Learning Experience in a Flipped Classroom Model: Predictors of Learning Satisfaction

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Abstract– This quantitative explanatory study employs a cross-sectional design to explore how affective commitment, behavioural engagement, expectation of effort, performance expectancy and relative advantage influence learning satisfaction in a flipped classroom model. Using multiple linear regression analysis, five predictor variables and one dependent variable are examined within a structural model to determine the key factors contributing to improving students' educational experience. The study sample was 215 male and female higher education students in Peru. The results of the study show that affective engagement is the most significant predictor of learning satisfaction in the flipped classroom model, with a coefficient of 0.545 and a p-value of 0.000. In addition, relative advantage also positively influences student satisfaction. These findings underline the importance of the emotional dimension and the perceived superior benefits of this pedagogical model. In conclusion, educators should focus on strengthening emotional engagement and effectively communicating the advantages of the flipped classroom to maximise student satisfaction.

Keywords— Affective commitment, Learning Experience, Flipped Classroom, Relative advantage, Learning satisfaction.

I. INTRODUCTION

The concept of the flipped classroom has been widely discussed and defined under various perspectives that converge on the centrality of the student, the incorporation of technologies, and the redefinition of the role of the educator. The flipped classroom is a method that challenges traditional education schemes, highlighting the role of the student as the protagonist of learning. At the same time, the teacher acts as a mediator or guide[1]. Similarly, Cuji Reino emphasizes using digital resources such as videos and readings, which allow the students to follow the class and explain and actively manage the content during their knowledge acquisition process [2].

Zeng characterizes the flipped classroom as a modern educational strategy that encourages students' development of skills and abilities, positively impacting their thinking and effective learning [3]. This model is a shift towards more dynamic and interactive learning, where the environment becomes both a collective and individual space, promoting meaningful learning mediated by the intensive use of technology [4, 5]. The personalization of education, where the activities and prior preparation of the student are key to an education adapted to their individual needs, fosters their autonomy and self-learning.

This approach reflects a consensus on the transformative impact of the flipped classroom on teaching and learning, shifting the focus from the teacher to the student and reconfiguring the use of time and educational resources to maximize active and personalized learning. These transformations challenge traditional educational methods and complement them, proposing a framework in which the student not only seeks information but also actively builds his or her knowledge in collaboration with peers and under the guidance of his or her educators.

Affective engagement in the flipped classroom context refers to the emotional attachment and positive feelings students develop toward their learning environment, including their peers and educators. This type of engagement is critical to fostering a motivating and supportive learning environment, which is crucial in flipped classrooms due to the unique structure of this educational model.

In flipped classrooms, students' engagement and learning experience are often enhanced compared to traditional educational settings. Studies indicate that this improved engagement is primarily due to the flipped classroom's active learning components and interactive nature [6-8]. Furthermore, the flipped classroom model significantly influences emotional and motivational outcomes such as enjoyment, motivation, and boredom reduction. Factors such as perception of preview materials, teacher facilitation, and active participation in learning activities play a crucial role in these emotional experiences [6, 9].

The flipped classroom also promotes strong relationships among peers and between students and instructors, creating a sense of community and support essential for affective engagement. Students feel recognized, safe, and valued in their learning environment [8, 10]. Furthermore, this educational approach fosters the development of affective skills through activities that require students to share ideas, respect their peers, and contribute to class discussions, helping to create a collaborative and supportive learning environment [7, 10]. Finally, affective engagement positively impacts learning outcomes, including interpersonal and communication skills, critical thinking, and problem-solving abilities. Students who participate in flipped classes often report higher satisfaction and better academic performance due to their emotional engagement with the learning process [7, 11, 12].

Behavioural engagement is defined as an active search by the student to connect his or her performance with academic challenges, which implies a critical analysis of the factors that influence his or her engagement and the identification of available support resources [13]. This relationship between behavioural engagement and academic performance is fundamental since the student analyzes and relates his or her engagement in the educational context, thus determining his or her performance.

Furthermore, behavioural engagement encompasses practical and emotional connective aspects, integrating previously developed theories, and allowing students to experience and describe behaviours linked to their learning experiences [14]. School engagement, for its part, is a crucial factor in the development of education, affecting cognitive, affective, and behavioural aspects that significantly influence the student's educational context [15]. Rodríguez-Castellanos and collaborators expand this view by exploring how behavioural engagement compares to different effectiveness practices, including both behavioural and physical strategies, such as training and nutritional education, thus contributing to the development of student behaviour [16].

