THE IMPACT OF STEAM EDUCATION ON 21ST CENTURY SKILLS (6C)

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Abstract. A transformation of higher education in Indonesia with a change in curriculum to MBKM presents new challenges in producing quality graduates. The Indonesian government recommends the PjBL model, and it has been studied with various integrations to improve the quality of learning in Indonesia. The quality of learning is influenced by the learning and teaching styles of students through specific learning techniques. This study aims to analyze the impact of STEAM Education on 21st-century skills (6C). First, the synergy between PjBL, Ethnoscience, STEAM, Multiple Intelligences, and Multiple Representations will be determined by analyzing articles from 2014 to 2024 using the systematic literature review method. The Systematic Literature Review method is a research stage to process 966 articles with 4,562 relevant words in Publish or Perrish 8 Software, and the data results are selected in Bibliometric VosViewers Software. The findings are PjBL integration research (2014-2024) in the form of the synergy of PjBL-Ethno-STEAM-MIR aspects in quantum synergy modelling— conclusion, classified against 6C skills as the impact of STEAM education in 21st-century skills. Further research is expected to develop the PjBL-Ethno-STEAM-MIR model and its teaching materials.
Keywords: 21st-century skills, Impact, Systematic literature review, STEAM education

1. Introduction

Teaching and learning styles characterize the characteristics of learning techniques needed to improve the quality of learning. Learning techniques so far still contain one or several combinations of existing learning strategies. This is without focusing on several core aspects that can be integrated in producing quality learning. Project-based learning models (PjBL), ethnoscience, STEAM, multiple intelligences, and multiple representations are core aspects that can be integrated, resulting in true quantum learning. All aspects are presented, namely: 1) producing a product through a project in inquiry-based learning (Project-Based Learning), 2) linking local wisdom that contains natural potential in the surrounding environment to be studied scientifically (Ethnoscience), 3) studying problem solving from various fields of STEAM (Science, Technology, Engineering, Art, Mathematics), 4) utilizing the potential of multiple intelligences from the learning style possessed, 5) mastering the ability of multiple representations as a teaching style, or being able to express an object/process in various ways as a form of understanding the concept possessed.

The PjBL model is one of the case method and team-based project learning models recommended for higher education in Indonesia [1]. This PjBL model supports the achievement of 21st century skills in the OBE (Outcome Based Education) curriculum [2]. The competencies of these 21st century skills include Communication, Collaboration, Critical Thinking, and Creative Thinking (4C) [3]. 21st century skills provide conditions for optimal learning [4], thus becoming part of the MBKM program's achievements. The Independent Learning-Independent Campus (MBKM) Program is a government policy to transform the higher education system in Indonesia in producing competent graduates, both soft skills and hard skills, to be more prepared and relevant to the needs of the times, preparing graduates as future leaders of the nation who are superior and have personality, and are able to develop potential according to their passion and talents [5]. The choleric character shows a strong leadership spirit, has

ambition, is energetic, strong-willed, active, independent, very independent, firm, has a strong stance in making decisions, high work discipline, is brave, and optimistic [6]. In addition, choleric characters also show self-confidence, like challenges, are organized, quick in making decisions, like to have opinions, are productive, enthusiastic and competitive [7]. Choleric characters are extroverted, and goal-oriented, have clear and strong goals, and dare to face challenges [6]. Student potential also needs to be developed by training multiple intelligences and multiple representations that they have. The potential for multiple intelligences is obtained from genetic factors inherited from parents or ancestors, and is strengthened by environmental factors [8]. Students with average intelligence are able to formulate information well, and students with average intelligence can solve problems through the potential for multiple representations [9] that they have. Thus, learning with PjBL integration needs to include choleric characters, and can train students' multiple intelligences-representations so that the goals of MBKM can be achieved optimally.

