Journal of Philology and Educational Sciences

EngiScience Publisher

Research Article

Blended Project-Based Learning Model on 21st Century Skills: A Qualitative Content Analysis

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Article Info

Article History
Received Mar 10, 2024
Revised May 23, 2024
Accepted Jun 02, 2024

Keywords
21st Century Skills
Blended PJBL
Learning stages
Model Influences

Abstract

The 21st century has revolutionized education with technology, but challenges such as teachers' resistance, students' comprehension issues, effective implementation, and teacher training persist. This study employs a qualitative content analysis to document and analyze data from 18 research studies on blended project-based learning models. It aims to identify the stages, research methods, subject areas, and educational levels that most frequently implement this model. Data was collected from Google Scholar, Scopus, and ERIC databases over the past five years (2019-2023). Findings reveal that 7 out of 18 journals discuss blended project-based learning models with similar syntax. Key findings include: (i) the combination of face-to-face and online learning enhances effectiveness; (ii) quasi-experimental methods are prevalent, particularly in biology and higher education; and (iii) blended project-based learning effectively improves 21st century skills, including critical thinking (mean effect size 1.65), creativity (mean effect size 1.19), and prob-lem-solving (mean effect size 1.44), resulting in an overall mean effect size of 1.42.

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1. Introduction

The 21st century has revolutionized education with technology, but challenges remain like teachers' resistance and students' comprehension issues, effective implementation, teacher training (Oluwagbohunmi & Alonge., 2023), technology integration, professional development, and social emotional learning are crucial. Research and dialogue are essential for relevant and effective learning in this area (Ahmed & Patrick., 2015).

The 21st century emphasizes globalization, requires skilled workers, and underscores investing in education and skills development (Fong et al., 2014; Oluwagbohunmi & Alonge., 2023). 21st century skills encompass communication, collaboration, ICT literacy, critical thinking, and problem solving (Andersen & Rustad., 2022). These skills are considered essential competencies in the 21st century (Voogt & Roblin.,

2012). These skills integrated the knowledge, skills, and characteristics needed to thrive in modern society (Lawati & Khan., 2023) or (Nesime & Kadir., 2023). The National Education Association (NEA) recommends the importance of 21st century skills such as critical thinking, problem solving, communication, collaboration, creative thinking, and innovation (Junaedi et al., 2020). These skills are crucial because of the changing human- machine interaction in the fourth industrial revolution, requiring excellent preparation for the 21st century generation (Hanifa et al., 2021). Science and technology advancement has revolutionized 21st century learning, with ICT integration being pivotal (Putra et al., 2021). Global curriculum now prioritizes 21st century skills to tackle challenges from the fourth industrial revolution (Hujjatusnaini et al., 2022). These skills are relevant in various disciplines, including teaching (Nahum., 2022). The education system should focus on cultivating these skills to bridge the skills gap in the workforce (Malissa & Shiau., 2022).

To enhance 21st century skills, teachers need to implement diverse and active learning methods in the classroom (Banda & Nzabahimana., 2021). The aim is effective learning via supportive models or methods to achieve objectives (Diani et al., 2018). The use of technology in learning is important to enhance students' flexibility and independence (Fahlevi., 2022) one way is through distance learning to form an integrated learning approach (Ana et al., 2022). The relevant learning today is a combination of blended learning and project-based learning (Putra et al., 2021). The model integrates internet technology and project-based tasks to train students in collaboration, problem solving, and teamwork (Rahma et al., 2023). In blended project-based learning, technology is utilized to enhance efficiency, activate learning, and produce problem-based products (Shih & Tsai., 2017;Mursid et al., 2022) students participate in projects to make the learning process more active (Hujjatusnaini et al., 2022; Putra et al., 2021). This model has been implemented in both secondary and higher education levels, making it easier for teachers to apply (Sari et al., 2022). The implementation of this model aligns with student development and supports the crucial 4C skills needed for the future (Puri & Hendawati., 2014).

The blended project-based learning model combines different teaching methods, including direct instruction, indirect instruction, collaborative learning, and technology-based internet learning, following the stages of both teaching models (Rahma et al., 2023). During face-to-face classes, project-based learning takes center stage, supported by e-learning platforms (Fahlevi., 2022).

