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ARTICLE

Reimagining Engagement Learning Outcomes in Flipped Classrooms Across Diverse Socioeconomic Backgrounds

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ABSTRACT

This study explores the impact of socioeconomic status (SES) on learning outcomes in flipped classrooms, with a focus on engagement as a mediating factor. The study involved the collection of data in 15 schools that adopted flipped instruction as an instructional strategy in science and mathematics, and the students involved were of a variety of backgrounds, in terms of SES. The scan demonstrated that engagement was already a very significant mediator of the correlation between SES and achievement, with elevated amounts of engagement showing the connection to superior academic achievement. Access to technology and parental support emerged as particularly important predictors of student engagement, especially when applied to lower-SES students, who had the greatest benefit of being engaged through peer-communally collaborative and teacher-provision digital scaffolding. The results indicate the relevance of the adaptive instructional delivery, which takes into account the SES conditions of students, giving everyone fair chances to learn in technology-based flipped learning environments. The paper highlights the value of engagement in the context of achievement gaps and suggests recommendations to be used by teachers and policymakers in the light of more inclusive and effective educational settings.

1. Introduction

The flipped classroom model has grown in popularity over the last few years in education as a revolutionary teaching method. This model rearranges the traditional relationship between students and teacher by providing the contents of the course outside the classroom, usually in form of videos or readings or online modules, and then devoting the classroom time to activities like problem solving, or discussions or collaborations among peers. It has been praised as an education model that puts more primacy on student engagement and it has been argued that it can encourage deep learning, critical thinking and student autonomy. Nevertheless, the flipped classroom is not an easy one. Among them, the issue of a disparate effect of this model on students of different socioeconomic statuses could be cited. Although the design of this model potentially can foster equity, the truth is that, socioeconomic differences are likely to affect not only exposure to resources that the learning environment requires (e.g., technology, time, and parent support), but also capability to provide substantive interactivity with the learning pro-

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cess [1-3].

The socioeconomic status (SES) and academic achievement relationship is well known and is characterized by the fact that lower-SES students experience more setbacks in the conventional academic environment. Such obstructions are inadequate access to technology, a reduced degree of parental support, and minimized supplementary out-of-school advancements. The emergence of flipped classrooms as a digital technology and self-directed learning-oriented model provokes the questions whether this pedagogical model proves itself to be the equalizer or whether through it the inequalities are reproduced accidentally. To be more precise, what is the work on SES and its programming of engagement and, consequently, learning outcomes in flipped classrooms?

The proposed study will be able to answer this question by finding out how engagement mediates the relationship between SES and learning outcomes in flipped classrooms. Engagement as a concept formulated by means of behavior, cognitive and emotional aspects is acknowledged to be a primary indicator of school success. Engagement, in the context of flipped classroom, does not only mean being proactive in the classroom, it also means how the learners approach content prior to class, how they work together and how they become part of their own education. Considering the multiplicity of element that determines engagement, prior knowledge, access to resources, and social support, it becomes critical to comprehend how engagement is conducted in various matching SES conditions to design meaningful and inclusive teaching practices [4-6].

This study examines secondary school students who have taken flipped science and mathematics classes the high-achievement gaps in which between students of higher and lower SES are particularly high. By addressing the related subjects, the work strives to bring some insight into the peculiar problems and opportunities of flipped classrooms in the environments where performance differences are the most apparent. It is based on information obtained on 15 schools that are practicing flipped instruction and how different levels of engagement resulting in various factors, including access to technology and parental involvement, translate to achievement outcomes [7].

The research is guided by the faith that engagement is a transformational intermediary variable that has the potential of cushioning the adverse impacts of lower SES on learning achievements. Participation in flipped classrooms takes the form of three interconnected phenomenon: behavioral, cognitive, and emotional. Behavioral engagement is student involvement in the learning process, which may be in the form of attendance of the classes and accomplishment of assignments and interactions among individual students. Cognitive engagement- how intellectually involved are students in the content (critical thinking, problem-solving). Emotional engagement is associated with the interest, pleasure and motivation of the students about the learning [8].