The PjBL model has been varied with various integrations of ethnoscience, STEM, STEAM, multiple intelligences, and multiple representations. PjBL integrated with STEM has an influence on creative thinking skills [10] which is effective in increasing student creativity [11], and can improve critical thinking skills in problem solving by training students' logical thinking skills in making decisions [12]. PjBL effectively improves student learning outcomes through the application of multiple representations [13]. PjBL-STEM integrated with multiple representations can improve mathematical communication skills [14], mathematical representation is one part of multiple representations, and reveals students' teaching styles or how students express objects/processes. Students' teaching styles are also influenced by students' learning styles [15]. The application of the integration of the PjBL and STEM models can accommodate students' learning styles [16], learning styles are related to multiple intelligences and student learning outcomes [17]. PjBL is supported by multiple intelligences [18] because the PjBL strategy facilitates the stimulation of the development of various forms of intelligence and the acquisition of skills in a number of fields [19]. Self-optimization of one's learning style can be the best way to learn effectively and have an efficient teaching style [15]. The mismatch between teaching style and student learning style affects the learning process [20]. PjBL integrated with ethnoscience can improve students' concern for the environment [21]. Implementation of the PjBL model integrated with Ethnoscience (PjBL-Ethno) can improve scientific literacy and students' cognitive learning outcomes [22], and have an impact on conceptual understanding of science [23]. Likewise, the PjBL-Ethno model integrated with STEM has a significant impact on improving students' critical and creative thinking skills [24]. The application of a scientific concept through the PjBL-Ethno-STEM model can be done to build creativity with scientific design in producing scientific products [25], and develop students' entrepreneurial characters [26]. In addition to the application of the PjBL-ethno-STEM model has the potential to improve 4C skills, students' conservation characters (responsibility, resilience, honesty, environmental care) also have the potential through the application of this model [27].

The PjBL model has also been integrated into STEAM with its significant influence on critical thinking skills [28] and creative [29], as well as problem solving [30] so that this learning becomes an alternative to improve 21st century skills [31]. This is because the integration of PjBL-STEAM can provide a comprehensive understanding of the relationship between scientific fields through the experience of learning 21st century skills [32] in improving 4C competencies [33]. The most researched STEAM-integrated PjBL research is on the topic of critical thinking and scientific literacy, Indonesia is ranked 2nd in the development of research and collaboration on this topic based on bibliometric analysis of the Scopus database with VosViewers [34]. PJBL can be integrated with Ethno and STEAM (PjBL-Ethno-STEAM), it was found that the application of this model can support the Sustainable Development Goals (SDGs) which produce innovative science products in learning [35]. PjBL-Ethno-STEAM can also improve numerical literacy skills [36], which are related to multiple representations in the form of mathematical representations, and are related to multiple intelligences in the form of mathematical-logical intelligence.

According to the PISA (Programme for International Student Assessment) database, in 2022 Indonesia was ranked 74th out of 80 countries with a PISA score of 178, Indonesia has the smallest

difference in science scores among countries and economies participating in PISA, the difference in science scores between the 10% of students with the highest scores, and the 10% of students with the lowest scores [37]. However, the transformation of the education system in Indonesia is in the spotlight because it has produced a new paradigm in the form of Merdeka Belajar or 'Emancipated Learning' [38]. The new Merdeka Curriculum or "Emancipation Curriculum" has three main objectives, namely: (1) simplified content, with a focus on basic competencies, (2) greater emphasis on pedagogy such as project-based learning, and (3) more flexibility for teachers and schools [39]. In Indonesia, the average performance in science of 15-year-olds is 383 points, compared to an average of 485 points in OECD (Organization for Economic Cooperation and Development) countries [37]. Based on this, the PjBL model still needs to be implemented because it is part of the MBKM objectives, and integrated learning techniques are needed that can improve the quality of education in Indonesia.

In addition, the results of the TIMSS (Trends in International Mathematics and Science Study) research show that in 2023 TIMSS Science also assesses the main science practices, namely these practices include scientific inquiry skills and are fundamental to all disciplines, science practice facilities are also very important for students to learn and understand science concepts and appreciate the nature of science and scientific knowledge [40]. Inquiry is part of the PjBL model, and the nature of science is included in local wisdom (ethnoscience), so PjBL and ethnoscience are appropriate to be integrated as integrated learning techniques in this study.

Indonesia has a variety of cultures that can utilize the local wisdom of its cultural communities in ethnoscience studies. The potential of local wisdom can support daily living needs, and the economy of cultural communities. The potential and problems as an impact of local wisdom studied in learning can train students' sensitivity to care about the environment. The knowledge and experience possessed by students can be used directly as a solution to the problems found. It is important to have integrated learning techniques that can be applied in learning to improve the quality of learning in higher education in Indonesia.