3. Methodology

The design of the present study follows a qualitative content analysis in which it concentrates on documenting or recording data and statistics. It further examines written documents. It further offers scientific viewpoints, empowering structured evaluations of diverse sources (Elo & Kyngäs, 2008). The research question is answered by searching for relevant articles on three different data sources: Google scholar,

Scopus, and ERIC. Google scholar is seen as an alternative source offering scholarly articles with extensive coverage (Sapitri et al., 2020). Scopus is chosen because it is the largest data center with international coverage (Saleh & Sumarni., 2016). Meanwhile, ERIC is chosen for its credible access and comprehensive reputation (Strayer., 2008). If articles are not available from the specified sources, the researcher will look for them on ResearchGate and Google. Articles from 2019 to 2023 are prioritized for current relevance. Keywords used in the article search are carefully selected, for instance "blended project-based learning model on critical thinking skills. The blended model applied to project-based learning is introduced with various terms, such as blended project-based learning (Purwanti et al., 2022), project based blended learning (Fahlevi., 2022), virtual project-based learning (Asfihana et al., 2022), project based online learning (Zen et al., 2022), and project based e-learning (Rusnawati et al., 2021). In this study, the term used is blended project-based learning. Each relevant article will be analyzed for information such as publication year, subject or course applied, educational level, study design, and effect size in specific cases (if calculated). To address the research questions, the study is categorized based on 21st century skill types, publication year, and effect size, followed by data analysis according to these categories.

3.1. Inclusion and Exclusion Process

Researcher's skill in setting boundaries and identifying criteria is crucial in designing studies for comprehensive reviews. Articles are included or excluded for analysis based on these criteria, with studies selected according to inclusion criteria from Table 1 and exclusion criteria. The search in this study covers six 21st century skills: critical thinking, problem solving, communication, collaboration, creative thinking, and ICT literacy (Voogt & Roblin., 2012), other 21st century skills are not part of this research category.

Table 1. Inclusion criteria used in article selection.

Criteria	Explanation
Interval time	The references are articles published between 2019-2023 in journals accredited nationally and internationally.
Topic Discussion	The researchers focused on blended project based laearning models and their influence on 21st century skills.
Limitation	Selected articles are restricted to the past five years in Indonesian and English to ensure research validity and avoid misinterpretation.
Database search	Researchers use Google Scholar, Scopus, and ERIC databases to find journal references.
Study results	Numerous studies explore the impact of implementing blended project-based learning on 21st century skills.

From the initial search, 786 articles were found: 744 from google scholar, 7 from Scopus, and 35 from ERIC. After screening, 395 irrelevant articles were removed. Further analysis led to 379 articles passing screening. Subsequently, 237 articles were eliminated due to irrelevant abstracts or unavailability, leav-

ing 142 suitable articles. However, 116 articles didn't meet inclusion criteria and were excluded. Eventually, 26 journals met inclusion criteria, further filtered for a minimum journal credibility of SINTA 3, resulting in 18 journals meeting all criteria. The article selection process is summarized in the PRISMA flowchart.

