpe, 2021), the Kaiser-Meyer-Olkin (KMO) value were 0.965, 0.726, 0.839 and 0.847 respectively.

Results of the Confirmatory Factor Analysis showed that χ^2/ df=3.733, which was within 5 (Kline, 2023), RMSEA=0.073, SRMR=0.0368, below 0.08 (Brown, 2015; Hooper *et al.*, 2008), NFI=0.937, NNFI=0.946, CFI=0.953, GFI=0.877, all indicators are above 0.9 except for GFI (Hu & Bentler, 1999; Tabachnick & Fidell, 2007; Thompson, 2004). It can be concluded that the scale model has a good fit. Four sub-scales of cognitive engagement, peer-relationship (emotional engagement- I), relationship with the faculty member (emotional engagement- II), and behavioral engagement's the construct reliability (CR) were 0.962, 0.937, 0.928 and 0.853 respectively, above 0.7 (Fornell & Larcker, 1981), the average variance extracted (AVE) were 0.715, 0.848, 0.763 and 0.853 respectively, above 0.5 (Fornell & Larcker, 1981), which indicates that the scale has good construct validity. In summary, it shows that the scale has good reliability and validity.

Results and Discussion

Student Engagement Was Overall Good

Table 2 shows the sample size, minimum, maximum, mean scores, and standard deviations of student engagement in the flipped classroom. The statistics show a normal distribution of student engagement total scores (see Figure 2). The mean values of items on the total scale and sub-scales are in the range of 3.6 to 4.0 with standard deviations less than 1. It is evident that overall student engagement and cognitive, peer relationship (emotional engagement-I), relationship with the faculty member (emotional engagement-II) and behavioral engagement is generally good. However, there are still differences in the mean scores for each dimension. The mean scores of peer relationship (emotional engagement-I) and relationship with the faculty member (emotional engagement-II) are higher than the mean scores of the other dimensions, which on the one hand indicates that students are willing to participate in the classroom and have positive emotional identification with their teachers and classmates. On the other hand, it may be due to the new teacher-student relationship advocated since the implementation of the new curriculum reform, in which teachers and students are both teachers and students and friends in teaching activities, which has led to a harmonious and congenial. The cognitive engagement dimension had the lowest mean score, indicating that students have a relatively weak tendency to self-regulate or use cognitive strategies and meta-cognitive strategies in C language programming learning.

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Table 2: The Mean Value of Total Scale and Sub-scale Items of Student Engagement

Scale	Sample Size	Minimum Value	Maximum Value	Mean Value	Standard Deviation
Total Scale	507	2.21	5.00	3.84	0.58
Cognitive Engagement	507	1.60	5.00	3.60	0.69
Peer Relationship (Emotional Engagement-I)	507	1.67	5.00	3.94	0.72
Relationship with The Faculty Member (Emotional Engagement-II)	507	1.25	5.00	4.00	0.72
Behavioral Engagement	507	2.00	5.00	3.80	0.71

