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PRECEDENCE AND IMPACT OF FLIPPED CLASSROOM ON STUDENT ENGAGEMENT: MEDIATING STUDY USING SEM-PLS

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Abstract:

Purpose: *This research confirms that an e-learning method such as the flipped classroom model improves active learning through students' engagement, critical thinking, and preparation for class. The research shows that when students were engaged in the class, liked learning new material, and were interested in it, they were more emotionally involved in the flipped classroom content, participated in class, felt good about themselves, and had fun. Afterwards, they demonstrated behavioural engagement by attending class, paying attention, and making an effort to complete assignments and participate in group work as instructed by their concerned teacher.* ***Method:*** *The participants were undergraduates enrolled in a BBA programme and postgraduate MBA course students studying at the university level in the Delhi-NCR region. 261 students, almost 35 per cent of the total population across all years, filled out the questionnaire. A questionnaire developed on Google Forms was distributed among students via the Google Classroom platform and WhatsApp. Students in the classroom were exposed to the flipped learning method using Edmodo and Google Classroom.* ***Findings:*** *Through the consequences of this study, it is demonstrated that, although there is an immediate and positive connection between Flipped Classroom Learning and student Engagement (t-esteem 33.146), the relationship is also positively mediated by (t-value 4.782) and Student Class Preparation (t-value 4.585). It is suggested to increase the scope of the study so that, rather than drawing a study sample from a single institution, future research includes participants from various*

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academic backgrounds and institutions. ***Practical Implications:*** *This research confirms that a flipped classroom model improves active learning through students' engagement, critical thinking, and preparation for class. This indicates that students were more emotionally invested in the flipped study hall content when they were keen on the class, delighted in learning new data, participated in class, felt good about themselves, and had fun.*

Keywords: *Structural Equation Model (SEM)-Partial Least Square (PLS); t- value; Flipped Classroom; E-Learning; Student Engagement.*

1. Introduction

By giving students access to course materials outside of class, "flipping the classroom" allows for more time in class for hands-on learning and discussion. November and Mull (2012) describe and support the flipped classroom paradigm. All flipped classroom approaches revolve around the notion that "students prepare for class by watching videos, listening to podcasts, reading articles, or considering questions designed to draw on prior knowledge," even if not all teachers implement the other concepts (pp. 1-5).

Most of the twentieth century was spent following the same model for delivering educational material. Like the training of employees in the era of the Industrial Revolution, this kind of teaching is also referred to as "industrialised education" (Ash, 2012, pp. 6-8) since it emphasises memorisation and straightforward application to future careers. English instructors throughout the industrial era have expected their pupils to read outside of class and be ready to analyse and synthesise what they have read in class. This is comparable to strategies employed in a flipped learning paradigm.

However, as the twentieth century drew to a close and the twenty-first started, working conditions began to change. The Internet and mobile devices become increasingly pervasive; information is readily available, and companies recognise this. Access to information is no longer dependent on memorisation. The environments beyond the schools are transforming, but the typical classroom is not. Students are still, for the most part, expected to show their knowledge by memorisation. Developmental evaluation keeps on analysing material that can be acquired by the most minimal degrees of understanding. The cross-country execution of the Normal Centre Principles in education is a prime example of this trend. The standards now require higher-order skill demonstration, yet many schools still prepare kids for tests developed in the last century (Roehl et al., 2013, pp. 44-49).

The flipped classroom model is gaining popularity among teachers because of the advantages new technologies provide. Since lecture-capture software and video-hosting/distribution platforms are so widely available, instructors in almost any field may devote more class time to engaging with their students one-on-one.

Since 2007, when it was first implemented at the university and graduate school levels, the "flipped classroom" educational model has trickled down to the secondary and even primary school levels. The flipped classroom idea was pioneered by two Colorado high school science instructors at Woodland Park High School (Siegle, 2014, pp. 51-55). Two professors, Jonathan Bergmann and Aaron Sams, devised the idea to employ screen-capture applications to record introductory lectures and assign them to students as homework. The students might then make a more productive use of class time. Even though the flipped classroom idea has been utilised in education since before 2007, it was

mostly for online-only reasons. Although Bergmann and Sams mention a slight variation in their flipping endeavour in their book Flip Your Classroom, the authors acknowledge this. They started filming to have more one-on-one time with each of their students in class. This opened the door to more frequent formative evaluation, instructive feedback, and individualised training (Bergmann and Sams, 2012).

