International Journal of Society Reviews (INJOSER) e-ISSN: 3030-802X
Vol. 3 No. 1, November 2025, pages: 288~303

SYSTEMATIC LITERATURE REVIEW : TRENDS IN E-LKPD IN THE CONTEXT OF SCIENCE LEARNING

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Abstract

Technological developments demand various sustainable innovations in the world of education. E-LKPD is one of the relevant media to support the learning process. This research is a systematic literature review (SLR) that aims to analyze the trend of E-LKPD in the context of science learning. This study is carried out by identifying, analyzing, and synthesizing research articles published in the last five years from 2020 to 2025 from leading databases such as Scopus, Google Scholar, and DOAJ. The results of the analysis show that the trend of using E-LKPD in science learning has increased significantly, especially in the development of interactive features, multimedia integration, and the application of innovative learning models such as inquiry, discovery learning, PBL, and PJBL. The results were obtained from 38 inclusive articles, after going through a filtering stage, 20 articles were used. The inclusive E-LKPD plays an important role in improving learning motivation, learning outcomes, scientific literacy, critical thinking skills, collaboration skills, and science process skills. However, challenges related to the technical, pedagogical, and cultural aspects of E-LKPD still need to be considered.

Keywords : E-LKPD, Innovation, Science, Media .

INTRODUCTION

Education in the digital era demands various continuous innovations in the delivery of learning materials to prepare students to face increasingly complex global

challenges. The learning paradigm in this era has shifted from teacher-centered learning to student-centered learning, and educators can formulate learning plans according to student needs. Currently, learning has utilized various digital technologies and interactive platforms to create a more flexible, personalized, and contextual learning experience. Innovations such as e-learning, blended learning, learning management systems (LMS), interactive media, and the use of artificial intelligence (AI) in education are increasingly being applied to increase the effectiveness and efficiency of learning. In addition, learning in this era also emphasizes the importance of character education and global values, such as tolerance, social responsibility, and awareness of environmental sustainability. Natural Sciences (IPA) as one of the disciplines that studies the environment, plays an important role in shaping students' logical, critical, and analytical thinking. In science learning, the need for innovation in learning media is becoming increasingly urgent, as current learning aims to master theoretical concepts, critical thinking skills, problem solving, and essential science process skills (TIMSS, 2019). Therefore, innovation in learning strategies is needed that can facilitate active student involvement, while supporting the achievement of expected competencies. However, the implementation of science learning still faces various challenges such as the lack of active student involvement in the learning process, limited media and learning resources, and less interactive and non-contextual learning, which can cause students to have difficulty understanding abstract concepts and affect their learning outcomes.

Educational success in schools can be monitored from the learning outcomes achieved by students through evaluation at the end of the learning process that has been carried out for a certain period (Nabillah & Abadi, 2020). The low student learning outcomes can be reinforced by the results of the Programme for International Student Assessment (PISA) 2022 survey released on December 5, 2023 by the Organization for Economic Cooperation and Development (OECD), which showed that Indonesia experienced an increase in ranking from the results of the 2018 PISA survey, but Indonesia also experienced a decline in the average ability scores of students in the fields of literacy, numeracy and science. Indonesia's average literacy score is 359 from a world average of 476, in numeracy it is 366 from a world average of 472, in science it is 383 from a world average of 485, this decline is thought to have occurred due to the impact of the Covid-19 pandemic which caused students to experience learning loss (lagging behind in learning), (OECD, 2023) In addition, based on the results of national and international studies on TIMSS (Trends in International Mathematics and Science Study) shows that students' learning outcomes and science process skills are still at a low level, especially at the elementary and secondary education levels, which is caused by a weak understanding of science concepts and the underdevelopment of students' critical and scientific thinking skills, (TIMSS, 2019). According to Sulastri et al. (2021), students experience difficulties in conducting

experiments and drawing conclusions due to low science process skills. Because science process skills are all skills used to discover and develop science through scientific methods to solve a problem. Furthermore, research conducted by Rahmawati & Prasetyo (2020) found that an inquiry-based learning approach can significantly improve conceptual understanding and the ability to formulate hypotheses. Similarly, research conducted by Hidayat (2019) demonstrated that the use of a STEM-based PBL learning model can increase student active engagement in the learning process and overall science learning outcomes.

