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# Project Based Flipped Learning (PjBFL) Model in Increasing Effectiveness Learning : A Systematic Literature Review

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**Abstract:** This study aims to examine the effectiveness of the implementation of PjBFL in improving 21st-century skills and identify interactive media that support its implementation through the Systematic Literature Review (SLR) method. The literature analyzed came from accredited journals indexed in the Scopus and Google Scholar databases, with a publication range of 2020–2024. The search keywords included "Project-Based Flipped Learning", "PjBFL", "flipped classroom", and "project-based learning". All articles found were selected using inclusion and exclusion criteria based on topic focus and full-text availability. The data selection and analysis process was carried out based on the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) which includes the stages of identification, screening, feasibility assessment, and reporting. The results of the analysis of 20 journals showed that PjBFL is effective in improving critical thinking skills, collaboration, creativity, problem solving, and learning motivation, especially at the higher education level. The interactive media that are predominantly used include Learning Management Systems (LMS), learning videos, e-modules, and digital communication applications. However, challenges such as low student engagement, student digital literacy and teacher readiness in producing digital content are still obstacles to implementation. Therefore, it is necessary to train educators, provide adequate digital infrastructure, and adapt content that is appropriate to the level of education and learning styles of students. This finding underlines the great potential of PjBFL in improving the effectiveness of learning in the digital era.

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## Introduction

Education is a basic human need and a fundamental element for the progress of a country (Hafeez et al., 2020). Along with the ever-evolving digital era, the world of education globally is undergoing significant transformation. The ideal condition in contemporary learning is the creation of a dynamic, collaborative, and learner-centered ecosystem, where they are actively involved in the process of constructing knowledge. This ideal learning environment facilitates the development of crucial 21st-century skills, such as critical thinking, complex problem solving, creativity, collaboration, and effective communication (Johnson et al., 2020). Learning is no longer seen as a one-way transfer of information, but as an interactive process that empowers learners to apply knowledge in real-world contexts, develop deep understanding, and build competencies that are relevant to the demands of the times.

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However, the reality of educational practices in the field often shows a striking difference from these ideal conditions. Traditional learning methods dominated by lectures and memorization are still rampant in many educational institutions, resulting in students tending to be passive, less motivated, and not having the opportunity to develop their potential optimally (Hafeez et al., 2021). In addition, limited time, resources, and infrastructure are often barriers for educators to implement innovative and effective learning approaches. The lack of training and support for educators in integrating new technologies and learning strategies also exacerbates the gap between expectations and reality. As a result, students often do not have the opportunity to develop essential 21st-century skills, which in turn can hinder their readiness to face challenges in the world of work and social life. The most important challenge in the education process is choosing an appropriate and effective teaching model to make the learning process useful and develop 21st-century skills (Senthamarai, 2018).

To bridge this gap, an innovative teaching model is needed, relevant, and learner-oriented, which can answer the educational needs in the digital era. One of the promising teaching models is Project Based Flipped Learning (PjBFL). This model integrates the power of project-based learning with the flipped classroom model, creating a dynamic and interactive learning environment. The implementation of the PjBFL model is expected to bring various benefits to students and educators. For students, this model can increase engagement, motivation, and learning autonomy, as well as develop essential 21st century skills. For educators, this model provides an opportunity to act as facilitators and guides, rather than just as information providers, allowing them to provide more personalized feedback and support the holistic development of students. In addition, the PjBFL model also has the potential to improve student learning outcomes, especially in terms of conceptual understanding, problem-solving skills, and creativity (Thomas, 2000).

Integration of PjBL and Flipped Learning in the PjBFL model, a dynamic and interactive learning environment is created. Students can gain basic knowledge through Flipped Learning outside the classroom, and then apply that knowledge in challenging and meaningful projects in the classroom. This model has the potential to increase student engagement, motivation, and learning outcomes, as well as develop essential 21st century skills. The results of Zarouk et. all. (2020) research, stated that the implementation of the PjBFL model can improve students' cognitive and metacognitive functions both individually and collaboratively. The results of Sholahuddin et. all (2023) research. showed that students' scientific literacy in classes implementing PjBL-FC (Project-Based Learning - Flipped Classroom) better than students who only apply PjBL (Project-Based Learning). In addition, the application of PjBFL can improve learning outcomes, creativity, critical thinking skills and problem-solving skills of students (Chua, 2020)

This study aims to explore in depth the implementation of the model. Project Based Flipped Learning (PjBFL) in improving the effectiveness of learning and the use of interactive media in supporting the success of its implementation. The contribution of this research is to provide a comprehensive overview of relevant research to identify best practices, challenges, and opportunities in the implementation of PjBFL. The results of this study are expected to provide valuable insights for educators, curriculum developers, and policy makers in their efforts to improve the quality and effectiveness of learning in the digital era.

  

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## Research Method

This research uses a method Systematic Literature Review (SLR) to explore the effectiveness of Project-Based Flipped Learning (PjBFL) in improving students' skills and to identify interactive media used in its implementation. SLR was chosen because it is able to provide a comprehensive understanding of relevant research results based on available secondary data (Nursalam et al., 2020).