These multiple perspectives reflect the importance of behavioural engagement not only in the academic field but also in the student's comprehensive development, supporting their motivation and ability to adapt and thrive within the educational system.

The expectation of effort in educational contexts is crucial to understanding how students interact with technological tools, especially regarding their ease of use. It is suggested that when students perceive technology as easy to use, they are more likely to adopt it in their learning process [17]. Furthermore, in a flipped classroom model, the expectation of effort implies significant planning and use of educational materials, fostering student autonomy in their learning [18].

In this same context, it is highlighted that the expectation of effort requires teachers to adopt new technological methodologies, which adds complexity to using learning platforms [19]. Students' perception of the effort required to learn through resources such as videos directly influences their motivation to participate actively in class [20]. If students believe their effort is proportional to the benefits obtained, their motivation and commitment will improve considerably [21].

In studies on online flipped classroom models, it was observed that students positively value the structure of the course; although it requires active participation, they perceive that the effort required is manageable and enriches the learning experience [22]. However, the expectation of considerable effort can generate anxiety and demotivation among students, especially if they do not clearly understand the expectations [23]. Finally, the importance of empirically validating the expectations of the flipped classroom is underlined to confirm its effectiveness in learning [24].

Performance expectation is a crucial factor influencing how students perceive the effectiveness of educational strategies and systems in improving their academic performance. Alyoussef points out that this expectation is linked to the adoption of new technological implements and the degree to which students use these systems, expecting positive results in their performance [17]. For their part, Ros and Laguna identify that students see the methodological strategy of the flipped classroom as an opportunity to improve their academic performance, which reinforces their learning and the development of metacognitive capacities [25].

Lucena et al. highlight that the flipped classroom, compared to traditional teaching models, can significantly improve student's grades and overall learning [26]. Fernández and Gaytán emphasize that the performance expectation of the flipped classroom strategy also affects how students manage their learning outside of class, leading to positive results in their performance and the development of skills such as critical thinking [27]. Furthermore, Aguayo Vergara observes that this expectation generates positive academic achievements since students, by having prior access to resources, arrive better prepared and more active in their classes [28].

Performance expectancy in the flipped classroom context translates into positive experiences, mainly during exams, as it facilitates collaborative work and improves students' interaction and cognitive skills [29]. This is how collaborative and autonomous learning in the flipped classroom improves students' performance and skills, encouraging an active approach to their education [30]. On the other hand, performance expectancy improves significantly thanks to students' high motivation and commitment to an interactive and socially active learning environment [31].

Relative or comparative advantage refers to each individual's unique ability to develop and optimize available resources, described as the effectiveness with which a person manages the resources at their disposal [32]. It is noted that relative advantage is linked to an individual's production and operation decisions at different times, directly affecting their productive efficiency.

The importance of relative advantage in adapting to changing structures allows needs to be met efficiently by optimizing resources and products. It is manifested in how users perceive and enjoy different attitudes towards a specific resource, evidencing the relevance of perception in the use of resources [33]. The theory of comparative advantage emphasizes efficiency in production as a mechanism to achieve specialization and, consequently, an absolute advantage [34].

In addition, it discusses how comparative and competitive advantage allows individuals and companies to achieve superior performance by offering products and services that stand out in the market, fostering continuous improvement and effective competition [35]. The relative advantage lies in the capacity for personal improvement and adaptation through a dialectical and comprehensive logic, showing the interaction between personal development and economic benefits [36]. Finally, it is concluded that relative advantage is positively

related to performance and behaviour, highlighting its impact on the knowledge and performance of individuals.

The learning experience in the flipped classroom context is significantly transformed by integrating methodologies that encourage greater student involvement in their educational process, considering that experience is the origin of discernment through the sensitive perception of the world and the experiences of each subject. This approach must be placed in the appropriate temporal and formative contexts to be effective. The objective is to provide learning experiences that are not unique and memorable but also foster sustainable development and strengthen community ties, thus enriching the academic curriculum in the flipped classroom [37]. In addition, Feuerstein's theory on cognitive structural modifiability fits well with the flipped classroom model, suggesting that cognitive structures can be modified through enriched learning experiences, typical in the flipped classroom where students face challenges that foster their intellectual development [38]. Learning experiences can be compared before and after implementing a flipped classroom, noting significant improvements in the organization of study time and interactions during classes [39].