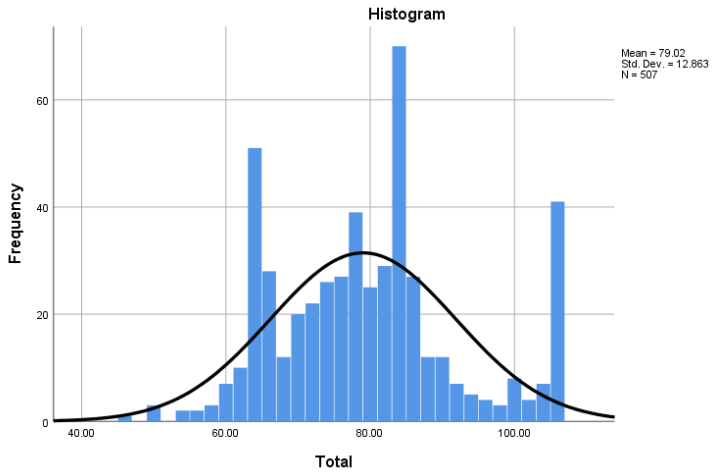

Figure 2: Histogram for Student Engagement Total Scores

The pairwise paired sample t-test of the mean for the student engagement sub-scales showed that emotional engagement is 0.41 higher than cognitive engagement and the difference was significant ($t = 15.13$, $p = 0 < 0.05$). Emotional engagement is 0.13 higher than behavioral engagement and the difference was significant ($t = 6.01$, $p = 0 < 0.05$). Behavioral engagement is 0.28 higher than cognitive engagement, and the difference was significant ($t = 12.13$, $p = 0 < 0.05$). This is linked to students watching videos, lessons that are interesting and interactive (Barlow & Fleming, 2016), positive interactions with teachers, online activities such as discussion forums and online content (Sun & Rueda, 2012) in flipped courses (Chao *et al.*, 2015). Experimental studies have found that emotions affect a variety of cognitive processes that contribute to learning, such as perception, attention, social judgment, cognitive problem-solving, decision-making, and memory processes (Clore & Huntsinger, 2007). This shows that learning support staff need to translate positive emotional experiences such as curiosity and happiness into positive and active learning actions in time, with attention to guiding and facilitate the effective application of learning strategies.

Student Engagement Item Scores Were Uneven

In terms of the specific scores of each sub-scale, the order from high to low was the relationship with the faculty member (emotional engagement-II), peer relationship (emotional engagement-I), behavioral engagement, and cognitive engagement. In the 10 items of cognitive engagement, *" I often preparation before the class and prepare the relevant materials (e.g., watch videos,*

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do quizzes, etc.) ", " I tried to find some information related to the course on other resources (e.g., teaching videos, journal articles, magazines, etc.) " had the lowest score. This suggests, firstly, that students may not be sufficiently intrinsically motivated to prepare before flipped classroom and actively seek out information relevant to the course. Teachers can enhance students' motivation to learn independently by meeting their three basic psychological needs (autonomy, sense of competence, and interpersonal relationships), thereby increasing engagement in learning (Ryan & Deci, 2000).

Secondly, students may also not have mastered effective learning strategies and lack the necessary meta-cognitive skills, such as goal setting, planning, information assessment, and integration, for effective preparation before flipped classroom and information searching. For example, in their review study, Dunlosky et al. (2013) found that teaching students effective strategies on how to prepare before the flipped classroom, organize information and search for relevant resources can improve their cognitive engagement and learning outcomes.

Thirdly, students may not have reasonable time management skills and are easily distracted by other study tasks, and social and recreational activities, resulting in their inability to allocate sufficient time for preparation before flipped classroom and information searches. Britton and Tesser (1991) also show that good time management skills are positively correlated with academic achievement. Students can better manage their time and increase their engagement in learning by having a clear study plan, setting priorities, and reducing distractions.

"*When I come across something important or something I don't quite understand, I watch the instructional videos over and over again* ", and "*I do practice tests/quizzes to check my understanding of the new knowledge*" had the highest score. This shows that after training in the flipped classroom model and the design of flipped teaching activities by the teachers, the students gradually mastered the use of videos and exercises for learning and was able to test their learning. Of the 4 items in relationship with the faculty member (emotional engagement-II), "*My teachers respect me as an individual*" had the highest score. This shows that students believe that their teachers respect their personalities and values. This is a very positive emotional identification and helps to build a good relationship between the student and the teacher. "*My teachers are always near me when I need them*" had the lowest score. This means that the teacher's support and feedback are not timely enough. This may be due to a lack of effective means of communication and emotional connection between the teacher and the student, or the teacher may have limited energy and feel overwhelmed. It is therefore recommended that teachers provide more opportunities for support and communication with students after class to address their questions and attend to their needs promptly, or use other support to provide timely feedback to students.

Students With Different Background Information Had Different Student Engagement

To test for differences in student engagement across the six categories of student background information, independent samples t-test and analysis of variance (ANOVA) were used.

The independent samples t-test is used for analysing whether there are significant differences in student engagement by gender and flipped learning experience. After Levene's test results found that there was no significant difference between the student engagement of boys and girls. It may be due to changes in socio-cultural factors and the implementation of educational policies and practices (Archer *et al.*, 2015) that have helped to eliminate gender differences in

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student engagement. However, gender differences in student engagement may still exist especially in the disciplines or cultural contexts and further research is needed to explore them in depth. Students who have had a flipped learning experience (mean =79.97) are significantly higher than those who have not had a flipped learning experience (mean =77.34). This is supported by the findings of Roehl et al. (2013) that students with flipped classroom experience showed higher levels of engagement in classroom activities.