Some of these findings have not been fully integrated due to gaps in understanding the most effective learning models. The role of supporting learning media such as textbooks, interactive modules, conventional student worksheets (LKPD), PPT, student worksheets (LKKS), and teaching aids significantly supports the learning process, but the availability of these teaching media in the field has not been optimally utilized. One example is the use of conventional student worksheets (LKPD), which have long been a popular learning instrument to facilitate student activities in understanding concepts. However, conventional LKPDs often have limitations in terms of interactivity, flexibility, and visual appeal (Nurrita, 2018). This can hinder student learning motivation and limit their exploration of the subject matter, especially in science lessons. Along with the development of digital technology, it has opened up new opportunities to transform LKPDs into a more dynamic and interactive format, namely E-LKPD (Electronic Student Worksheets). E-LKPDs utilize various multimedia features such as text, images, audio, video, interactive simulations, and animations, which can be accessed through digital devices such as computers, tablets, or smartphones. The potential of e-LKPD in increasing student engagement, enriching learning experiences, and adapting learning to diverse learning styles has been extensively researched and shows a growing trend. Various studies have examined the effectiveness of e-LKPD in improving learning outcomes, motivation, and specific skills such as higher-order thinking skills and science process skills (Wahyuni et al., 2020; Supriadi et al., 2021). However, to comprehensively understand how e-LKPD develops and is implemented in science learning, a systematic review of the existing literature is necessary. This systematic literature review (SLR) is essential for identifying development trends, features, and effectiveness of e-LKPD in the context of science learning. Thus, this research is expected to provide valuable insights for educators, media developers, and policymakers in optimizing the use of e-LKPD to create more effective, innovative, and relevant science learning to meet current demands. Based on the description above, the research questions to be answered are as follows: What are the trends in the development and implementation of e-LKPD in science at the junior high school level over the past five years? What learning model is most often combined with E-LKPD in the context of science learning at junior high school level?;

and what are the general challenges or obstacles identified in the development and implementation of E-LKPD science at junior high school level?

METHOD

This SLR process uses the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method to evaluate and filter relevant articles on e-LKPD trends in the context of science learning. The first step is to determine the research need and set clear objectives to identify e-LKPD trends in the context of science learning. The main keywords used in the article search include "design", "effectiveness", "E-LKPD", "media innovation", and "science learning By using the Publish or Perish search engine, data was collected from Google Scholar. The articles searched were limited to between 2020 and 2025. The next stage was the identification stage, which aimed to check for similar articles. The same articles would be excluded from the analysis. Furthermore, the article title filtering stage was based on the title containing E-LKPD development, E-LKPD innovation, E-LKPD effectiveness, E-LKPD design, and utilization of E-LKPD in science learning. This search resulted in 1000 articles, then identification was carried out to find articles that had similarities so that 45 articles were obtained. A total of 943 articles that did not have similarities were then reviewed based on their titles. A total of 12 articles used the literature study method.

The next screening stage was conducted by reading the article abstracts. This screening process resulted in 38 eligible articles. Article selection was based on several criteria: articles explaining the development of E-LKPD in science learning, articles on qualitative and quantitative research methods, and classroom action research (CAR) at the junior high school level. The screening process resulted in 20 articles. Articles that passed this stage were then thoroughly reviewed to ensure they met all established inclusion criteria. The entire identification and screening process is detailed in Figure 1.