In terms of practical applications, learning experiences in the flipped classroom bring students closer to realities that they might encounter in the world of work, using educational strategies based on solving cases within a virtual learning environment [40]. Service learning (SLL) as a methodology in the flipped classroom involves students in authentic contexts and specific problems, facilitating the development of professional skills and academic content practically and reflectively [41].

This comprehensive approach in the flipped classroom places direct experience at the centre of the learning process, highlighting its importance as a driver of cognitive and emotional development [42]. The flipped classroom not only improves academic performance but also prepares students to face challenges in a collaborative and autonomous environment, improving their comprehension skills and their ability to work in a team [43]. These experiences strengthen learning, making students acquire knowledge and develop a deep commitment to their education [44]. Based on these considerations, the following hypotheses are formulated:

H1: A significant positive relationship exists between affective commitment (CA) and learning satisfaction (SA).
H2: Behavioral commitment (CC) and learning satisfaction (SA) have a significant positive relationship.
H3: A significant positive relationship exists between expectation of effort (EEX) and learning satisfaction (SA).
H4: Performance expectation (PEX) correlates directly and significantly with learning satisfaction (SA).
H5: Greater recognition of relative advantage (ADV) positively correlates with learning satisfaction (SA).

II. METHODOLOGY

The research approach is quantitative, cross-sectional, of the explanatory type of multiple linear regression. Five predictor variables and one dependent or explanatory variable were used for the structural model. The instrument was designed especially for the study.

The sample consisted of 215 higher education students. With an equal representation of both sexes (51% women and 49% men), with ages ranging from 16 to 31 years, with a mean of 19.71 and a standard deviation of 4.40. The data were collected through an online survey during October and November 2024. Respondents were randomly selected, and participants gave their consent in advance.

The components of the instrument are organised on a 5-point Likert scale, where (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree, and (5) strongly agree. Before the final application of the instrument, exploratory factorial tests were carried out with an initial sample of 80 people from the sample, achieving a reasonable fit for its final application. The structure of the instrument is as follows: predictor variables: Affective commitment (CA); Behavioural engagement (CC), Expectation of effort (EEX), Performance expectation (PEX) and Relative advantage (ADV). As explanatory variable: learning satisfaction (SA). SmartPLS, version 4.1.0.9, was used through the regression module to treat and analyse the data.

III. RESULTS

Table I summarizes the coefficients obtained from a multivariate linear regression model applied to identify predictors of learning satisfaction. The standardized and unstandardized coefficients are presented along with their standard errors (SE), t-values, p-values, and 95% confidence intervals, specifically between 2.5% and 97.5%. These intervals offer insight into the precision of the coefficient estimates, where the inclusion of zero in this range suggests the predictor's statistical non-significance.

Affective commitment (AC) showed a significant standardized and unstandardized coefficient of 0.545, with a standard error of 0.059 and a t-value of 9.251, highlighting its strong influence on learning satisfaction. The associated p-value is less than 0.001, indicating robust statistical significance. Furthermore, the 95% confidence interval (from 0.429 to 0.661) does not include zero, reaffirming the critical importance of affective engagement as a positive determinant of learning satisfaction within the flipped classroom model.

In contrast, behavioural engagement (CC) and Expectation of effort (EEX) showed p-values of 0.175 and 0.431, respectively, indicating that they are not significant predictors of learning satisfaction in this context. The confidence intervals for CC (from -0.035 to 0.193) and EEX (from -0.068 to 0.159) include zero, evidencing that these factors do not affect the dependent variable statistically. This finding suggests that these components of the educational model may not be as influential as initially anticipated in students' perception of satisfaction.

Likewise, relative advantage (ADV) also proved to be a statistically significant predictor, with a coefficient of 0.136 and a p-value of 0.013. The 95% confidence interval for ADV (from 0.029 to 0.242) excludes zero, indicating a positive contribution to learning satisfaction. This result emphasizes the relevance of perceiving tangible benefits in using new educational methodologies, such as the flipped classroom, to increase student satisfaction. The data suggest that strengthening the perception of relative advantages could be an effective strategy to improve educational outcomes in this learning environment.