Analysis of variance (ANOVA) is used to analyse whether student engagement was different by the college, preferred course mode, type of preparation before the flipped class, and level of technology skills. The results found that the College of Information Engineering had a significantly higher mean score in student engagement than the mean score of the College of Civil Engineering (4.60) and the College of Mathematics and Statistics (6.57). The College of Chemistry and Chemical Engineering had a significantly higher mean score in student engagement than the mean of the College of Civil Engineering (7.73) and the College of Mathematics and Statistics (9.70). The mean score between the College of Information Engineering and the College of Chemistry and Chemical Engineering, and the mean score between the College of Mathematics and Statistics and the College of Civil Engineering were not significant differences. Students in the College of Information Engineering and the College of Chemistry and Chemical Engineering are likely to be more proficient in the technological tools and software associated with their courses, which makes them more likely to engage in technology-related learning activities (Karakoç *et al.*, 2022). Furthermore, students with high levels of technical mastery are more likely to interact and collaborate with teachers and other students through online platforms and interactive tools (Sun *et al.*, 2008).

For preferred course delivery method differences, the LSD's post hoc analysis showed that the mean score of students who preferred flipped classroom was 2.98 higher than that of students who preferred face-to-face classroom, and the difference was significant ($F = 3.066$, $p < 0.05$). This is because students who prefer flipped classrooms may be more interested in self-directed learning, as flipped classrooms provide more opportunities for them to actively engage in the learning process (Lo & Hew, 2017). Moreover, such students may be more inclined to actively engage in classroom discussions and interactions, which prompts them to think more deeply and understand the course content, thus increasing their self-motivation and engagement in learning (Strayer, 2012).

For the type of preparation before the flipped class, the LSD's post hoc analysis showed that the mean score of students who have prior preparation for each class, was 9.10 higher than that of students who prepared occasionally, and 13.80 higher than that of students who never preparation, and the mean score of students who preparation occasionally was 4.69 higher than that of students who never preparation, and the difference was significant ($F = 39.57$, $p < 0.05$). This is because preparation before the flipped class enables students to be exposed to course content in advance, increases their level of understanding and preparation for class content, and enhances their participation in class discussions (Bergmann & Sams, 2012). In addition, preparation before the flipped class stimulates students' curiosity and interest and increases motivation to learn, thus promoting active participation (Fautch, 2015). So, teachers need to provide clear instructions and objectives in the preparation before flipped classroom tasks to help students focus and prepare for class discussions (Roehl *et al.*, 2013). Teachers can also design preparation before the flipped class activities to stimulate curiosity and thinking and to make connections to classroom content (Lo & Hew, 2017).

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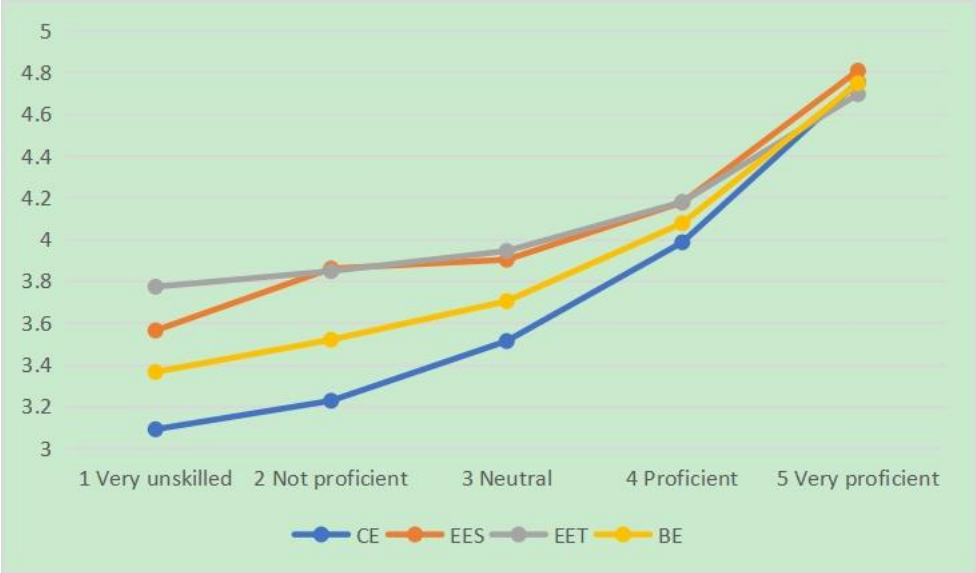
The ANOVA result showed that the students with different information technology levels had significant differences in the total scale of student engagement, and four sub-scales of cognitive engagement, peer relationships (emotional engagement-I), relationships with the faculty member (emotional engagement-II), behavioral engagement ($F_{\text{total scale}} = 44.82$, $p_{\text{total scale}} < 0.05$. $F_{\text{cognitive engagement}} = 56.61$, $p_{\text{cognitive engagement}} < 0.05$. $F_{\text{peer relationships (emotional engagement-I)}} = 18.30$, $p_{\text{peer relationships (emotional engagement-I)}} < 0.05$. $F_{\text{relationships with the faculty member (emotional engagement-II)}} = 11.93$, $p_{\text{relationships with the faculty member (emotional engagement-II)}} < 0.05$. $F_{\text{behavioral engagement}} = 24.87$, $p_{\text{behavioral engagement}} < 0.05$). Further multiple comparisons found that the students with very unskilled information technology levels were significantly lower than the students with very proficient information technology levels in cognitive, emotional engagement, behavioral, and overall student engagement.



