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Systematic Literature Review: Ethnoscience-Based E-Module Development with Project-Based Learning Using Google Site to Enhance Student Creativity in Chemistry

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Abstract: Fostering student creativity is essential to meet the demands of 21st-century learning, which has been integrated into Indonesia's current national education framework through the implementation of the Independent Curriculum (*Kurikulum Merdeka*). This study aims to examine research trends related to the development of ethnoscience-integrated e-modules using the Project-Based Learning (PjBL) model in the context of chemistry education to enhance students' creativity. A descriptive-analytical method was employed in this study, with data collected from scientific documents indexed in Google Scholar between 2015 and 2024. The research tools used included Publish or Perish and Dimensions.ai, while data visualization and trend mapping were conducted using VOSviewer. The results indicate a significant decline in publication trends over the past three years, suggesting a decreasing focus on this intersection of digital learning, contextual science, and creativity development. These findings highlight a promising opportunity for future researchers to explore underrepresented themes and keywords identified in this review, particularly those that integrate local wisdom, digital platforms, and creativity enhancement in science education.

Keywords: Creativity; Chemistry education; Ethnoscience; E-module; Google Site; Project-Based Learning

Introduction

Learning is a process designed to help students learn what to know and what to be able to do individually or groups (Jufri & Wahab, 2023). Learning always changes and develops in accordance with the time. The development of the 21 st century is characterized by the existence of information technology that is growing rapidly at an extraordinary speed (Elitasari, 2022). 21 st century has its own uniqueness characterized by education focusing on the 21 st century skills (Rosnaeni, 2021). 21 st century skills in this era of technological development requires students to have skills in accordance with the 4C concept, namely critical thinking, cooperation, communication, and creativity (Nantana & Wiradimadja, 2023).

It is recognized that success is not limited only to intelligence, but also to creativity and commitment to the task or desire for achievement (Munadar, 2014). In the world of education,especially schools, creativity is considered a sign that a learner has experienced development which is shown by making his own work that has been fulfilled (Idrus, 2022). To support the increasing creativity of students, it must be supported by using appropriate teaching materials to increase student creativity.

E-module is a form of information display that is loaded with a book format that is presented electronically and can be accessed using electronic devices such as computers and smartphones (Ramadanti et al, 2021). Compared to printed modules, e-modules can be equipped with animations, videos, and other

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interactive features so that students can enhance their learning experience (Rismayanti et al, 2022). This e-module will be implemented on chemistry learning. Chemistry focuses on learning the difference between visible and invisible chance processes, such as observing chances in colour, smell, or bubbles at the macroscopic or laboratory level (Syamsuri et al, 2022). Chemistry is a submicroscopic field of science so it is difficult for students to understand the concept. Visualization-based chemistry learning can help overcome this problem (Safitri & Sari, 2022). Therefore, it is necessary to develop an E-module to have students increase creativity in chemistry learning.

The e-modulus to be developed will be integrated with its ethnoscience. Ethnoscience is a learning strategy that integrates cultural I and its learning activities. Every culture must contain elements of Science in it that can be learned (Lestarani et al, 2021). Ethno Sciences-integrated learning will help students understand phenomena believed by the community and combined with scientific science including chemistry, so ethnoscience science integrated learning is strongly influenced by culture of students or school (Utari et al, 2021). To implement learning with e-module, a project-based learning model as project-based learning model will be used. One of the learning models that can help improve student creativity in implementing Project-based learning (PjBL) learning model. Learners can be trained to think critically, creatively, and are required to solve problems with the learning models. This learning model is based on Project or activities as the core of its learning (Riskayanti, 2021).

This a-module will be loaded to the Google site. Google site is a tool used to create a website and can be customized as desired and can be used in the development of a modulus (Farida & Indah, 2021). This e-module development will use the ADDIE models. So based on the problems that have been described, the purpose of the study is to determine the trend of developing ethnoscience-integrated e-module assisted by Google Site with a project-based learning on chemistry material to increase student creativity.

Method

This study employed a Systematic Literature Review (SLR) approach aimed at identifying, understanding, and describing research trends related to the development of ethnoscience-integrated e-modules assisted by Google Sites using the Project-Based Learning (PjBL) model in chemistry education, specifically in enhancing students' creativity.

The SLR was conducted by following a structured protocol based on the phases of Planning, Conducting, and Reporting. The stages of the review are elaborated below:

Data Sources

The secondary data used in this study were derived from scientific literature indexed in Google Scholar. Two supporting tools were utilized to collect and manage the data systematically:

- Publish or Perish (PoP): used to extract relevant research articles from Google Scholar based on predefined keywords.
- Dimensions.ai: used as a supplementary tool to validate citation relationships, assess article relevance, and ensure research quality.