The review was conducted on articles published between 2020 – 2024 obtained from the Scopus and Google Scholar databases. The search keywords included "Project-Based Flipped Learning", "PjBFL", "flipped classroom", and "project-based learning". All articles found were selected using inclusion and exclusion criteria based on topic focus and full-text availability.

The data selection and analysis process was carried out based on the PRISMA guidelines (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) which includes the stages of identification, screening, feasibility assessment, and reporting. In the initial stages of the search, researchers set specific criteria for entering literature into the database, namely only journals that discuss the implementation of Project Based Flipped Learning (PjBFL) in the context of learning. Furthermore, inclusion and exclusion criteria were applied, considering the publication period between 2020 and 2024 to ensure the relevance and currency of the data analyzed.

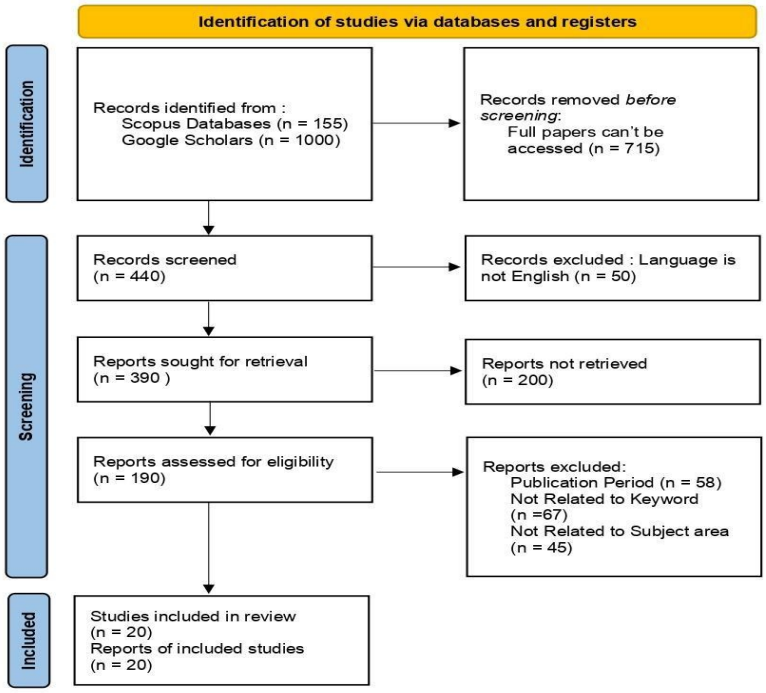


**Figure 1. Prisma flow diagram**

The number of journals identified through the Scopus database is 155 journals, while from Google Scholar there were 1000 journals, so the total number of identified journals was 1,155 journals. A total of 715 journals were removed because their full text could not be accessed. Thus, the number of journals remaining for screening was 440 journals. Of the 440 journals screened, 50 journals were excluded because they did not use English. Thus, the number of journals remaining for the next stage was 390 journals. Of the 390 journals available, 200 journals were not successfully accessed for further assessment. Thus, the journals that could be tested for eligibility were 190 journals. After further assessment of the

  

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190 journals, 58 journals were excluded because they did not comply with the specified publication period, 67 journals were excluded because they were not relevant to the research keywords, and 45 journals were excluded because they did not comply with the field of study being studied. Thus, the number of journals that met the requirements and were further analyzed was 20 journals.

The inclusion criteria in this study include national and international journals that discuss the effectiveness of the PjBFL model at various levels of education, factors that influence the implementation of the model, and methods used in its implementation. Meanwhile, the exclusion criteria include journals that do not focus on the PjBFL model, do not have full-text access, inadequate methodological quality, and journals that only discuss PjBL or Flipped Learning eparately without integration of both. Journals in languages other than English are also excluded.

## Results and Discussion

At the filtering stage by adjusting the inclusion and exclusion criteria of the identified journals, the researcher succeeded in filtering and summarizing 20 articles that met the criteria as in Table 1.

**Table 1: Summary of PjBFL Model Implementation Literature**

| No | Author (Year) | Title | Method | Key Findings |
|---|---|---|---|---|
| 1 | Zarouk, M., Olivera, E., Peres, P., & Khaldi, M. (2020) | *The Impact Of Flipped Project-Based Learning On Self-Regulation In Higher Education* | Quantitative | PjBFL enhances independent learning strategies and student motivation |
| 2 | Judy Dori, Y. J., Kohen, Z., & Rizowy, B. (2020) | *Mathematics For Computer Science: A Flipped Classroom With An Optional Project* | Quantitative | PjBFL improves conceptual understanding and problem solving skills |
| 3 | Ramadhani, R., & Fitri, Y. (2020) | *A Project-Based Learning Into Flipped Classroom For Epub3 Electronic Mathematics Learning Module (Emlm)-Based On Course Design And Implementation* | R&D | PjBFL-based eMLM improves statistical thinking skills |
| 4 | Moreno-Ruiz, L., Castellanos-Nieves, D., Braileanu, B. P., González-González, E. J., Sánchez-De La Rosa, J. L., Groenwald, C. L. O., & González-González, C. S. (2020) | *Combining Flipped Classroom, Project-Based Learning, And Formative Assessment Strategies In Engineering Studies* | Quantitative | PjBFL improves active learning and learning outcomes |
| 5 | Tong, Y., & Wei, X. (2020). | *Teaching Design And Practice Of A Project-Based Blended Learning Model.* | Quantitative | PjBBL model improves inquiry and teamwork skills |
| 6 | Sánchez-Muñoz, R., Carrió, M., Rodríguez, G., Pérez, N., & | *A Hybrid Strategy To Develop Real-Life Competences Combining Flipped Classroom,* | Quantitative | PjBFL fosters teamwork, oral communication, |