CE: Cognitive engagement score, EES: Peer relationships (emotional engagement-I) score, EET: Relationships with the faculty member (emotional engagement-II) score, BE: Behavioral engagement score

Figure 3: Student Engagement and Student IT Proficiency Means Line Graphs

As can be seen in Figure 3, the scores for cognitive engagement, peer relationships (emotional engagement-I), relationships with the faculty member (emotional engagement-II), and behavioral engagement significant growth as students' IT proficiency increased. IT level from very unskilled to neutral in relation to relationships with the faculty member (emotional engagement-II) growth flattened. This is because students with very low levels of IT proficiency may lack familiarity with basic technology tools and applications, which may result in lower behavioral engagement in classroom activities and learning tasks. This group of students may lack confidence in their technical skills, which may affect their willingness to actively participate and express their opinions in the classroom (Compeau & Higgins, 1995). Furthermore, a lack of technological self-confidence may reduce students' engagement at the cognitive level as they may focus more on the use of technology at the expense of understanding and applying the course content (Saadé & Kira, 2009).

Conclusion

This research explored the overall student engagement, the various types of engagement in the sub-scales, and the differences in the characteristics of the six types of student engagement of Chinese university students based on the scale. The research found that the overall student

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engagement of university students was generally good. The emotional engagement was significantly higher than behavioral and cognitive engagement. There were no significant differences between male and female students' engagement in learning. Students in the College of Information Engineering and the College of Chemical Engineering were significantly higher student engagement than students in the College of Civil Engineering and the College of Mathematics and Statistics. Students whom preferred flipped courses mode had significantly higher student engagement than those who preferred traditional face-to-face courses mode. The students with very unskilled information technology levels were significantly lower than the students with very proficient information technology levels in cognitive, emotional, behavioral, and overall student engagement.

The above findings provide a useful reference for university flipped teaching and learning support. However, there were also some gaps and shortcomings in this research due to the level of research, research conditions, and time limitations. The study only surveyed 507 learners, a slightly smaller sample size, making the generalization of some of the findings potentially difficult to extend to a larger whole. At the same time, this research focuses on a group of university students (mainly freshmen and sophomores) in science and technology at Long Dong University, without considering differences in grade level, university level, ethnicity, place of birth, university location, discipline classification (arts, science, and technology, etc.) and nationality, which is insufficient in terms of the diversity of the study population. It is therefore expected that the sample size will be expanded subsequently to consider fully the diversity of sources and types of learners and to analyse in depth their level of engagement and behavioral patterns, etc., to enhance the adaptability and transfer ability of the findings.

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References

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the Student Engagement Instrument. *Journal of school psychology*, 44(5), 427-445.

Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. *Journal of research in science teaching*, 52(7), 922-948.

Ary, D., Jacobs, L. C., Sorensen, C., & Walker, D. (2013). Introduction to research in education: Cengage Learning. *Journal of Correctional Education*, 9-22.

Barlow, T., & Fleming, B. (2016). A science classroom that's more than a game. *Teaching science*, 62(2), 31-37.

Bashir, S., & Hamid, I. (2022). Pharmacy students' perception of learning and engagement in a flipped-classroom of a physiology course. *Innovations in Education and Teaching International*, 59(4), 453-461.

Bergmann, J., & Sams, A. (2012). Flip your classroom: Reach every student in every class every day. *International society for technology in education*.

Bishop, J., & Verleger, M. A. (2013). The flipped classroom: A survey of the research. *In 2013 ASEE Annual Conference & Exposition*, 23-1200.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 8 Issue 51 (September 2023) PP. 97-109
DOI 10.35631/IJEPC.851007

Bormann, J. (2014). Affordances of flipped learning and its effects on student engagement and achievement (Graduate Research Papers). *University of Northern Iowa*, 137.