TABLE I
SUMMARY COEFFICIENTS

	Unstandardized	Standardized	SE	T value	P value	2.5 %	97.5 %
Affective commitment (CA)	0.545	0.545	0.059	9.251	0.000	0.429	0.661
Behavioural engagement (CC)	0.079	0.079	0.058	1.360	0.175	-0.035	0.193
Expectation of effort (EEX)	0.045	0.045	0.057	0.790	0.431	-0.068	0.159
Performance expectation (PEX)	0.104	0.104	0.057	1.807	0.072	-0.009	0.217
Relative advantage (ADV)	0.136	0.136	0.054	2.503	0.013	0.029	0.242
Intercept	-0.000	0.000	0.047	0.000	1.000	-0.092	0.092

Table II presents an analysis of variance (ANOVA) associated with a regression model that examines the predictors of learning satisfaction in a flipped classroom model. This ANOVA analysis details that the total sum of squares is 215,000, reflecting the total variability in learning satisfaction, both explained and unexplained by the model, while the error sum of squares is 97,849, indicating the variability not explained by the model. The regression sum of squares is 117,151, showing the variability that the model's independent variables explain on learning satisfaction. The degrees of freedom associated with the regression are five, corresponding to the number of predictor variables, and the mean square of the regression is calculated at 23,430, significantly more significant than the mean square of the error of 0.468. The F-statistic value achieved is 50.045, suggesting a statistically significant model with a p-value close to zero (0.000). This F-value indicates an extremely low probability of obtaining such a statistic if the independent variables had no impact on the dependent variable, corroborating the importance and significant influence of the model variables on learning satisfaction within a flipped classroom context. This high degree of significance of the model confirms that the predictor variables are relevant and effective in explaining variations in learning satisfaction in innovative educational environments.

TABLE II
ANOVA TEST

	Sum square	df	Mean square	F	P value
Total	215.000	214	0.000	0.000	0.000
Error	97.849	209	0.468	0.000	0.000
Regression	117.151	5	23.430	50.045	0.000

Table III presents the collinearity statistics for the variables included in a regression model, specifically each variable's variance inflation factors (VIF). These values are essential to assess whether multicollinearity exists among the predictor variables, which could affect the accuracy of the model coefficient estimates.

The VIF values in the table are all less than 2, indicating that multicollinearity among the variables is not a significant problem in this model. Typical thresholds for concern about multicollinearity are usually at VIFs above five or, in more conservative cases, above 10. In this case, the highest VIF is 1.594 for affective commitment (CA), closely followed by behavioural engagement (CC) at 1.540, and effort expectancy (EEX) and performance expectation (PEX), both at 1.515. Relative advantage (ADV) has the lowest VIF, at 1.346. These values indicate that each predictor variable has a low correlation with the other variables in the model. Therefore, each one contributes unique information to the analysis, facilitating reliable and robust statistical interpretations of the impact of these variables on learning satisfaction within the flipped classroom model.

TABLE III
COLLINEARITY STATISTICS - VIF

Variables	VIF
Affective commitment (CA)	1.594
Behavioural engagement (CC)	1.540
Expectation of effort (EEX)	1.515
Performance expectation (PEX)	1.515
Relative advantage (ADV)	1.346

Table IV provides a detailed analysis of the standardized coefficients in a regression model, focusing on their statistical significance and the consistency of estimates across samples. The table includes the original sample coefficients (O), the sample mean (M), the standard deviation (STDEV), the T values calculated as the absolute value of the original coefficient divided by its standard deviation (|O/STDEV|), and the associated p values.

Affective Commitment (CA): With a coefficient of 0.545 and a p-value of 0.000, this variable shows a strong and significant relationship with the dependent variable in the model. The stability of this coefficient is notable, with a T value of 7.891, indicating that affective engagement is a consistent and robust predictor of learning satisfaction in the flipped classroom context.

Behavioral Engagement (CC): Although the coefficient for this variable is 0.079, it does not reach statistical significance with a p-value of 0.250. The relatively low T-value of 1.150 suggests that the relationship between behavioural engagement and learning satisfaction may be weak or inconsistent across different samples.

