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I-CReST 2025: 080-052 – From Screen to Classroom: Student Perceptions of Asynchronous Teaching and Learning Physics at Foundation Level

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ABSTRACT

This study investigates the effectiveness of a blended learning which combined asynchronous video-based instruction and a remedial face-to-face class to improve a conceptual understanding among physics students in the Centre for Foundation Studies, International Islamic University Malaysia (CFS, IIUM). Beginning their physics class, the students were giving a briefing on blended learning to be conducted throughout their physics class. A survey has been also conducted with the purpose of knowing their readiness on learning the physics subject. Over a two-weeks of period, students engaged in self-paced asynchronous learning using YouTube pre-recorded video lectures and doing exercises from the textbook, which also served as attendance markers. The achievement of the students was assessed from a test namely Post Asynchronous Test which they have attempted after completing this online learning from YouTube pre-recorded video. The survey and test result were recorded. The students then attended a face-to-face remedial class with the lecturer on the same topics they have learnt previously from the YouTube pre-recorded video lectures and the exercises they have attempted. Another set of test, namely Post Face-to-face Test is given to see the student's achievement after they engaged in the remedial face-to-face classes. Another set of survey items developed as online questionnaires is dispersed and responded by the students. Upon comparing to their result in a previous Post Asynchronous Test, the results of the Post Face-to-face Test has showed the notable increasement in student performance after their engagement with the lecturer in the face-to-face remedial classes. In addition to this, quantitative feedback from the survey was also collected to explore the student perceptions of both learning modes. Students enjoyed the flexibility and the chance to replay the videos, especially because the explanations were clear and helped them understand difficult topics. However, challenges included difficulty maintaining motivation learning alone, lack of real-time feedback, and surrounding distractions. In contrast, they found that face-to-face classes are more helpful because they could interact with lecturer and classmates, asked questions directly and stay focused. All the mean scores for the survey items after implementing face-to-face learning mode fall within the range of 3.15 to 3.82 which conform that students generally choose to agree and strongly agree that the face-to-face learning mode enhances their conceptual understanding, engagement and motivation, and perceived effectiveness in learning physics subject as compared to asynchronous learning mode. This study concluded that while the online learning is helpful, students improve more when it is followed by well-planned face-to-face remedial sessions.

Keywords: Blended learning; asynchronous teaching and learning; remedial face-to-face classes; YouTube pre-recorded lecture videos

1. INTRODUCTION

Physics is often perceived as a challenging subject to most of the students due to the requirement to understand and relates both the conceptual and practical of the subject content. The student's achievement across various topics in physics were done through various assessment to ensure their progress of their learning can be monitored [1]. Various teaching tools such as the integration of technology in physics education has become an essential area of research due to its potential to overcome various challenges and shortcomings in the traditional teaching methods [2]. Incorporating diverse types of learning tools during the teaching and learning (TNL) session may promote more engaging, effective and inclusive learning environment.

Blended learning which combines both online and face-to-face learning mode in TNL physics makes learning physics more interactive and favourable to the students [3]. Online resources have allowed students to learn at their own pace, accommodating different learning speeds [4]. Blended learning achieves defined pedagogical goals and fosters active, collaborative, and student-centred learning experiences [5]. Blended learning, with its fusion of delivery methods, is tailored to meet the diverse learning requirements of students across various subjects, fostering personal ownership and satisfaction in the learning journey [6]. This pedagogical approach caters to diverse learning styles and preferences, offering flexibility and personalized learning experience [7].

Asynchronous learning, a key component of many blended learning models, allows students to engage with course materials at their own pace and on their own schedule, often through pre-recorded lectures, online forums, and digital resources. This self-directed learning approach empowers students to take control of their education, revisit complex concepts as needed, and manage their learning around other commitments. The rise of blended learning has been further accelerated by the COVID-19 pandemic, which necessitated the rapid adoption of online and hybrid teaching models in educational institutions worldwide [8]. The shift towards online learning environments has presented both opportunities and challenges for educators and students alike.

