



Differentiated social studies based on hypermedia e-modules to foster sustainable social attitudes of elementary students

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Article info	Abstract
Keywords: differentiated learning, elementary school, hypermedia e-modules, social studies, sustainable social attitudes	The present study examines the effect of differentiated social studies supported by hypermedia e-modules on the development of sustainable social attitudes among elementary students. A quasi-experimental design with a pre-test-post-test control group is employed. The participants were 60 fifth-grade students from an elementary school in Majalengka, Indonesia. They were selected using total sampling and divided into an experimental group (n = 30) and a control group (n = 30). The experimental group receives differentiated social studies instruction supported by hypermedia e-modules, while the control group receives instruction using conventional textbooks. Data were collected using a 10-item sustainable social attitudes questionnaire that measures empathy, social responsibility, cooperation, tolerance, environmental concern, and social awareness. The instrument demonstrates acceptable validity and reliability (Cronbach's $\alpha = 0.744$). Data were analyzed using descriptive statistics and an independent samples t-test. The results indicate that the experimental group obtained higher post-test scores ($M = 85.60$, $SD = 8.66$) than the control group ($M = 80.90$, $SD = 9.11$), with a statistically significant difference, $t(58) = 2.05$, $p = 0.045$, and a moderate effect size (Cohen's $d = 0.53$). These findings imply that integrating hypermedia e-modules within differentiated social studies instruction can support the development of sustainable social attitudes among elementary students. The study contributes to the growing body of research on technology-supported differentiated learning in elementary social studies, although further research with larger samples and longer interventions is recommended.

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1. Introduction

Social studies in elementary schools plays an essential role in helping students understand social realities and develop awareness of their roles within society. Beyond transmitting knowledge about historical, geographical, and socio-cultural phenomena, social studies also aims to cultivate social values and attitudes that support responsible citizenship (Erol et al., 2025; Sharp & Purdum, 2019). These attitudes include empathy, cooperation, tolerance, and social responsibility, which collectively contribute to what is increasingly referred to as sustainable social attitudes, defined as the multimodal manner in which the rich capacity of individuals to demonstrate responsible and ethical behavior toward others and the environment in a sustainable manner (Uge et al., 2019; Katilmiş et al., 2011).

To achieve these objectives, social studies instruction should connect conceptual knowledge with students' real-life social experiences. Social studies not only introduces historical and geographical concepts but also helps students understand the complex interactions between individuals, society, and the environment (Haryanti et al., 2022). In this context, social studies can be conceptualized in terms of acquisition, action, and motivation. The acquisition stage focuses on developing students' awareness and initial understanding of social issues. The action stage involves applying knowledge and values through behaviors related to real-life social problems. The motivation stage emphasizes creating learning situations that encourage students to take responsible actions through exposure to new information, communication, and documentary-based learning resources (Weder et al., 2022).

However, several studies indicate that the development of students' social attitudes through social studies has not yet been optimal. Previous research reports that students' environmental awareness and social responsibility remain relatively low in various schools (Muthi & Sujarwo, 2025; Putri et al., 2025). This condition is often associated with learning practices that emphasize theoretical knowledge rather than meaningful engagement with real-life social issues (Maksum et al., 2021). In several classrooms, social studies is still implemented through teacher-centered approaches, which provide limited opportunities for students to reflect on social values and apply them in authentic contexts (Almazroui, 2023). Furthermore, Husin et al. (2025) found that environmental concern, as a component of social attitudes, has received limited attention because environmental awareness education is not consistently prioritized in numerous schools.

Teachers play a crucial role in designing social studies instruction that responds to students' diverse characteristics and learning needs (Şeker, 2024; Wibowo et al., 2025). One pedagogical approach that supports this goal is differentiated instruction, which enables teachers to adjust content, learning processes, and learning products according to students' readiness, interests, and learning profiles (Tomlinson, 2017; Tomlinson & Jarvis, 2023). Through differentiated instruction, students can access learning materials and activities that align with their individual learning needs, thereby supporting deeper engagement with learning content. In social studies,

this approach can facilitate students' exploration of social issues in ways that are more meaningful and relevant to their personal experiences.

