Evaluating the Usability of the 3Fs Flipped Model to Enhance Student Engagement: A Case Study at INTI International College Penang

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ABSTRACT

This study investigates the usability of the 3Fs Flipped Model (Flipped, Formative, and Feedback) in promoting student engagement at INTI International College Penang. Grounded in digital pedagogy and instructional design, the model integrates pre-class content delivery, ongoing formative assessment, and timely feedback to support active, student-centered learning. The novelty of this study lies in its structured integration of the 3Fs model with digital tools such as asynchronous video lectures, interactive Google Forms, Padlet discussions, and real-time quizzes using Quizizz and Mentimeter across each phase of learning to enhance engagement and self-directed learning. A quantitative approach was employed, involving 151 students from four academic programmes: General Studies, Information Technology, Business Studies, and Physics. Data were collected using Google Forms to explore students' experiences and perceptions of the model. The study specifically examined engagement levels before and during class sessions. Results indicated strong positive associations between structured formative activities and students' reported preparedness for class. In-class engagement also improved, with timely feedback contributing significantly to motivation and self-reflection. Overall, students reported positive engagement experiences across disciplines when formative assessment and feedback were systematically integrated. The findings are limited to the current context but suggest possible relevance to similar higher education settings and further studies employing experimental or longitudinal methods are recommended.

Keywords: Flipped Classroom, Instructional Design, Student Engagement, Formative Assessment and Feedback

INTRODUCTION

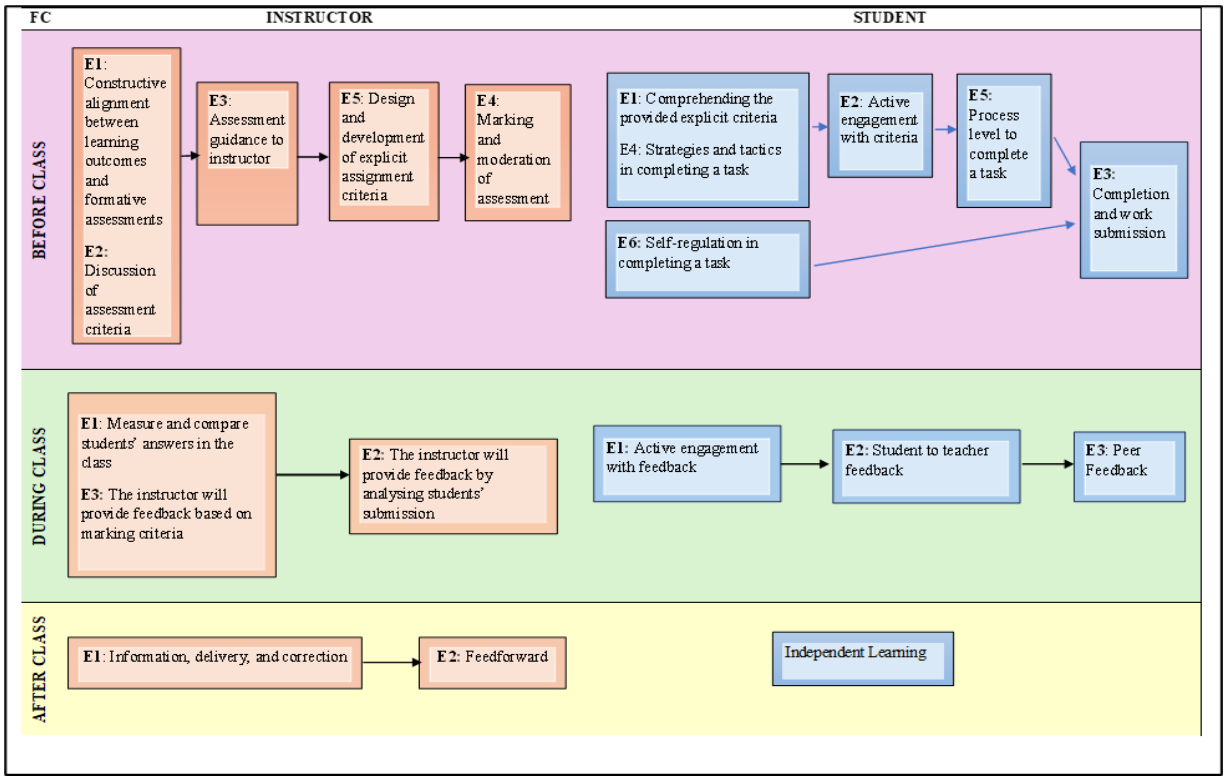
The advancement of technology has enhanced teaching and learning practices in higher education in the 21st century. The flipped classroom (FC), also known as the inverted classroom, has been widely adopted in tertiary education. According to Bergmann and Sams (2012), in flipped learning, students are required to watch pre-recorded videos and engage in independent learning before the actual class. Class time is then fully devoted to in-depth discussions of the learning topic. The teacher provides all the learning materials before class and, during class, teacher will play their role as a facilitator rather than a "sage on the stage." In other words, in flipped learning, the construction of knowledge will take place during pre-class independent learning, while further discussions during class promote deeper understanding and more meaningful learning.