The research topic of PjBL model integration towards ethnoscience, STEAM, multiple intelligences, and multiple representations needs to be studied more deeply in order to determine research trends over the past 10 years (2014-2024). The research trends found can strengthen the synergy of collaboration from all elements of the PjBL model, ethnoscience, STEAM, and MIR (Multiple Intelligences-Representations) which are longitudinal in nature. The synergy of collaboration of these 4 pillars is illustrated in the form of quantum synergy modeling, refer to Figure 1.
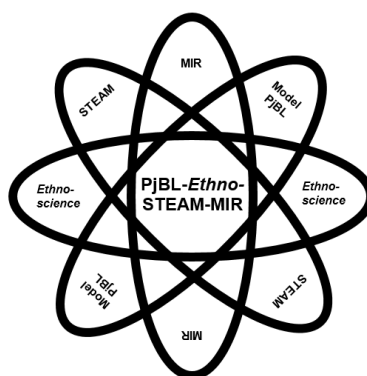

Figure 1. Quantum Synergy Modeling

Quantum Learning can create an effective and creative learning environment, a fun learning process, increase life and career success, and accelerate the achievement of learning goals [41], and utilize the left and right brain [42]. Integrated learning techniques with the PjBL-Ethno-STEAM-MIR quantum synergy modeling pattern have a new side by revealing research trends and their characteristics. This integrated learning technique needs to be described through research analysis. Both the analysis of

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relevant research topics, learning technique procedures shown from the stages, and the characteristics of integrated learning techniques. This integrated learning technique contains the learning and teaching styles of students that are blended into the learning segment. The characteristics formed are adjusted to the objectives of the MBKM curriculum in order to improve the quality of learning in higher education in Indonesia.

This study aims to: (1) analyze the research trend of PjBL model integration towards ethnoscience, STEAM, multiple intelligences, multiple representations (2014-2024), and (2) analyze the characteristics of integrated learning techniques in improving the quality of learning in higher education in Indonesia. This study is expected to open up knowledge insights through the analysis of PjBL-Ethno-STEAM-MIR integration, and further research can be carried out in the form of developing the PjBL-Ethno-STEAM-MIR model, and its teaching materials.

2. Method

The research method uses a Systematic Literature Review. Systematic Literature Review (SLR) or Systematic Review (SR) is carried out through a series of stages and protocols to avoid bias and subjective understanding [43], is stricter and well-defined, more comprehensive and detailed with a literature selection period [44]. Systematic literature review diagram [45], refer to Figure 2.
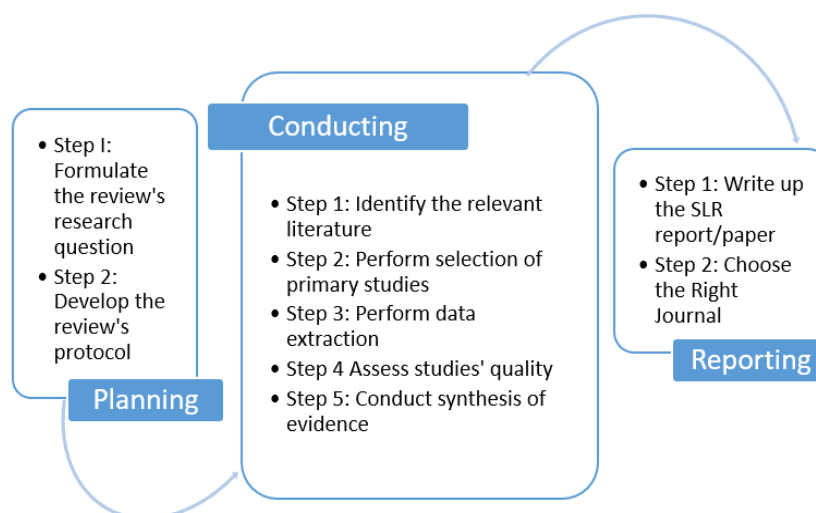
Figure 2. Systematic Literature Review

2.1 Planning-Step 1: Formulate the review's research question

The formulation of Research Questions (RQs) about the effectiveness of treatment should focus on 5 elements known as PICOC, see Table 1.

