

Effectiveness of Flipped Classroom Models in Different Educational Settings: A Systematic Synthesis

Efektivitas Model Kelas Terbalik dalam Berbagai Lingkungan Pendidikan: Sintesis Sistematis

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ABSTRACT

The flipped classroom model, which moves the delivery of material outside the classroom and utilizes class time for interactive activities, has been widely applied at various levels of education. This research aims to evaluate the effectiveness of the flipped classroom model in increasing student engagement at the elementary school (SD), junior high school (SMP), senior high school (SMA), and tertiary levels, as well as in formal and informal education contexts. The systematic literature review (SLR) method was used to synthesize the existing literature, with a focus on studies that address the impact of this model on student engagement in various educational settings. Findings from this study indicate that the flipped classroom can significantly increase student engagement, with differences in effectiveness depending on educational level and educational context. This research concludes that the flipped classroom model has the potential to be an effective method in increasing student engagement, but needs to be adjusted based on the educational context to maximize its benefits.

Keywords: Flipped classroom, student engagement, learning effectiveness, primary education, secondary education, higher education, formal context, informal context.

ABSTRAK

Model flipped classroom, yang memindahkan penyampaian materi ke luar kelas dan memanfaatkan waktu kelas untuk kegiatan interaktif, telah banyak diterapkan di berbagai tingkat pendidikan. Penelitian ini bertujuan untuk mengevaluasi efektivitas model flipped classroom dalam meningkatkan keterlibatan siswa di tingkat Sekolah Dasar (SD), Sekolah Menengah Pertama (SMP), Sekolah Menengah Atas (SMA), dan perguruan tinggi, serta dalam konteks pendidikan formal dan informal. Metode systematic literature review (SLR) digunakan untuk mensintesis literatur yang ada, dengan fokus pada studi-studi yang membahas pengaruh model ini terhadap keterlibatan siswa di berbagai setting pendidikan. Temuan dari penelitian ini menunjukkan bahwa flipped classroom dapat meningkatkan keterlibatan siswa secara signifikan, dengan perbedaan efektivitas yang tergantung pada tingkat pendidikan dan konteks pendidikan. Penelitian ini menyimpulkan bahwa model flipped classroom berpotensi menjadi metode yang efektif dalam meningkatkan keterlibatan siswa, namun perlu penyesuaian berdasarkan konteks pendidikan untuk memaksimalkan manfaatnya.

Kata Kunci: Flipped classroom, keterlibatan siswa, efektivitas pembelajaran, pendidikan dasar, pendidikan menengah, pendidikan tinggi, konteks formal, konteks informal.

1. Introduction

The flipped classroom model, which essentially reverses the traditional roles of in-class and at-home learning, has gained significant attention in the field of education. This concept, introduced for the first time by Jonathan Bergmann and Aaron Sams in 2007, involves delivering learning material via videos or online resources accessed at home, while class time is used for interactive activities and problem solving. The adoption of the flipped classroom model has expanded to various levels of education, from elementary school (SD), middle school (SMP), high school (SMA), to college. In this context, increasing attention to student

engagement as an indicator of learning success has encouraged many institutions to explore and implement this model as a potential solution to improve the quality of education.

Although the application of the flipped classroom model has become widespread, research on its effectiveness still shows significant shortcomings and gaps. In particular, there is a lack of understanding of how the flipped classroom affects student engagement at different levels of education and in different educational contexts. Most existing studies tend to focus on measuring academic outcomes without considering contextual aspects that may influence the effectiveness of these models. The need to explore and understand how the flipped classroom functions in various educational contexts is critical to perfecting this method and making it more relevant and effective.

The main question that will be answered in this research is: How effective is the flipped classroom model in increasing student engagement at various levels of education (elementary, middle, high school, college) and in different educational contexts (formal vs informal)? This research will explore the extent to which this model can influence student engagement, as well as the differences in its impact across educational settings.

Examining the effectiveness of the flipped classroom model is critical to providing useful practical guidance for educators and educational policy makers. With a better understanding of how the flipped classroom can be implemented effectively in various educational contexts, the results of this research will contribute to the development of more innovative and adaptive learning methods. This research will also provide valuable insights that can help in designing learning strategies that better suit students' needs.