  

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| No | Author (Year) | Title | Method | Key Findings |
|---|---|---|---|---|
| | Moyano, E. (2020). | *Jigsaw Method And Project-Based Learning* | | and creative thinking |
| 7 | Chua, K. J., & Islam, M. R. (2021) | *The Hybrid Project-Based Learning–Flipped Classroom: A Design Project Module Redesigned To Foster Learning And Engagement* | Quantitative | Integration of FC and PjBL improves problem solving skills |
| 8 | Padzil, M. R., Abd Karim, A., & Husnin, H. (2021) | *Employing DDR To Design And Develop A Flipped Classroom And Project Based Learning Module To Applying Design Thinking In Design And Technology* | R&D | PjBFL modules enhance creativity and design thinking |
| 9 | Karismawati, E. P. (2021) | *Students' Perspectives on Project-Based Learning Integration into Flipped Critical Listening Course during COVID-19 Pandemic: An Example from Indonesia.* | Qualitative | PjBFL module enhances creativity and design thinkingPjBFL is effective in learning Listening during the pandemic |
| 10 | Syawaludin, A., Prasetyo, Z.K., Jabar, C.S.A. & Retnawati, H. (2022) | *The Effect Of Project- Based Learning Model And Online Learning Settings On Analytical Skills Of Discovery Learning, Interactive Demonstrations, And Inquiry Lessons* | Quantitative | PjBL and online environment are effective in training prospective teachers' analytical skills |
| 11 | Listiqowati, I., Budijanto., Sumarmi., & Ruja, I. N. (2022) | *The Impact Of Project-Based Flipped Classroom (Pjbfc) On Critical Thinking Skills.* | Quantitative | PjBFL has a significant impact on critical thinking skills |
| 12 | Mursid, R., Saragih, A. H., & Hartono, R. (2022) | *The Effect Of The Blended Project-Based Learning Model And Creative Thinking Ability On Engineering Students' Learning Outcomes* | Quantitative | PjBFL is effective in blended learning for engineering learning outcomes |
| 13 | Sholahuddin, A. (2023) | *Project-Based and Flipped Learning in the Classroom: A Strategy for Enhancing Students' Scientific Literacy* | Quantitative | PjBFL is more effective than PjBL in improving scientific literacy |
| 14 | Asda, E. F., Effendi, E., Maaruf, A., Fathony, H., & Hidayati, I. (2022). | *The Validity of E-Learning Chemistry Learning in SMA/MA Project Based Learning on Hydrocarbons Using the Flipped Classroom Approach in Class XI Senior High School* | R&D | PjBL-based e-learning with FC approach is declared valid and practical. |
| 15 | Huang, W., London, J. S., & Perry, L. A. (2023) | *Project-Based Learning Promotes Students' Perceived Relevance In An Engineering Statistics Course:* | Quantitative | PjBFL increases learning relevance and collaborative |

  

| No | Author (Year) | Title | Method | Key Findings |
|---|---|---|---|---|
| | | *A Comparison Of Learning In Synchronous And Online Learning Environments* | | readiness |
| 16 | Mayar, F., Putra, F. W., Monia, F. A., Kosassy, S. O., Fadli, R. P., & Arinalhaq, R. (2023) | *Project-Based Learning Model Development Using Flipped Classroom for Drawing Learning in College* | R&D | The PjBFL model increases student motivation and engagement |
| 17 | Aydin, G., & Mutlu, O. (2023) | *Project-Based Learning And The Flipped Classroom Model Supported Project-Based Learning's Impact On Academic Success, Retention, And Individual Innovation Competence* | Quantitative | PjBFL improves learning outcomes and student innovativeness |
| 18 | Bolivar, R., Triviño Jaimes, N. R., & Gonzalez, E. A. (2023) | *Implementation And Benefits Of Hybrid Methodology: Flipped Classroom And Project-Based Learning In Mechanical Engineering Courses* | Mix Methods | Hybrid FC-PjBL improves concept understanding and emotional engagement |
| 19 | Hao, L., Tian, K., Mohd Salleh, U. K., Leng, C. H., Ge, S., & Cheng, X. (2024). | *The Effect Of Project-Based Learning And Project-Based Flipped Classroom On Critical Thinking And Creativity For Business English Course At Higher Vocational Colleges* | Quantitative | PjBFL improves creative and critical thinking skills |
| 20 | Köpeczi-Bócz, T. (2024) | *The Impact Of A Combination Of Flipped Classroom And Project-Based Learning On The Learning Motivation Of University Students* | Quantitative | Combination of FC and PjBL improves learning outcomes and motivation |

The table above summarizes the various research designs used, ranging from quantitative, qualitative, to development and mix method, which strengthens the validity of the findings on the effectiveness of the PjBFL model.