Search Strategy

The search was conducted using keyword combinations as follows:
("ethnoscience" OR "local wisdom") AND ("e-module" OR "digital module") AND ("Google Site") AND ("chemistry learning") AND ("creativity") AND ("project-based learning")

The search was limited to articles published between 2013 and 2024, written in English or Indonesian, and available in open access format. Selected literature included peer-reviewed journal articles from nationally accredited or internationally reputable journals and relevant conference proceedings.

Inclusion and Exclusion Criteria

To ensure the relevance and academic quality of the reviewed literature, the following inclusion and exclusion criteria were applied:

- Inclusion: (1) Articles focused on the development of e-modules in chemistry learning; (2) Articles that integrate ethnoscience and/or utilize project-based learning approaches; (3) Articles that address students' creativity.
- Exclusion: (1) Articles without full-text access; (2) Non-peer-reviewed works (e.g., theses, opinion pieces, blogs); (3) Duplicate publications or those lacking scientific rigor.

Data Analysis

The collected data were analyzed using VOSviewer software to:

- Visualize keyword relationships and research trends through bibliometric mapping (e.g., keyword co-occurrence, author co-citation, and topic clusters).
- Identify dominant themes and emerging research directions in the area of ethnoscience-based digital module development in chemistry education.

Additionally, a descriptive content analysis was conducted to examine publication trends, frequently cited journals, prevailing research methods, and potential future research gaps.

Validation Procedures

Manual screening of article titles and abstracts was carried out to ensure alignment with the research focus.

- Ambiguous articles were reviewed in full-text format for clarification.
- Only peer-reviewed and academically credible articles were included in the final analysis.

This systematic method is expected to provide a comprehensive overview of the state-of-the-art in the development of ethnoscience-integrated, digitally-assisted chemistry learning modules, and to serve as a foundation for future empirical and developmental research in science education.

Result and Discussion

This study uses research documents from research trends in the development of ethnoscience-integrated e-modules assisted by Google Sites with project-based learning models on chemistry learning to increase students creativity from 2015-2024. Figure 1 related to research trends shows that the increase in research occurred in 2016 and 2020.a decrease in the last 3 years including 2024. Especially between 2016 to 2017 and 2020 to 2022 there was a very drastic decline. The year 2024 has a low frequency with less than 25 studies.

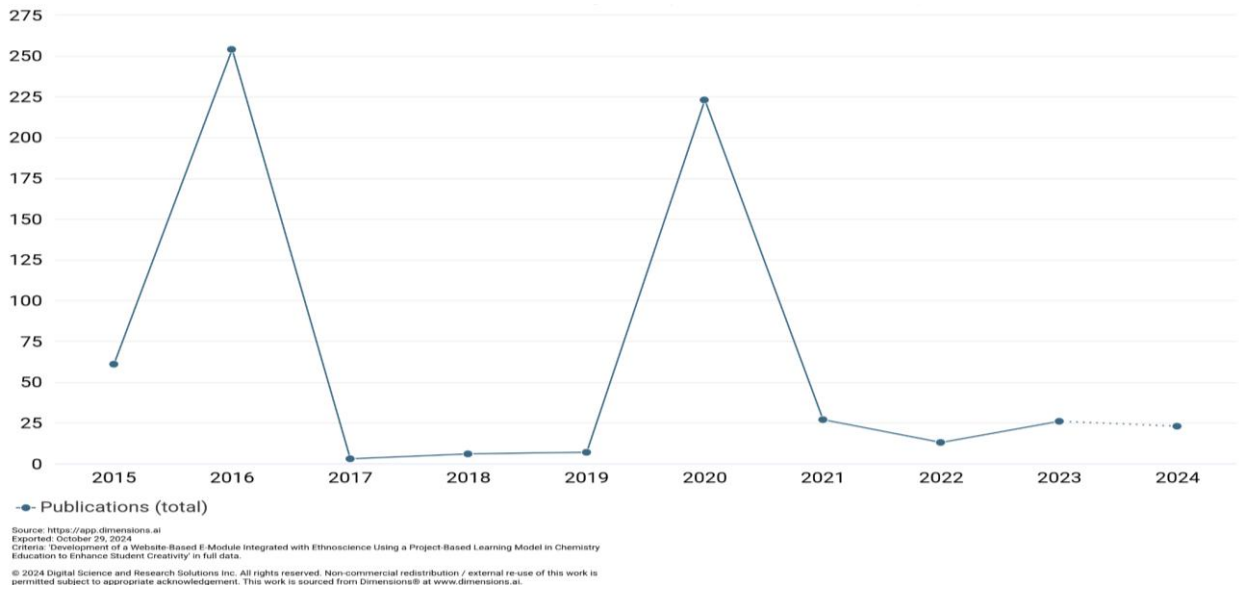

Figure 1. Research trends in Each Year

Table 1 presents the type research related to the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students creativity.