2. Literature Review

2.1 Transitioning from Traditional to Flipped Classroom Learning Method

Learners were initially exposed to learning materials in the classroom, as was the norm in conventional pedagogy. Then, they were given homework to do at home to prove what they had learned. However, significant problems with this approach to education make it less than ideal for today's learners (Brunsell & Horejsi, 2013, p. 8). Traditional education's flaws include requiring students to take notes and listen passively during lectures (Kuzu, 2007, pp. 34-51; Danker, 2017, pp.171-186), allocating too little class time to practising what students have learned (Yan & Song, 2013, pp. 114-116), and leaving them on their own to complete homework assignments (Mireille, 2014, pp. 1-79). As a result, a growing number of educators are adopting the flipped classroom approach. Due to its potential to solve long-standing problems with conventional education, the flipped classroom approach is attracting increasing interest from educators throughout the globe. New content is not presented to students during class time but instead assigned as homework before class begins (Clark, 2013, pp. 11-24). Teachers should use their time in class by reviewing students' homework rather than teaching new material from scratch. Therefore, the remainder of class time is spent on the practical application of the material under the instructor's close supervision. As a result, the flipped classroom transforms the original passive and classical classroom activities into active and individual ones (Sohrabi & Iraj, 2016, pp. 514-524). Despite flipped learning's potential as an approach that lets students learn at their own speed ahead of class and works with top-to-bottom shared and understudy-to-educator connections in class (Chen et al., 2019, pp. 2288–2307), promoting students' active learning remains a challenge. It can altogether affect their commitment and learning execution in class.

Flipped classrooms have been found to increase student engagement and motivation and promote more significant interaction and collaboration among students. A study by Kim (2014) found that flipped classrooms were related to higher levels of understudy commitment and interest in the subject matter and increased opportunities for student-centred learning (pp. 37-50).

Flipped classroom learning is a functioning learning methodology that energises understudies to actively participate in their education by reversing the traditional lecture format. Case-based learning (CBL) and problem-based learning (PBL) are popular instructional approaches in today's classrooms. Integration of FC with either PBL or CBL in the classroom is seldom studied, and the aspects that might affect its success are never investigated, including which combination of activities would be most beneficial to students' learning and engagement (Oliván-Blázquez et al., 2022).

In a flipped classroom, students use different cognitive levels to study, and the activities for teaching and learning themselves are switched around. Whereas the more significant part of class time in traditional schooling is spent listening to a lecture or watching a PowerPoint, the majority of time in a flipped classroom is spent on doing

meaningful work that requires students to utilise their higher-order thinking skills (HOTS) (Williams, 2013, pp. 167-179). In a flipped classroom, students are given course materials ahead of time and are expected to study them on their own, so professors may focus on leading them through practical exercises that demand higher-level thinking. By contrast, conventional classrooms often assign students the most challenging aspects of their education (such as putting what they have learned into practice) as homework when their professors are not there to provide any assistance.

Figure 1 shows a comparison of the cognitive rigour of the two pedagogical approaches.