**Table 2. Recapitulation of research design**

| No | Research Design | Number of Journals | Journal Author (Year) |
|---|---|---|---|
| 1 | Qualitative | 1 | Karismawati (2021) |
| 2 | Quantitative | 14 | Judy Dori, et.al. (2020), Sánchez-Muñoz, et.al. (2020), Chua & Islam (2021), Moreno, et.al. (2020), Aydın & Mutlu (2023), Huang, et.al. (2023), Sholahuddin (2023), Tong, et.al. (2020), Hao, et. al. (2024), Syawaludin, et. al. (2022), Mursid, et. al. (2022), Köpeczi Bócz (2024), Zarouk, et. al. (2020), Listiqowati, et. al. (2022) |
| 3 | R&D | 4 | Ramadhani & Fitri (2020), Padzil, et.al. (2021), Mayar, et.al. (2023), Asda, et. al. (2022) |
| 4 | Mix Methods | 1 | Bolivar, et.al. (2023) |

  

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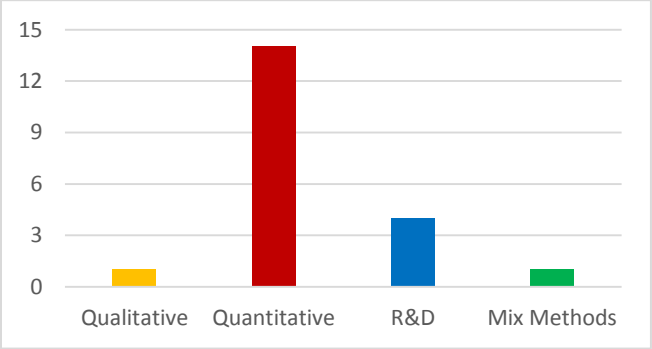


**Figure 2. Journal Research Design**

From the results of the analysis of 20 journals that discuss the implementation of Project-Based Flipped Learning (PjBFL), it is known that the most frequently used type of research is quantitative research, especially with experimental design. This is due to several fundamental reasons. First, the PjBFL approach is an innovative learning model that needs to be proven objectively effective. Therefore, many researchers choose the experimental method to test the extent to which PjBFL is able to improve learning outcomes, critical thinking skills, collaboration, or student motivation compared to conventional learning methods. Second, the quantitative approach allows researchers to obtain numerical data that can be analyzed statistically, making the results easier to interpret and generalize. Third, the experimental design provides control over external variables that may affect the results of the study, so researchers can conclude that the changes that occur are due to the implementation of PjBFL, not other factors.

In addition, many reputable international journals prefer research with experimental designs because they are considered to have high validity and reliability. Therefore, it is not surprising that quantitative research with experimental designs is the main choice in examining the effectiveness of the PjBFL model.

**RQ1: The effectiveness of the Project Based Flipped Learning (PjBFL) model on the skills developed at the education unit level.**

The following table recapitulates the results of the analysis of 20 journals based on the level of education, as well as the effectiveness of the Project Based Flipped Learning (PjBFL) model on hard skills and soft skills developed.

**Table 3. Recapitulation of the Effectiveness of the PjBFL Model**

| No | Level | Number of Journals | Hard Skills Indicator | Journal Author (Year) | Soft Skills Indicator | Journal Author (Year) |
|---|---|---|---|---|---|---|
| 1 | Elementary School | 1 | Learning outcomes, knowledge retention, student innovation competence | Aydın & Mutlu (2023) | - | - |
| 2 | Junior High School | - | - | No articles with junior high school subjects | - | No articles with junior high school subjects |
| 3 | Senior High | 3 | Learning outcomes | Asda, et. al. (2022) | - | - |

  

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| No | Level | Number of Journals | Hard Skills Indicator | Journal Author (Year) | Soft Skills Indicator | Journal Author (Year) |
|---|---|---|---|---|---|---|
| | School | | Critical thinking skills | Ramadhani & Fitri (2020) | - | - |
| | | | Science literacy | Sholahuddin (2023) | - | - |
| 4 | Perguruan Tinggi | 16 | Learning outcomes | Huang, et.al. (2023) | Collaboration | Tong, et.al. (2020), Sanchez-Muñoz, et. al. (2020) |
| | | | Critical thinking skills | Listiqowati, et. al. (2022), Hao, et. al. (2024) | Oral communication | Sánchez-Muñoz, et.al. (2020) |
| | | | Analytical ability | Syawaludin, et. al. (2022) | Creative thinking | Padzil, et.al. (2021), Mursid, et. al. (2022) |
| | | | Problem solving ability | Chua & Islam (2021) | Learning motivation | Mayar, et.al. (2023), Köpeczi Bócz (2024) |
| | | | Inquiry ability | Tong, et. al. (2020) | Confident | Huang, et.al. (2023) |
| | | | Active engagement | Moreno, et.al. (2020), Judy Dori, et.al. (2020) | Ability to learn independently | Zarouk, et. al. (2020) |
| | | | | | Critical listening | Karismawati (2021) |
| | | | | | Emotional engagement | Bolivar, et.al. (2023) |