Britton, B. K., & Tesser, A. (1991). Effects of time-management practices on college grades. *Journal of educational psychology*, 83(3), 405.

Brown, T. A. (2015). Confirmatory factor analysis for applied research. *Guilford publications*.

Butt, A. (2014). Student views on the use of a flipped classroom approach: Evidence from Australia. *Business Education & Accreditation*, 6(1), 33.

Chao, C. Y., Chen, Y. T., & Chuang, K. Y. (2015). Exploring students' learning attitude and achievement in flipped learning supported computer aided design curriculum: A study in high school engineering education. *Computer Applications in Engineering Education*, 23(4), 514-526.

Chen, L., Wang, X., Li, J., Bao, H., & Ren, G. (2016). Promoting students' engagement? Flipped classroom matters a lot– An empirical research in college. In Blended Learning: Aligning Theory with Practices. *The 9th International Conference, ICBL 2016, Beijing, China, July 19-21, 2016, Proceedings 9* (pp. 196-206). Springer International Publishing.

Clore, G. L., & Huntsinger, J. R. (2007). How emotions inform judgment and regulate thought. *Trends in cognitive sciences*, 11(9), 393-399.

Compeau, D. R., & Higgins, C. A. (1995). Computer self-efficacy: Development of a measure and initial test. *MIS quarterly*, 189-211.

Creswell, J. W. (2012). Educational research: Planning, conducting, and evaluating quantitative and qualitative research. *Pearson Education, Inc.*

Davies, R. S., Dean, D. L., & Ball, N. (2013). Flipping the classroom and instructional technology integration in a college-level information systems spreadsheet course. *Educational Technology Research and Development*, 61, 563-580.

DeLozier, S. J., & Rhodes, M. G. (2017). Flipped classrooms: A review of key ideas and recommendations for practice. *Educational psychology review*, 29, 141-151.

DeVellis, R. F., & Thorpe, C. T. (2021). *Scale development: Theory and applications* (Ed.p.1-113). Sage publications.

Dixson, M. D. (2010). Creating effective student engagement in online courses: What do students find engaging?. *Journal of the Scholarship of Teaching and Learning*, 1-13.

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science in the Public interest*, 14(1), 4-58.

Fautch, J. M. (2015). The flipped classroom for teaching organic chemistry in small classes: is it effective?. *Chemistry Education Research and Practice*, 16(1), 179-186.

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. *Journal of Marketing Research*, 18(3), 382-388.

Fredricks, J. A., Blumenfeld, P., Friedel, J., Paris, A., Moore, K., & Lippman, L. (2005). School engagement: What do children need to flourish. *The Search Institute Series on Developmentally Attentive Community and Society*, 3, 305-321.

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of educational research*, 74(1), 59-109.

Fulton, K. P. (2012). 10 Reasons to Flip: A Southern Minnesota School District Flipped Its Math Classrooms and Raised Achievement and Student Engagement. *Phi Delta Kappan*, 94(2), 20-24.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 8 Issue 51 (September 2023) PP. 97-109
DOI 10.35631/IJEPC.851007

Gunuc, S., & Kuzu, A. (2015). Student engagement scale: development, reliability, and validity. *Assessment & Evaluation in Higher Education*, 40(4), 587-610.

Guthrie, J. T., Wigfield, A., & VonSecker, C. (2000). Effects of integrated instruction on motivation and strategy use in reading. *Journal of educational psychology*, 92(2), 331.

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural Equation Modelling: Guidelines for Determining Model Fit. *Electronic Journal of Business Research Methods*, 6 (1), 53–60.

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural equation modelling: a multidisciplinary journal*, 6(1), 1-55.

Hung, H. T. (2015). Flipping the classroom for English language learners to foster active learning. *Computer Assisted Language Learning*, 28(1), 81-96.

Karakoç, B., Eryılmaz, K., Turan Özpolat, E., & Yıldırım, İ. (2022). The effect of game-based learning on student achievement: A meta-analysis study. *Technology, Knowledge, and Learning*, 1-16.

Kim, Y. M., Yoon, Y. S., Hong, H. C., & Min, A. (2019). Effects of a patient safety course using a flipped classroom approach among undergraduate nursing students: A quasi-experimental study. *Nurse Education Today*, 79, 180-187.

Kline, R. B. (2023). *Principles and practice of structural equation modelling.* Guilford publications.