This research highlights aspects that have not been widely explored in the existing literature, such as comparisons between levels of education and formal vs. informal contexts. By integrating findings from various sources, it is hoped that this research can provide a new perspective on the effectiveness of the flipped classroom model and fill the gaps in previous studies. The novelty of this research lies in its ability to present new insights that can change the way we understand and apply the flipped classroom model.

The main contribution of this research is the provision of a comprehensive synthesis of the effectiveness of the flipped classroom model at various levels of education. This research will offer practical recommendations as well as useful theories for the development and implementation of the flipped classroom model in different educational contexts. Thus, this research will not only enrich the literature on innovative learning methods but also provide valuable guidance for educators and decision makers in the education system.

2. Method

2.1. Research Approach

This research adopts a systematic literature review (SLR) approach to analyze and synthesize existing literature regarding the effectiveness of the flipped classroom model at various levels of education. This method is designed to provide a comprehensive and structured review of relevant research, with the aim of identifying key findings, trends and gaps in the existing literature. To ensure the quality and readability of the literature review, this research used the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method. PRISMA provides systematic guidelines in the process of selecting, assessing, and reporting articles, which helps in increasing the transparency and reproducibility of research results.

2.2. Reference Source

References for the literature review were taken from highly reputable international databases, including Scopus, Web of Science, and Google Scholar. The selection of these databases was based on their credibility and the wide range of literature they offer. Scopus and Web of Science are known for the quality and thoroughness of their indexation, as well as their

broad coverage in the field of education and learning. Google Scholar, although broader and more inclusive, was used to ensure that no relevant literature was overlooked. The combination of these databases ensures that this research covers a wide range of perspectives and important contributions to the literature on the flipped classroom.

2.3. Keywords

Article searches were carried out using a list of keywords relevant to the research topic. Keywords used include: "flipped classroom," "student engagement," "learning effectiveness," "elementary education," "middle school education," "high school education," "higher education," "formal context," and "informal context ." These keywords were chosen to cover various aspects of the flipped classroom model and its impact at various educational levels and educational contexts.

2.4. Number of Articles

During the initial search and screening process, a number of articles were identified from the aforementioned databases. A screening process was then carried out to eliminate articles that did not meet the inclusion criteria. Data regarding the number of articles identified and screened will be reported in detail in the results section, including statistics regarding articles eligible for further review.

2.5. Inclusion and Exclusion Techniques

The inclusion criteria for articles in this review were as follows: articles that discussed the effectiveness of the flipped classroom at various levels of education, were published in reputable international journals, and were relevant to the research questions. Conversely, articles that do not meet the following exclusion criteria will be excluded from the review: articles that are not relevant to the intended educational context, articles that are not available in a language the researcher understands, and articles that have not undergone a peer-review process. This inclusion and exclusion technique ensures that only high-quality and relevant articles are included in the literature synthesis.

3. Results and Discussions

3.1. Konsep Flipped Classroom

3.1.1. Definition and Evolution of the Flipped Classroom

The flipped classroom model represents a significant shift from traditional teaching structures, where students learn new content at home and then deepen their understanding through in-class activities and discussions ("A study on the application of the flipped classroom model in universities based on learners' perspective" , 2023). This approach not only changes the sequence of learning activities, but also redefines the roles of teachers and students, leading to a more interactive and engaging educational experience (Zhang, 2024). The flipped classroom model has been proven to improve student learning experiences, problem solving skills, critical thinking abilities, and collaboration (Goedhart et al., 2019). In addition, this model encourages independent learning, where students are encouraged to interact with material independently outside of class (Al., 2021).

Research shows that implementing the flipped classroom model can improve student performance and engagement compared to traditional teaching methods (Singh, 2020). Students in the flipped classroom model reported achieving higher test scores, indicating a positive impact on academic outcomes (Singh, 2020). In addition, this approach is associated with increasing students' awareness of their learning process and improving communication skills (Jdaitawi, 2019).