The results of the analysis of the 20 articles reviewed in this study show that the Project-Based Flipped Learning (PjBFL) model has a positive impact on improving students' 21st century skills. The PjBFL model has been proven to improve various skills, both hard skills such as critical thinking, conceptual understanding, creativity, and problem solving skills, as well as soft skill ssuch as collaboration, communication, learning motivation, and active involvement. A study by Zarouk, et al. (2020) showed that PjBFL can strengthen students' self-regulation and independent learning strategies. Research by Listiqowati, et al. (2022) and Hao, et al. (2024) revealed that PjBFL has a significant impact on critical thinking skills and creativity. Chua & Islam (2021) and Judy Dori et al. (2020) found that the integration flipped classroom and project based learning can improve students' problem-solving abilities and conceptual understanding.

Research at the primary education level by Aydın & Mutlu (2023) states that PjBFL can improve students' academic achievement, knowledge retention, and innovation competence. Meanwhile, at the high school level, Sholahuddin (2023) found a significant increase in science literacy in students who learned using the PjBFL model compared to regular PjBL. This shows that PjBFL is relevant to be applied at various levels of education although it is most dominantly used in higher education. Thus, this data provides a clear

  

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picture that the effectiveness of PjBFL gets stronger as the level of education increases, and this model has great potential to be widely used in an effort to improve students' overall skills, both in terms of academic and social-emotional. If systematically integrated at all levels, PjBFL could become a relevant and transformative learning strategy in the 21st century education era.

**RQ2: Interactive media implemented in the application of the Project Based Flipped Learning (PjBFL) model.**

In implementing the Project-Based Flipped Learning (PjBFL) model, interactive media plays a crucial role in creating an engaging and effective learning experience. These media not only serve as a means of delivering information, but also as a means of increasing student engagement, encouraging collaboration, and facilitating self-directed learning.

The following table summarizes the interactive media found in the 20 journals selected for analysis, with an emphasis on how these media are integrated into the Project-Based Flipped Learning (PjBFL) model.

**Table 4. Recapitulation of Interactive Media in PjBFL Model**

| No. | Types of Interactive Media | Impact of using interactive media | Journal Author (Year) |
|---|---|---|---|
| 1 | Online Learning Platform (LMS) | The Moodle application facilitates the teaching and learning process, making it easier to manage classroom activities. | Asda, et. al. (2022) |
| | | The integration of online technologies like Teams and Moodle platforms allows for personalized learning, enabling students to engage with content at their own pace and style. | Köpeczi Bócz (2024) |
| | | A blended learning model, combining face-to-face instruction with online learning via a Learning Management System, enhances the learning experience by incorporating interactive media in both settings. | Mursid, et. al. (2022) |
| | | Digital platforms provide students with flexible learning environments, allowing them to engage with content at their own pace. | Mayar, et.al. (2023) |
| | | The Schoology platform enables students to share their work, receive feedback, and engage in discussions, fostering a deeper comprehension of the content. | Karismawati (2021) |
| | | The Moodle platform aims to increase student engagement and facilitate learning by providing a wide array of resources aligned with learning objectives | Bolivar, et.al. (2023) |
| | | The SIENA platform includes a chat function for student interaction, facilitating student communication and collaboration | Moreno, et.al. (2020) |
| | | The online course website provides students with access to all learning content, including 15-minute learning videos, lecture notes, syllabus, and solutions to class practice questions and problems. | Judy Dori, et.al. (2020) |
| | | Use of the LMS as a platform where students can access course materials, submit assignments, and interact with peers and facilitators thereby enhancing the learning experience | Zarouk, et. al. (2020) |

  