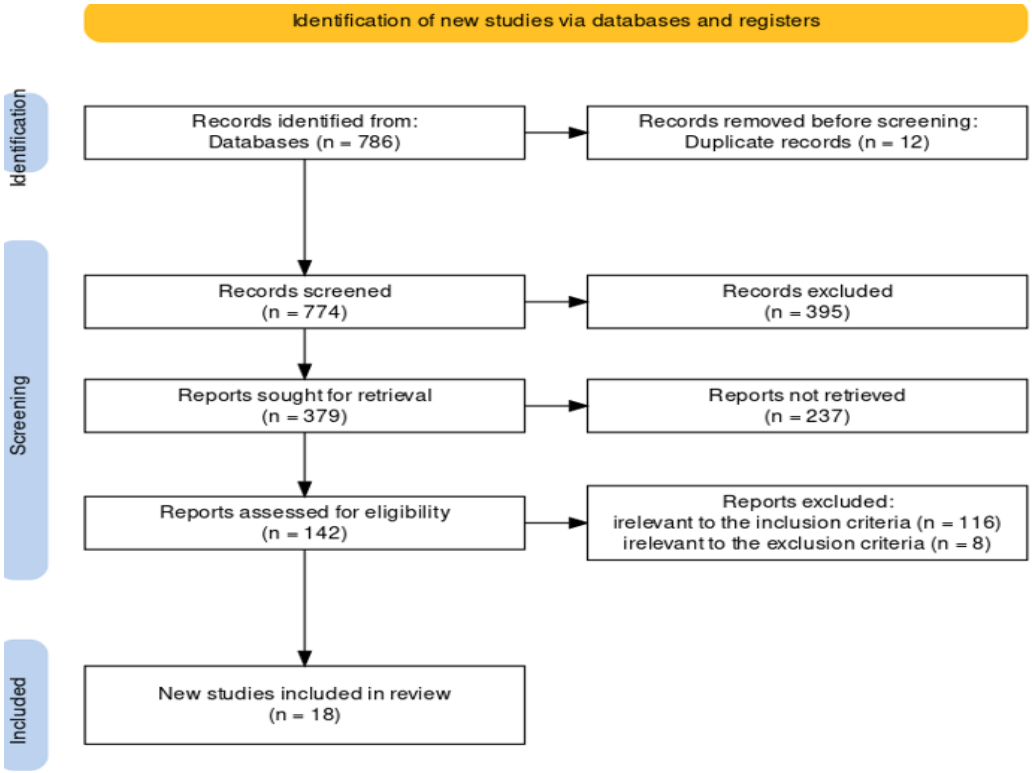

Figure 1. PRISMA Flowchart (Haddaway et al., 2022)

4. Results and Discussions

4.1. What are the stages of implementing the blended project-based learning model used in the last five years?

Recent studies have explored blended project-based learning, combining aspects of blended and project-based learning. Seven out of 18 analyzed journals outline implementation stages, including planning, theoretical background, discussion, group determination, data analysis, conclusion, project presentation, and evaluation, to enhance critical thinking skills (Taufiq et al., 2020). Some studies integrate this model with six learning stages: problem analysis, project design planning, research, creation, product evaluation, and presentation (Hujjatusnaini et al., 2022). Other studies investigate the effect of blended project-based learning on critical thinking skills, using a learning cycle involving pretesting, project planning, monitoring, presenting results, and final evaluation (Pantiwati et al., 2023).

This model has been researched for its effect on creative thinking skills, focusing on problem solving, activating prior knowledge, demonstrating applying, and integrating new knowledge (Yustina et al., 2020). Other studies outline learning stages: problem introduction, project planning, scheduling, project monitoring, data collection, and result presentation (Mursid et al., 2022). Learning starts with project questions, group formation, planning, testing, evaluation, guided by the teacher with final inquiries (Ulya et al., 2022). Blended project-based learning starts with essential questions, followed by proposal design, scheduling, project monitoring, result evaluation, and learning reflection (Anggraini et al., 2022). Below is a table summarizing the stages of the blended project-based learning model.

Table 2. Stages of implementing the blended project-based learning model

Journal code	Year publication	Blended project-based learning model syntax
2K	2020	Planning investigation, theory search and presentation, group determination, and data evaluation.
9K	2020	Formulating problems, activating knowledge, demonstrating, applying, integrating new knowledge.
11K	2022	Introducing the problem, designing tasks, scheduling, observing, assessing, reviewing topics.
5K	2022	Questioning the problem, planning the project, researching, creating products, improving, presenting project results.
14K	2022	Questioning, designing, scheduling, monitoring, evaluating outcomes, assessing participant experiences.
21K	2022	Posing fundamental questions, planning project, scheduling, project execution, presenting, evaluating.
25K	2023	Identifying questions, designing, scheduling, presenting project outcomes, evaluating.

From 2019 to 2023, a blended project-based learning model was consistently used, combining face to face and online learning. Though not detailed in 2019, its stages were generally uniform across studies, following previous research. Rahm's syntax, similar to Yuni Pantawati's, was most relevant, known for its efficiency and clarity. This model merges project-based learning, blended learning, and technology to aid teaching and learning.