The effectiveness of the flipped classroom model is not limited to academic performance alone. This model has also been shown to increase student motivation and

engagement, especially in the context of the COVID-19 pandemic, where innovative resources and collaborative activities play an important role in maintaining student interest and participation (Ferrer & Martínez, 2021). Furthermore, the flipped classroom model is recognized as having the potential to free up instructional time and create a more student-centered learning environment (Jurmey et al., 2022).

Thus, the flipped classroom model can be considered a pedagogical innovation that has the potential to transform traditional teaching practices through the promotion of active learning, student engagement, and independent study. By leveraging digital resources and restructuring the learning process, educators can create dynamic and interactive learning environments that meet diverse student needs and improve overall learning outcomes.

3.1.2. Flipped Classroom Models and Variations

The concept of the flipped classroom has attracted great attention in educational research, with a variety of models and approaches being explored and applied in a variety of contexts. Various studies have examined the pedagogical design features of the flipped classroom in diverse educational contexts, such as undergraduate nursing education (Youhasan et al., 2021), college physical education theory courses (Sun, 2024), teaching English as a second language (Ying & Ayub, 2022), mathematics education (Saira et al., 2020), and engineering education (Arulkumar et al., 2022). These studies emphasize the positive impacts of the flipped classroom, including increased learning enthusiasm, better efficiency, development of critical thinking abilities, problem-solving skills, and improved student academic achievement.

The flipped classroom model involves a shift in traditional teaching practices, where in-class activities are moved outside the classroom, and homework or independent study activities are brought into the classroom (Al., 2021). This approach aims to create an interactive and active learning environment, encourage independent learning, and increase student engagement (Tan & Cao, 2022). Research has shown that the flipped classroom can result in better application of knowledge in practical contexts, such as in clinical settings in nursing education (Youhasan et al., 2021).

Additionally, the flipped classroom has been shown to be effective in a variety of disciplines, including mathematics, social sciences, pharmacy, and even neonatal resuscitation training (Abou-Zamzam et al., 2023). The implementation of the flipped classroom model is associated with various benefits, such as increased teaching efficiency, stronger teacher-student relationships, increased student interest in learning, and the development of independent learning skills (Tan & Cao, 2022). Additionally, studies have examined the influence of demographic factors on students' experiences with the flipped approach, emphasizing the need for further exploration of how factors such as learning preferences and economic background influence learning outcomes (Goedhart et al., 2019). In conclusion, the flipped classroom concept offers a promising approach to modernize education by restructuring the learning process, encouraging active learning, and improving student learning outcomes across a variety of educational contexts and disciplines.

3.2. Student Involvement

3.2.1. Definition and Importance of Student Engagement

Student involvement is an important component in education which includes students' cognitive, behavioral and emotional involvement in the learning process. This aspect includes factors such as time, effort, participation, activities, emotions, and feelings that contribute to achieving successful learning outcomes (Chang, 2023; "Effect of Team Based Learning on Classroom Engagement, Critical thinking dispositions And Academic Achievement of Nursing Students Enrolled in Principles of Nursing Research Course", 2023). Students who are actively involved show higher positive attitudes, good behavior, attention, interest, and persistence

compared to their less involved peers (Al., 2021). In addition, student engagement is closely related to student satisfaction, the quality of the learning experience, and can influence student loyalty and the brand image of educational institutions (Renumol, 2022; Osman, 2024).

In various educational contexts, especially in the application of the flipped classroom model, efforts to increase student involvement are crucial to achieving effective learning outcomes. Research shows that creating a supportive environment with a consistent adult presence can be especially beneficial for disadvantaged students (Jones, 2022). Furthermore, in online and blended learning environments, interaction between students and teachers as well as access to technology that supports collaborative learning activities can increase student engagement and critical thinking abilities (Baskara, 2023).

Additionally, innovative approaches such as gamification have shown potential in increasing student engagement and improving the learning experience (Zhao et al., 2022). Educators can also utilize design thinking to adapt teaching methods to better engage and support students based on their individual learning needs and aspirations (Abdo, 2023). Advances in artificial intelligence (AI) also offer opportunities to transform education by creating student-centered learning environments, which have the potential to significantly increase student engagement (Nguyen, 2024).