Kong, S. C. (2015). An experience of a three-year study on the development of critical thinking skills in flipped secondary classrooms with pedagogical and technological support. *Computers & Education*, 89, 16-31.

Kuh, G. D. (2001). Assessing what really matters to student learning inside the national survey of student engagement. *Change: The magazine of higher learning*, 33(3), 10-17.

Kuh, G. D. (2003). *The national survey of student engagement: Conceptual framework and overview of psychometric properties.* Indiana University Centre for Postsecondary Research and Planning.

Lai, C., & Hwang, G. (2016). A self-regulated flipped classroom approach to improving students' learning performance in a mathematics course. *Computers & Education*, 100, 126-140.

Lianab, J., & Jiab, J. A. (2021). A Quasi-Experimental Study of Chinese University English Learners' Engagement in a Flipped Classroom. *In 29th International Conference on Computers in Education (ICCE 2021)* (Vol. 1, pp. 493-502).

Lo, C. K., & Hew, K. F. (2017). A critical review of flipped classroom challenges in K-12 education: Possible solutions and recommendations for future research. *Research and practice in technology enhanced learning*, 12(1), 1-22.

Lo, C. K., & Hew, K. F. (2021). Student engagement in mathematics flipped classrooms: Implications of journal publications from 2011 to 2020. *Frontiers in Psychology*, 12, 672610.

Mason, G. S., Shuman, T. R., & Cook, K. E. (2013). Comparing the effectiveness of an inverted classroom to a traditional classroom in an upper-division engineering course. *IEEE transactions on education*, 56(4), 430-435.

McLaughlin, J. E., Roth, M. T., Glatt, D. M., Gharkholonarehe, N., Davidson, C. A., Griffin, L. M., ... & Mumper, R. J. (2014). The flipped classroom: a course redesign to foster learning and engagement in a health professions school. *Academic medicine*, 89(2), 236-243.

International Journal of Education, Psychology and Counseling
IJEPC
EISSN : 0128-164X
Volume 8 Issue 51 (September 2023) PP. 97-109
DOI 10.35631/IJEPC.851007

Meece, J. L., Blumenfeld, P. C., & Hoyle, R. H. (1988). Students' goal orientations and cognitive engagement in classroom activities. *Journal of educational psychology*, 80(4), 514.

Miller, R. B., Greene, B. A., Montalvo, G. P., Ravindran, B., & Nichols, J. D. (1996). Engagement in academic work: The role of learning goals, future consequences, pleasing others, and perceived ability. *Contemporary educational psychology*, 21(4), 388-422.

Missildine, K., Fountain, R., Summers, L., & Gosselin, K. (2013). Flipping the classroom to improve student performance and satisfaction. *Journal of Nursing Education*, 52(10), 597-599.

Mok, H. N. (2014). Teaching tip: The flipped classroom. *Journal of information systems education*, 25(1), 7-11.

Pascarella, E. T., Seifert, T. A., & Blaich, C. (2010). How effective are the NSSE benchmarks in predicting important educational outcomes. *Change: The Magazine of Higher Learning*, 42(1), 16-22.

Roehl, A., Reddy, S. L., & Shannon, G. J. (2013). The flipped classroom: An opportunity to engage millennial students through active learning. *Journal of Family and Consumer Sciences*, 105(2), 44.

Ryan, R. M., & Deci, E. L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary educational psychology*, 25(1), 54-67.

Saadé, R. G., & Kira, D. (2009). Computer anxiety in e-learning: The effect of computer self-efficacy. *Journal of Information Technology Education: Research*, 8(1), 177-191.

Strayer, J. F. (2012). How learning in an inverted classroom influences cooperation, innovation, and task orientation. *Learning environments research*, 15, 171-193.

Sun, J. C. Y., & Rueda, R. (2012). Situational interest, computer self-efficacy and self-regulation: Their impact on student engagement in distance education. *British journal of educational technology*, 43(2), 191-204.

Sun, P. C., Tsai, R. J., Finger, G., Chen, Y. Y., & Yeh, D. (2008). What drives a successful e-Learning? An empirical investigation of the critical factors influencing learner satisfaction. *Computers & education*, 50(4), 1183-1202.

Tabachnick, B. G., & Fidell, L. S. (2007). *Experimental designs using ANOVA (Vol. 724).* Belmont, CA: Thomson/Brooks/Cole.

Thompson, B. (2004). Exploratory and confirmatory factor analysis: Understanding concepts and applications. *Washington, DC*, 10694(000), 3.