The engagement during the time spent in flip type classrooms can be influenced by the external factors and the internal factors. Access to technology and parental involvement are examples of external factors which can assist or impede the process of successful interaction with the material among the students. As an example, higher-SES students might be more connected to the available technologies and have a more stable home learning environment, therefore, being capable of connecting with the course more deeply. Conversely, students with low-SES families might have a problem with access to the digital content, places with no noise to study, or lack of parental support since the parents do not necessarily have time or resources and leave to themselves are not experts in the field of education. Such inequalities are capable of influencing not only the engagement rates of students but also their grades [9].

The rationale of this study lies in the idea that engagement as an intermediate between the SES and variations in the outcomes of learning is a variable that has been examined in conventional, face-to-face setting of learning but remains insufficiently studied in flipped classroom. In addition, the research will also set out to test the assumption that flipped classrooms, through their focus on cooperative learning and deployment of technology, hold specific advantages for students of lower-SES and that low-SES students may benefit more as a result of interactive, peer-supported task and teacher advocacy of technology through digital scaffolding.

The main objective of this study will be to see how engagement will relate to the linkage between SES and flipped classroom learning outcomes. In order to do so the following key research questions are answered:

What is the relationship between SES and flipped classrooms learning outcomes?

How strong is the mediation between SES and achievement, when it comes to student engagement?

Does access to technology and parental support affect the levels of engagement in flipped-classrooms?

Which instructional characteristics (e.g., peer teamwork, teacher-directed scaffolding) have specific advantages to what extent to the students of lower-SES?

Through these questions, the research will offer quality information on how flipped classrooms can be modeled and performed in such a way that they promote fair learn-

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ing to all students irrespective of their socioeconomic status[10].

A contribution to the still-emerging body of literature on flipped classrooms, technological aspects of teaching, and equity in learning outcomes is also expected of the findings of this research. Knowing how engagement as a mediating variable plays out in the context of flipped classrooms (especially when there is diversity of SES) can assist educators and policymakers provide more inclusive teaching methods to support all students regardless of their SES backgrounds. This study presents practical recommendations on how flipped learning could be modified in order to better accommodate students of lower SES by determining the exact mechanisms through which lower-SES students could benefit from collaborative and scaffolded instruction facilitated by the flipped model [11, 12].

Additionally, the research can contribute to the creation of more general debates about the concept of educational equity and the contribution of technology to the achievement gap closure. With the expansion of digital learning models in the educational system, it is important to make sure that these developments will not automatically create gaps, but rather enable new opportunities to flourish amongst all the students. This study aims to answer this challenge by looking into how flipped classrooms may be modified according to the needs of students of different socioeconomic backgrounds and eventually providing a fairer outcome in education.

2. Methodology

The research involved a mixed methodology, as both quantitative assessment and statistical analysis were used to examine how a socioeconomic background affects learning results in a flipped classroom setting. Research was conducted in 15 secondary schools spread out in different regions, each of which was using the flipped instruction in science and mathematics subjects. The proposed research question would be to investigate the relationship between socioeconomic status (SES) and achievement mediated by engagement on the one hand and taking into consideration key antecedents related to technology access and parental support on the other hand [13].

2.1 Design & Setting

This research study was a multi-site research based on a cross-sectional model where data was only achieved during a single semester in the academic year (approximately 16 weeks). The involved schools were found within urban and suburban/rural areas to guarantee the diversity of communities concerning community resources, technology access, and demographics. They all tended to be introducing a hybrid cycle flipped learning in science (i.e., physics, chemistry), in mathematics (i.e., algebra, geometry) as a part of school curriculum, thereby offering a chance to see how the model was affecting in these areas, where achievement gaps are commonly observed [14].

2.2 Participants & Sampling

A sample size of 1,200 students was used in the research with the average class being composed of 30 students. The subject group was between grades 9 and 12 and the male/female ratio was about 48/52 percent. Schools were chosen according to their adherence to a flipped classroom strategy and the high level of variety among the students of diverse SES origins. The classification of SES was based on eligibility to free or reduced-price lunch (FRL) as the main variable, where lower-SES students were the ones who were qualified to receive FRL and higher-SES ones thought as those not qualified [15].The actual background of the students in terms of SES was quite different across the schools to illustrate, in school A (an urban district), 70 percent of the students were lower-SES, whereas in school B (a suburban district), only 30 percent of the students were lower-SES students. Such differences are echoes of the corresponding differences presented to the students in their various communities by their accesses to resources and social capital [16].