4.2. How is the implementation of the blended project-based learning model reviewed based on research methods, subjects, and educational levels?

Based on critical assessment, 18 journals discuss blended project based learning implementation, covering research methods, subjects, and educational levels, as indicated in the table below:

Table 3. Implementation of the blended project-based learning model based on research methods, subjects, and educational levels

Journal code	Journal data	Research method	Subjects	Educational levels
17K	Umi Kholifah, dkk (2019)	Quantitative descriptive approach	Data communication & computer networking	College
6K	N. Zakiah (2019)	Quantitative descriptive approach	Teaching in learning strategies	College
7K	Abdul (2019)	Quasi experiment	Biology	College
8K	Riski A.C, (2019)	Classroom action Research	Chemistry	High school
2K	M. Taufiq dkk (2020)	Quantitative descriptive approach	Astronomy	College
9K	Yustina, (2020)	Quasi experiment	Biology	College
3K	W. Sumarni (2021)	Quantitative descriptive approach	Learning program	College
10K	Badr A. (2021)	Quasi experiment	-	Junior high school
16K	Mira Juwita, dkk (2021)	Focus group description	ICT	Vocational high school
4K	Ani P. dkk (2022)	Quasi experiment	Biology	College
14K	Nike A. dkk (2022)	Classroom action Research	College	College
21K	Rosyidatul, (2022)	Qualitative descriptive	Mathematic	High school
5K	Hujjatusnaini, dkk (2022)	Quasi experiment	Biology	College
19K	Ade A. dkk (2022)	Classroom action Research	Plant morphology	College
11K	R. Mursid, dkk (2022)	Quasi experiment	Multimedia ICT	College
23K	Dini , dkk (2022)	Quantitative approach	Biology	High school
26K	Aliftika (2022)	Quasi experiment	Guidance in ICT	Vocational high school
25K	Yuni P. (2023)	Experimental Research	Chemistry	Junior high school

The researcher evaluated the blended project-based learning model for 21st century skills, considering research methods, subjects, and educational level.

4.2.1. Researchers utilized a range of research methods, including quantitative descriptive, classroom action research, quasi experimental, descriptive qualitative, and focus group discussion.

The bar chart displays research methods in education: quantitative descriptive (5), quasi experimental (8), classroom action research (3), qualitative descriptive (1), and focus group discussion (1). Quasi experimental is most prevalent for its accuracy in determining cause and effect, enabled by researchers' control

of variables before and after the study (Akbar et al., 2023). Franklen & Wallen highlight experimental research's uniqueness in enabling direct manipulation of variables and testing cause and effect hypotheses (Mutri., 2014).