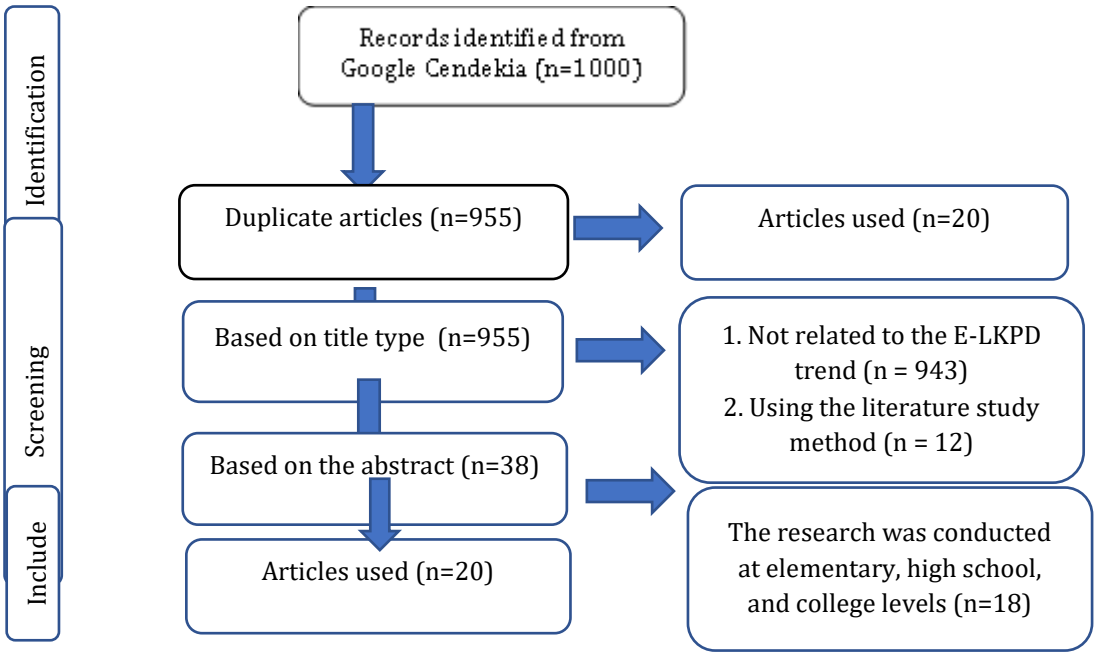

Figure 1. PRISMA diagram (PRISMA 2020 *flow diagram for new systematic reviews*

RESULTS AND DISCUSSION

Results

The following are the results of a literature *review* and selection analysis of several data sources conducted by the author, resulting in the discovery of 20 articles relevant to the research topic. Information related to the analysis of these articles can be found in Table 1 below.

Table 1. Analysis of Articles Related to E-LKPD Trends in Science Learning

No	Author Name and Year	Article Title	Types of research	Model / Approach	Research result
	Andika Setia Pratama, Asri Widowati, Insih Wilujeng, 2021	Development of E-LKPD Science Based on Guided Inquiry with NOS Content on the Topic of Energy Change to Improve Students' Digital Literacy	R & D	Guided Inquiry	The results of the study are that the E-LKPD based on guided inquiry containing NOS (nature of science) which has been developed is suitable for use in science learning for class VII of junior high school to develop students' digital literacy skills.
	Riska Wahyuni, 2021	Implementation of E-LKPD Based on Project Based Learning (PJBL) to Improve Student Motivation and Learning Outcomes	PTK	PJBL	The results of this study are that the application of PjBL-based E-LKPD on the human respiratory system material in online learning in class VIII-B of SMP Negeri 3 Tarutung in the 2020/2021 academic year can increase students' motivation and learning outcomes.
	Subekti, MAS, Prahmana, RCI, 2021	Developing interactive electronic student worksheets through discovery learning and critical thinking skills during the pandemic era	R & D	Discovery Learning	The research results showed that the developed e-LKPD was deemed feasible in terms of validity, practicality, and effectiveness, as evidenced by the average student score, which fell into the very practical category. Its effectiveness was demonstrated by an increase in students'

