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EXECUTING THE INTEGRATIVE STEM LESSON UNIT PLAN FOR SCHOOL

Abstract. The results of scientific research on the topic "implementation of an integral plan of STEM Lessons for school" were analyzed. The systematically developed STEM lessons section plan helps the student awaken student creativity in stem practice programs and activities, developing skills rather than science and math-oriented concepts in the 21st century, including teaching media and technology literacy, productivity, social skills, communication, flexibility, and initiative.

Keywords: STEM, chemistry, education

Introduction

In secondary education, chemistry offers a window into the fundamental nature of the world and its materials. Mastery of this subject demands a solid grasp of its basics, typically taught in the 9th-grade curriculum.

As we enter the 21st century, traditional teaching methods falter in the face of evolving generations and technological advancements. An urgent need arises for innovative approaches that leverage modern technologies to enhance learning outcomes. Integrated school programs, advocated since 2010, encounter obstacles, primarily due to vague understanding of integrated learning, hindering the implementation of STEM.

Effective integration of all four STEM fields proves most beneficial, fostering comprehensive understanding and interdisciplinary connections. Real-life applications of scientific knowledge aid in comprehension, while integrative teaching motivates both teachers and students. Crucially, engaging students in engineering design challenges underscores the importance of leveraging engineering technologies for educational advancement. Chemistry in secondary education thus becomes a gateway to broader interdisciplinary learning, vital for preparing students for the challenges of the future.

Literature review

The study by Sari, N. A., Mulyani, S., Hastuti, B., & Indriyanti, N. Y. (2021, March) aims to assess the level of STEM literacy and problem-solving skills among grade twelve students in chemistry materials, within the context of 21st-century learning expectations. Conducted in Sragen Regency, Indonesia, the research involved seventy participants and employed a qualitative methodology. Questionnaires comprising open-ended questions were distributed, covering six cases with ten items each, addressing science literacy, mathematical literacy, technology-engineering literacy, and problem-solving. Results indicate a prevalent deficiency in STEM literacy and problem-solving abilities among the students. Notably, the majority lacked proficiency in these areas, indicating a misalignment with the expectations of 21st-century learning paradigms. This research underscores the pressing need for targeted interventions to enhance STEM literacy and problem-solving skills within the Indonesian education

system. The findings highlight a critical gap between educational goals and student proficiency, emphasizing the imperative for reforms aimed at fostering these essential competencies among students.

Implementing the STEM approach in chemistry education addresses societal needs and enhances students' skills. While previous STEM research primarily focused on student skill improvement, your study aimed to gauge chemistry teachers' perceptions of this approach. Using a purposive-design survey method, 37 chemistry teachers in Central Java, Indonesia, participated, employing random sampling. Results indicated positive teacher perceptions towards integrating STEM into chemistry learning. However, challenges like teacher unfamiliarity and time constraints hindered implementation. Nevertheless, teachers believe STEM application can enhance students' 21st-century skills. This research underscores the importance of considering educators' perspectives in educational innovation, emphasizing the potential benefits and obstacles of integrating STEM in chemistry classrooms.

Methodology

A comprehensive review more 20 academic articles fulfilling the plan of the Integrative STEM lesson plan for the school for the study of chemistry was carried out, 10 of which were analyzed, special attention was paid to aspects of the structure of the Integrative STEM lesson plan for the school in Chemistry Lessons. Working with keywords such as "STEM", "chemistry", "education" made it possible to identify relevant research and articles for inclusion in the analysis. The study of articles and their comparison made it possible to identify the main components and principles of the methods of implementing the executing the Integrative STEM Lesson Unit Plan for school used in the context of teaching chemistry.

Sampling

In order to accomplish the goal, we examined 10 scientific publications, including methodological books, essays, and scientific journals.

Article name (author, year of publication)	Description
Çalış, S. (2020).	Teachers tackled challenges in creating STEM lesson plans involving real-life problems, integrating scientific knowledge, and ensuring material disclosure.
Duangsri, T., Chomchid, P., & Phusopha, J. (2017).	This study aimed to develop a creative STEM lesson plan for efficient performance and processing outcomes.