2.3 Instructional Context

These assignments were aimed at the basic understanding and acquiring preliminary training exercises. The activities such as problem-solving in the in-class students collaboratively, peer discussions, and project-based learning were facilitated by teachers. Moreover, instructional design included such forms as digital scaffolding supporting the students in their cognition of complicated ideas since it offers guided notes, just-in-time assessments, and interactive quizzes [17].

Slight changes were made to the application of the flipped model in schools. Other schools (e.g., School A) had more focus in the realm of peer cooperation where groups of students were to solve the problems and experiments in class. On the contrary, other schools (e.g. School C) were more teacher-led, and offered extra digital resources and individual tutoring during in-class tasks to support struggling students. Such changes in classroom organization gave us a chance to examine the interaction of various instructional characteristics with student engagement, especially by lower-SES students [18].

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2.4 Measures

2.4.1 Achievement

Any measurement of achievement of students was done through standardized assessment that was established to assess knowledge acquisition as well as evaluation of problem-solving skills. The design of these assessments, which concerned major concepts in science and mathematics as put forward within the curriculum standards of the state, was done by the joint efforts of the school district officials. Final exam scores which reflect an individual cumulative knowledge acquired in the semester, were used as the key dependent variable [19].

2.4.2 Engagement

Engagement was quantified on a multi-dimensional scale specifically created in this research that can measure behavioral, cognitive and emotional aspects. The behavioral component measured the level of involvement of the students in learning activities that included, attending class, doing pre-class assignments, and cooperating with peers. Cognitive engagement has been assessed on the levels of thinking and solving problems critically that the students had and their capability to apply the acquired concepts in new situations. Index of emotional connectivity was recorded in terms of self-reports in which students were asked the extent of their motivation, interest, and enjoyment during the lesson. The scales (engagement) were validated through proxy tool (exploratory factor analysis) and it demonstrated high reliability (Cronbach alpha coefficient = 0.92) [20, 21].

2.4.3 SES Indicators

Free/reduced lunch eligibility was mainly used as an indicator of SES. In order to further refine the SES variable, supplementary indicators were applied, such as neighborhood socioeconomic indices (e.g. median household income, parent education levels and community resources) which were procured in local school district databases [22].

2.4.4 Technology Access

Technological access of students was quantified through a survey evaluating the access to technology (e.g. laptops, tablets), and internet connection at home. The survey also contained questions regarding how often the respondent utilizes technology to accomplish educational tasks and whether respondents experience any obstacles related to technology (slow connection, shared computers/treatises between family members, etc.) [23, 24].

2.4.5 Parental Support

The Parental support was measured via a composite survey that comprised some questions that looked at the role of parents in the education of their children [25]. This involved parental assistance with regard to the homework and teacher interaction, as well as parental support of academic activities. Support provided by parents was also measured in terms of home conditions like having a quiet place to study and expectations of the parents about their children grades [26].

2.4.6 Controls

Several control variables were included in the analysis to account for factors that could influence achievement and engagement independent of SES [27]. These included prior achievement (measured by students' scores from the previous year in related subjects), special education status, and language proficiency (e.g., English Language Learners).

2.5 Procedures

Data were collected through surveys administered to students at the beginning and end of the semester. Students completed self-report questionnaires on engagement, technology access, and parental support. In addition, teachers provided weekly logs documenting their instructional activities, including the extent of peer collaboration and the use of digital scaffolding tools. Achievement scores were gathered from the final exams, and students' SES status was verified using school district records [28].

Fidelity checks were conducted regularly by research assistants to ensure that the flipped classroom model was being implemented as designed. These checks included classroom observations, teacher interviews, and review of instructional materials. A sample of classrooms was also observed to verify the extent to which engagement activities (e.g., group work, discussions) were happening as planned [29].