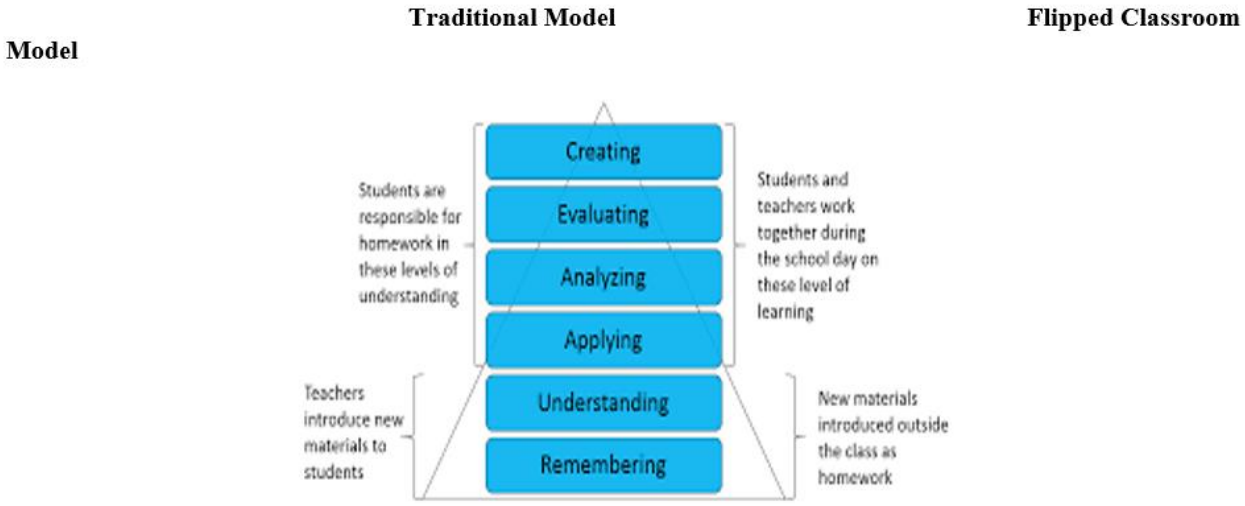

Figure 1: The Different Cognitive Strategies Used in the Flipped Classroom Model (Williams, 2013).

2.2 Student engagement, critical thinking, and preparation time are all affected by the flipped classroom model

Studies on the effects of flipped classrooms on pupils' attention spans have been conducted regularly. (Mclaughlin et al., 2013, p. 1-8) compared students' interest levels during the first-year pharmaceutical programme taught using the conventional technique in 2011 with that of students in 2012. The average level of participation was 3.51 in 2011 and 3.78 in 2012. It has been noticed that pupils in a flipped algebra class in a rural high school are very engaged in their learning (Clark, 2013, pp. 91-115). Student participation was 76% in a typical classroom, whereas 88% in a flipped classroom. A professor at Singapore Management University's School of Management System flipped his programming class by having students work in pairs and found that student participation increased. (Danker, 2015, p. 171-186) employed the flipped classroom technique with students in a Researchers at Sunway University in Malaysia surveyed students in a flipped diploma in performing arts programme and found that 67% of them found the material engaging and were enthusiastic about learning more about it. At the University of British Columbia, (Deslauriers et al., 2011, pp. 862-864) found that first-year physics undergraduate students were much more engaged in flipped classroom activities (85%) than in standard lectures (45%). Dublin Institute of Technology (DIT) second-year Chemical Thermodynamics students in Dublin, Ireland, were among the first to experience the flipped study hall model. Since his undergraduate students were keen on the substance

before the talk, joined the lectures, and made good progress on given activities during the lecture (Seery, 2015, pp. 1-8), he found that his adoption of the flipped classroom strategy to promote student engagement was effective.

High levels of emotional involvement preceded high levels of behavioural engagement among TESOL undergraduates in Malaysia who were presented with the flipped study hall strategy for guidance (Jamaludin & Osman, 2014, pp. 124-131). The College of Engineering at Penn State tried out the flipped classroom style. Therefore, pupils had extra time in class to implement what they had learned by making use of tools and activities taken straight from the real world (Toto & Nguyen, 2009, pp. 1-4). Researchers observed that using this method in the classroom led to higher levels of participation from students.

Objective 1: To determine the impact of Flipped classroom Learning (FCL) on Student Engagement (SE).

Hypothesis 1: There is a positive relationship between Flipped classroom Learning (FCL) and Student Engagement (SE).

Students' ability to think critically was shown to be significantly improved by using the Flipped Classroom Model, as demonstrated by (Miele, 2014, pp. 519-541). Wulandari (2017) also conducted research in this area, albeit their findings could have been more robust and showed a tendency to vary in the opposite direction of the impact of the model variables used in the Flipped Classroom (pp.194-205).

The abovementioned research gives academics a chance to speculate on the possible results of utilising the Flipped Classroom Model's ability to study and, by extension, their critical thinking and scientific knowledge.

Objective 2: To determine the impact of Flipped Classroom Learning (FCL) on Students' Critical Thinking Ability (CTA).

Hypothesis 2: There is a positive relationship between Flipped classroom Learning (FCL) and Students' Critical Thinking Ability (CTA).