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| No. | Types of Interactive Media | Impact of using interactive media | Journal Author (Year) |
|---|---|---|---|
| 2 | Video | Online video as the main interactive media tool, which includes evaluative questions to monitor student understanding of key concepts | Sánchez-Muñoz, et.al. (2020) |
| | | Recorded videos and readings allow students to engage with the material at their own pace before participating in interactive classroom activities | Hao, et. al. (2024) |
| | | Animated video technology helps engage students and makes learning more dynamic and visually appealing | Tong, et.al. (2020) |
| | | These videos likely serve as pre-class materials that engage students before attending class sessions, allowing them to familiarize themselves with the content | Sholahuddin (2023) |
| | | YouTube video creation allows students to express their understanding of statistics in the context of their lives and careers, as well as improve their communication skills | Huang, et.al. (2023) |
| | | Pre-recorded videos serve as the primary medium for delivering theoretical content, allowing students to access the material at their own pace | Chua & Islam (2021) |
| | | The study used online videos as the main interactive media tool, which included evaluative questions to monitor students' understanding of key concepts | Sánchez-Muñoz, et.al. (2020) |
| | | Watching a video before class prepares students for in-class activities, enhancing their collaboration and communication skills, allowing them to focus on basic concepts and solve problems. | Aydın & Mutlu (2023) |
| 3 | Zoom and WhatsApp | Zoom enables effective online learning through recording, chat, discussion, and sharing presentations, while WhatsApp provides a secure platform for text, voice, and video communication among students. | Listiqowati, et. al. (2022) |
| 4 | Digital teaching materials (E-Modules) | The Lectora Inspire app was utilized to create digital teaching materials that promote inquiry-based learning, enabling simple experimental practices and detailed instructions. | Syawaludin, et. al. (2022) |
| | | The electronic math learning module (eMLM) uses SIGIL software for an interactive learning experience, where eMLM integrates text, audio, and video to increase student engagement | Ramadhani & Fitri (2020) |
| | | Flipped classroom and Project-Based Learning modules to provide initial exposure and familiarize students with learning materials outside of class hours before they attend class | Padzil, et.al. (2021) |

  

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The data listed in the table above is presented visually through the diagram below.

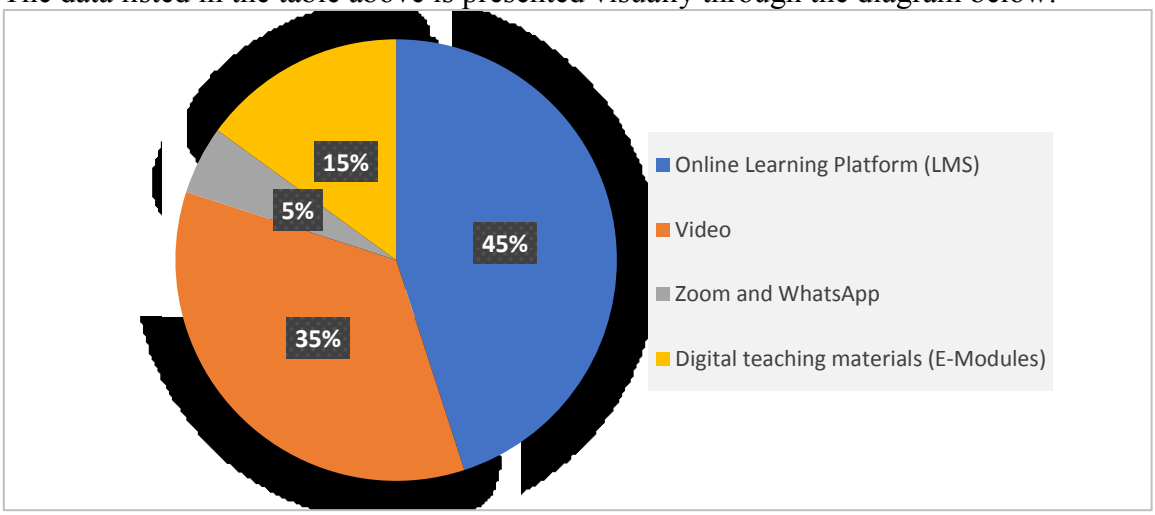


**Figure 3. Percentage diagram of interactive media usage**

From the analysis of 20 journals that discuss the application of interactive media in the Project-Based Flipped Learning (PjBFL) model, it is found that the utilization of digital media contributes significantly to improving the quality of 21st century learning. In the PjBFL model, various interactive media are used to support active, collaborative and student-centered learning. Some studies such as Koepeczi-Bócz (2024), Asda, et al. (2022), and Mursid, et al. (2022) show that platforms such as Moodle, LMS, and project-based e-learning help increase learning flexibility as well as student engagement. The advantage of these interactive media lies in their ability to facilitate systematic and flexible learning management, allowing students to learn at their own pace and style. The LMS also supports the integration of various types of content such as videos, readings, and interactive exercises, and provides communication features to enhance student collaboration and engagement. However, drawbacks include the dependence on internet connection and adequate devices, as well as the potential for low motivation to learn if there is no direct interaction.

The next media is learning videos, either in the form of animations, recorded lectures, or interactive videos. Tong, et al. (2020) and Ruiz, et al. (2020) note that the use of animated videos and collaborative platforms can improve students' teamwork, creativity and concept understanding. Videos have the advantage of helping students understand concepts in a visual and engaging way, as well as allowing them to learn independently before class sessions take place. This strengthens their readiness for face-to-face discussions and collaboration. However, quality video production requires time and technical skills, and overly passive learning can reduce effectiveness if not complemented by reflective or evaluative activities.