					critical thinking skills after being treated with electronic LKS.
	Devi Andriani, Neni Hasnunidah, Abdurrahman, 2022	The Effect Of E-Worksheet In Eco-Friendly Technology Oriented With Argument Driven Inguary Model To Improve Students Argumentation Skills	Quantitative	Argument Driven Inquiry (ADI)	The results of the study are that the influence of E-LKPD on environmentally friendly technology material with the ADI model can improve students' argumentation skills in science learning.
	Muntiani Rohmah, (2022)	Use of Google Classroom Media with Live Worksheets to Improve Science Learning Outcomes in Magnetic Material for Middle School Students	PTK	Quasi-experimental	The results of this classroom action research show that the science learning process using Google Classroom media assisted by Liveworksheets makes students active, happy, more motivated and can improve student learning outcomes.
	Waruwu, Rinda Mawar Rianti, (2022)	Development of Electronic Science Student Worksheets Based on Guided Inquiry for Junior High School Students on the Material of Light and Optical Instruments	R&D	Guided Inquiry	The research data obtained from descriptive analysis, namely the characteristics of the electronic LKPD developed for junior high school students on the material of light and optical instruments, can be tested at the next stage, namely the implementation and product evaluation stage.
	Indiarti Dwi Fina, Mustaji Mustaji, Utari Dewi, 2023	Analysis of the Needs of E-LKPD Based on Problem Based Learning for Science Learning for Class VIII Junior High School	Qualitative-Descriptive	PBL	The results of the research are the importance of developing E-LKPD based on Problem Based Learning to help teachers increase student activity in group discussions, critical reasoning and make E-LKPD an interactive media in science learning.
	Hamidah, Afreni and Anggereini,	Development of Electronic Student	R & D	PBL	E-LKPD based on Problem Based Learning can be

	Evita, 2023	Worksheets (E-LKPD) Based on Problem Based Learning as an Effort to Improve Critical Thinking Skills of Grade VIII Students on Respiratory System Material.			used as a learning medium as an effort to improve students' critical thinking skills in science learning, especially respiratory system material.
	Nikmah Yurida, Widayanti, Arini Rosa Sinensis, Ratih Purnama Pertiwi, (2023)	Development of Electronic Teaching Materials for Student Worksheets (E-LKPD) Based on Guided Inquiry Regarding Student Learning Outcomes and Interests	R & D	Guided Inquiry	The results of this study are valid and practical E-LKPD. Furthermore, this study measures the effectiveness of E-LKPD on student learning outcomes and interests in class VIII of SMP NU Bumirahayu.
0	Sarifah Jum'atu, Supeno, Aris Singgih Budiorso, (2023)	Development of Multidimensional Diagram-Based ELKD to Improve Inquiry Skills and Learning Outcomes of Junior High School/Islamic Junior High School Students in Science Learning	R&D	Guided Inquiry	The E-LKPD is produced based on a multidimensional thinking diagram which is very valid and has practicality to improve inquiry skills and learning outcomes.
1	Vera Yulanda, Afreni Hamidah, Evita Anggereini, 2023	Development of Electronic Student Worksheets (E-LKPD) Based on Problem Based Learning as an Effort to Improve Students' Critical Thinking Skills	R & D	PBL	The results of this study indicate that PBL-based e-LKPD can improve students' critical thinking skills in science learning, particularly in the respiratory system. Validation results by material experts and media experts indicate that the e-LKPD is very valid and categorized as suitable for use.
2	Wulan Febriningsih, Kristina Eniwati, Widodo Setiyo Widodo, 2023	Implementation of Discovery Learning-Based Electronic Student Worksheets to Improve Critical Thinking of Junior	PTK	Discovery Learning	The results of the study showed that there was an increase in critical thinking skills of students at SMP Negeri 4 Pakem through the

		High School Students			implementation of electronic LKPD based on discovery learning, which was seen from the effectiveness test of the results of providing the discovery learning model treatment in science learning.
3	Zeni Setiyawati, Supeno, Zainur Rasyid, Ridlo, 2023	The Effect of the 5E Learning Cycle Model with Multirepresentation-Based E-LKPD on Junior High School Students' Scientific Reasoning	Quantitative	Learning Cycle 5E	The results of the study showed that the application of the 5E learning cycle model accompanied by the use of multi-representation-based electronic worksheets had a positive influence and impact on improving students' scientific reasoning.
4	*Dede Daud, (2024)*	Development of SETS-Oriented Interactive ELKPD with Liveworksheets to Improve Student Interest and Learning Outcomes	R & D	ASSURE Method	The results of the t-test and n-gain score showed a significant difference in the improvement of learning outcomes between the experimental group and the control group, this indicates that the developed E-LKPD is effective in improving student learning outcomes.
5	*Endang Purnama, Suroso Multi Laksono, Adi Nestiadi, Septi Kurniasih, 2024*	E Development -LKPD on the Theme of Biodiversity Based on Research Results for Improving the Conservation Literacy Skills of Junior High School Students	R & D	PJBL	The development of E-LKPD with a biodiversity theme can improve students' conservation literacy skills and become an alternative teaching material to address environmental problems in conservation areas and the surrounding environment.
6	*Izza Nuril Ilma, Sutrisno, Lia Puji Lestari, 2024*	The Effect of the TGT Type Cooperative Model Assisted by E-LKPD	Quantitative	TGT Type Cooperative	The results of the study showed that there was a significant influence of the TGT type cooperative