In a flipped classroom, students and teachers work collaboratively in three distinct phases: before, during, and after class preparation (Kong, 2015, pp. 16-31). They first go through the subject at their speed using online learning platforms prior to the start of class (class preparation). After this, students and the instructor engage in interactive learning activities such as discussing, debating, presenting, and role-playing the lesson's material (Tucker, 2012, pp. 82-88). Ultimately, this method aims to improve both classroom instruction and student learning. Exercises serve to both solidify and expand students' knowledge. Consolidating what students have learned after class, on the other hand, requires them to review course materials to improve their understanding and provides them with opportunities to learn independently, apply what they have realised, work with others, and get constructive criticism from their instructors. Thus, data suggests that flipped learning substantially impacts college students across disciplines (Sergis et al., 2018, pp. 368-378). The flipped classroom method aims to have students bring questions to the class that are more closely related to the material being covered. The students then put their language skills to use in classroom-based collaborative activities (Herreid & Schiller, 2013, pp. 62-66).

Objective 3: To determine the impact of Flipped Classroom Learning (FCL) on Students' Class Preparation (SCP).

Hypothesis 3: There is a positive relationship between Flipped Classroom Learning (FCL) and Students' Class Preparation (SCP).

3. Methods

3.1 Instrument

Based on the literature review and other investigations (Newman et al., 2016, pp. 52-71); Afrilyasanti et al., 2016, pp. 65-81; Nouri, 2016, pp. 1-10; Khanova et al., 2015, pp. 1-8), we created a thirty-item Likert scale questionnaire.

In the primary part of the overview, members are asked to provide some basic personal information about themselves, such as their gender, year in school, and highest level of education. Before giving out questionnaires, we also briefed the study's sample about the flipped classroom concept.

3.2 Procedure

The population for this study were undergraduate BBA course students and postgraduate MBA course students studying at the university level in the Delhi-NCR region. Out of a total population of 840 students across all years, including both graduate and postgraduate students, 261 finally filled out the questionnaire, almost 35 per cent of the total population. A descriptive type of research design is used for this research.

A questionnaire developed on Google Forms was distributed among students via the Google Classroom platform and WhatsApp. Students in the classroom were exposed to the flipped learning method using Edmodo and Google Classroom. Students used to be provided readings, assignments, case studies, etc., ahead of time through Google Classroom, and in-class learning would then include student participation. It has been established that when the flipped classroom method is used, students are more involved and do more of the work in the classroom.

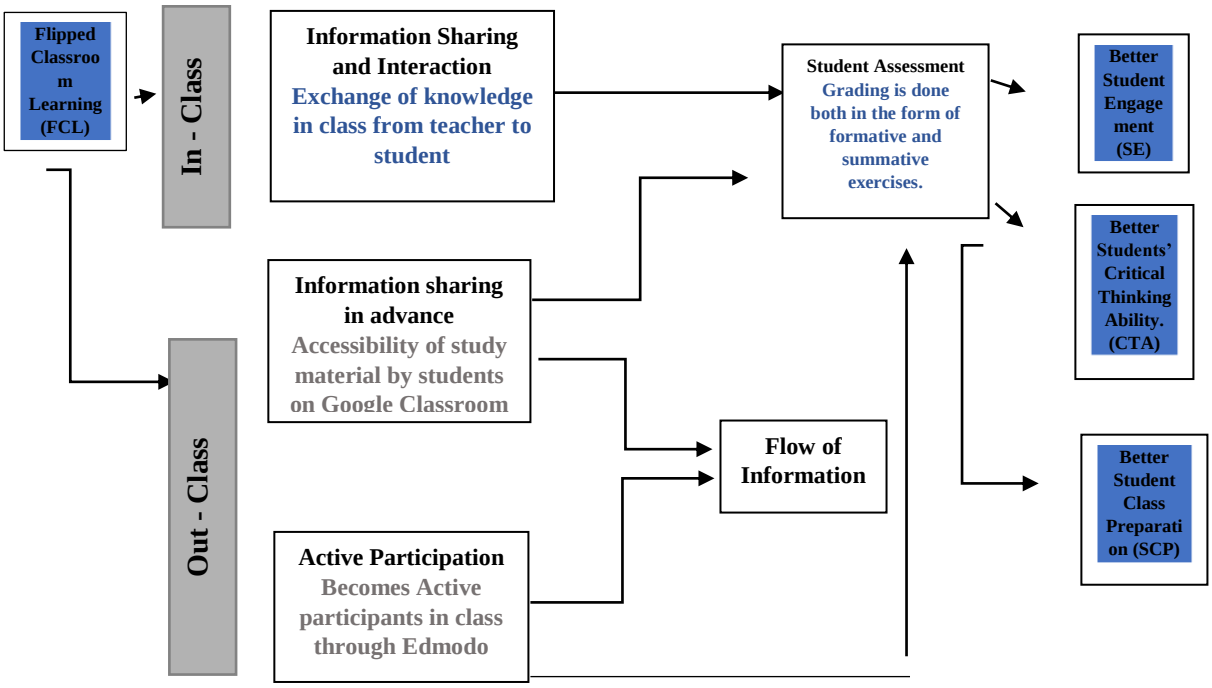

Figure 2: Conceptual model of the metrics to understand the impact of flipped classroom learning on student assessment