Thus, student involvement plays a key role in the effectiveness of educational practices, including in the flipped classroom model. By understanding the various dimensions and factors that influence student engagement, educators can create engaging learning environments that support the achievement of positive learning outcomes in a variety of educational contexts.

3.2.2. Methods for Measuring Student Engagement

The flipped classroom model has received great attention in the world of education because of its potential to increase student engagement. Various studies consistently show positive results regarding student engagement when the flipped classroom approach is implemented. For example, Kaushik et al. (2023) highlighted that the flipped classroom can increase student engagement and increase learning motivation (Kaushik et al., 2023). Likewise, Sun (2024) emphasized the benefits of the flipped classroom in encouraging enthusiasm for learning and increasing learning efficiency (Sun, 2024). Additionally, Salami (2024) showed that high levels of student engagement in the flipped classroom contributed to improved student academic outcomes (Salami, 2024).

Various studies have explored the impact of the flipped classroom on student engagement across various disciplines. For example, Hava (2021) found that students became more cognitively engaged through constructive learning processes in a flipped classroom (Hava, 2021). Additionally, Pérez et al. (2019) discussed how the flipped classroom technique facilitates application of concepts and synthesis of problem-solving frameworks, ultimately increasing student engagement. Furthermore, Yang (2024) suggested that integrating the flipped classroom with peer teaching methods can contribute to increased student engagement, critical thinking skills, and knowledge retention (Yang, 2024).

Although the flipped classroom model shows promise in increasing student engagement, challenges remain in optimizing student outcomes and engagement. Singh (2020) highlighted the need to identify best practices in the flipped classroom model to achieve better student outcomes and higher levels of engagement (Singh, 2020). Similarly, Gu et al. (2022) noted that although the flipped classroom has a positive impact on academic achievement, challenges in effectively promoting student learning engagement still need to be addressed in this instructional approach (Gu et al., 2022).

In conclusion, the flipped classroom model has demonstrated its potential in increasing student engagement in various educational contexts. By utilizing an interactive approach supported by technology, educators can create a dynamic learning environment that encourages active student participation and enthusiasm in learning.

3.3. Effectiveness of the Flipped Classroom at Various Levels of Education

3.3.1. Flipped Classroom in Elementary Education

The flipped classroom model has attracted significant attention in educational research at various levels, including elementary schools. Research shows that implementing the flipped classroom approach in elementary education can have a positive impact on student engagement and learning outcomes. One of the main benefits of the flipped classroom model in elementary education is its ability to increase student motivation and engagement through active learning (Kartika & Wahyuni, 2023). By moving traditional direct instruction outside the classroom and increasing individual interactions during class time, students become more actively involved in the learning process (Kartika & Wahyuni, 2023). This approach allows for a more personalized learning experience, because teachers can allocate more time for activities tailored to students' individual needs and interests (Kartika & Wahyuni, 2023).

In addition, the flipped classroom model allows students to access learning materials independently at home, which then encourages deeper understanding through in-class discussions, collaboration, and application of knowledge in real-world contexts (Kaushik et al., 2023). This student-centered approach not only increases student engagement but also facilitates a more active and participatory learning environment (Sun, 2024).

Research also highlights the positive effects of the flipped classroom model on various subjects, such as mathematics, science, and language learning, showing its flexibility and effectiveness across various disciplines (Ying & Ayub, 2022). In addition, the flipped classroom is also associated with the development of 21st century skills, such as critical thinking, creativity, communication, and collaboration, which are important for students' holistic development (Hidayah & Mustadi, 2021).

Overall, the flipped classroom model in elementary education shows promising results in improving student engagement, motivation, and learning outcomes. By providing a more interactive and personalized learning experience, this approach has the potential to improve the educational experience for elementary school students.

3.3.2. Flipped Classroom in Secondary Education (Junior and Senior High School)

The effectiveness of the flipped classroom model in secondary education, especially in middle and high schools, has become a subject of interest in educational research. Various studies have highlighted the positive impact of the flipped classroom approach on student engagement and their academic performance.