Table 1. Identification of PICOC

Population (P)	Students; software
Intervention (I)	Software Publish of Perrish 8; Software Bibliometric VosViewers; digital library Google Scholar; classification; integration of PjBL models to ethnoscience, STEM, STEAM, multiple intelligences, multiple representations (2014-2024); methods; techniques; datasets; curriculum purpose (MBKM) in Indonesia; characteristics of PjBL-Ethno-STEM; and expected characters.

Comparison (C)	The results of the analysis of the Bibliometric VosViewers software with a study of research literature on the integration of PjBL-Ethno-STEM/STEAM and multiple intelligences-representations in Indonesia (2014-2024); Characteristics of the PjBL-Ethno-STEM integration model with the expected characteristics in the curriculum purpose (MBKM) of Indonesia.
Outcomes (O)	The synergy between PjBL, Ethnoscience, STEAM, Multiple Intelligences, and Multiple Representations will be determined by analyzing articles from 2014 to 2024
Context (C)	Integrated PjBL models have an impact on STEAM Education on 21st-century skills (6C)

The formulation of Research Questions (RQs) of PICOC in research, see Table 2.

Table 2. The formulation of Research Questions (RQs) of PICOC

No.	Research Question
RQ1	What kind of synergy PjBL integrated models (2014-2024) to ethnoscience, STEAM, multiple intelligences, and multiple representations are selected by researchers in the software Bibliometric VosViewers?
RQ2	How to impact of STEAM Education on 21st-century skills (6C)?

2.2 Planning-Step 2: Develop the review's protocol

A plan that specifies the basic review procedures (method), see Table 3.

Table 3. Components of the review's protocol

Background	Potential: The PjBL model is recommended in educational learning in Indonesia. The integration of PjBL to ethnoscience, STEM, STEAM, multiple intelligences, multiple representations has been studied. There are expected characters in the objectives of the MBKM curriculum. There is no integrated learning technique involving the synergy aspects of PjBL-Ethno-STEAM-MIR. Problems: a literature review is needed to determine the research trend of PjBL integration, an integrated learning technique with quantum synergy modeling is needed to improve the quality of learning in higher education, the characteristics of integrated learning techniques need to be determined, and the characters formed according to the objectives of the MBKM program through integrated learning techniques need to be determined.
Research Questions	Compiled based on PICOC. 1. What kind of research trend PjBL integrated models (2014-2024) to ethnoscience, STEAM, multiple intelligences, and multiple representations are selected by researchers in the software Bibliometric VosViewers? 2. What kind of integrated learning techniques characterization are proposed for improving learning quality in Indonesia's higher education?
Search term	Project-based learning, ethnoscience learning, STEAM learning, multiple intelligences learning, multiple representations learning.
Selection criteria	Analysis of integrated PjBL research variations in Indonesia from 966 articles, determining the most relevant trend topics from title analysis, establishing research trends as part of integrated learning techniques, and analyzing relevant literature in determining the characteristics of integrated learning techniques.
Quality checklist and procedures	Digital library: Google Scholar Data Collection Application Software: Publish or Perrish 8. Publication Year: 2014-2024 (last 10 years). Publication Type: Journal Conference Proceedings, International Journal, National Journal in Indonesia. Data Extraction Software: VosViewers
Data extraction strategy	Selection of data information from keywords title, abstract, and full text.

2.3 Conducting Step-1: Identify the relevant literature

A comprehensive and exhaustive searching of studies to be included in the review, see Table 4.

**Table 4.** Component of Identify The Relevant Literature

Identifying relevant literature topics from Google Scholar	PjBL-ethnoscience, PjBL-STEM, PjBL-STEAM, PjBL-multiple intelligences, PjBL-multiple representations.
Identifying relevant literature topics from Google	The curriculum of government policies in Indonesia is an e-book guide to Merdeka Belajar-Kampus Merdeka (MBKM) programs.
Identifying relevant literature topics from Publish or Perrish 8 (search string)	software AND (project-based learning* OR project learning*) AND (ethnoscience learning* OR ethnoscience*) AND (STEAM learning* OR Science Technology Engineering Art Mathematics*) AND (multiple intelligences learning* OR multiple intelligences learning* OR multiple intelligences learning) AND (multiple representations learning* OR multiple representation learning* OR multirepresentation learning*). Selected studies: 966 articles, 4,562 title words
Identifying relevant literature topics from VosViewers	All combined article data was collected from Publish or Perrish 8 PjBL-Ethno-STEAM-MIR. Selected studies: 64, Occurrence: 10, manual selection into 25 most relevant words.

