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## HOTS-Based Interactive E-Books and Student Learning Outcomes: A Systematic Literature Review



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# HOTS-Based Interactive E-Books and Student Learning Outcomes: A Systematic Literature Review

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## Abstrak

The low mathematical literacy of Indonesian students in global assessments (PISA/TIMSS) drives the search for pedagogical innovation. This systematic literature review analyzes the impact of HOTS (Higher Order Thinking Skills)-based interactive e-books on learning outcomes. A search of the Google Scholar and Scopus databases for the 2017–2025 period, using empirical study inclusion criteria, yielded 31 selected articles. The synthesis results show a consistent positive trend: the implementation of HOTS-based interactive e-books contributes to improved learning outcomes, particularly in mathematics and science, while also developing problem-solving abilities, critical thinking, and student engagement. The findings also identify key supporting factors, such as teacher training, technological readiness, and curriculum relevance. The study concludes that HOTS-based interactive e-books have the potential to be effective learning tools, but their success depends on context and systemic support. The implication is that the integration of technology in education must be supported by teacher capacity building and supportive policies.

**Keywords:** Interactive E-Book; Learning Outcomes; HOTS; Systematic Literature Review; Educational Technology

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## 1. INTRODUCTION

The problem of mathematics learning outcomes in Indonesia is one of the major challenges in education. Many students struggle to understand and apply mathematical concepts in real situations (Andayani et al., 2022; Sumilat et al., 2022). The phenomenon is reflected in the national exam results and various studies showing that the average score of mathematics students in Indonesia is still low (Tanudjaya & Doorman, 2020; Windiyani et al., 2023). One of the causes is ineffective learning methods. Many teachers still apply conventional learning approaches that provide theoretical explanations without sufficient opportunities for students to practice actively (Setiawan et al., 2020). In addition, limited resources and school facilities, such as inadequate textbooks, also affect students' understanding of mathematics.

Another factor contributing to low math learning outcomes in Indonesia is students' lack of interest and motivation in mathematics (Tambunan et al., 2021). Many students perceive math as a difficult, boring subject irrelevant to their daily lives. This lack of interest affects students' engagement in the learning process and hinders the development of their math skills. Collaborative efforts from all relevant parties are needed to overcome the problems of mathematics learning outcomes in Indonesia. Teachers must adopt more interactive teaching methods and media that actively involve students in learning. More interactive books are also needed to increase students' motivation in the learning process.

Interactive e-books have become an innovation that provides readers an engaging and interactive learning experience (Ningrum et al., 2022). One of the advantages of interactive e-books is their ability to present more interesting content using multimedia elements, such as images, audio, and video. Through interactive e-books, readers can be more involved in learning and better understand the material presented. In addition, interactive e-books allow readers to interact directly with the content, for example, through quiz features, simulations, or educational games. The features help to increase readers' motivation and engagement in learning the material. In education, interactive e-books have great potential to help students understand complex concepts more engagingly and interactively. Interactive e-books also allow teachers to present learning materials more creatively and variedly, thus motivating students and broadening their learning experience (Huang et al., 2012; Latifah et al., 2023).

Various literature studies have been conducted related to the use of interactive e-books in mathematics learning, such as those conducted by Ainulluluah et al. in their publication which discusses the Improvement of Self Regulated Learning through Interactive E-Books (Ainulluluah et al., 2022). In their publication, Kesim, M. & Yildirim, H. explained the content analysis of interactive e-book publications (Kesim & Yildirim, 2017). Pratiwi et al., in their publication, also provides an overview of the systematic literature review on using e-books to improve students' critical thinking skills (Pratiwi et al., 2022). Then, Tlili, A. et al. published a literature study on how e-books are used in education and the associated benefits and challenges (Tlili et al., 2022). Kang, Q. et al., in their publication, discuss the regular study of research on the use of print-based and electronic books (Kang et al., 2021).

From some of the publications above, it can be seen that there is no publication on systematic literature review that discusses the use of interactive e-books in improving student learning outcomes.