Expectation of Effort (EEX): Similar to behavioural engagement, effort expectancy has a low coefficient of 0.045 and a p-value of 0.515, indicating that it is not a significant

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predictor of learning satisfaction. The T-value of 0.650 reinforces that this variable has little to no consistent influence on the dependent variable.

Performance Expectation (PEX): This coefficient is moderately higher (0.104) but still falls short of statistical significance with a p-value of 0.081. The T-value of 1.747 suggests that there might be some relationship between performance expectancy and learning satisfaction. However, this relationship is not strong or consistent enough to be considered significant in this analysis.

Relative Advantage (ADV): With a coefficient of 0.136 and a p-value of 0.005, relative advantage shows a significant and positive relationship with learning satisfaction. The T-value of 2.807 indicates that this variable is a reliable and effective predictor of learning satisfaction in the educational model analyzed.

Overall, the results propose that while affective commitment and relative advantage are significant and consistent predictors of satisfaction in a flipped classroom model, the other variables, such as behavioural commitment, effort expectancy, and performance expectancy, do not demonstrate a significant impact or consistency in their effects. This may indicate that the emotional and perceptual aspects of the learning model have more influence on learning satisfaction than behavioural measures or effort-related expectations.

TABLE IV
STANDARDIZED COEFFICIENTS – MEAN, STDEV, T VALUES, P VALUES

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values
Affective commitment (CA)	0.545	0.544	0.069	7.891	0.000
Behavioural engagement (CC)	0.079	0.074	0.068	1.150	0.250
Expectation of effort (EEX)	0.045	0.049	0.070	0.650	0.515
Performance expectation (PEX)	0.104	0.103	0.059	1.747	0.081
Relative advantage (ADV)	0.136	0.136	0.048	2.807	0.005

Figure 1 represents the results of an explanatory multiple linear regression model, which assesses how various predictor variables influence learning satisfaction (SA). Arrows indicate the direction and influence of each variable on learning satisfaction, with standardized coefficients and p-values in parentheses for each predictor.

Affective Commitment (CA): With a coefficient of 0.545 and a p-value of 0.000, this variable strongly predicts learning satisfaction. Affective Engagement has the most significant impact on learning satisfaction in this model, indicating that emotional aspects linked to Engagement with the course or study program are critical to students' perceptions of satisfaction.

Relative Advantage (ADV): The relative advantage also contributes significantly to learning satisfaction with a coefficient of 0.136 and a p-value of 0.013. This predictor reflects how perceptions of the superior benefits of a flipped classroom model versus traditional methods can improve student satisfaction.

Behavioural Engagement (CC) and Effort Expectancy (EEX): Both present low coefficients (0.079 and 0.045, respectively) and p-values that do not reach the significance threshold (0.175 and 0.431, respectively). These results suggest that neither behavioural Engagement nor effort expectancy significantly impacts learning satisfaction in this context. These variables may not be as crucial in influencing how students value their learning experience.

Performance Expectation (PEX): Although it has a coefficient of 0.104, its p-value of 0.072 puts it on the verge of statistical significance. This indicates a possible influence on learning satisfaction, although not as strong as affective Engagement or relative advantage.

Intercept: The intercept has a coefficient of 0.000 with a p-value of 1.000, indicating that it is insignificant. This is common in regression models where the focus is on the slopes of the relationships between variables rather than on the y-intercept.

The model reveals that affective Engagement and relative advantage are key determinants of learning satisfaction in a flipped classroom environment. Meanwhile, other factors such as behavioural Engagement, effort, and performance expectancy have a minor or non-significant influence. This underscores the importance of fostering strong emotional Engagement and effectively communicating the advantages of new educational methodologies to maximize student satisfaction.
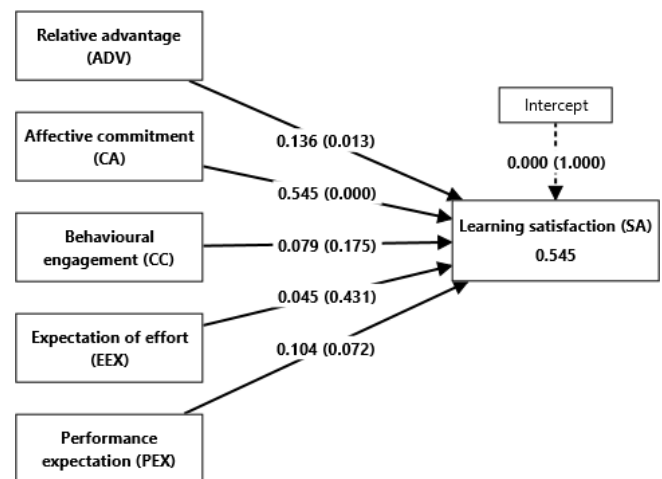

Figure 1 Multiple linear regression explanatory model results.