2.4 Conducting Step-2: Perform selection of primary studies

Perform a selection of primary studies; see Table 5.

Table 5. Inclusion and Exclusion Criteria

Inclusion criteria	Studies in academics using large and small-scale datasets. Studies discuss and compare integrated learning techniques modelling in the area of trend research of integrated model PjBL to ethno-STEAM-MIR with curriculum education in Indonesia. For studies that have both the book, only the journal version will be included. For duplicate publications of the same study, only the complete and newest one will be included.
Exclusion criteria	Studies without a strong validation or including defect prediction in searching. Studies discussing defect prediction datasets, methods, and frameworks in a context other than software defect prediction. Studies with dissertation. Studies written in English.
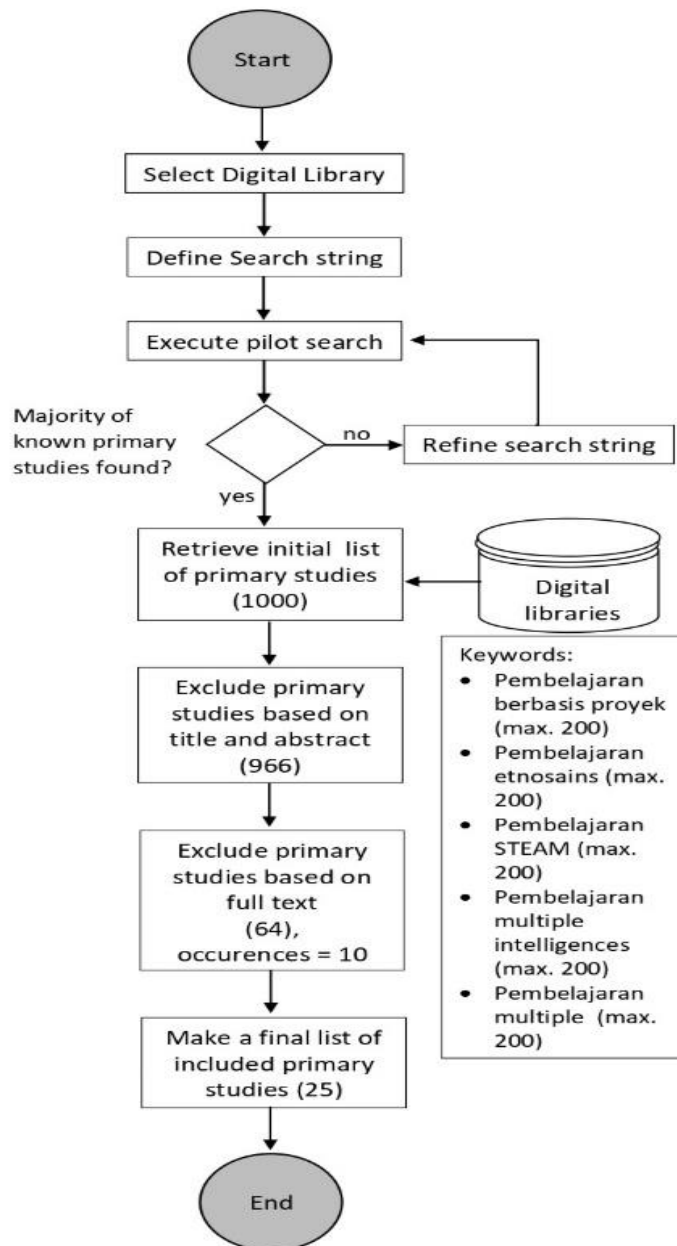
Figure 3. Studies Selection Strategy in Research

2.5. Conducting Step-3: Perform data extraction

1. Reviewing the integration of the PjBL model to ethnoscience, STEM/STEAM, multiple intelligences, multiple representations, and PjBL integration research topics.
2. Determining the trend of PjBL integration research from relevant research topics, all aspects of which are included in the integration learning technique.
3. Forming stages of integrated techniques according to the orientation of each aspect that is synergized through quantum synergy modeling.
4. Reviewing the characteristics of the PjBL-ethno-STEM model (5C: Communication, Collaboration, Critical Thinking, Creative Thinking, Conservation) compared to the objectives of the MBKM curriculum in Indonesia (leadership character).
5. Reviewing the predicted character that is in accordance with the definition that is likely to emerge from the integrated learning technique.