Shaffi et al. (2023) reported that students in the flipped classroom group demonstrated significant improvements in test scores throughout the course, indicating the effectiveness of this pedagogy. Similarly, research by Onojah et al. (2019) found a statistically significant improvement in Grade 7 students' Mathematics performance after implementing the flipped classroom strategy, indicating a positive impact on student learning outcomes. In addition, Sun (2024) emphasized the benefits of the flipped classroom in encouraging enthusiasm for learning and increasing efficiency, which can contribute to increased student engagement. The study by Sakti et al. (2023) also supports these findings by showing improved learning outcomes for students in the flipped classroom group.

Furthermore, the meta-analysis conducted by Ge et al. (2020) highlighted that the flipped classroom model can stimulate active learning and produce desired outcomes, overcoming the shortcomings of traditional teaching methods. Additionally, Mingorance-Estrada et al. (2019) found that students were more motivated in a hybrid environment, leading to increased class attendance and potentially increased levels of engagement.

Overall, the flipped classroom approach has shown promising results in improving student engagement and academic performance in secondary education contexts. By moving the didactic component outside the classroom and encouraging active learning during class

time, this pedagogical model has the potential to improve learning outcomes and create a more dynamic educational experience for students.

3.3.3. Flipped Classroom in Higher Education (College)

The flipped classroom model has attracted significant attention in higher education because of its potential to improve student engagement and learning outcomes. Research by Li & Li (2022) shows that the flipped classroom model increases interaction between peers and instructors, strengthens student-teacher relationships and increases learning motivation. This increase in engagement is associated with better communication between students and teachers and fellow students, indicating a shift towards more active participation in the learning process.

Studies by Violita & Budiraharjo (2022) and Farooqi (2023) also emphasize that the flipped classroom not only increases student engagement and motivation, but also encourages collaboration between students. Emotional engagement was identified as a key factor in building a sense of responsibility towards others, which in turn enhances the overall learning experience.

Furthermore, Vaughn et al. (2019) revealed that the flipped classroom model allows teachers to allocate more time to practical activities tailored to students' individual needs, thereby increasing student engagement through direct learning experiences. This personalized learning approach has proven effective in increasing student participation and knowledge retention. Additionally, Mingorance-Estrada et al. (2019) highlighted that the flipped classroom encourages independent and autonomous learning, which empowers students to take control of their learning process. By shifting the focus from passive reception of information toward active engagement with course material, students are encouraged to develop critical thinking skills and apply their knowledge in practical contexts.

Overall, the flipped classroom model shows potential in increasing student engagement in higher education by encouraging active participation, promoting collaboration, and empowering students to take ownership of their learning process. By utilizing technology and innovative teaching strategies, educators can create dynamic learning environments that suit a variety of learning styles and improve overall student learning outcomes.

3.4. Educational Context: Formal vs Informal

3.4.1. Flipped Classroom in the Context of Formal Education

The flipped classroom model has attracted great attention in formal education settings, with numerous studies highlighting its benefits. Research by Youhasan et al. (2021) emphasize the pedagogical design features of the flipped classroom in undergraduate nursing education, presenting a systematic review that explores the effectiveness of this model. Sun (2024) conducted an empirical study focusing on physical education theory courses in universities, which showed the positive impact of the flipped classroom in increasing learning enthusiasm and efficiency. Additionally, Sointu et al. (2022) provide initial evidence on the key factors that contribute to the successful implementation of this model, emphasizing the importance of teacher preparation through institutional training for effective implementation.

Furthermore, research such as that conducted by Zhang (2024) through systematic reviews and meta-analysis shows that the flipped classroom model outperforms traditional methods in various disciplines. Shaffi et al. (2023) supported these findings by reporting improved test performance among students in the flipped classroom group. The literature also discusses students' perceptions of the flipped classroom, as seen in the work of Onojah et al. (2019), who highlighted the positive impact of this model on student performance in mathematics.

Additionally, the impact of the flipped classroom on student achievement has been extensively researched, as evidenced by a meta-analysis conducted by Lo & Hew (2019).