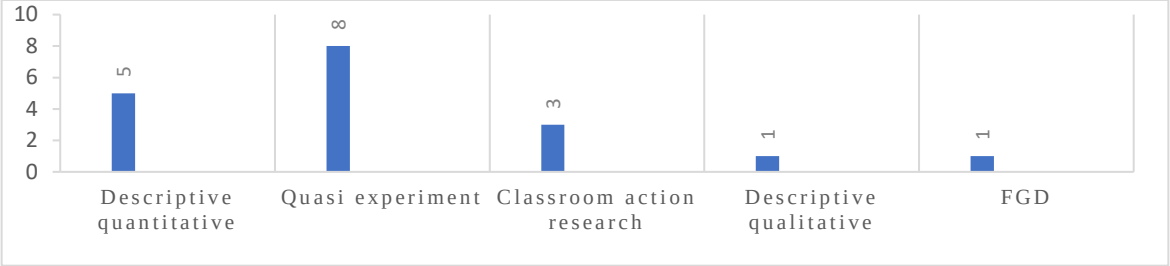

Chart 1. The distribution of research methods

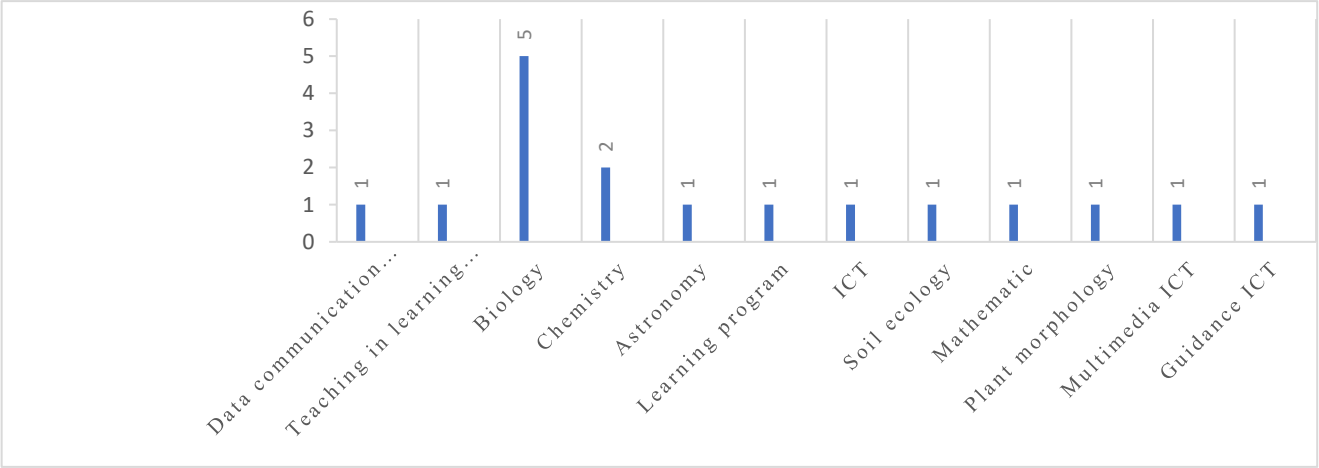

Chart 2. The distribution of subjects

4.2.2. The subjects or courses utilized by researchers can be viewed in the bar chart below:

Blended project-based learning is widely used in biology due to teachers and lecturer frequently employing project-based methods in relevant laboratory settings. Integrating technology enhances learning effectiveness by offering flexible, limitless concepts, aiding students' understanding of the material.

4.2.3. Blended project-based learning is implemented across various educational levels, junior high school, vocational high school or high school, and college.

The chart bar shows 2 studies at junior high school, 5 at senior high school or vocational high school, and 10 at tertiary education level (college) implementing this model. College adopts this model most due to the 21st century learning paradigm emphasizing skills like information retrieval, problem formulation, analytical thinking, collaborative problem solving, and technological literacy (Oktari et al., 2022). Bustami's research indicates that in Indonesian secondary schools, conventional teaching methods prevail, emphasizing textbooks and teacher centered learning, leading to passive student attitudes (Pantiwati et al.,

2023). Therefore, at the college level, students are anticipated to be proactive change agents with essential competencies. Researchers implement the blended project-based learning model for prospective teachers to enhance crucial 21st century skills in addressing modern challenges.

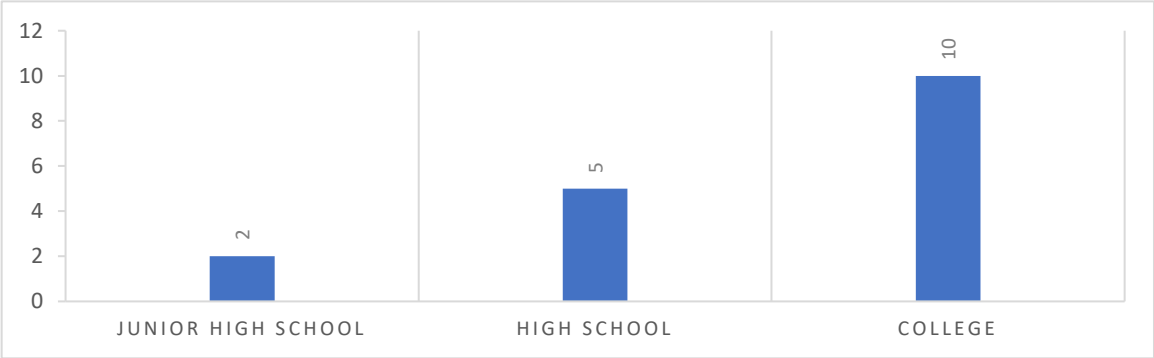

Chart 3. The distribution of education levels

4.3 What is the effectiveness of implementing the blended project-based learning model on 21st century skills in the field of education?