2.6 Analytic Strategy

The data were analyzed using multilevel modeling (MLM) to account for the nested structure of the data (i.e., students within schools). MLM allows for the examination of both individual-level (student) and group-level (school) factors. A multilevel structural equation model (SEM) was used to test the hypothesized mediation model, where engagement was posited as a mediator between SES and achievement.

The mediation model tested whether engagement

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explained a significant proportion of the relationship between SES and achievement. The model also included direct and indirect paths, with technology access and parental support as potential antecedents of engagement. To assess the robustness of the findings, multiple sensitivity analyses were conducted, including testing alternative operationalizations of SES (e.g., using neighborhood-level SES indices) and examining the influence of prior achievement on the results [30].

2.7 Ethics

The study was approved by the institutional review board (IRB) to ensure ethical standards were maintained. Informed consent was obtained from all participating students and their parents, with assurances of confidentiality and the voluntary nature of participation. Data were anonymized, and all analyses were conducted on aggregated data to ensure privacy [31].

3. Results

The results of assessments of 15 secondary schools with flipped classroom available in two subjects of sciences and mathematics were analyzed in the approach to the investigation of the relationship between social economic status (SES), engagement, and learning outcomes. Hypotheses were tested and research questions answered based on descriptive statistics/correlation and multilevel modeling. The findings give salient information on the relationship mediated by engagement between one hand SES and achievement and on the other hand, the levels of engagement which are mediated by technology access and parental support between people of different SES.

3.1 Sample Characteristics

In this study, there were 1,200 students enrolled by 15 secondary schools and the gender ratio was close (48% male, 52% female). The schools were heterogeneous in the terms of SES. To illustrate, in School A (urban district) 70 percent of students were labelled as low-SES and in School B (suburban district) only 30 percent of students had low SES backgrounds. Throughout the sample, about 55 percent of students were lower-SES as established by their eligibility to be served meals free/reduced price (FRL).

In terms of technology access, 90% of students reported having a device (laptop, tablet, or desktop) at home, though access to high-speed internet was less reliable, particularly in lower-SES households. Only 65% of lower-SES students reported having reliable internet access, compared to 92% of higher-SES students. Parental support was also a significant variable, with 75% of higher-SES students reporting high levels of parental involvement in academic activities (e.g., assisting with homework, attending parent-teacher meetings) versus 50% of lower-SES students [32].

3.2 Descriptive Statistics

Descriptive statistics for key variables, including achievement scores, engagement, SES, and technology access, are summarized in Table 1. Overall, students in the flipped classrooms achieved relatively high average final exam scores ($M = 85$, $SD = 10$), with higher-SES students outperforming their lower-SES peers on the standardized assessments ($M = 88$ vs. $M = 82$). Engagement scores ($M = 4.2$, $SD = 0.8$) also varied across SES groups, with higher-SES students showing higher levels of engagement across the three dimensions (behavioral, cognitive, and emotional). Lower-SES students had notably lower scores for emotional engagement ($M = 3.9$ vs. $M = 4.4$) and cognitive engagement ($M = 4.0$ vs. $M = 4.3$) [27, 33].

3.3 Correlation Analysis

Bivariate correlation analyses were conducted to explore the relationships between SES, engagement, technology access, parental support, and achievement. Results indicated that SES was significantly negatively correlated with achievement ($r = -0.31$, $p < 0.001$), with lower-SES students achieving lower scores on the final exams. Engagement, on the other hand, was positively correlated with achievement ($r = 0.65$, $p < 0.001$), suggesting that higher engagement levels were associated with better academic performance.

Technology access and parental support were both positively correlated with engagement, particularly with cognitive and emotional engagement. Specifically, technology access showed a moderate correlation with behavioral engagement ($r = 0.35$, $p < 0.001$) and cognitive engagement ($r = 0.42$, $p < 0.001$), while parental support was strongly correlated with emotional engagement ($r = 0.52$, $p < 0.001$) and cognitive engagement ($r = 0.48$, $p < 0.001$) (27, 34).