Analysis of R^2 and Adjusted R^2 and the Durbin-Watson statistics provide important information about the quality and fit characteristics of the regression model used to assess the determinants of learning satisfaction (SA).

R^2 (Coefficient of Determination): The value of R^2 is 0.545, indicating that approximately 54.5% of the variability in learning satisfaction can be explained by the predictor variables included in the model. This is of considerable value in social science and education contexts, where human influence and contextual factors can make capturing a large proportion of the variability in a single model challenging.

The adjusted R^2 is 0.534, slightly lower than the unadjusted R^2. The Adjusted R^2 modifies the coefficient of determination to reflect the number of predictors in the model, providing a more accurate measure of the fit quality, which is especially important in models with multiple variables. An adjusted R^2 that remains close to R^2 indicates that the model is appropriate and that the variables included have statistical significance, with little to no redundancy.

The Durbin-Watson statistics are 1.899, which is close to 2. This value indicates the independence of the errors (residuals), where a value of 2 indicates no autocorrelation in the model residuals. Values substantially less than two or greater than two may indicate positive or negative autocorrelation, respectively. In this case, a value of 1.899 means that autocorrelation is not a significant concern, supporting the validity of the statistical inferences made from the model.

Taken together, these indicators propose that the regression model has a good fit and is suitable for interpreting the effects of the independent variables on learning satisfaction in a flipped classroom context. The low autocorrelation of the residuals and a robust model fit reinforce the results' reliability, allowing educators and researchers to make informed decisions based on these findings.

IV. DISCUSSION AND CONCLUSIONS

The flipped classroom has revolutionized the educational experience by allowing for a more personalized and active approach to learning. This pedagogical model facilitates interaction and engagement and creates an environment that is fundamentally conducive to student emotional and cognitive development. The interactive nature of the flipped classroom enhances affective engagement by involving students more directly and personally in their educational process, which is essential for meaningful and long-lasting learning [6].

Affective engagement in the flipped classroom is closely linked to improved learning outcomes. Active participation in learning activities allows students to absorb information and apply it, reinforcing retention and understanding of the material. Studies such as those by Jang & Kim [7] and Steen-Utheim & Foldnes [8] have shown that when students are actively engaged, their academic performance improves, and their overall satisfaction with the learning process also increases. Furthermore, affective engagement positively affects the dynamics within the classroom, fostering an environment where students feel safe and supported to express their ideas and opinions. This collaborative environment is crucial for developing soft skills such as effective communication and teamwork, which are essential in most current professional contexts [9, 10].

The interaction between students and teachers is also richer in the flipped classroom, as teachers take on the roles of facilitators and mentors rather than transmitters of knowledge. This role shift helps build deeper and more meaningful relationships between students and teachers, which can positively impact students' motivation and engagement. The quality of these interactions is often reflected in better assessments and more constructive feedback, which are key to students' academic and personal growth [45]. In terms of practical implementation, the success of the flipped classroom depends largely on the quality and relevance of the learning materials provided before classes. The materials should be designed to adequately prepare students for in-class sessions, where the focus shifts to in-depth analysis and critical discussion. The effectiveness of this approach has been highlighted in multiple studies, which point out that a well-designed pre-class preparation is crucial to maximizing the benefits of the flipped classroom [39].

The study's findings reinforce the importance of affective engagement in the flipped classroom, underlining how this pedagogical model not only improves academic performance but also enriches the overall educational experience. Educators should, therefore, strive to implement and continuously improve their flipped classroom strategies, ensuring that teaching materials and methods are pedagogically sound and emotionally enriching.

Ultimately, widespread adoption of the flipped classroom could represent a paradigm shift in education, providing students with the tools necessary to succeed in an increasingly complex and connected world. Evidence suggests that this model is not only effective in academic terms but is also vital for the student's holistic development, preparing them not only as learners but as capable and competent individuals in all facets of life.

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