The effectiveness of 21st century skills depend on the pedagogy used in teaching (Banda & Nzabahimana., 2021). In this section, the researcher discusses improving 21st century skills through effective learning models.

4.3.1. Blended Project Based Learning Model

Teachers need to collaborate on lesson plans, pedagogy, and subject mastery with technology to create creative learning tailored to students' needs. Implementing the blended project based learning model is crucial for achieving 21st century learning objectives (Putra et al., 2021). Generation Z must develop critical thinking skills: logic, reasoning, analysis, creativity, problem solving, and decision making (Adriadi et al., 2022). These skills are crucial as they involve cognitive processes in goal setting, gathering solutions, and decision making (Eliyasni et al., 2019). Problem solving skills are crucial in 21st century, necessary in various aspects of life to effectively resolve issues (Cetin., 2023). Critical thinking is closely related to problem solving, as it involves the application of knowledge and thinking skills in the problem-solving process (Winarti et al., 2018). Skill like collaboration, communication, and creative thinking are crucial in the 21st century. Project-based learning supported by technology can enhance these skills (Putri & Hendawati., 2014). Of 18 analyzed journals, 11 emphasize the use of blended project-based learning for 21st century skills, as shown:

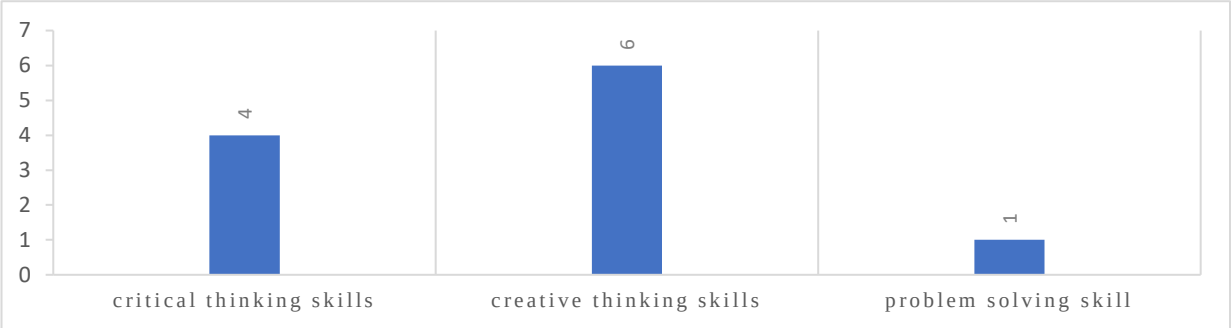

Chart 4. The distribution of 21st century skills

Table 4. The effectiveness of implementing the blended project-based learning model on 21st century skills

Journal code	21st century skills	Result	Effect size	Mean effect size	Category
2K	Critical thinking skill	Blended project based lerning model boosts critical thinking in biology teacher candidates	1,85		
4K		Implementing blended projects improves students' 21st century skills, especially critical thinking	1,77		
5K		Implementing blended project-based learning for biology teacher candidates enhances high level skill, like critical thinking	2,09		
26K		Implementing blended project-based learning enhances critical thinking	0,88	1,65	High
6K	Creative thinking skills	Implementing blended project-based learning enhances creative thinking	0,61		
7K		Implementing blended project-based learning enhances creative thinking	1,62		
8K		Implementing blended project-based learning enhances creative thinking	0,58		
9K		Implementing blended project-based learning enhances creative thinking skills in biology teacher candidates	1,68		
10K		Implementing blended project-based learning enhances creative thinking	1,91		
11K		Implementing blended project-based learning enhances creative thinking	0,75	1,19	High
14K	Problem solving skills	Blended project-based learning enhances students' problem solving skills	1,44	1,44	High
		Mean		1,42	High

From the chart, 4 journals demonstrate improvement in the blended project-based learning model regarding critical thinking skills, 6 journals indicate enhancement in creative thinking skills, 1 journal shows improvement in problem solving skills. Further information is available in the table below.