There are many advantages that have been highlighted in previous research regarding the adoption of this new teaching strategy in tertiary education. Flipped learning has been shown to improve students' learning achievement (Lee & Wallace, 2018; Polat & Karabatak, 2021), performance (Ruiz-Jimenez et al., 2022), and participation (Othman et al., 2023) in the classroom. However, some researchers have emphasized that both teachers and students face certain difficulties in flipped learning. Some teachers observed that students were not prepared or failed to complete the assigned pre-class tasks, and as a result, they were lost or disengaged during

class (Fructuoso et al., 2022; Sointu et al., 2023). Likewise, students asserted that they were not briefed about the pre-class tasks and did not receive explicit instructions on how to complete independent learning before class (Bond (2020; Rawas et al. (2020). Despite these challenges, limited empirical studies have examined how structured formative assessment and feedback practices within flipped classrooms are associated with student engagement particularly in higher education contexts.

Therefore, in this study, the 3Fs model, a modified flipped classroom model (Mahalecumy & Azidah, 2024), is utilized to support teaching and learning practices in flipped classrooms. This 3Fs model focuses on flipped formative feedback in flipped classrooms and can serve as a guideline for both teachers and students. Flipped formative assessment is an important component of flipped learning (Jeong et al., 2021). Teachers are required to carefully design and prepare learning content based on the course learning outcomes (CLOs) and to provide explicit instructions to students. Feedback in flipped classrooms is inevitable and represents an important element in supporting student engagement in flipped learning. Timely feedback for formative assessments has been associated with students' engagement and learning experiences in flipped classroom (Winiewski et al., 2020; Jia et al., 2023). In short, both formative assessment preparation and real-time feedback are associated with student engagement in flipped learning.

The 3Fs model highlights the teacher's role before class, during class, and after class. Similarly, it guides students on how to actively participate and stay informed about formative assessments before, during, and after class. One potential advantage of adopting this model in flipped learning is the provision of a structured guideline that supports clarity of roles within the flipped learning environment. The main objective of this study is to examine the usability of the 3Fs model in relation to students' engagement in the flipped classroom. In this study, usability is conceptualized as students perceived ease of engagement with formative assessment and feedback processes in the flipped classroom. The focus is on how students interact with, understand, and respond to formative learning activities and feedback embedded in the 3Fs Flipped Model. This conceptualization aligns with pedagogical perspectives that emphasizes learner experience and engagement in instructional design. The 3Fs model is outlined as follows:



METHODOLOGY

This study employed a quantitative correlational research design to examine the relationship between formative assessment practices embedded in the 3Fs Flipped Model and student engagement in a flipped classroom context. The study did not include a control group, pre-test/post-test comparison or longitudinal design. Therefore, the findings indicate associations rather than causal effects. The target respondents were undergraduate students enrolled in General Studies, Information Technology, Business Studies, and Physics programmes at INTI International College, Penang. A survey strategy was adopted with the individual as the unit of analysis, and the study implemented formative assessment preparation based on the 3Fs model, which comprised three stages: Pre-Class Preparation, During Class, and After Class.

The intervention was conducted over four weeks, and data were collected through a self-administered online questionnaire. The survey link (Google Form) was distributed via Canvas (for the SUT programme), the LMS (for INTI programmes) and via WhatsApp group chats, as these platforms provided a faster and more convenient means of reaching respondents. A total of 151 students voluntarily completed the questionnaire. A random sampling method was employed to ensure adequate representation across the three programme categories. The survey instrument was validated prior to administration. The responses collected through Google Forms were analysed using SPSS. Simple linear regression analysis was conducted to examine the strength and direction of relationships between formative assessment components and student engagement in flipped classroom.