Sutoyo, S., Azizah, U., & Allamin, S. (2019).	The study investigates the efficacy of integrating a guided inquiry model with STEM to enhance student critical thinking skills using the 4-D model.
Koes-H, S et al. – 2021.	This work can influence the design of learning activities in STEM education.
Aydin-Gunbatar, S., Ekiz-Kiran, B., & Oztay, E. S. (2020).	It showed that a new model, Laser, has been proposed that requires time and support for effective integrated STEM education.
Chien, H. (2019)	To provide learners autonomy over planning, information, learning strategies, and student evaluation through the presentation of the design process for a competence framework for STEM education.
Karpudewan, M., & Daman Huri, N. H. (2022)	STEM-lab offers four interdisciplinary activities in electrochemistry
Eid, A. -2014	To create a chemistry unit that exemplifies the integration of technology, pedagogy, and content to promote STEM-related study and vocations.
Siregar, L., & Silaban, S. (2023)	To develop a STEM-based chemistry module that will improve the activities and learning results for students.
Syukri, M., Yanti, D. A., Mahzum, E., & Hamid, A. (2021)	To enhance students' science process abilities in physics learning by creating a Learning Program Plan (LPP) using a PjBL model based on the STEM method.

Data collection

During my research work, I searched for articles on the topic "implementation of an integrated STEM lesson plan for school" in Google Scholar, especially paying attention to the keywords "STEM", "chemistry", "education". I studied various academic databases to find relevant literature and critically evaluated the ways in which each article addressed the research objectives. This process helped to ensure

that relevant and high-quality articles were included in the analysis on the topic, which contributed to a comprehensive understanding of the application of the implementation of the integrated STEM lesson plan for school.

Data analysis

After carefully examining each article, I discovered that ten of them fully addressed the study's goals and provided insightful details about the usefulness and real-world applications of project-based learning when implementing the unit plan for an integrated STEM lesson in the classroom.

Result

Based on the results of a comprehensive analysis of the data, it includes various approaches to teaching the implementation of the Integrative STEM lesson plan for school. In addition, many studies have concluded that using the STEM method provides opportunities for students and helps improve students' abilities. In the study of articles, I focused on 4 part. First, keywords should be considered in the research work and correspond to the purpose of the study. I noticed that the STEM method is used not only in secondary and higher educational institutions, but also in universities. The practical parts of these works are devoted to the implementation of the lesson plan of high school students about 80%. In each item we reviewed, the use of chemistry STEM lesson plan 60% and 40% provided models.

Article No	Author, main idea	Categories			Respect for the work's objective yes/no
		Key issue	Unit plan/ Model	School/ university	
1	Çalış, S. (2020).	+	Unit plan	school	yes
2	Duangstri, T., Chomchid, P., & Phusopha, J. (2017).	+	model	school	yes
3	Sutoyo, S., Azizah, U., & Allamin, S. (2019).	+	model	school	yes
4	Koes-H, S et al. – 2021.	+	Unit plan	school	yes
5	Aydin-Gunbatar, S., Ekiz-Kiran, B., & Oztay, E. S. (2020).	+	model	university	yes
6	Chien, H. (2019)	+	Unit plan	university	yes
7	Karpudewan, M., & Daman Huri, N. H. (2022)	+	Unit plan	school	yes
8	Eid, A. -2014	+	Unit plan	school	yes
9	Siregar, L., & Silaban, S. (2023)	+	Unit plan	school	yes
10	Syukri, M., Yanti, D. A., Mahzum, E., & Hamid, A. (2021)	+	model	school	yes
Total		100%	60%	80%	100%

Conclusion

In conclusion, I analyzed the results of the “**Executing the Integrative STEM Lesson Unit Plan for school**”. I made sure that a systematically compiled lesson plan helps students build a solid foundation for scientific principles, critical thinking skills, and problem-solving abilities.

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