After analysis, 11 out of 18 journals are categorized for calculating the effect size value. Effect sizes ranging from $0,2 \leq d < 0,5$ are deemed low, $0,5 \leq d \leq 0,8$ moderate, and $> 0,8$ is considered high (Louis et al., 2007). Implementing blended project-based learning significantly boosts 21st century skills, with a mean

effect size of 1,42. Especially in enhancing critical thinking, creative thinking, and problem-solving skills. Here's an explanation of the impact of blended project-based learning on 21st century skills.

4.3.1. Blended Project Based Learning Model on Critical Thinking Skills

Fourth journals indicate an increase in critical thinking skills with a mean effect size of 1,65. This supports previous findings regarding the ineffectiveness of conventional learning. Through blended project-based learning, critical thinking skills can be enhanced as this model allows learners to develop knowledge and skills by investigating questions, problem, and challenges (Aliftika et al., 2021). Critical thinking skills are essential for analyzing daily problems and are valuable assets in both social and personal aspects of life (Pantiwati et al., 2023). Therefore, students accustomed to analyzing daily problems will indirectly apply these skills in learning. Study results indicate that although not all students master these skills, the use of blended project-based learning is effective in enhancing students' critical thinking skills.

4.3.2. Blended Project Based Learning Model on Creative Thinking Skills

Analysis of 6 journals shows creative thinking skill with a mean effect size 1,19 indicating high effectiveness. This is attributed to the 21st century being labeled as the era of human capital, marked by rapid advancements in science and technology. Given the constant challenges in life across internal, educational, and occupational environments, creative thinking becomes crucial for addressing and solving these issues (Sumarni et al., 2021). Creative thinking allows individuals to tackle problems from diverse perspectives and through different approaches (Daker et al., 2020). Creative thinking impacts learning by enabling learners to generate their own ideas, opening doors to new insights and perspectives in understanding various concepts (Sumarni et al., 2021). Students with creative thinking skills can improve their decision making, evaluation, and problem solving skills (Saregar et al., 2016). Experts concur that 21st century skills can be enhanced through the implementation of blended project based learning models, allowing learners to engage in independent learning tailored to their needs (Wahyudi & Winanto., 2018).

4.3.3. Blended Project Based Learning Model on Problem Solving Skills

One analyzed journal on problem solving skills obtained a mean effect size of 1,44 indicating a high level of problem-solving skills. Active student participation in blended project-based learning helps enhance these skills, enabling them to tackle daily challenges and develop critical thinking in problem solving. This model aids in transferring learning from school to real world applications (Anggraini et al., 2022).

Journals analysis indicates that the blended project-based learning model has a positive impact on the development of 21st century skills, not only in science education but also in various other subjects such as data communication computer networking, ICT, multimedia ICT, and teaching learning strategies. Its implementation encourages student engagement, stimulates critical thinking and strengthens essential skill in the 21st century era. However, the model is still less common in physics education, while in chemistry and biology education many researchers have successfully implemented it resulting in positive impacts on the learning process.

5. Conclusions

In conclusion, the literature review on the Blended Project-Based Learning (BPBL) model highlights its remarkable influence on enhancing 21st-century skills among learners. Incorporating face-to-face and online educational methods in line with project-based learning has been demonstrated to promote creativity, communication, critical thinking, and collaboration. The reviewed literature systematically emphasizes the developments in the student involvement and self-directed learning, vital skills, and aptitudes in the current day's energetic and multimedia-based world. As long as educational models proceed to expand, the Blended Project-based learning paradigm arises as an effective strategy to nurture learners with the necessary skills to flourish in the 21st century.

This study reviews the impact of blended project-based learning on 21st century skills. Findings: (i) It combines face to face and online learning, enhancing effectiveness. (ii) Quasi experimental methods are common, with biology as a key subject, especially in higher education. (iii) Blended project-based learning has been proven effective in improving 21st century skills, including critical thinking (mean effect size 1,65), creativity (mean effect size 1,19), and problem solving (mean effect size 1,44), resulting in an overall mean effect size of 1,42.

Declaration of Competing Interest: The authors declare that they have no known competing of interest.

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