Meanwhile, Karismawati (2021) and Mayar, et al. (2023) highlighted the importance of social media and communication apps such as WhatsApp and Zoom in supporting interaction and learning motivation during the project process. Zoom enables real-time synchronous learning with discussion, presentation and recording features, while WhatsApp facilitates quick communication through text, voice and video. The advantages of this media lie in its ease of access and familiarity of use. However, limitations arise from the high bandwidth requirement for Zoom, as well as the lack of systematic learning management features on WhatsApp.

Furthermore, digital teaching materials (e-modules) also play an important role in this model. Digital teaching materials (E-Modules) support modern technology-based learning. E-

  

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modules can be designed with various software that allows the integration of multimedia elements to increase learner engagement and understanding. Ahmad Syawaludin, et al. (2022) developed digital teaching materials using the Lectora Inspire application, which supports engaging content design and inquiry-based learning, particularly to facilitate simple experimental practices through detailed instructions. Meanwhile, Rahmi Ramadhani and Yulia Fitri (2020) created an Electronic Mathematics Learning Module (eMLM) using SIGIL software. This module combines text, audio, and video to create a more interactive and enjoyable learning experience for students. On the other hand, Mohd Ridzuan Padzil, et al. (2021) developed a learning module that integrates the flipped classroom and Project-Based Learning approaches to provide early exposure to subject matter outside of school hours, so that students are better prepared and familiar with the topic before taking part in classroom learning. This proves that digital teaching materials (e-modules) are proven to play an important role in increasing the effectiveness of project-based learning models, where the advantages include flexibility of learning time, integration of attractive multimedia, and the ability to support learning differentiation. However, challenges in developing e-modules include the need for technical skills and the risk of low effectiveness for students who are less independent or unfamiliar with digital learning.

Overall, the combination of interactive media in the PjBFL model provides a more meaningful and effective learning experience. Nevertheless, the selection and implementation must be adjusted to students' conditions, infrastructure readiness, and learning objectives to ensure truly optimal results. Sholahuddin et al. (2023) recommend the development of differentiated PjBFL-based e-modules. Sarah (2024) and Listiqowati et al. (2022) emphasize the importance of teacher training in the use of technology-based flipped learning. Another suggested strategy is to implement PjBFL gradually, starting with the introduction of instructional videos and the strengthening of students' digital literacy. Thus, it can be concluded that PjBFL supported by interactive media is an innovative learning strategy that is relevant to the challenges of 21st century education. This model not only encourages academic improvement, but also fosters students' independence, collaboration and learning motivation. Its success is highly dependent on content design, teacher readiness and adequate technological infrastructure.

## Conclusion

The Project-Based Flipped Learning (PjBFL) model is effective in improving 21st-century skills like collaboration, communication, creativity, and problem-solving. It is widely applied in higher education, but research opportunities are limited at the junior high school level. Interactive media, such as Learning Management Systems, videos, quizzes, and online simulations, support the flipped phase and collaborative process. These tools not only serve as learning resources but also shape meaningful, flexible, and appropriate learning experiences for learners.

## Recommendation

Based on the results of the study on the effectiveness of the Project Based Flipped Learning (PjBFL) model in learning, teachers are encouraged to begin integrating interactive media, especially e-modules, into the project-based and flipped classroom approach more deeply. Teachers can attend training on e-module development using more user-friendly applications such as *Canva for Education* or *Book Creator*, in order to accommodate various student learning styles and improve accessibility for both teachers and students.

  

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Teachers also need to reflect on and evaluate the implementation of the PjBFL model in their classrooms and adapt the model according to the characteristics of the subject and the needs of the students. In addition, it is important for teachers to collaborate with peers in professional learning communities to share best practices in the use of project-based and flipped e-modules.

**References**

Asda, E. F., Effendi, E., Maaruf, A., Fathony, H., & Hidayati, I. (2022). The Validity Of E-Learning Chemistry Learning In Sma/Ma Project Based Learning On Hydrocarbons Using The Flipped Classroom Approach In Class XI Senior High School. *International Journal of High Information, Computerization, Engineering and Applied Science (JHICE)*, *2*(01), 1-9.

Aydin, G., & Mutlu, O. (2023). Project-Based Learning And The Flipped Classroom Model Supported Project-Based Learning's Impact On Academic Success, Retention, And Individual Innovation Competence. *International Journal of Contemporary Educational Research*, *10*(4), 823-833.

Bolivar, R., Triviño Jaimes, N. R., & Gonzalez, E. A. (2025). Implementation and benefits of hybrid methodology: Flipped classroom and project-based learning in mechanical engineering courses. *International Journal of Mechanical Engineering Education*, *53*(1), 102-124.

Chua, K. J., & Islam, M. R. (2021). The hybrid Project-Based Learning–Flipped Classroom: A design project module redesigned to foster learning and engagement. *International Journal of Mechanical Engineering Education*, *49*(4), 289-315.

Hafeez, M., Kazmi, Q. A., Tahira, F., Hussain, M. Z., Ahmad, S., Yasmeen, A., & Saqi, M. I. (2020). Impact of School Enrolment Size on Student's Achievements. Indonesian Journal of Basic Education, 3(1), 17-21.