3.3 Research Objectives

1. To determine the impact of Flipped classroom on Student Engagement (SE).
2. To determine the impact of Flipped classroom on Students' Critical Thinking Ability (CTA).
3. To determine the impact of Flipped classroom on Students' Class Preparation (SCP).
4. To determine the mediation effect of CTA and SCP on FCL and SE.

4. Results

Smart PLS 4.0 (Ringle, Wende, & Becker, 2022) was used to conduct a PLS-SEM analysis of the estimation model. Cronbach's alpha, average extracted variance (AVE), discriminant validity, factor loading, and composite reliability were investigated as means of evaluating the measurement model. Figure 3 and Table 1 provide the outcomes of the evaluated measuring scheme.

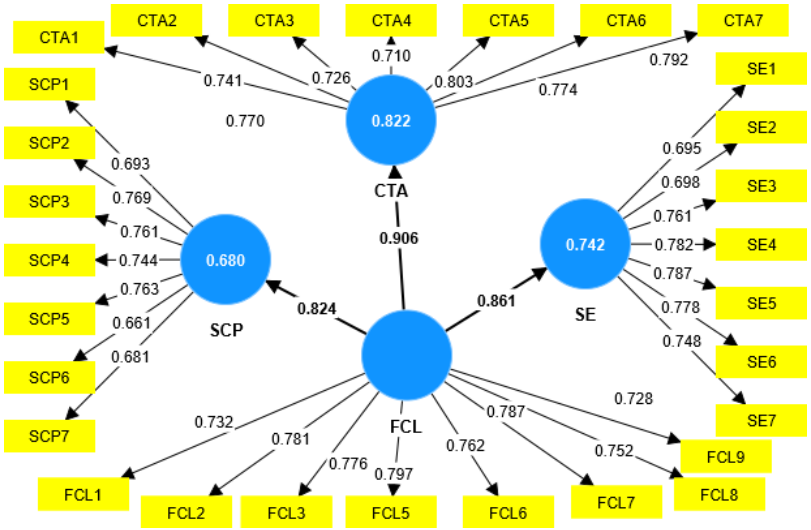

Figure 3: Measurement model

List of Abbreviations in Figure 3: FCL – *Flipped Classroom Learning;* SE– *Student Engagement*; CTA – *Critical Thinking Ability;* SCP – *Student Class Participation.*

The overall effect of FCL on CTA, SCP, and SE is assessed. Here, student engagement, students' critical thinking ability, and class participation are the factors that determine if FCL is an effective tool to enhance student performance in class or not. All the construction factors' loadings are displayed in Figure 3. According to the criteria for convergent validity set out by Hair et al. (2010), factor loadings should be greater than 0.5. Therefore, convergent validity was achieved in this investigation. Cronbach's alpha, composite reliability and average relative effectiveness are shown in Table 1. As indicated by George and Mallery (2003), a Cronbach's alpha of more than 0.7 (> 0.9) is considered very good. More than 0.7 in the present investigation is really good. Also, composite

dependability should be at least 0.7, and AVE should be at least 0.5 (Fornell & Larcker, 1981, pз. 382-388). In this investigation, both AVE and composite reliability are excellent (Table 1).

Table 1. Cronbach's alpha, composite reliability, and the ensemble AVE's average value

	Cronbach's alpha	**Composite reliability (rh_a)**	**Composite reliability (rh_c)**	**Average variance extracted (AVE)**
CTA	0.878	0.880	0.905	0.578
FCL	0.898	0.899	0.918	0.585
SCP	0.850	0.852	0.886	0.527
SE	0.870	0.872	0.900	0.564

Tables 2, 3, and 4 show the discriminant validity using Fornell & Locker criteria, cross-loading and Heterotrait-monotrait ratio. When the concept yi is more similar to its indicators than other constructs, as suggested by the Fornell-Locker criterion, discriminant validity will be demonstrated. For an indicator to meet cross-loading standards, the strength of its outer loading with its build should be higher than any of its cross-loadings (correlations) with other constructs. The heterotrait-monotrait (HTMT) ratio measures the degree of association between two measures. The constructions are not separate if HTMT>=0.9.