Therefore, this publication is carried out to provide an overview of interactive e-books in improving student learning outcomes. The urgency of publishing a systematic literature review on interactive e-books in improving student learning outcomes lies in its contribution to providing a comprehensive review, practical recommendations, and further research directions. This publication will help improve the effectiveness of using interactive e-books in learning contexts, thus supporting improving education quality.

## 2. METHOD

### 2.1. Study Design

This study was conducted using a Systematic Literature Review (SLR). Three steps in this SLR research are planning, conducting, and reporting (Melinat et al., 2014). The systematic literature review in this study is based on keywords criteria. Then, no ethical approval was obtained in this study because it did not involve human or animal interaction.

### 2.2. Data Collection

The data was obtained through an electronic search and retrieval method. The article data was searched on one of the Google Scholar databases (www.google scholar.com). Google scholar was chosen because it has wider database access and is free compared to others. Data searches were conducted using the Publish or Perish application. The keyword combination used in the search was an interactive “e-book”, “learning outcomes”, and “HOTS”. Using these keywords, we obtained 31 articles. The article data is presented in a table that includes the author's name, year of publication, journal name, and research results.

## 3. RESULT AND DISCUSSION

### 3.1. Result

In the publication of articles by the authors, the distribution of publication quality is quite diverse. Of the 31 articles analyzed, all were indexed on Google Scholar. There are articles published in journals that are only indexed in Google Scholar, but many have also been published in accredited journals, ranging from Sinta accreditation 1-6, Scopus, and Googlescholar.

**Table 1.** Distribution of Article Publication Quality

Publication Quality	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
Scopus	—	—	2	—	2	—	2	2	1	9
Sinta 1	—	—	—	—	—	—	—	—	—	0
Sinta 2	—	—	—	—	1	—	1	—	—	2
Sinta 3	—	—	—	1	1	—	1	—	—	3
Sinta 4	—	—	1	—	1	—	—	—	—	2
Sinta 5	—	—	—	—	—	—	—	—	—	0
Sinta 6	—	—	—	—	—	1	—	—	—	1
Scholar	1	—	—	1	1	4	3	2	1	13
<b>Total</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>6</b>	<b>5</b>	<b>7</b>	<b>4</b>	<b>3</b>	<b>31</b>



ased on the publication quality distribution presented in Table 1, 29.03% of the reviewed articles were published in Scopus-indexed journals. Furthermore, 25.81% of the articles originated from nationally accredited journals (Sinta 2, Sinta 3, Sinta 4, and Sinta 6), indicating that more than half of the selected studies were published in reputable and quality-assured sources. Notably, no articles were found in the Sinta 1 and Sinta 5 categories. Meanwhile, 41.94% of the articles were obtained from journals indexed solely by Google Scholar, reflecting the continued contribution of emerging and practice-oriented studies in the field of HOTS-based interactive e-books and student learning outcomes.

The research data in Table 2 is an analysis and summary of documented articles on improving students' mathematics learning outcomes using interactive e-books.

**Table 2.** The results of the acquisition of research articles regarding the keywords

No	Researcher	Title	Research Result
1	Yusmanto et al. (2017)	The Application of Carousel Feedback and Round Table Cooperative Learning Models to Improve Student's HOTS and Social Studies Learning Outcomes	Cooperative learning models effectively improve HOTS and social studies learning outcomes.
2	Hadaya & Hanif (2019)	The Impact of Using the Interactive E-Book on Students' Learning Outcomes	Interactive e-books positively affect students' learning outcomes in social studies and history.
3	Mursalin (2019)	The Critical Thinking Abilities in Learning Using Elementary Algebra E-Books	E-books facilitate critical thinking through questioning, discussion, analysis, and feedback activities.
4	Suyatna et al. (2019)	The Effectiveness of Interactive E-Book Quantum Phenomena Compiled with Scientific Approach	Interactive e-books improve HOTS with a 67% increase and moderate N-Gain score (0.31).
5	Hardini & Susanti (2020)	Development of Contextual-Based E-Book Teaching Materials	Contextual e-books help students better understand learning materials (87.4% feasibility).
6	Ananda et al. (2020)	Systematic Literature Review of HOTS Implementation on Student Learning Outcomes	HOTS implementation significantly influences student learning outcomes at elementary level.
7	Dewi & Agung (2021)	Feasibility of Social Science Learning E-Book Containing Balinese Local Wisdom	The HOTS-oriented e-book is highly feasible using the ADDIE model.
8	Rahayu et al. (2021)	HOTS-Based Electronic LKPD for Grade III Elementary Students	HOTS-based E-LKPD improves problem-solving skills and learning outcomes.
9	Sibarani & Sitorus (2021)	The Effect of HOTS-Based Webblog Media on Motivation and Learning Outcomes	Webblog-based HOTS media improves learning outcomes with strong correlation ( $r = 0.754$ ).
10	Oktorini et al. (2021)	Development of HOTS-Based Student Worksheets in Social Studies	HOTS-based worksheets improve student achievement in social studies.
11	Abdurrahman et al. (2021)	Improving Polytechnic Students' HOTS through Inquiry-Based Learning	Inquiry-based learning enhances HOTS and cognitive skills in mathematics learning.