2. METHODOLOGY

In this study, the main materials are 5 pre-recorded Lecture Videos uploaded to YouTube channel with total time duration of 158.94 minutes for Chapter 1 and Chapter 2 of Physics I subject taken by Dentistry and Pharmacy foundation programmes students in CFS, IIUM. These videos are used as the teaching source in asynchronous video-based instruction. Students engaged in self-paced asynchronous learning using YouTube pre-recorded lecture videos and accompanying by assigned exercises taken from a chosen physics textbook. There are two pre-recorded video lectures for Chapter 1: Physical Quantities and Vectors with subtopics of Physical Quantities, Units, Dimensional Analysis and Vectors. The other three pre-recorded lecture videos are providing lecture on Chapter 2: Motion in One and Two Dimensions with subtopics of Displacement, Speed, Velocity, Acceleration, Motion Diagram, Graphs, Motion in one Dimension with Constant Acceleration and Motion in Two Dimensions.

In the beginning of the asynchronous session, an online briefing by the lecturer was carried out via Microsoft Teams, explaining on how this asynchronous session shall be done. An online survey has been conducted with purpose to know the readiness and motivation among students as well as challenges or difficulties predicted by the students. Over a two-weeks of period, students engaged in self-paced asynchronous learning using the YouTube pre-recorded lecture videos and accompanying 14 questions and exercises assigned from textbook, which also served as attendance markers. One telegram group is set up as medium for students to ask

questions or carry out discussion. To check students' progress after the online learning, they took a Post Asynchronous Test physically, and their mark is recorded. The Post Asynchronous Test consists of ten multiple choice questions and three structured questions with total mark of twenty-five. To evaluate more on post asynchronous learning session, a set of survey items developed as online questionnaires is distributed and answered by the students.

After the asynchronous session, the students then are required to attend face-to-face remedial classes consisting of lecture sessions and tutorial sessions with the lecturer. After the face-to-face remedial classes, the students took another face-to-face test namely Post Face-to-face Test, to see if they improved more and their mark is recorded. The structured of this test is the same to the Post Asynchronous Test. To inspect more on the effectiveness of face-to-face remedial classes, another set of survey items developed as online questionnaires is dispersed and responded by the students.

In this study, quantitative method research design was employed by using questionnaires and tests. The responses were measured by means of the Likert scale. Using a scale of one to four (1 = Strongly Disagree, 2 = Disagree, 3 = Agree and 4 = Strongly Agree), the respondents identified their choices for each survey item. In the survey, 33 responses were recorded and the data from Google Form was extracted and analysed. The results of the survey were analysed using descriptive analysis. The means of each item were extracted to determine the central tendency of the results. In summary, the sequences of the methodology applied in this research is represented by Fig. 1 where it consists of designing material, execution of the asynchronous session as well as face-to-face session and finally collecting and analysing of the data.