Table 1. Types of research publications

Publication Type	Publication
Chapter	832
Book (*edited*)	135
Monograph	39
Artikcle	12

Based on the results presented Table 1. related to the type of research publication from the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students creativity, there are five types of publication. These publications include chapters, books, monographs, articles, and proceedings. Chapters have the highest publication rate with a total of 832 publications, while the lowest publication is in proceedings with two publications.

Table 2. Trends in the top 5 research source titles

Name	Publication	Citation	Average citation
Knowledge Phating: Multi-, Inter-and Trans-Disciplining in Social Science Series	17	4	0.24
Advances is Social Science, Education and Humanities Research	16	15	0.94
Contemporary Trends and Issues in Science Education	4	12	3.00
Jurnal Penelitian Pendidikan IPA	3	11	3.67
AIP Conferences Proceedings	2	3	1.50

Table 2 presents data on the trend of the top source titles in research on the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students' creativity. .There are five top source titles including in this study. This table shows that the source of Knowledge Phating: Multi-, Inter-and Trans-Disciplining in Social Science Series has the most publications, namely 17 publications with a citation of four and average citation of 0.24. Knowledge Phating: Multi-, Inter-and Trans-Disciplining in Social Science Series is a book and journal publisher better known as AOSIS Publishing. AOSIS Publishing is engaged in social science that seeks to advance debate and dialog in the research domain. In addition, they study the humanities and social science.

The source with the most citation with 14 citations with the second highest number of publications with 16 publications with an average citation of 0.94 citation is Advances in Social Science, Education, and Humanities Research with another name Atlantis Press. This publisher has several types of research publication, namely proceedings, journal, and books. Atlantis press is a global open access publisher with scientific, technical, and medical (STM) content.

Table 3. Top 5 research citation

Title	Writer	Year	Citation
Integrating ethnoscience on critical-thinking oriented web-based e-module of secondary school science	Sari, M. P., Muttaqin, A., Putri, R. E., & Oktavia, R	2024	3
E-UKMB ethno-STEM: The development of independent learning activities to train students' critical thinking skills in pressure topics	Setiayani, A., Sudamin, S., & Ellinawati, E	2022	3
Systematic literature review: Analysis of ethno-STEM and student's chemistry literacy profile in 21 st century	Primadianingsih, C., Sumarni, W., & Sudarmin, S	2023	7
Meta-analisis: Pengaruh pendekatan STEm berbasis etnosains terhadap kemampuan pemecahan masalah dan berpikir kreatif siswa	Rahman, A., Suharyat, Y., & Ilwandri, I	2023	2
The contributing of chemistry learning is supporting education of sustainable development: A systematic literature review	Murti, A & Hernani, H	2023	1

Table 3 presents information related to the top 5 citations about trends in research on the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students' creativity.

Table 4. Research trend keyword

Term	Occurrences	Relevance
Inquiri	5	3.98
Learning	3	2.58
Jurnal	3	1.82
Research	4	1.80
Ethnoscience	5	1.64
Pbl	6	1.29
Engineering	5	0.95
Mathematics	5	0.95
Problem	15	0.95

The results of the visualization of the research landscape map represent the visual of the scientific research subject. The results of bibliometric mapping on the co-word network in articles related to the topic of development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students' creativity are illustrated in Figure 2.

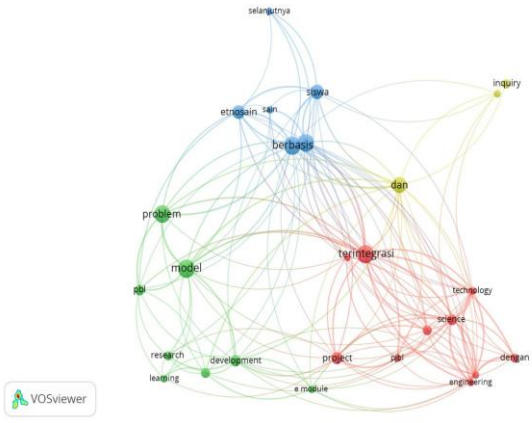

Figure 2. Research network visualization

Based on the visualization results presented by Figure 2 the results of bibliometric keyword mapping of research trends from the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students' creativity, 25 keywords are often used in these studies from 2015 to 2024. The figure also produced a visualization of the research network that shows the network between the visualized terms.