2.6. Conducting Step-4: Assess studies's quality

Table 6. The question assesses studies' quality, is adopted [46]

Item	Answer
Was the article referred to?	Yes/No.
Were the aim(s) of the study clearly stated?	Yes/No/Partially
Were the study participants or observational units adequately described?	Yes/No/Partially
Were the data collection carried out very well?	Yes/No/Partially
Were potential confounders adequately controlled for in the analysis?	Yes/No/Partially
Were the approach to and formulation of the analysis will be conveyed?	Yes/No/Partially
Were the findings credible?	Yes/No/Partially

Conducting Step-5: Conduct synthesis of evidence
This study uses Descriptive Synthesis (narrative/non-quantitative). The synthesis process with explanations of words in the form of 'tell the story' to reveal the results of research findings.

Report-Step 1: Write up the SLR report/paper
The report of findings presents an introduction in the form of background and objectives. The main body contains a review method. Results that describe the data. Discussion that explains the results of the data findings. The conclusion answers the formulation of the problem in achieving the research objectives.

Report-Step 2: Choose the Right Journal
The journals used in this study are at the national (Indonesian) and international levels, both in Indonesian and written in English. The author's name, title, keywords, and topic are information that will help determine the content of learning research in Indonesia that contains aspects of the study of PjBL integration of ethnoscience, STEM/STEAM, multiple intelligences, and multiple representations. Articles are published in the Google Scholar digital library.

After a systematic literature review found the synergy of the PjBL model's integration, a mapping of the learning technique framework from the integration of PjBL with ethnoscience, STEAM, and Multiple Intelligences Representations was carried out. This learning resulted in the impact of STEAM education on 21st-century skills (6C).

3. Results and Discussion

3.1. Results

Analysis of each keyword with a maximum search limit of 200, there are 5 keywords so that the total maximum search is 1000 articles. After that, a search was carried out using the Publish or Perrish 8 application on the Google Scholar (GS) data source. There are 200 articles on 'Project-Based Learning', 'Ethnoscience Learning', 'STEAM Learning', 'Multiple Intelligences Learning', and only 166 articles on 'Multiple Representations Learning'. A total of 966 articles were analyzed. Each prefix is given an Indonesian keyword, namely 'Learning' so that the collection of research articles in Indonesia is specific. Keyword searches can only be done for each aspect, so that repeated analysis is carried out on each aspect. Furthermore, the data stored in several RIS format files are combined, so that the PjBL-Ethno-STEAM-MIR synergy dataset is obtained in one RIS format file.

The results of the literature study in this study found that higher education in Indonesia tends to use various variations of integrated PjBL models. Integration of PjBL-STEM [10,11,12]; PjBL-MR [13]; PjBL-STEM-MR [14]; PjBL-STEAM-MI [16]; PjBL-MI [18,19]; PjBL-Ethno [22-23]; PjBL-Ethno-STEM [24,25,26,27]; PjBL-STEAM [28,29,30,31,32,33]; and PjBL-Ethno-STEAM [35,36]. This is reinforced by the analysis of Vos Viewers bibliometric data. It was found that there were 4,562 identical words, then with occurrences of 10, the threshold limit is 64 words. Manual selection was carried out

until 25 most relevant words were found to determine the integration of PjBL topics with other aspects in this study. The results obtained are displayed in the form of Bibliometrics in the VosViewers application.
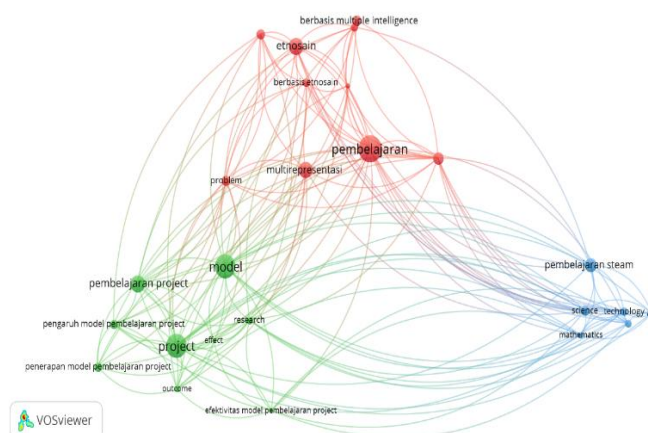
Figure 4. Bibliometric Vos Viewers integration of Synergy PjBL with Ethnoscience, STEAM, Multiple Intelligences, Multiple Representations.