Hafeez, M., Zafar, N., & Hafeez, M. (2021). A Critical Review on Discussion and Traditional Teaching Methods. Psychology and Education, 58(1), 1871-1886.

Hao, L., Tian, K., Mohd Salleh, U. K., Leng, C. H., Ge, S., & Cheng, X. (2024). The Effect Of Project-Based Learning And Project-Based Flipped Classroom On Critical Thinking And Creativity For Business English Course At Higher Vocational Colleges. *Malaysian Journal of Learning and Instruction (MJLI)*, *21*(1), 159-190.

Huang, W., London, J. S., & Perry, L. A. (2023). Project-Based Learning Promotes Students' Perceived Relevance In An Engineering Statistics Course: A Comparison Of Learning In Synchronous And Online Learning Environments. *Journal of Statistics and Data Science Education*, *31*(2), 179-187.

Johnson, L., Adams Becker, S., Estrada, V., & Freeman, A. (2020). NMC Horizon Report: 2020 Higher Education Edition. Educause.

Judy Dori, Y. J., Kohen, Z., & Rizowy, B. (2020). Mathematics for computer science: A flipped classroom with an optional project. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(12).

Karismawati, E. P. (2021). Students' Perspectives on Project-Based Learning Integration into Flipped Critical Listening Course during COVID-19 Pandemic: An Example from Indonesia. *Journal of Second Language Acquisition and Teaching*, *27*, 31-51.

  

*Vol. 12 No. 2 : April 2025*
*E-ISSN: 2722-4627*
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Köpeczi-Bócz, T. (2024). The impact of a combination of flipped classroom and project-based learning on the learning motivation of university students. *Education Sciences*, *14*(3), 240.

Listiqowati, I., Budijanto., Sumarmi., & Ruja, I. N. (2022). The impact of project-based flipped classroom (PjBFC) on critical thinking skills. International Journal of Instruction, 15(3), 853- 868.

Mayar, F., Putra, F. W., Monia, F. A., Kosassy, S. O., Fadli, R. P., & Arinalhaq, R. (2023). Project-Based Learning Model Development Using Flipped Classroom for Drawing Learning in College. *JOIV: International Journal on Informatics Visualization*, *7*(4), 2415-2420.

Moreno-Ruiz, L., Castellanos-Nieves, D., Braileanu, B. P., González-González, E. J., Sánchez-De La Rosa, J. L., Groenwald, C. L. O., & González-González, C. S. (2020). Combining Flipped Classroom, Project-Based Learning, And Formative Assessment Strategies In Engineering Studies. *International Journal of Engineering Education*, *35*(6), 1673-1683.

Mursid, R., Saragih, A. H., & Hartono, R. (2022). The Effect of the Blended Project-Based Learning Model and Creative Thinking Ability on Engineering Students' Learning Outcomes. *International Journal of Education in Mathematics, Science and Technology*, *10*(1), 218-235.

Padzil, M. R., Abd Karim, A., & Husnin, H. (2021). Employing DDR To Design And Develop A Flipped Classroom And Project Based Learning Module To Applying Design Thinking In Design And Technology. *International Journal of Advanced Computer Science and Applications*, *12*(9).

Ramadhani, R., & Fitri, Y. (2020). A Project-Based Learning Into Flipped Classroom For Epub3 Electronic Mathematics Learning Module (Emlm)-Based On Course Design And Implementation. *Universal Journal of Educational Research*, *8*(7), 3119-3135.

Sánchez-Muñoz, R., Carrió, M., Rodríguez, G., Pérez, N., & Moyano, E. (2020). A Hybrid Strategy To Develop Real-Life Competences Combining Flipped Classroom, Jigsaw Method And Project-Based Learning. *Journal of Biological Education*, *56*(5), 540-551.

Sholahuddin, A. (2023). *Project-Based and Flipped Learning in the Classroom: A Strategy for Enhancing Students' Scientific Literacy (EU-JER_Scopus Indexed_Q3). repo-dosen. ulm. ac. id*.

Senthamarai, S. (2018). Interactive teaching strategies. Journal of Applied and Advanced Research, 3(1), S36-S38.

Syawaludin, A., Prasetyo, Z.K., Jabar, C.S.A. & Retnawati, H. (2022). The Effect Of Project-Based Learning Model And Online Learning Settings On Analytical Skills Of Discovery Learning, Interactive Demonstrations, And Inquiry Lessons. *Journal of Turkish Science Education*, 19(2), 608-621.

Thomas, J. W. (2000). A review of research on project-based learning. Report prepared for the Autodesk Foundation.

Tong, Y., & Wei, X. (2020). Teaching Design And Practice Of A Project-Based Blended Learning Model. *International Journal of Mobile and Blended Learning (IJMBL)*, *12*(1), 33-50.

Zarouk, M., Olivera, E., Peres, P., & Khaldi, M. (2020). The Impact Of Flipped Project-Based Learning On Self-Regulation In Higher Education. *International Journal of Emerging Technologies in Learning (iJET)*, *15*(17), 127-147.

  