RESULTS AND DISCUSSION

Table 1. Results of the simple linear regression analysis

Variables	**Pearson Correlation (r)**	**R^2**	***P* Value**
Assessment before class and Engagement	.686	0.470	<.001
Assessment during class and Engagement	.705	0.497	<.001
Assessment techniques in FC and Engagement	.702	0.493	<.001
Formative Feedback and Engagement	.777	0.603	<.001

Assessment before class and Engagement

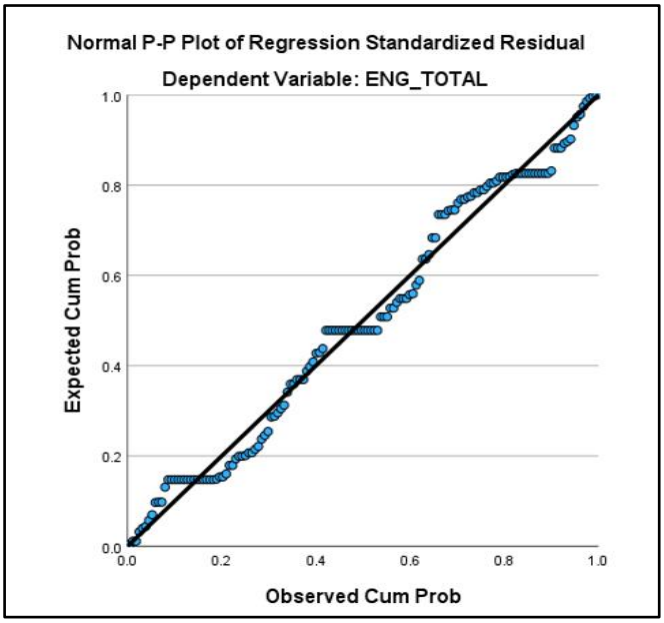


Figure 1: Probability plot for assessment before class and engagement.

Assessment during class and Engagement

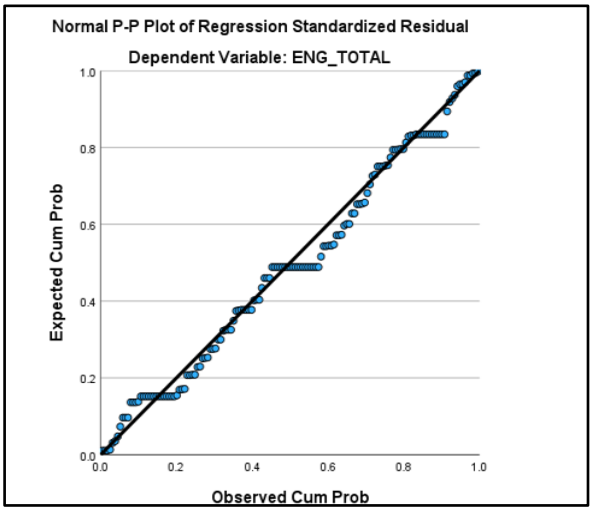


Figure 2: Probability plot for assessment during class and engagement

Assessment techniques in FC and Engagement

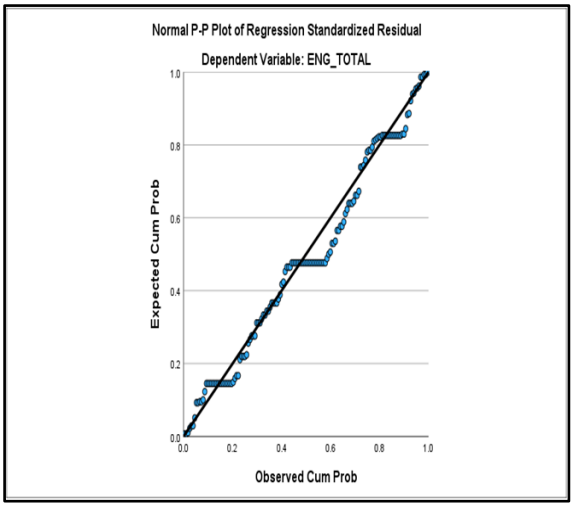


Figure 3: Probability plot for assessment techniques in feedback and flipped classroom and engagement.