Table 2: Discriminant Validity (Fornell Locker criteria)

	CTA	FCL	SCP	SE
CTA	0.760			
FCL	0.906	0.765		
SCP	0.857	0.824	0.726	
SE	0.883	0.861	0.846	0.751

Table 3: Cross Loadings

	CTA	FCL	SCP	SE
CTA1	0.770	0.717	0.676	0.693
CTA2	0.741	0.643	0.572	0.581
CTA3	0.726	0.657	0.587	0.650
CTA4	0.710	0.623	0.638	0.662
CTA5	0.803	0.712	0.713	0.691
CTA6	0.774	0.731	0.671	0.679
CTA7	0.792	0.730	0.695	0.734
FCL1	0.620	0.732	0.587	0.629
FCL2	0.717	0.781	0.647	0.676

FCL3	0.716	0.776	0.657	0.696
FCL5	0.738	0.797	0.635	0.660
FCL6	0.701	0.762	0.628	0.589
FCL7	0.721	0.787	0.668	0.703
FCL8	0.663	0.752	0.648	0.668
FCL9	0.663	0.728	0.567	0.645
SCP1	0.565	0.510	0.693	0.602
SCP2	0.645	0.632	0.769	0.651
SCP3	0.609	0.571	0.761	0.602
SCP4	0.599	0.580	0.744	0.601
SCP5	0.694	0.643	0.763	0.670
SCP6	0.647	0.675	0.661	0.616
SCP7	0.570	0.540	0.681	0.540
SE1	0.639	0.628	0.581	0.695
SE2	0.650	0.584	0.650	0.698
SE3	0.660	0.645	0.643	0.761
SE4	0.659	0.637	0.617	0.782
SE5	0.711	0.706	0.689	0.787
SE6	0.665	0.657	0.657	0.778
SE7	0.653	0.662	0.608	0.748

Table 4: Heterotrait-monotrait ratio (HTMT) – Matrix

	CTA	FCL	SCP	SE
CTA				
FCL	1.018			
SCP	0.986	0.935		
SE	1.009	0.972	0.981	

5. Hypothesis Testing

Smart PLS 4 was used to analyse a structural model after evaluating the measurement model.

This was accomplished by looking at both direct and indirect impacts. Considering the path coefficient and t value, the hypothesis was verified. The current study has six hypotheses, three direct and three indirect.

H1*: There is a positive and direct relationship between Flipped Cassroom Learning (FCL) and Student Engagement (SE)*

H2*: There is a positive and direct relationship between Flipped Classroom Learning (FCL) and Students' Critical Thinking Ability (CTA).*

H3*: There is a positive and direct relationship between Flipped Classroom Learning (FCL) and Students' Class Preparation (SCP).*

H4: *There is a positive and indirect relationship between Flipped classroom Learning (FCL) and Student Engagement (SE) with Students' Critical Thinking Ability (CTA) as a mediator.*

H5: *There is a positive and indirect relationship between Flipped classroom Learning (FCL) and Student Engagement (SE) with Students' Class Preparation (SCP) as a mediator.*

H6*: There is a positive and indirect relationship between Students' Class Preparation (SCP) and Student Engagement (SE) with Students' Critical Thinking Ability (CTA) as mediator.*