3.4 Multilevel Mediation Analysis

To test the hypothesized mediation model, multilevel modeling (MLM) was employed, with students nested within schools. The model assessed the direct and indirect effects of SES on achievement, with engagement serving as a mediator. The results of the multilevel structural equation model (SEM) are presented in Figure 1.

The analysis revealed that SES had a significant direct effect on achievement ($\beta = -0.31$, $p < 0.001$), indicating

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that lower-SES students had lower achievement scores. Engagement was found to be a significant mediator, explaining 40% of the variance in achievement scores. Specifically, engagement accounted for a substantial portion of the negative impact of lower-SES on achievement. The indirect effect of SES on achievement through engagement was significant ($\beta = -0.20$, $p < 0.001$), suggesting that engagement partially mediated the SES-achievement relationship.

Technology access and parental support were both significant predictors of engagement. Technology access had a moderate positive effect on behavioral ($\beta = 0.30$, $p < 0.001$) and cognitive engagement ($\beta = 0.35$, $p < 0.001$), while parental support was a strong predictor of emotional engagement ($\beta = 0.45$, $p < 0.001$) and cognitive engagement ($\beta = 0.40$, $p < 0.001$). Notably, the influence of technology access and parental support on engagement was stronger for lower-SES students, as evidenced by significant cross-level interactions. For lower-SES students, the positive effect of technology access on engagement was amplified ($\beta = 0.45$, $p < 0.001$), while the effect of parental support on emotional engagement was also more pronounced ($\beta = 0.50$, $p < 0.001$) [35].

3.5 Interaction Effects: Benefits for Lower-SES Students

One of the main conclusions of the analysis was the variances difference of the instructional features on lower-SES students. In particular, students with low-SES would benefit more through peer-to- peer collaboration and scaffolding by teachers. The mean engagement scores increased significantly ($M = 4.3$) with more collaboration's activities participated by lower-SES students than those admitting to less collaborative activities ($M = 3.8$). Also, students of lower-SES background who got more digital scaffolding (e.g., guided notes, interactive quizzes) felt more cognitively engaged ($M = 4.4$) and were more likely to achieve better ($M = 84$) than their more scaffolded-limited counterparts ($M = 3.9$ and $M = 78$, respectively).

Such results indicate that among the lower-SES students, the peer-to-peer interaction and teacher-facilitated digital assistance attributed to the flipped classroom model can serve as pivotal leverage points that can enhance the engagement level as well as the performance of the students. These differences in effect are evident in figure 2, where it is clear that the higher-SES students did not greatly benefit as compared to the lower-SES students on structured collaboration and the effects of scaffolding.

3.6 Robustness Checks

There were robustness checks done to ascertain the stability of the findings. Even when the SES operationalization was relaxed (Indicators of neighborhood-level socioeconomic indicators were used), the findings did not change, still with engagement mediating the influence between SES and achievement. The primary findings were corroborated by sensitivity analyses, which took the prior achievement into consideration, further boosting the validity of the mediation model [36].

3.7 Summary of Results

To a clear extent, the analysis proved that engagement is a significant mediator between SES and achievement in the domain of flipped classrooms. SES had a direct effect on achievement where the lower-SES students demonstrated lower grades in the final exams. Engagement (especially after the lower SES was buffered by access to technology and parental support) also mitigated the negative impact of the lower SES on the learning outcomes. Moreover, it was revealed that peer-to-peer cooperation and instructor-based digital scaffolding were of special value to the low-SES learners, promoting the significance of differentiated instructional practices, which support the variety of student needs.

4. Discussion

This study findings offer significant details into the role played by engagement on the moderation of socioeconomic status (SES) and achievement interaction using flipped classrooms. The study is relevant because the targeted group of secondary school students only and their engagement in science and mathematics can be affected by the access to technology and support of parents as well as the instructional strategies. As demonstrated in the findings, engagement is a significant factor determining achievement gap between lower-SES and higher-SES students, and specific instructional strategies proved to be more valuable to the students with disadvantaged background.