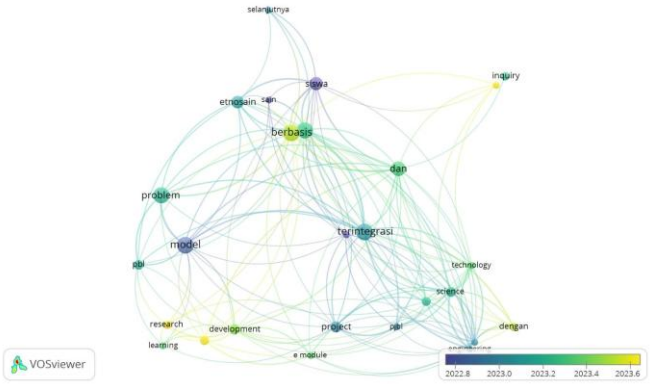

Figure 3. Overlay Visualization

The visualization presented in Figure 3 is an overlay visualization. This overlays visualization services to show the historical trance of the research. The darker the bibliometric trace produced, the longer the research has been concluded (Habibi et al, 2022). This research trend was concluded from 2015 t0 2024. The research trends that have the darkest color here are students, science, models, integrated, project, and PBL. This research was popular in 2022. While that is rarely done or has a light color in inquiry and research.

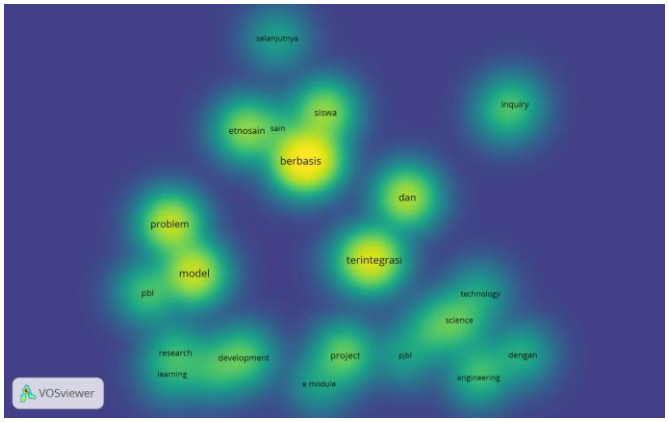

Figure 4. Visualisasi densitas

The density visualization was done to help in seeing the sparse components of the research (Fauddin et al, 2023). The writing on the brightest visualization is interpreted as a more dominant topic. In the study, the more dominant topics are only a few, namely based, integrated, mod and problem. While topics that are not dominant include ethnoscience, students, and development, project, science, inquiry, and PBL, research, learning, e-module, technology, engineering, with, and so on.

In general, research on the development of ethnoscience-integrated e-module assisted by Google site with project-based learning model on chemistry learning to improve students' creativity is very important to do because creativity is highly emphasized in the development of the current curriculum, namely the independent curriculum (Anggelia et al, 2022).

Conclusion

The trend of research focusing on the development of ethnoscience-integrated e-modules assisted by Google Sites using the Project-Based Learning (PjBL) model in chemistry education has demonstrated a marked decline in recent years, as evidenced by the limited number of high-relevance studies identified in the reviewed literature. This downward trajectory indicates a gap in ongoing scholarly exploration, particularly in the intersection of contextual learning, local wisdom, digital innovation, and creativity enhancement within the science education domain.

Moreover, the low frequency and co-occurrence density of core keywords such as "ethnoscience," "Google Site," and "student creativity" suggest that this area remains underexplored and fragmented, with insufficient integration across relevant themes. This presents a significant research opportunity for future studies to bridge the theoretical and practical dimensions of digital pedagogy, local cultural integration, and 21st-century skills development—especially in chemistry instruction.

Thus, it is imperative for researchers and curriculum developers to revisit and revitalize this line of inquiry by designing and empirically validating innovative, culturally responsive digital learning tools that not only reflect the richness of ethnoscientific knowledge but also stimulate student creativity through authentic, project-based learning environments supported by accessible technologies such as Google Sites.

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The author declares no conflict of interest.

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