		Crossword Puzzle on Science Learning Outcomes for Class VIII			learning model assisted by E-LKPD crossword puzzles on the learning outcomes and social skills of students.
7	Faradiba Desy Aulia, Suhartono Suhartono, Arif Widyatmoko, 2024	Implementation of E-LKPD (Electronic Student Worksheets) Based on Problem Based Learning to Improve Collaboration and Communication Skills of Class VII I of SMP Negeri 15 Semarang	PTK	PBL	The results of the study show that E-LKPD based on Problem Based Learning is very suitable for use in learning because it can improve the collaboration skills and communication skills of students in cycle 1 and cycle 2 in class VII I of SMP Negeri 15 Semarang.
8	*Sarifa Nurhalisa, Anda Juanda, Novianti Muspiroh, 2024*	Implementation of the Problem Based Learning (PBL) Learning Model Assisted by E-LKPD to Improve Students' Ability to Solve Problems on the Human Respiratory System Material	Quantitative	PBL	The results of this study are that the application of the Problem Based Learning (PBL) model assisted by E-LKPD can increase student activity, improve problem-solving abilities and student responses.
9	*Sufy Amalianor Jannah Muhammad Kusasi Yasmine Khairunnisa,, 2024*	Development of PBL-Based ELKPD Using Liveworksheets to Improve Students' Scientific Literacy Skills	R & D	PBL	The results of the study show that PBL-based E-LKPD using live worksheets is valid, practical, and effective in improving the scientific literacy skills of junior high school students in science learning.
0	Maria Vianey, Vidriana Oktoviana Bano, Audrey Louise Makatita, 2025	Implementation of the Jigsaw Type Cooperative Learning Model Assisted by Animated Video Media and E-LKPD Liveworksheets to Improve Learning Outcomes	PTK	Jigsaw type cooperative learning model	The results of the study show that the application of the Jigsaw type cooperative learning model assisted by animated video media equipped with LKPD Liveworksheet can improve student learning outcomes in science subjects at Anda Luri Catholic Middle School.

Discussion

Based on the 20 articles analyzed, several research designs are commonly used in the E-LKPD IPA trend. Some of the research designs found are presented in Figure 2.

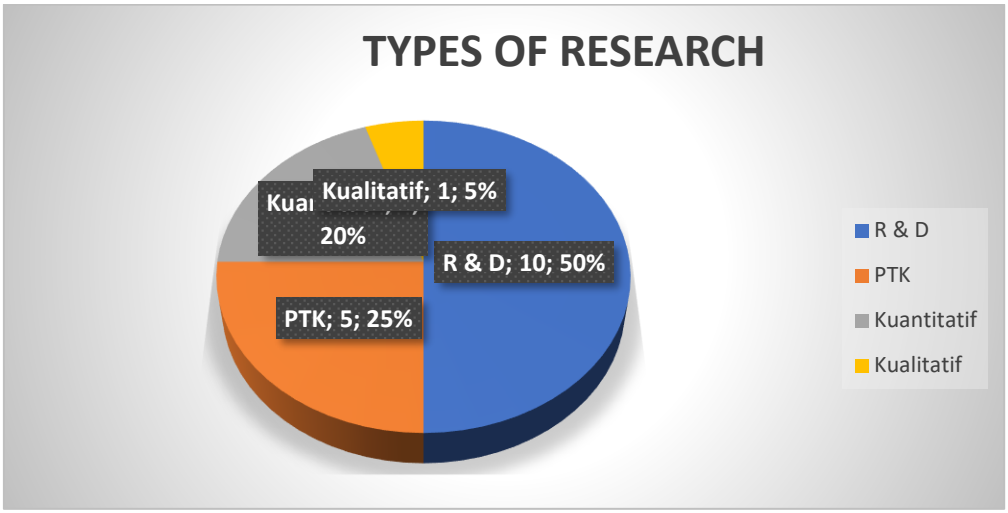

Figure 2 Research design commonly used in research on E-LKPD trends in science lessons at junior high school level.