4.1 Interpretation of Key Findings

According to the study, SES proved a true predictor of achievement and in most occasions, lower-SES students performed lower in the final tests than the higher-SES students. This is consistent with research available on the endemic achievement gaps associated with SES regardless of the venue in conventional classrooms. Nonetheless, the findings also add that engagement is an important mediator of this association. In particular, engagement contributed to 40 percent of the variance in achievement scores indicating that the more students are engaged behaviorally, cognitively, and emotionally, the higher their scores in

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academics, irrespective of their SES backgrounds.

Importantly, the study found that engagement was not uniformly distributed across SES groups. Higher-SES students reported higher levels of engagement in all three dimensions (behavioral, cognitive, and emotional) compared to their lower-SES peers. This is consistent with prior research that suggests students from more advantaged backgrounds tend to have more resources and support that foster engagement, such as access to technology, parental involvement, and a more stable home environment. Lower-SES students, in contrast, often face barriers such as limited access to technology, less parental support, and less conducive home learning environments, all of which can hinder their ability to engage fully with the flipped classroom model.

The study revealed, however, that engagement was also a powerful mediator of the relationship between SES and achievement in the sense that engaging more even with lower-SES students could counter the adverse effects of impoverished resources and services. This presentation is one of the important conclusions because it indicates that engagement can be a very strong mechanism to improve academic performance in the flipped classroom and, especially, among disadvantaged students [37].

4.2 Instructional Implications

The fact that this study targets determining what features of the flipped classroom instruction are relevant to engagement of students across different SES groups can be said as being among the most significant contributions to the field. Based on the findings, a number of instructional tactics, which can avert the detrimental effects of low SES on engagement and accomplishment, are indicated.

4.3 Peer Collaboration

It was discovered that lower-SES students were much more advanced with peer-collaborative activities, which is the primary component of the flipped classroom model. Such activities enabled classmates to collaborate with one another, exchange ideas and ideas and resolve challenges in a friendly team. In the case of lower-SES students, social learning and emotional support that came about through peer collaboration would allay some of the difficulties encountered by such students in less resourceful home environments. Lower-SES students followed through with greater engagement and better achievement outcomes when the classroom encouraged peer collaboration. This implies that the inclusion of organized, collaborative learning activities in flipped classrooms may be convenient when working with students who have disadvantaged backgrounds [38].

4.5 Teacher-Led Digital Scaffolding

Use of digital scaffolding, in the form of guided notes, interactive quizzes, and just-in-time assessments that is facilitated by teachers, was also found to be important toward assisting engagement, especially of lower-SES students. These learners tend to lack in self-regulation and independent learning and scaffolding is a key aspect of the overall success of these learners in flipped classrooms. The implications of the findings indicate that, scaffolding facilitates the process of guiding students through comprehending difficult material by giving them a hand that they require to proceed through the material as they find it easy and interesting. When it comes to lower-SES students, whose families might not provide them with any further academic support, such a form of teacher-led intervention may prove an essential step toward cognitive engagement and achievement growth.

4.6 Differentiated Support for Low-SES Students

The other important conclusion of this research is the conditional usefulness of particular characteristics of the flipped classroom to lower-SES learners. In particular, the findings imply that technology provision and parental support have more significant benefits among lower-SES students in terms of engagement; thus, these two issues serve as a powerful predictor of emotional and cognitive engagement. Schools and teachers must be enlightened on the existence of such differences, and they can evaluate the development of specific actions to be employed among students of lower-SES origin. As an illustration, equal access to the technology itself, such as by deploying loaner computers or boosting school internet capacity, might close the digital divide and thereby improve participation. Besides, it can enhance emotional involvement and motivation by increasing parental participation in Perhaps, due to regular communications and materials that can be used to support students at home [39].

4.7 Classroom Environment and Resource Allocation

The findings of the study also indicate that it is vital that we ensure the development of the environment in the classroom that will promote the engagement of all learners. Despite the imperativeness of technology and parental support, the flipped classroom model may be the effective means of captivating the students when intended by teachers. A combination of active, collaborative and peer-supported learning opportunities - in addition to a deepening

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of cognitive engagement - assists in fostering a sense of community and emotional connection to the material as well. In the case of lower-SES students, a well-organized classroom environment contributing to the provision of such opportunities may balance the detriments caused by the limited access to external resources [40].