Formative Feedback and Engagement

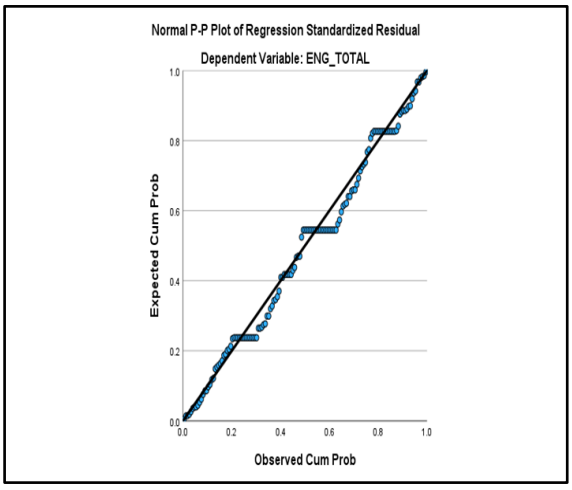


Figure 4: Probability plot for formative engagement.

The findings of this study indicate consistent positive associations between formative assessment practices embedded in the 3Fs Flipped Model and student engagement in the flipped classroom context. Across the four examined categories namely assessment before class, assessment during class, assessment techniques in the flipped classroom, and formative feedback. Based on the results, all variables demonstrated strong positive correlations with student engagement with Pearson correlation coefficients (r) ranging from approximately 0.69 to 0.78. The coefficients of determination (R^2) indicate that between 47% and 60% of the variance in student engagement can be explained by these formative assessment components. All relationships were statistically significant at $p < 0.001$ and outcomes of the P–P plots showed no major deviations from normality which is also supporting the appropriateness of the regression analyses.

Among the four categories, formative feedback demonstrated the strongest association with student engagement. This may be explained by the role of feedback in supporting self-regulated learning within flipped learning environments. In flipped classrooms, students are required to engage with learning materials independently before class, which increases the need for guidance and clarification. Timely formative feedback may help students monitor their understanding, clarify expectations and adjust their learning strategies. As a result, this may support students' behavioural and cognitive engagement during in-class activities.

The positive associations identified for assessment before and during class suggest that structured formative assessment practices may help address common challenges reported in flipped learning such as lack of preparedness and uncertainty regarding task expectations. Thus, clear instructions, aligned assessment criteria and formative checks during class may reduce confusion and support active participation in flipped classroom. Furthermore, these findings highlight how formative assessment practices are associated with student engagement within the studied context. In addition, the findings of this study highlight that student engagement in flipped classroom is not only influenced by instructional delivery but also by the design of assessment and feedback processes which is consistent with previous research. The study adds to the literature by examining these relationships within an integrated 3Fs model across multiple programmes at INTI International College Penang while recognising the limitations of the findings.

Moreover, it is important to note that this study employed a correlational design without a control group, pre-test/post-test comparison or longitudinal study design. In this regard, the findings do not establish causal relationships but instead highlight patterns of association that require further investigation. Future research employing experimental or longitudinal designs utilising the 3Fs model may provide deeper insights into how formative assessment and feedback influence student engagement in flipped classroom settings in tertiary education.

CONCLUSION

This study concludes by introducing and implementing the 3Fs model, a modified flipped classroom model developed by Mahalecumy & Azidah (2024), to examine the teaching and learning experience through carefully planned formative assessment with real-time formative feedback. By focusing on flipped formative assessment, the model offers educators and students clear and useful guidelines that ensure timely feedback and formative assessment are seamlessly integrated before, during, and after class sessions. This structured approach clarifies the roles of teachers and students and supports student engagement in flipped learning environments.

Additionally, this study highlights the importance of well-designed formative assessment and timely feedback aligned with the course structure as important elements for implementation. The limitation of this study is that this was the first attempt to implement the 3Fs model after its development. Therefore, the research findings of this study should be interpreted within its limitations. A longitudinal study over several semesters is proposed for future research to evaluate the usability of the 3Fs model in the flipped classroom in order to provide a comprehensive example of formative assessment and feedback practices for various selected courses. Finally, the study aims to examine the usability of the 3Fs model in relation to student engagement, providing insights into how formative assessment and timely feedback are associated with flipped classroom practices in higher institutions.

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