Research using Quantitative or Experimental research design was found as many as 4 articles with a percentage of 20%, this design is generally used to see the effectiveness of the application and influence of learning models integrated with the use of E-LKPD in science learning. This design aims to test the influence of E-LKPD which is innovated with several learning models on student learning outcomes, problem-solving abilities, argumentation skills, and *scientific reasoning* . Experimental designs usually involve two groups, namely the experimental group that receives learning treatment by utilizing E-LKPD and the control group that receives learning treatment by utilizing conventional LKPD. Research by (*Sarifa Nurhalisa, Anda Juanda, Novianti Muspiroh, 2024; Izza Nuril Ilma, Sutrisno, Lia Puji Lestari, 2024;* Zeni Setiyawati, Supeno, Zainur Rasyid, Ridlo, 2023; Devi Andriani, Neni Hasnunidah, Abdurrahman, 2022) used an experimental design to test the effect of utilizing E-LKPD innovated with learning models in science lessons. Research using qualitative research designs was found as many as 1 article with a percentage of 5%, this design aims to analyze the need for E-LKPD integrated with the PBL learning model in science learning can address the diversity of student needs and the results of the research are the importance of developing E-LKPD based on *Problem based learning* is carried out to help teachers in increasing student activeness in group discussions, critical reasoning and making E-LKPD as an interactive media in science learning. This research was conducted by (Indiarti Dwi Fina, Mustaji Mustaji, Utari Dewi, 2023).

Research using the Development or R & D research design was found in 10 articles with a percentage of 50%; this design aims to produce E-LKPD products.

Research by (Andika Setia Pratama, Asri Widowati, Insih Wilujeng, 2021; Subekti, MAS, Prahmana, RCI, 2021; Waruwu, Rinda Mawar Rianti, (2022); Hamidah, Afreni and Anggereini, Evita, 2023; Nikmah Yurida, Widayanti, Arini Rosa Sinensis, Ratih Purnama Pertiwi, (2023); Sarifah Jum'atu, Supeno, Aris Singgih Budiorso, (2023); Vera Yulanda, Afreni Hamidah, Evita Anggereini, 2023; *Dede Daud, (2024); Endang Purnama, Suroso Multi Laksono, Adi Nestiadi, Septi Kurniasih, 2024; Sufy Amalianor Jannah, Muhammad Kusasi, Yasmine Khairunnisa, 2024)* , using development design to produce E-LKPD based on several learning models to improve student learning outcomes and interests, scientific literacy skills, critical thinking skills, and students' conservation literacy skills. Classroom Action Research (CAR) is usually carried out in several cycles, with each cycle including planning, action, observation, and reflection. Research by (Riska Wahyuni, 2021; *Muntiani Rohmah, (2022);* Wulan Febriningsih, Kristina Eniwati, Widodo Setiyo Widodo, 2023; Faradiba Desy Aulia, Suhartono Suhartono, Arif Widyatmoko, 2024; Maria Vianey, Vidriana Oktoviana Bano, Audrey Louise Makatita, 2025), uses CAR to see the effect of E-LKPD on student learning outcomes and motivation, critical thinking skills, and collaboration and communication skills.

Several models/approaches that are commonly used in research on E-LKPD trends in science learning that were found in the 20 articles are presented in Figure 3.