4.8 Policy and Leadership Considerations

These findings are also very significant to educational policymakers and school leaders, especially in view of continued adoption of technology in teaching and learning in schools. Technology access, as the study reveals, is a key aspect in encouraging participation, and this is an aspect that ought to be given priority by school districts in order to provide fair access to digital assets. This may mean supplying devices to those students who need them, stable home internet access or creating offline learning content that the students who have low connectivity can use.

There is also the need to put into consideration by schools' policies which foster parental engagement in the learning process of their students and particularly those with lower-SES backgrounds. This may take the form of providing workshops on the role of parent in the academic progress of students at home, or providing constant communication between teachers and parents to share feedback on the progress of each child. It also requires teacher professional development. Not only should teachers be provided with the technical knowledge on how to apply a flipped classroom classroom knowledge in an effective way, but also provided with means to appeal to different learners. This can incorporate training on how to develop inclusive learning environments, work with digital scaffolding tools efficiently, and organize peer-collaborative activities that can encourage active engagement of all the students [41].

4.9 Limitations

Although the findings of this research are quite informative, it has various limitations that ought to be put into consideration. To start with, this study was based on a cross-sectional design that restricts the possibility of making a causal inference. The longitudinal studies would be useful in determining the long-run impacts of implementing flipped classroom on levels of engagement and performance with various SES groups. Second, although the research topic was the effect of engagement, other factors including the quality of the teacher, classroom environment, and student motivation might also affect achievement. Future studies should take these aspects into account in order to get a more detailed picture of the flipped classroom model efficacy. Lastly, the research has used some self-description measures of engagement, which can be biased. The future study might be enhanced by the inclusion of the observational data or peer rating in order to triangulate the results [42].

4.10 Future Research

This paper raises a number of possible avenues of future investigations. Next, additional research into the particular forms of peer-collaborative activities that tend to work with lower-SES students the best would improve instructional options. A study that tries to understand the effects of the various scaffolding methods on engagement within different subject areas will also be helpful Lastly, research on the orchestrating impact of flipped learning on the academic life courses of students especially those of less privileged backgrounds would shed more light on the viability of the model of flipped classroom as an inclusive model of learning [43].

Expounding on these results, future studies can further develop a means to make flipped classroom approach work in a way that addresses the needs of all students more specifically those of the lower-SES student body.

5. Conclusion

Engagement is found to be a crucial variable in mediating the effect of the socioeconomic status of children and their learning outcomes in flipped classrooms. Our data confirm that although SES has direct influence on achievement it is possible that engagement through direct access to technology and parental involvement combined with specific instructional interventions lies in the power of reducing those differences. Namely, peer collaboration and digital scaffolding by the teacher shows particularly high benefits to students with lower-SES.

The findings reinforce the importance of dynamic teaching methods that will take into consideration the various settings of the students in the flipped learning situation. This translates to educators being quick to develop classroom activities that will actively involve the students, especially the disadvantaged ones, and offer supporting intervention with the aid of technology and well-organized interactions. Also, increasing access equity to digital resources and greater parental support can be highly relevant in supporting lower-SES students with both engagement and academic progress.

School leaders and policymakers should make closing the digital gap and encouraging inclusive learning one of the priorities. Alongside implementing the policies that

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will guarantee access to technology, providing professional development in efficient flipped learning practices to teachers, and engaging parents, the schools will achieve a more equal learning experience of all students without worrying about their economic status.

To sum up, the flipped classroom is a promising approach functioning to enhance engagement and develop positive academic outcomes among the students, particularly when it is aligned with the needs of diverse learners. Future studies must also continue to define the long-term academic impact of flipped instruction, especially as it relates to lower-SES students, and also determine that other teaching activities as the one discussed here can intensify engagement in different kinds of learning environments. As we work to fine tune and adjust flipped classroom strategies, we need to eventually work towards having a humane educational system where the socio economics of any students does not affect his/her performance negatively.

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