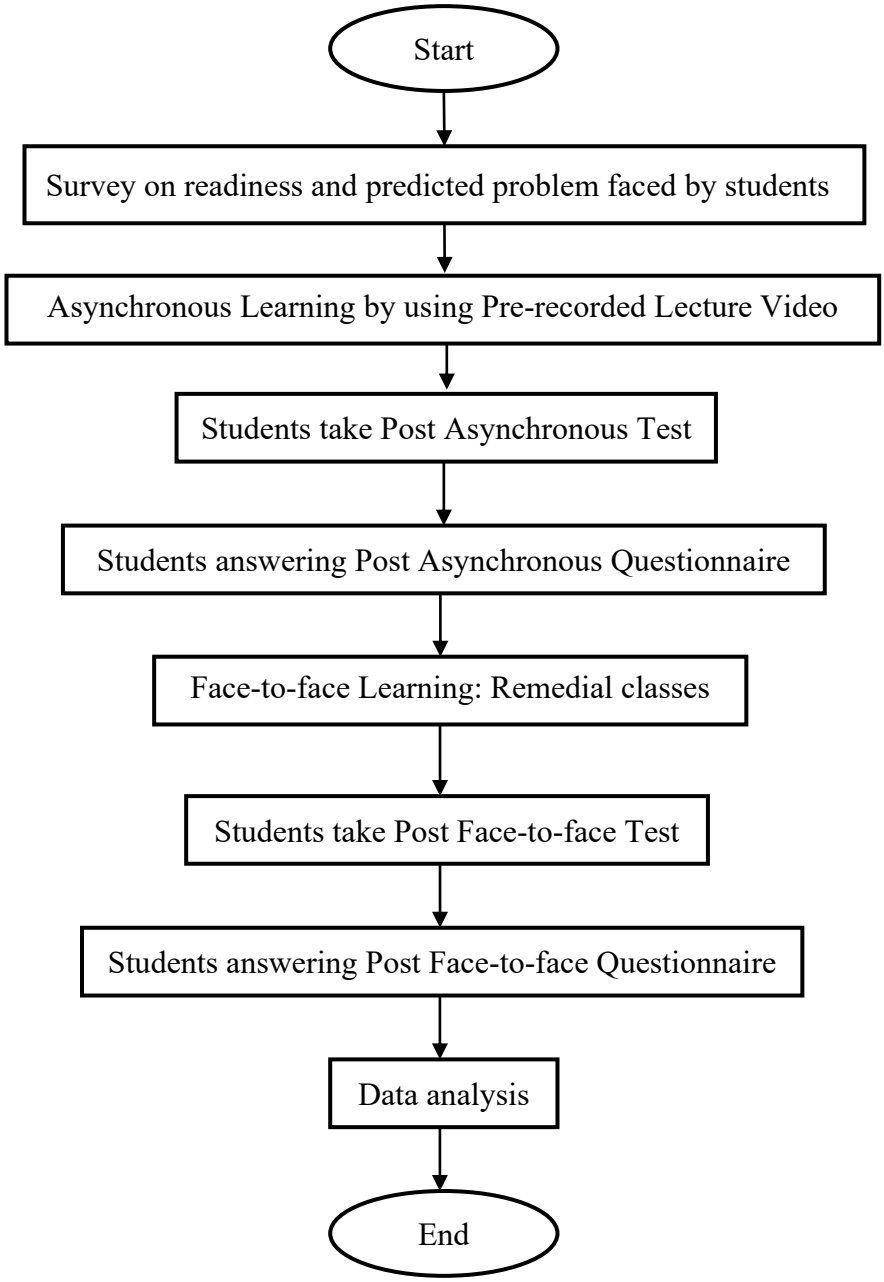

Fig. 1. Sequences of the research methodology

3. RESULT AND DATA ANALYSIS

Two sets of questionnaires were given to the students at end stages of each teaching process. The first questionnaire was distributed after students completed asynchronous learning, which primarily involved video lectures and independent study materials.

Subsequently, after transitioning to face-to-face classes, the students were given a second questionnaire. The surveys measured any changes in their conceptual understanding in physics, engagement and motivation and perceived effectiveness. The comparative data from both stages allowed for a clearer assessment of how blended learning impacts student outcomes in learning physics at foundation level.

In this part, nine survey items are tested on the students. The students are required to select one of the choices on the Likert scale from 1 to 4 (1=Strongly Disagree, 2=Disagree, 3=Agree, 4= Strongly Agree). The category of the scale on which the mean falls is represented by a score that is used to interpret the Likert scale results as in **Table 1** as in a study by M. B. Yazon et. al [9].

Table 1. Likert scale

Category	Range
Strongly Disagree	1.00 – 1.75
Disagree	1.76 - 2.50
Agree	2.51 – 3.25
Strongly Agree	3.26 – 4.00

3.1 Analysis of Student Feedback on Conceptual Understanding in Physics

The feedback is presented in Fig. 2, illustrating the mean values of students' responses across these three sub-themes. For each sub-themes, students rated both asynchronous and face-to-face learning modes. The bar chart uses a color-coded scheme to distinguish between the two modes of delivery, allowing for visual comparison of asynchronous and after face-to-face delivery mode. The feedback is categorised into three sub-themes which are Understanding of Subtopics, Application of Knowledge, and Confidence.