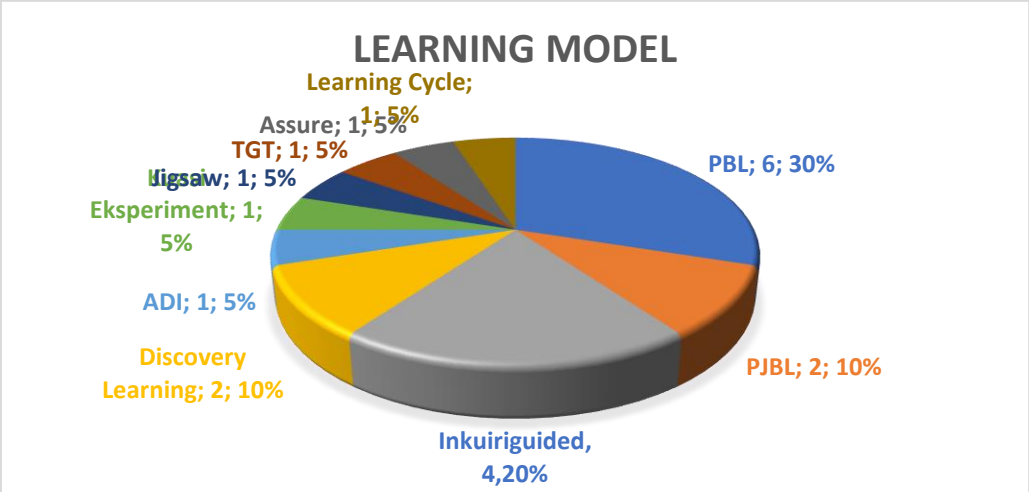

Figure 3. Models/Approaches commonly used in research on E-LKPD trends in learning

Science.

Research using the *Problem Based Learning* (PBL) model approach was found in 6 articles with a percentage of 30%. This strategy emphasizes learning that focuses on solving real problems as a way to develop critical thinking skills, collaboration, and in-depth conceptual understanding in students. Student-centered learning begins with the provision of contextual problems and the learning process is collaborative. The role of the teacher is only as a facilitator and not as the main source as a provider of information, and teachers can help students in identifying problems, gathering

information, developing strategies, and evaluating results. Research by (Indiarti Dwi Fina, Mustaji Mustaji, Utari Dewi, 2023; Hamidah, Afreni and Anggereini, Evita, 2023; Vera Yulanda, Afreni Hamidah, Evita Anggereini, 2023; Faradiba Desy Aulia, Suhartono Suhartono, Arif Widyatmoko, 2024; *Sarifa Nurhalisa, Anda Juanda, Novianti Muspiroh, 2024; Sufy Amalianor Jannah Muhammad Kusasi Yasmine Khairunnisa, 2024;* using the *Problem Based Learning* (PBL) model and proven to improve learning outcomes, scientific literacy, critical thinking skills, and critical reasoning of students.

Research using the *Project Based Learning* (PJBL) model was found in 2 articles with a percentage of 10%, this model emphasizes real projects as a learning tool, because students can learn from the design and implementation of projects. The projects studied are directly related to real-life contexts, students are required to take the initiative, be creative, be responsible, and the role of the teacher as a facilitator in the learning process. Research by (Riska Wahyuni, 2021; *Endang Purnama, Suroso Multi Laksono, Adi Nestiadi, Septi Kurniasih, 2024) used the Project Based Learning (PJBL) model in the development and implementation of E-LKPD in science learning.* Research using the *Discovery Learning model* was found in 2 articles with a percentage of 10%, this model encourages students to discover knowledge themselves through the process of exploration, observation, and investigation. The teacher acts as a facilitator who provides opportunities for students to learn actively and find their own answers to the questions asked. Research by (Subekti, MAS, Prahmana, RCI, 2021; Wulan Febriningsih, Kristina Eniwati, Widodo Setiyo Widodo, 2023), using the *Discovery Learning model* can improve students' critical thinking skills.

Four articles, representing 20% of the research findings, used the guided inquiry learning model. This model can build conceptual understanding, scientific thinking, and develop science process skills in science learning. Teachers provide research questions and guidance on the steps of scientific work that students must answer. Research by (Andika Setia Pratama, Asri Widowati, Insih Wilujeng, 2021; Waruwu, Rinda Mawar Rianti, (2022); Sarifah Jum'atu, Supeno, Aris Singgih Budiorso, (2023) Research using the *Argument Driven Inquiry* (ADI) method was found in 1 article with a percentage of 5%, this model or method is an inquiry-based learning approach that emphasizes the development of critical thinking skills, scientific argumentation, and student collaboration. Research by (Devi Andriani, Neni Hasnunidah, Abdurrahman, 2022), used the ADI model to improve students' argumentation skills. Research using the quasi-experimental model was found in 1 article with a percentage of 5%, this model is one of the quantitative research methods used to determine the effect of a treatment on a variable, without full randomization of the subjects **.** There is a comparison between the group given treatment (experiment) and the group not given treatment (control). Research by (Muntiani Rohmah, (2022), used a quasi-experimental model to increase student motivation and learning outcomes *.*