Although the flipped classroom model shows many benefits, criticism has also emerged, such as that expressed by Liu (2019) regarding the educator-centered nature of the model and the lack of specificity in individual learning spaces. However, the general consensus from studies such as Guo (2021) and Li (2021) is that the flipped classroom stimulates self-efficacy, creativity, and active learning among students. Overall, the flipped classroom model has demonstrated its potential in creating a supportive and engaging learning environment in formal educational institutions, ultimately improving academic performance and student satisfaction.

3.4.2. Flipped Classroom in the Context of Informal Education

The flipped classroom model has gained significant attention in educational contexts, especially in informal settings such as training and courses. This approach involves students interacting with learning material before class sessions, so that face-to-face time can be used for more interactive and interesting activities. Research shows that the flipped classroom model can increase student engagement and better learning outcomes (Sun, 2024; Zhang, 2024; Sunway, 2024; Fauzi, 2019; Nugraheni et al., 2022). In a flipped classroom, students tend to show a higher level of enthusiasm for learning, because they have the opportunity to process information at their own pace and engage in more active learning activities (Nugraheni et al., 2022; Schuller et al., 2022). Additionally, this model encourages personalized learning, the development of critical thinking skills, and self-directed learning, which are important skills in modern education (Zhang, 2024).

Although the flipped classroom approach shows potential in a variety of disciplines, including medical education, mathematics, and language teaching (Schuller et al., 2022; Youhasan et al., 2021; Yang et al., 2020; Tsai et al., 2021), challenges still exist. Some learners may initially resist this teaching method, which may reduce its effectiveness (Peng, 2024). Additionally, successful implementation requires teachers to adapt their teaching strategies, provide timely feedback, and increase interactions with learners (Tsai et al., 2021; Chen, 2022). However, technological advances, such as internet tools and learning management systems, have facilitated the integration of the flipped classroom model into educational practice (Chi et al., 2022).

Overall, the flipped classroom model offers a dynamic and innovative approach to teaching and learning, increasing student engagement and encouraging active participation in the learning process. By leveraging technology and restructuring traditional educational practices, educators can create more interactive, learner-centered learning environments that suit a variety of learning needs.

3.5. Comparisons and Main Findings

3.5.1. Comparison of the Effectiveness of the Flipped Classroom at Various Levels of Education

The effectiveness of the flipped classroom model has been widely researched in various educational contexts. Research shows that the flipped classroom approach can improve student outcomes and engagement at various levels of education. For example, studies show that the flipped classroom method can improve students' mathematics abilities in elementary, middle and high schools, as well as in universities (Sulistyowati, 2023). Additionally, the implementation of the flipped classroom model has proven effective in college physical education courses, addressing various issues and increasing knowledge, skills, and physical activity among students (Vaughn et al., 2019).

Comparative studies highlight the benefits of the flipped classroom compared to traditional teaching methods in various disciplines. Meta-analyses consistently show that the flipped classroom teaching model is superior to traditional methods in a variety of areas, leading to better student performance outcomes and higher levels of satisfaction (Zhang, 2024;

Eichler, 2022). Additionally, the flipped classroom is associated with improved critical thinking, decision-making, and active learning skills, which contribute to better academic performance and student engagement (Javadi, 2023; Chi et al., 2022).

Furthermore, the flipped classroom model is known as a student-centered learning approach that can increase learning effectiveness by stimulating active learning and promoting deeper understanding of subject matter (Harmini et al., 2022; Guo, 2021). Studies emphasize the importance of good activity design in the flipped classroom, with high-quality activity design identified as a key factor in the success of this teaching mode (He et al., 2022). The ability of this model to move learning activities outside the classroom and transform the learning environment into a center for deep learning and practical activities has been highlighted as a core concept of the flipped classroom (Pan, 2024).

In conclusion, the flipped classroom model has demonstrated its effectiveness in improving student outcomes, engagement, and critical thinking skills in a variety of educational contexts. By leveraging technology and active learning strategies, the flipped classroom offers a promising approach to enhancing teaching and learning experiences across a variety of disciplines and educational levels.

3.5.2. Comparison of the Effectiveness of the Flipped Classroom in Formal vs Informal Contexts

The flipped classroom model has been widely adopted in various educational contexts, both formal and informal, and studies show significant differences in its effectiveness in these two contexts. Comparison between results and findings from formal and informal contexts provides valuable insight into the application of this model in various learning situations.