The red color indicates cluster 1, green color cluster 2, and blue color cluster 3. The larger the circle display indicates the research trend with the keyword. The connection thread shows the connectivity of frequently studied research titles (research trends). Writings in the form of words are the most relevant topics, and have connectivity between topics.

Table 7. Keyword Cluster of PjBL-Ethno-STEAM-MIR Research Trends

Cluster 1 (10 item)	Cluster 2 (9 item)	Cluster 3 (6 item)
-based on ethnoscience	-model effectiveness	- art
-based on multiple intelligence	-project learning	-engineering
-in learning	-effect	-mathematics
-ethnoscience	-model	-steam learning
-method	-outcome	-science
-multi representation	-project learning	-technology
-learning	-model application	
-science learning	-project learning	
-problem	-influence of project learning	
-strategy		

This analysis shows that the integration of the PjBL model to ethnoscience, STEAM, and multiple intelligences and multiple representations has connectivity. Each aspect in the PjBL integration has a connection between one another. This reveals that the PjBL-Ethno-STEAM-MIR Integration is still a research trend (2014-2024) in Indonesia. It was found that all aspects are synergistic with each other, the connectivity of quantum synergy modeling to the aspects of the PjBL model, Ethnoscience, STEAM, and Multiple Intelligences-Representations (MIR) can be realized in the form of integrated learning techniques. Thus, integrated learning techniques are learning techniques that contain aspects of PjBL-Ethno-STEAM-MIR that are integrated with each other. Based on the orientation of the study of each aspect of PjBL-Ethno-STEAM-MIR, a framework for thinking about integrated learning technique procedures can be prepared with Income stages (Integrating PjBL-ETHNO-STEM/STEAM) [27,35], Process stages (Integrating PjBL-Ethno-STEAM with Multiple Intelligences-Representations (MIR), Outcome stages (Integrating PjBL-Ethno-STEAM-MIR).

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Table 8. Framework of Thought for Integrated Learning Technique Procedures

| Implementation	Components	Implementation
Income	Integrating PjBL-ETHNO-STEM/STEAM	1. Conducting exploration of the potential and problems of local wisdom of a region to be studied scientifically (Ethnoscience). 2. Determining problem-solving strategies studied in the fields of Science, Technology, Engineering, Art, Mathematics (STEAM). 3. Producing innovative products with an inquiry approach through learning projects (PjBL) that are in accordance with Ethno-STEAM integration.
Process	Integrating PjBL-Ethno-STEAM with Multiple Intelligences-Representations (MIR)	1. Integrating PjBL-Ethno-STEAM with Multiple Intelligences-Representation (MIR): 2. Implementing PjBL integrated with Ethno-STEAM by utilizing the potential of multiple intelligences as students' learning styles, and manifested in the form of multiple representations as students' teaching styles or expressing objects/processes in various ways.
Outcome	Integration of PjBL-Ethno-STEAM-MIR	1. Can demonstrate conceptual understanding through teaching style or expressing objects/processes in various ways (multiple representation). 2. Can increase the potential of multiple intelligences possessed by increasing the dominance of the learning style possessed, as well as increasing the tendency of other intelligence potentials. 3. Can produce innovative products that contain elements of local wisdom and as solutions or resolutions to problems studied.

3.2. Discussion

The Discussion should be an interpretation of the results rather than a repetition of the Results. The discussion should explore the significance of the results of the work, not repeat them. A combined Results and Discussion section is often appropriate. Avoid extensive citations and discussion of published literature.