Figure 4: Structural Model

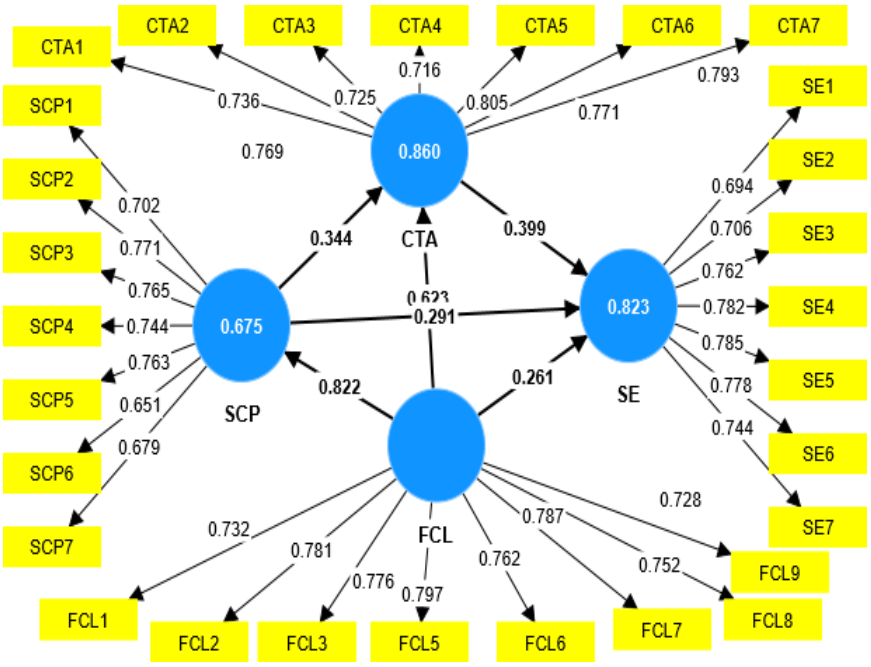

Table 5: Structural model assessment (Direct effects)

Hypothesis Testing		Original Sample (o)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (o/STDEV)	P Values	Decision
Hyp. 1	FCL -> SE	0.861	0.862	0.026	33.146	0.000	Accepted
Hyp. 2	FCL -> CTA	0.906	0.907	0.016	56.591	0.000	Accepted
Hyp. 3	FCL -> SCP	0.824	0.825	0.034	24.330	0.000	Accepted

Since the t-value for each of the three direct hypotheses (H1, H2, and H3) was greater than 1.96 (see Table 5), all three were accepted. In addition, the mediation impact was studied using PLS (SEM) bootstrapping. According to Hair et al. (2014), this is a viable method for analysing a small sample size.

Table 6: Structural Model Assessment (Indirect effects)

Hypothesis Testing		Original Sample (o)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (o/STDEV)	P Values	Decision
Hyp. 4	FCL ->CTA-> SE	0.249	0.247	0.052	4.782	0.000	Accepted
Hyp. 5	FCL ->SCP->SE	0.239	0.236	0.052	4.585	0.000	Accepted
Hyp. 6	SCP->CTA->SE	0.137	0.135	0.038	3.591	0.000	Accepted

In addition, the method of Preacher and Hayes (2004, pp. 717-731), Preacher and Hayes (2008, pp. 879-891) was followed when investigating the mediation effect, as suggested by (Hair et al., 2014). Therefore, the present research used Smart PLS 4.0 (Ringle et al., 2022) to investigate the relationship between CTA and SCP as a mediator using the bootstrapping approach and re-sampled a total of 5000 data points to check the t-value.

6. **Discussion**

This research confirms that a flipped classroom model improves active learning through students' engagement, critical thinking, and preparation for class. This indicates that students were more emotionally invested in the flipped study hall content when they were keen on the class, delighted in learning new data, participated in class, felt good about themselves, and had fun. Afterwards, they demonstrated behavioural engagement by attending class, paying attention, and making an effort to complete assignments and participate in group work as instructed by the instructor.

The overall effect of FCL on CTA, SCP, and SE was assessed. It was found that student engagement, students' critical thinking ability, and class participation are the factors that determine that FCL was an effective tool to enhance student performance in class.

Through this study, we were also able to accept all our hypotheses (Hyp. 1-6)

According to our study, students who actively participate in class by asking questions and fostering two-way contact with the instructor learn more effectively and develop better critical thinking skills.

Mediation Effect of CTA and SCP on FCL and SE:

Through the results of this study, it is proved that though there exists a direct and positive relationship between FCL-SE (t-value 33.146), the relationship is also positively mediated by CTA (t-value 4.782) and SCP (t-value 4.585). The results of this study back up the claim that instructors in flipped classrooms try to boost their students' critical thinking ability (CTA) by paying more attention to them, encouraging them to participate actively, and, ultimately, boosting their SCP. During in-class group tasks like discussion

boards on Edmodo, etc., lecturers in flipped classrooms often prefer to concentrate on students. More significantly, they adopt meta-cognitive methods (such as concentrating on class activities and time management) that may increase student involvement. Examples include facilitating in-class group work, offering meta-cognitive input before class, and aiding with reflection after class.