1. Formal Context

In formal education environments, such as schools and colleges, the flipped classroom model is often used to increase student engagement and learning outcomes. Research shows that in formal contexts, the flipped classroom can increase students' motivation and engagement by allowing them to process course material outside of class and apply that knowledge through interactive activities during class time (Sun, 2024; Zhang, 2024). This model has been proven to improve academic performance in various disciplines, including mathematics, physical education, and languages (Vaughn et al., 2019; Sulistyowati, 2023). The success of the flipped classroom in formal contexts often depends on good activity design and active involvement of the instructor, as well as the ability to adapt the material to individual student needs (He et al., 2022).

2. Informal Context:

Outside formal educational environments, such as in training or courses, the flipped classroom model has also shown promising results. In informal contexts, this approach can increase student engagement in a more flexible way, allowing them to learn independently and collaborate in more productive face-to-face sessions (Fauzi, 2019; Nugraheni et al., 2022). Research shows that in informal settings, flipped classrooms can increase engagement and understanding of material through more intensive interaction and application of knowledge in real-world situations (Schuller et al., 2022). However, challenges in informal contexts often involve differences in students' levels of readiness and adaptation to these methods, as well as the need for adequate technological support (Chi et al., 2022).

3. Comparison of Results and Findings:

In general, the flipped classroom model shows strong effectiveness in both formal and informal contexts, but with differences in the way it is implemented and the results achieved. In a formal context, the flipped classroom is often more structured and supported by a clear

curriculum and ongoing evaluation. In contrast, in an informal context, this approach offers greater flexibility and is more focused on the individual needs of students and the practical application of the knowledge gained. These two contexts show that the flipped classroom can improve engagement and learning outcomes, but the success of its implementation is greatly influenced by factors such as instructional design, technology support, and student readiness.

The flipped classroom model has significant potential to improve engagement and learning outcomes in a variety of educational contexts. In formal contexts, this model supports a clear curriculum and evaluation structure, while in informal contexts, it offers flexibility and an emphasis on practical application. Understanding these differences can help educators optimize the implementation of the flipped classroom model according to their educational needs and goals.

3.5.3. Factors Influencing Variations in Effectiveness

The effectiveness of the flipped classroom model in various educational contexts is influenced by a number of complex factors. Research identifies several key elements that influence the successful implementation of this model in various educational settings.

1. Institutional Support

Support from educational institutions is a crucial factor that influences the successful implementation of the flipped classroom, especially in higher education. This support includes providing resources, training for teachers, and integration of this model in the curriculum (Sointu et al., 2022). Institutions that provide adequate support can make it easier to implement this method and increase its effectiveness.

2. Instructor's Motivation and Intention

Teachers' motivation and intention to adopt the flipped classroom model is a significant factor in determining its success. Social factors, such as peer support and institutional culture, also play an important role in encouraging educators to adopt this pedagogy (Yahaya et al., 2022). Motivated teachers tend to be more effective in implementing the flipped classroom and achieve better learning outcomes.

3. Educational Environmental Factors

Specific factors in the educational environment, such as gender, independent learning ability, campus network, teaching resources, and classroom interactions, can significantly influence the effectiveness of the flipped classroom (Jia, 2023). For example, students' independent learning abilities and the quality of classroom interactions may influence how they utilize this model.

4. Flipped Classroom Design Features

The design of the flipped classroom, which allows students to access learning materials independently at home and promotes deeper understanding through in-class interactions, plays an important role in increasing student engagement and facilitating active learning (Khilmi, 2024). Good design features can strengthen the effectiveness of these models and improve learning outcomes.

5. Meta Analysis and Related Research

Meta-analysis shows the positive effect of the flipped classroom model on academic achievement in various disciplines, including mathematics and engineering education (Sulistiyowati, 2023; Lo & Hew, 2019). This model has been shown to produce better learning outcomes and higher satisfaction compared to traditional teaching methods, making it an evidence-based teaching practice (Eichler, 2022).