The procedure for integrated learning techniques to impact STEAM Education on the 21st Century Skills (6C):

1. Implementation (I). Implementing learning through synergy of integration aspects of PjBL, ethnoscience, STEAM, and MIR:

a. Analyze (A). Analyze ethnoscience in learning through exploration of the potential and problems of local wisdom of a region using scientific methods, and determine the problem-solving hypothesis.

b. Classify (C). Classify the components of studies across various fields of Science, Technology, Engineering, Art, Mathematics (STEAM) as a form of solution/problem solving at the analyze stage.

   c. Practice (P). Practicing learning projects in producing innovative products with an inquiry approach (PjBL) as a solution to problems that have been classified at the classify stage.

   d. Utilize (U). Utilize the potential of multiple intelligences as student learning styles (multiple intelligences) in the implementation of PjBL-Ethno-STEAM-MIR at the practice stage.

   e. Realize (R). Realizing learning outcomes from students' teaching styles by representing problem solving in various ways (multiple representations) according to students' learning styles at the utilize stage.

2.   Observation (O). Observing students' learning styles from the characteristics of multiple intelligences that predominantly appear in the application of integrated learning techniques PjBL, ethnoscience, STEAM, and MIR.

3.   Verification (V). Testing students' teaching styles or students' abilities in representing an object/process in various ways (multiple representations) through professional competency tests reviewed from their conceptual understanding as an impact of the application of integrated learning techniques (PjBL-Ethno-STEAM-MIR).

4.   Evaluation (E). Evaluating the increase in multiple intelligences and multiple representations that occur in each segment of the learning material studied from the results of the application of integrated learning techniques (PjBL-Ethno-STEAM-MIR).

5.   Correction (C). Making improvements and repetitions with the same integrated learning techniques on different materials, until students are accustomed to and show an increase in the quality of learning in learning.

Integrated learning technique modeling (PjBL-Ethno-STEAM-MIR) which impacts STEAM Education, refer to Figure 5.
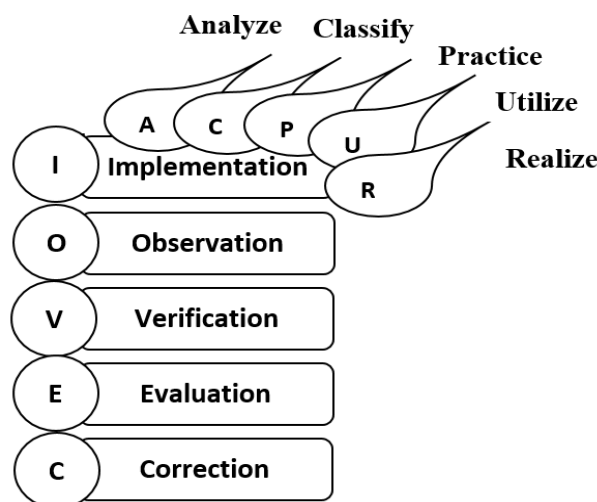
Figure 5. Integrated Learning Technique Modeling (PjBL-Ethno-STEAM-MIR)

Integrated learning techniques contain aspects of PjBL-Ethno-STEAM-MIR. The characteristics of integrated learning techniques are obtained by classifying the characteristics of PjBL-Ethno-STEM integration [27] with multiple intelligences and multiple representations.

Quantum synergy through the integration of PjBL-Ethno-STEAM-MIR has the potential to improve 6C skills, namely Communication, Collaboration, Critical Thinking, and Creative Thinking (4C), Conservation character (responsible, tough, honest, caring for the environment) [27], and Choleric character (strong leadership, energetic, strong will, active, independent, high work discipline, brave, optimistic, confident, like challenges, organized, productive, and competitive) [6,7]. This Choleric character is in accordance with the achievement of the objectives of the MBKM curriculum program in

Indonesian universities, namely students have superior leadership and personality [5]. Choleric character shows Courageous character.

4. Conclusion

The impact of STEAM Education in the 21st century, namely 6C skills (Critical Thinking, Creative Thinking, Communication, Collaboration, Conservation, and Courageous). PjBL model integration (2014-2024) towards ethnoscience, STEAM, multiple intelligences, and multiple representations selected with Bibliometric VosViewers software shows that there is a synergy of PjBL-Ethno-STEAM-MIR aspects that are mutually continuous to form a quantum synergy modeling. Integrated learning techniques contain integration between PjBL-Ethno-STEAM-MIR. Integrated learning techniques consist of: Implementation (I), Observation (O), Verification (V), Evaluation (E), Correction (C). Implementation consists of Analyze (A), Classify (C), Practice (P), Utilize (U), Realize (R). This research is expected to be able to carry out further research in the form of developing the PjBL-Ethno-STEAM-MIR model, and its teaching materials.

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