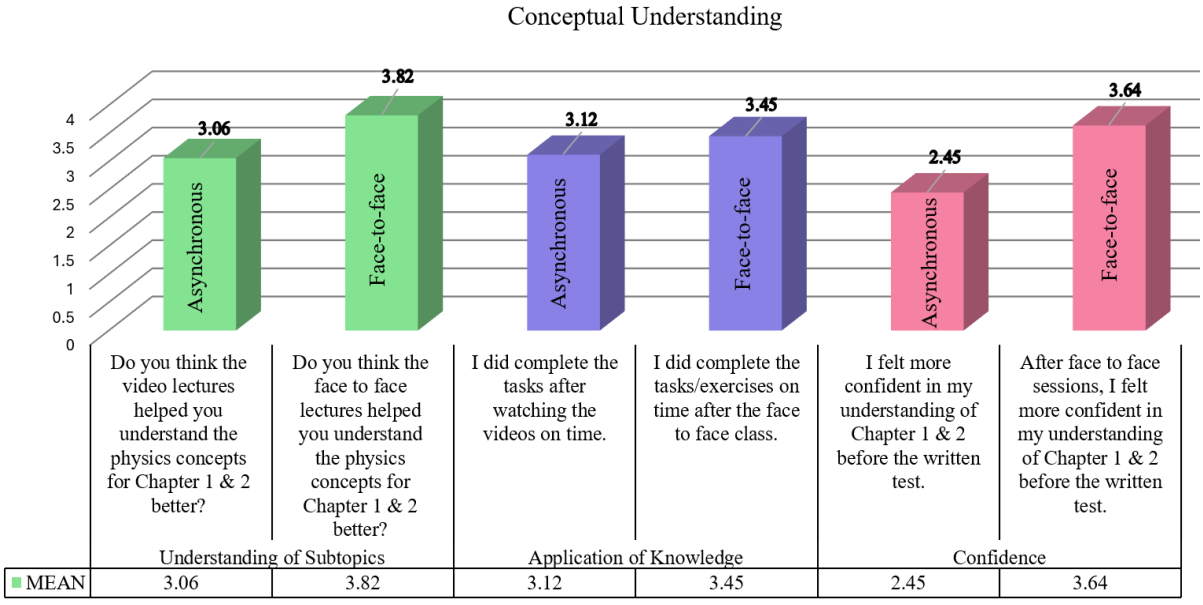

Fig. 2. Analysis of student feedback on conceptual understanding in physics

3.1.1 Understanding of Subtopics

The video lectures received a mean score of 3.06, suggesting that students found them moderately helpful in understanding the physics concepts for Chapter 1 and 2. In contrast, the face-to-face lectures recorded a higher mean score of 3.82, indicating that students perceived them as significantly more effective in enhancing their conceptual understanding. In conclusion, face-to-face learning mode provided better clarity and conceptual depth.

3.1.2 Application of Knowledge

Students reported moderate task completion after asynchronous learning mode with mean score of 3.12, while the students scored higher mean of 3.45 for task/exercise completion after face-to-face learning mode. This suggest that they were more able to apply their knowledge and complete the given tasks after in person clarification. In conclusion, completion of the tasks is more meaningful after the face-to-face interaction due to clearer instruction and motivation.

3.1.3 Confidence

At the end of the asynchronous learning mode, the students rated their confidence at the mean score of 2.45, showing low self-assurance in their understanding before the written test. However, after the face-to-face learning mode, their confidence increased substantially to 3.64.

3.1.4 Conclusion on Conceptual Understanding in Physics

In conclusion, personal interaction, explanation, and the ability to ask questions directly to the lecturer and classmates were greatly improved students' confidence in their learning. From the findings of these three sub-themes, face-to-face learning mode consistently outperformed asynchronous learning mode across all aspects: Understanding of Subtopics, Application of Knowledge, and Confidence.

3.2 Analysis of Student Feedback on Engagement and Motivation

The findings on Engagement and Motivation are presented in Fig. 3, illustrating the mean values of students' responses across three sub-themes: Task Completion, Enjoyment and Comfort, and Motivation. Like Fig. 2, students rated both asynchronous and face-to-face learning formats for each sub-theme.