7. Implications

Seeing that this is their most memorable time in a flipped classroom, understudies are hesitant to completely share their own lecture notes throughout class. Students, however, benefit from being better prepared for class if they share their needs and wants with their instructors, talk about what they're interested in learning, ask for help if they need it, and otherwise do all they can to make the material as engaging as possible.

8. Conclusion

Through this research, students' self-regulating ability affected their participation in social and academic activities. FCL was influenced directly by Student Engagement, Critical thinking ability and Student class participation and indirectly by one's self-efficacy. FCL increases students' engagement. FCL has been shown to develop students' decisive reasoning abilities further. Understudies in this exploration were more likely to contribute to class discussions and actively learn while using a flipped classroom model that used online platforms like Edmodo and Google Classroom. By using these digital mediums, students could discuss their approaches to learning and problem-solving with the instructor and their classmates in real-time.

9. Limitation of Study

The research has the expected limitations. Although the sample size is adequate, all of the participants are from the single university, which may limit the study's generalizability.

Finally, the research was done for a very short period of time, which may limit the generalizability of the results about the impact of the flipped classroom. The authors of this research propose a scope for future studies in this regard.

9.1 Scope for Future Research

First, rather than drawing a study's sample from a single institution, it's suggested that future research include participants from a variety of academic backgrounds and institutions. The second piece of recommendation is to broaden the scope of the research beyond the three variables (SE, SCP, and CTA) that were the primary emphasis of this one. Finally, a longitudinal study is required to assess the impact of the flipped classroom style on the aforementioned characteristics, so expanding the sample to include courses other than management is the third suggestion.

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Appendix:

Course Experience Questionnaire: Precedence of Flipped Classroom and Its Impact on Student Engagement: The Mediating Study of Students Critical Thinking Ability and Class Preparation Using SEM-PLS.

1. Name:

2. Course:
   - BBA
   - MBA
3. Section:
   - Section A
   - Section B
   - Section C
4. Gender:
   - Male
   - Female

We are conducting research which seeks to study perception of students on flipped learning method. Given below are a few statements regarding the above-mentioned topic. Please tick the most appropriate option according to you against the statement, Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5).

Strongly Disagree 1 2 3 4 5 Strongly Agree

1. I believe that viewing videos and writing notes help me learn more effectively.
2. I feel more confident for my exam thanks to the flipped classroom style.
3. While viewing the videos, I attempt to learn as much as possible.
4. I wish more teachers used the flipped or inverted classroom paradigm.
5. I regularly pause or replay portions of the videos to better comprehend the topic.
6. I enjoy viewing the video tutorials.
7. The flipped classroom inspires me to think critically and creatively.
8. Learning basic information prior to class improves my knowledge of the topic.
9. The flipped classroom allows me to ask frequent questions inside the classroom.
10. My attention is drawn towards the learning process by the flipped classroom.
11. We must conduct more work outside of the classroom using flipped classroom.
12. A flipped classroom might be an effective teaching method.
13. A flipped classroom can increase interest in topics.
14. After seeing the video content, I felt ready to undertake course activities in class.
15. The flipped classroom seems to be more interactive than the typical classroom.
16. Because of the flipped classroom, I have less class chance to practice the ideas of the course in class.

17. The flipped classroom decreases the work required to comprehend the fundamentals of the subject matter.
18. The flipped classroom, in conjunction with information distribution outside of class and solving problems in class, is an educational style fit for my specialty.
19. I am more driven to understand the course contents as a result of the flipped classroom.
20. Improved collaborative learning with flipped classroom.
21. A flipped classroom can increase student engagement.
22. With flipped classes, I was able to learn at my own speed.
23. The flipped classroom allows me to interact with other students more effectively.
24. I feel that flipped classroom education helps me learn content better than traditional lecture-based training.
25. I would tell a friend about flipped classroom.
26. My learning style is best suited to a flipped classroom.
27. I believe that mastering learning in a flipped classroom boosted my academic performance.
28. My engagement with professors was not limited by flipped courses.
29. I believe that understanding concepts through flipped classroom helped my grasp of the course.
30. My reliance on the teacher has been decreased thanks to flipped classroom learning.