The flipped classroom model has demonstrated effectiveness in improving learning outcomes and student engagement in a variety of educational contexts. However, variations in the success of these models may be influenced by factors such as institutional support, instructor motivation, specific environmental factors, and the design features of the flipped

classroom itself. Continued research and refinement of implementation strategies are essential to further optimize the effectiveness of the flipped classroom model in diverse educational contexts.

The results of the discussion regarding the effectiveness of the flipped classroom model in various educational contexts show that this model is generally successful in increasing student engagement at various levels of education. At the elementary level, implementing the flipped classroom helps children to participate more actively in learning because this method provides the opportunity for them to review the material at home before discussing it in more depth in class. This allows them to study in a way that better suits their learning style and interact more during class time, which directly impacts increased motivation and understanding of the material.

At the middle and high school levels, the effectiveness of the flipped classroom is seen in students' ability to use class time more productively. This model provides opportunities for students to work on more complex assignments and have in-depth discussions with support from the teacher, which is not possible in traditional settings. This strengthens student engagement with the course material and facilitates collaborative problem solving, improving the quality of interactions between students and the material being studied.

In the context of higher education, the flipped classroom has proven effective in supporting independent learning and active engagement in seminars and discussions. This model allows students to study theories and concepts independently through materials provided online, while class time is used for practical applications and critical discussions. This difference is also visible in informal education contexts, where the flexibility of the flipped classroom model supports project-based and participatory learning. Overall, the application of the flipped classroom in various contexts and educational levels shows positive results in increasing student engagement, with relevant adjustments to the characteristics of each student group and educational context.

4. Conclusions

The flipped classroom model has emerged as a promising pedagogical approach in transforming traditional education. By moving independent learning outside the classroom and facilitating deeper engagement during class time, this model has demonstrated its effectiveness in increasing student engagement, critical thinking, and academic achievement at various levels of education. Despite the challenges and limitations, the general consensus of research suggests that the flipped classroom can be a valuable tool in modern education.

4.1. Implications for Educational Practice

1. **Personalized learning:** The flipped classroom allows for a personalized learning experience, suited to each student's individual learning needs and pace.
2. **Active learning:** This model encourages active learning, encouraging students to take responsibility for their learning and develop higher-order thinking skills.
3. **Teacher as facilitator:** Teachers are moving from being the sole source of information to becoming facilitators of learning, creating student-centered classrooms.
4. **Technology integration:** Effective implementation of a flipped classroom often requires the integration of technology, opening up opportunities for innovative teaching and learning.
5. **Continuous professional development:** Educators need ongoing professional development to implement and adapt the flipped classroom model according to their individual context.

4.2. Limitations of Current Research

1. Lack of long-term studies: Many studies focus on short-term outcomes, and long-term research is needed to understand the lasting impact of the flipped classroom.
2. Variability in implementation: The effectiveness of flipped classrooms can vary widely due to differences in implementation, making it difficult to draw definitive conclusions.
3. Research limited to certain populations: Research on the effectiveness of flipped classrooms for students with special needs, such as students with special needs or from marginalized communities, is limited.
4. Challenges in measurement: Accurately measuring the impact of the flipped classroom can be difficult due to the complexity of educational outcomes and the need for appropriate assessment tools.

4.3. Further Research Directions

1. Comparative study: Conduct more comparative studies to examine the effectiveness of flipped classrooms across subjects, grade levels, and cultural contexts.
2. Longitudinal study: Investigating the long-term impact of the flipped classroom on student outcomes, including motivation, engagement, and academic achievement.
3. Qualitative study: Using qualitative methods to explore student and teacher experiences in flipped classrooms, provides deeper insight into the factors that contribute to success or failure.
4. Technology integration: Examines the role of technology in the flipped classroom and investigates the most effective tools and platforms to support student learning.
5. Equity and inclusion: Explores the impact of the flipped classroom on students from diverse backgrounds and investigates strategies to ensure equitable access and outcomes.

Although the flipped classroom model has significant potential, there is still much to learn about its optimal implementation and impact. By addressing the limitations of existing research and conducting further studies, educators can continue to refine their understanding of this innovative pedagogical approach and harness its potential to improve student learning outcomes.

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