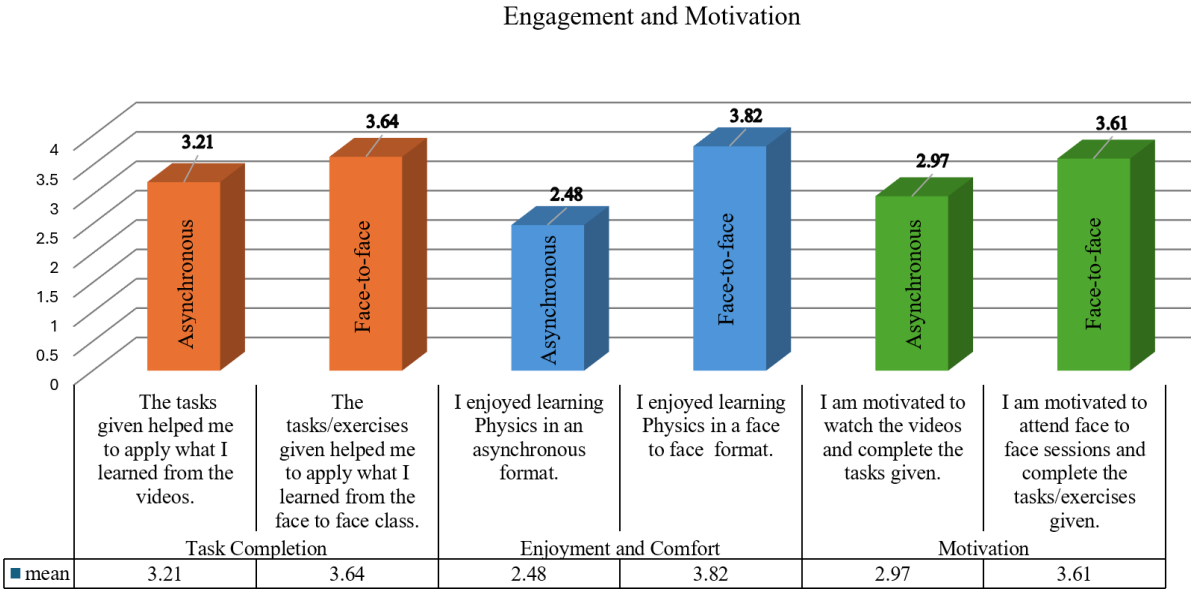

Fig. 3. Analysis of student feedback on engagement and motivation

3.2.1 Task Completion

Face-to-face learning mode scored higher mean of 3.64 than asynchronous sessions of mean score 3.21. This suggests that the students found tasks and exercises were more effective when conducted in a face-to-face environment, probably due to direct interaction, clearer guidance, and the opportunity to ask questions in real time.

3.2.2 Enjoyment and Comfort

A stark contrast is observed where face-to-face learning mode received a high mean of 3.82, while asynchronous learning mode scored significantly lower at 2.48. This indicates that students enjoy and feel more comfortable learning physics in a face-to-face learning mode. The lower enjoyment in asynchronous sessions could be due to lack of interaction, isolation, or difficulty in understanding material independently.

3.2.3 Motivation

In terms of motivation, the students were more motivated to attend and participate in face-to-face learning mode where the mean score is 3.61 as compared to completing the asynchronous task with the mean score of 2.97. The motivation gap suggests that the physical presence of lecturer and classmates during face-to-face sessions played a key role in encouraging students to stay engaged.

3.2.4 Conclusion on Student Feedback on Engagement and Motivation

Across all the sub-theme categories, face-to-face learning mode consistently outperformed asynchronous methods in terms of task completion, enjoyment, and motivation. This trend implies that though asynchronous methods can support independent learning, yet they may not fully address students' needs for interaction, immediate feedback, and engagement.

3.3 Analysis of Student Feedback on Perceived Effectiveness

Fig. 4 shows the students' perceptions of the effectiveness of the two different learning modes across three main areas which are Test Preparedness, Test Performance, and Recommendation to Others. For each of these sub-themes, students rated both asynchronous and face-to-face learning modes.