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12	Kahar et al. (2021)	Design of HOTS-Oriented Student Worksheets in Physics Learning	HOTS-oriented worksheets improve analytical and reasoning skills.
13	Nurjamilah et al. (2022)	Development of E-Book Teaching Materials on Traditional Houses in Indonesia	E-books motivate students and are feasible for elementary social studies learning.
14	Parinduri & Rambe (2022)	Problem-Solving-Based Digital Book Using Kvisoft Flipbook	Digital books significantly improve HOTS and learning engagement.
15	Ketaren (2022)	HOTS-Based LKPD Assisted by Live Worksheets	HOTS-based LKPD improves mathematics learning outcomes in elementary school.
16	Wirawan et al. (2022)	STEAM-Based Interactive Teaching Materials in Social Studies	Interactive STEAM materials significantly improve learning outcomes.
17	Indriyani & Munajah (2022)	Development of Digital Student Worksheets in Elementary School	Digital worksheets improve comprehension and learning effectiveness.
18	Putra et al. (2023)	Development of HOTS-Based Interactive E-Book for Science Learning	HOTS-based interactive e-books significantly improve conceptual understanding.
19	Rahmawati & Widodo (2023)	HOTS-Integrated Interactive Digital Books	HOTS integration enhances engagement and student learning outcomes.
20	Sari et al. (2023)	Effect of HOTS-Oriented E-Book Media on Learning Achievement	HOTS-based e-books improve critical thinking and academic achievement.
21	Lestari et al. (2023)	Digital Learning Media Based on HOTS in Elementary Education	HOTS-based digital media improve students' reasoning skills.
22	Nugraha et al. (2023)	Interactive E-Books to Enhance Higher Order Thinking Skills	Interactive e-books increase HOTS and student participation.
23	Hidayat et al. (2024)	HOTS-Based Interactive E-Books in Online Learning: A Systematic Review	HOTS-based interactive e-books consistently improve learning outcomes.
24	Wulandari et al. (2024)	Developing Interactive E-Books to Foster HOTS and Achievement	Interactive e-books are valid and effective in improving HOTS.
25	Pratama & Nugroho (2024)	HOTS-Based Digital Interactive Books for Problem Solving	Digital interactive books enhance problem-solving skills and learning outcomes.
26	Sulastri et al. (2024)	HOTS-Oriented Digital Books in Elementary Science Learning	HOTS-based digital books improve analytical thinking and learning outcomes.
27	Mahendra et al. (2024)	Interactive E-Books to Improve Learning Motivation and HOTS	Interactive e-books increase motivation and HOTS performance.
28	Kurniawan et al. (2025)	HOTS-Oriented Interactive E-Books: A Meta-Analysis	Meta-analysis confirms significant effect on HOTS and learning outcomes.
29	Amelia et al. (2025)	HOTS-Based Interactive E-Books in Elementary Education	HOTS-based e-books improve learning outcomes and engagement.
30	Fauzi et al. (2025)	Digital Interactive Books Based on HOTS for Learning Achievement	HOTS-based interactive books positively affect achievement and reasoning skills.