Research using the Assure method found 1 article with a percentage of 5%, this model is... Focusing on technology- and media-based learning planning, this model was developed to help teachers design teaching and learning activities systematically and effectively. This model is particularly useful when integrating media and technology into science learning. Research by (*Dede Daud, (2024),* uses the Assure method to improve student interest and learning outcomes . Research using the 5E *Learning Cycle model* was found as many as 1 article with a percentage of 5%, this model *is* a constructivism-based learning model designed to help students build conceptual understanding gradually through active learning experiences. This model consists of five integrated learning phases . Research by (Zeni Setiyawati, Supeno, Zainur Rasyid, Ridlo, 2023), uses the 5E learning cycle model to improve students' *scientific reasoning* . Research using the Cooperative Teams Games Tournaments TGT model was found as many as 1 article with a percentage of 5%, this model is a cooperative learning model that combines teamwork and healthy competition through academic games. The characteristics of this model are that students can learn from small heterogeneous groups, there are several stages in the tournament in the game, students are directed to learn through educational games that have been presented, there is evaluation and awarding, and the teacher's task is as a facilitator. Research by (*Izza Nuril Ilma, Sutrisno, Lia Puji Lestari, 2024),* used this model to improve student learning outcomes. Research using this model Jigsaw type cooperative learning was found in 1 article with a percentage of 5%, this model can be applied in science learning with the aim of encouraging cooperation, individual responsibility, and positive interdependence between students, and is very suitable for learning involving complex material that can be divided into several parts. Research by (Maria Vianey, Vidriana Oktoviana Bano, Audrey Louise Makatita, 2025), uses this model to improve student learning outcomes.

Over the past five years, namely from 2020 to 2025, there has been significant development in the development and implementation of E-LKPD. for science learning especially at junior high school level such as: increasing variety of development approaches (R&D) and development models used, integration with technology such as the *Liveworksheet program* , the purpose of developing E-LKPD focuses on 21st century skills and the existence of validity, practicality and effectiveness tests. The learning model most often combined in the E-LKPD trend in science learning is the (PBL) model, because it is very in line with the characteristics of E-LKPD, and this model is easy to integrate with digital media. The development and implementation of E -LKPD Science at junior high school level brings many benefits, but also faces a number of challenges and obstacles that come from technical, pedagogical, and cultural aspects . Common challenges that can be identified include: time constraints and technical problems on platform/web revealed in the research (*Sarifa Nurhalisa, Anda Juanda, Novianti Muspiroh, 2024). According to research (* Vera Yulanda, Afreni Hamidah, Evita Anggereini, 2023) **,** designing a good E-LKPD (valid, practical, effective) requires a long

time, trials, and revisions. Research by (*Dede Daud, (2024), states that* many teachers are not accustomed to developing or using E-LKPD based on certain models (e.g. PBL, STEM, SETS), as well as a lack of technical and pedagogical training.

CONCLUSION

Based on the results of a systematic review of a number of articles and research in the last five years, it can be concluded that the development and implementation of E -LKPD in science learning shows significant improvements in terms of content quality, pedagogical approaches, and technology integration. E -LKPD has become an effective alternative learning media in supporting 21st-century skills, such as *critical thinking* , *problem solving* , *collaboration* , and *creativity* . The main trend shows that the PBL learning model is the most dominant approach in the development of E -LKPD, because it is very suitable for the characteristics of ELKPD which is exploratory and contextual. In addition to PBL, other approaches such as *PJBL, Guided Inquiry, Cooperative TGT, Jigsaw and Discovery Learning* as well as other learning models have been widely adopted, especially in science materials that require active student involvement. The use of interactive platforms such as *Liveworksheet* , *Google Forms* , and Android applications strengthens student engagement and increases learning motivation. However, a number of challenges in the development and implementation of E-LKPD These include limited school infrastructure, uneven digital skills of teachers and students, and a lack of training and policy support in developing digital learning media .

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