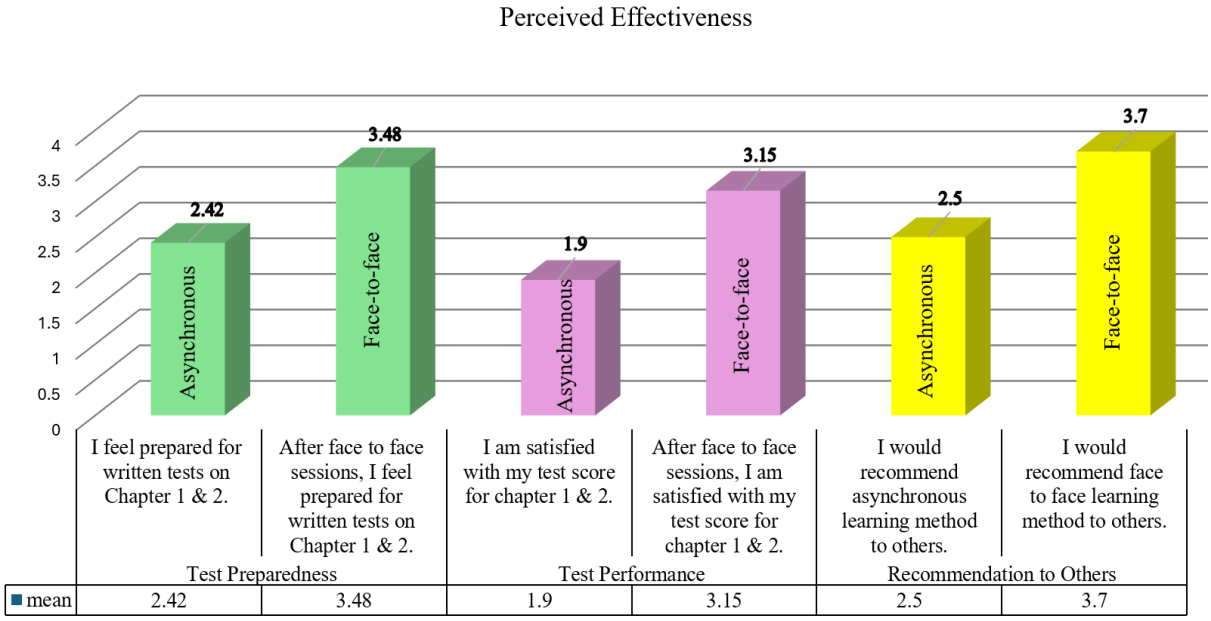

Fig. 4. Analysis of student feedback on perceived effectiveness

3.3.1 Test Preparedness

The data reveals that face-to-face learning mode with mean score of 3.48 was perceived as more effective in preparing students for the written test compared to asynchronous learning with mean of 2.42.

This suggests that while videos provide a foundational level of understanding, they lack the interactivity, clarification opportunities, and direct engagement that in-person sessions offer. The noticeable gap indicates a strong preference for synchronous interaction when it comes to building confidence before test.

3.3.2 Test Performance Satisfaction

The students expressed a significantly low overall satisfaction with their test score after asynchronous learning mode where the mean is 1.9 only. However, this perception improved significantly for their test score after attending face-to-face learning mode where the mean is increased to 3.15.

The low baseline satisfaction suggests a performance gap that might be due to from initial confusion or incomplete understanding during asynchronous learning mode. The improvement after face-to-face learning mode highlights the corrective impact of real-time feedback, discussion, and guided reinforcement. This help in bridging the gap between knowledge and assessment readiness.

3.3.3 Recommendation to Others

When asked whether they would recommend the learning methods, students were more likely to recommend face-to-face learning mode where the mean score is 3.7. While asynchronous learning mode scored lower with mean of 2.5.

This indicates a clear students' preference for face-to-face learning mode. The significant difference implies that students value interaction which is often missing in asynchronous formats.

3.3.4 Conclusion on Student Feedback on Perceived Effectiveness

The finding strongly supports the effectiveness of synchronous or face-to-face learning mode in promoting student preparedness, enhancing satisfaction with test performance, and encouraging peer recommendation. Although asynchronous learning mode offers flexibility and some support, they appear to be insufficient as a standalone approach.

4. CONCLUSION

The findings of this study clearly demonstrate that face-to-face or synchronous learning mode consistently outperforms asynchronous learning mode across multiple dimensions which are Conceptual Understanding, Engagement and Motivation, and Perceived Effectiveness. While asynchronous video lectures offer flexibility and serve as a valuable tool for introducing key physics concepts, they are not enough if being used as standalone approach. Students reported higher satisfaction, better test preparedness, and greater motivation following direct, interactive sessions.

Quantitative results further reinforce this trend where the average test score after asynchronous learning was 14 out of 25 marks. Meanwhile, the average test score improved to 19 out of 25 marks after face-to-face learning mode covering the same content. This significant gain highlights how in person interaction deepens understanding and helps students combine their knowledge more effectively.

All the mean scores for the survey items after implementing face-to-face learning mode fall within the range of 3.15 to 3.82. According to the Likert scale as in **Table 1**, this indicates that students generally agree to strongly agree that face-to-face learning mode enhances their Conceptual Understanding, Engagement and Motivation, and Perceived Effectiveness.

Therefore, it is recommended that asynchronous learning be strategically integrated with structured, synchronous sessions. This blended learning model allows students to first explore content independently and then increase their understanding through guided instruction, collaborative tasks, and lecturer's feedback where ultimately promoting deeper learning and improved academic performance.

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