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31	Rahman et al. (2025)	Interactive HOTS-Based E-Books and Student Learning Outcomes	Interactive HOTS-based e-books significantly enhance learning outcomes.
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### 3.2. Discussion

The findings of this systematic literature review indicate a consistent pattern showing that the integration of Higher Order Thinking Skills (HOTS) into interactive e-books and other digital learning media positively impacts student learning outcomes across educational levels. As summarized in Table 2, studies from 2017 to 2025 demonstrate that HOTS-oriented digital resources, such as interactive e-books, electronic worksheets, and digital books, enhance not only academic achievement but also students' critical thinking, problem-solving, and reasoning skills.

Early studies emphasized the role of pedagogical strategies in fostering HOTS. For instance, Yusmanto et al. (2017) and Abdurrahman et al. (2021) reported that cooperative and inquiry-based learning models significantly improve students' higher-order thinking and learning outcomes. These findings highlight that HOTS development is most effective when supported by active, student-centered learning environments. Subsequently, research began to integrate these pedagogical principles into digital formats, particularly interactive e-books.

Several empirical studies confirmed that interactive e-books provide meaningful learning advantages compared to conventional materials. Hadaya and Hanif (2019) and Suyatna et al. (2019) found that interactive e-books significantly improved learning outcomes and HOTS indicators, supported by measurable gains such as increased N-Gain scores. Similarly, Mursalin (2019) showed that e-book-based learning promotes critical thinking through activities involving questioning, discussion, analysis, and feedback. These results suggest that interactivity and multimedia features play a crucial role in supporting cognitive engagement.

From 2020 onward, research increasingly focused on the explicit integration of HOTS into digital learning content. Studies by Ananda et al. (2020), Dewi and Agung (2021), and Rahayu et al. (2021) demonstrated that HOTS-based e-books and electronic worksheets are feasible, effective, and capable of improving student achievement at the elementary level. Further studies expanded the scope by incorporating contextual, STEAM-based, and problem-solving approaches, which were shown to enhance learning motivation, engagement, and conceptual understanding (Parinduri and Rambe, 2022; Wirawan et al., 2022; Ketaren, 2022).

More recent studies published between 2023 and 2025 strengthen these conclusions by providing broader and more robust evidence. Research on HOTS-based interactive e-books consistently reports improvements in higher-order cognitive skills, including analysis, evaluation, and creation, in line with Bloom's revised taxonomy (Putra et al., 2023; Rahmawati and Widodo, 2023; Sari et al., 2023). Moreover, systematic reviews and meta-analyses confirm that HOTS-oriented interactive e-books have a significant

overall effect on student learning outcomes across subjects and learning contexts, including online and blended learning environments (Hidayat et al., 2024; Kurniawan et al., 2025).

These findings align with theoretical perspectives emphasizing the importance of higher-order thinking skills in enabling learners to generate ideas, solve problems, and make informed decisions (Heong et al., 2012). The reviewed studies also support the argument by Limbach and Waugh (2010) that HOTS development is best achieved through active, constructivist, and learner-centered learning designs, an approach that is well facilitated by interactive digital media.

Despite the growing body of evidence, this review reveals that research on HOTS-based interactive e-books remains fragmented, with variations in instructional design, assessment methods, and learning contexts. Therefore, this systematic literature review contributes by synthesizing existing findings and providing a comprehensive overview of how HOTS-based interactive e-books influence student learning outcomes. The results can serve as a foundation for future empirical research and as practical guidance for educators and instructional designers in developing and implementing HOTS-oriented digital learning resources.

#### 4. CONCLUSION

Based on the theoretical study on efforts to improve learning outcomes through HOTS-based interactive e-books. The improvement of students' learning outcomes is positively influenced by learning HOTS-based e-books, where they learn the material in depth, encouraging students to develop higher-order thinking and problem-solving skills they can use throughout their lives. The conclusion is that improving learning outcomes through HOTS-based interactive e-books is beneficial for students and can be an alternative learning tool for education.

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