At the same time, advances in digital technology provide opportunities to enrich learning environments through interactive multimedia resources. Hypermedia-based e-modules integrate text, images, audio, video, and interactive links, allowing students to access learning materials in a flexible and rich multimodal manner (Holisoh et al., 2025; Rizki et al., 2025; Naimah et al., 2025; Primayanti et al., 2024). According to multimedia learning theory, the integration of multiple representations can enhance students' cognitive processing and support meaningful learning experiences (Mayer, 2024). Digital learning resources such as e-modules have also been shown to support student autonomy and improve engagement in the learning process (Wiyanarti et al., 2024). Digital technologies integrated into social studies, such as interactive platforms and hypermedia-based resources, have been found to enhance students' engagement and higher-order thinking skills (Lingga et al., 2025). Collaborative, contextual, and interactive learning, according to the characteristics of elementary students, helps develop social skills, social awareness, responsibility, and involvement of students in community life (Purnamasari et al., 2025). These findings reveal that the integration between innovative learning approaches and digital technology has great potential in supporting the development of students' cognitive and social aspects (Alyusfitri & Gistituati, 2024; Hayatun & Istiningsih, 2020; Nurzafirah et al., 2020).

Previous studies have highlighted the potential of differentiated learning and digital learning resources in improving educational outcomes. Research on differentiated learning often focuses on increasing learning engagement and academic achievement (Nursanti et al., 2025), while studies on hypermedia-based learning mainly examine improvements in cognitive understanding and digital learning environments (Kioko et al., 2025). Other studies highlight the role of interactive and contextual learning strategies in social studies education, such as project-based learning and collaborative activities, in supporting the development of social responsibility and social awareness (Shih, 2024; Sartika et al., 2025). However, these instructional approaches are often examined separately. Consequently, empirical studies investigating the integration of differentiated instruction and hypermedia-based learning resources to foster sustainable social attitudes remain limited, particularly in elementary social studies within developing learning environments that integrate both pedagogical differentiation and interactive digital media.

Addressing this gap is crucial because integrating differentiated pedagogy and hypermedia technology can create learning environments that are both adaptive and interactive, enabling students to explore social issues through personalized learning pathways while engaging with rich multimedia representations of social realities. Such integration can support not only cognitive understanding but also the internalization of social values relevant to sustainable social attitudes.

Unlike previous studies that examine differentiated instruction and digital learning resources separately, this study empirically investigates the integration of differentiated instruction and hypermedia-based e-modules to foster sustainable social attitudes among elementary students. Therefore, this study examines the influence of differentiated social studies supported by hypermedia e-modules on the sustainable social attitudes of elementary students. This study contributes to the literature by empirically examining how integrating differentiated instructional strategies and hypermedia-based e-modules can support the development of sustainable social attitudes in elementary social studies.

Based on this framework, the research question addressed is that Do differentiated social studies supported by hypermedia e-modules significantly influence the sustainable social attitudes of elementary students?

Accordingly, the research hypothesis is formulated as follows:

H₁: Students who participate in differentiated social studies supported by hypermedia e-modules demonstrate significantly higher sustainable social attitude scores than those who receive differentiated learning using conventional textbooks.

2. Method

This study employs a quantitative approach using a quasi-experimental design to examine the effectiveness of a differentiation-based social studies supported by hypermedia e-modules in improving the sustainable social attitudes of elementary school students (Creswell & Creswell, 2018). The study employs a pre-test–post-test control group design, allowing researchers to compare learning outcomes between an experimental and a control group before and after the intervention. The study design is presented in **Table 1**.

Table 1. Pre-test-post-test control group design

Experiment	O ₁ (pre)	X1	O ₂ (post)
Control	O ₃ (pre)		O ₄ (post)

In this design, Table 1 illustrates that O₁ and O₃ represent the pre-tests administered before the learning intervention to measure students' initial sustainable social attitudes. X represents the treatment, namely the implementation of a differentiation-based social studies integrated with hypermedia e-modules. O₂ and O₄ represent the post-tests administered after the intervention to determine changes in students' sustainable social attitudes.

The study population comprised all fifth-grade students in classes VA and VB at SD Negeri 1 CH in Majalengka, Indonesia. Since the number of students in the population was relatively small, the study used a total sampling technique, in which all members of the population were included as research participants. The total number of participants was 60 students, divided into two groups. 30 students in class VA were assigned as the experimental group, while 30 students in class VB served as the control group. The experimental group receives instruction using a differentiation-based social studies supported by hypermedia e-modules, while the control group receives differentiated instruction using conventional learning materials, such as textbooks, without hypermedia e-modules. This distinction ensures that the only major difference between the groups was the experimental group's integration of the hypermedia e-module.

The present study's research instrument is a non-test questionnaire designed to measure sustainable social attitudes. The questionnaire consists of ten statements related to students' social attitudes, which are measured using a four-point Likert scale by checking (√), always (4), often (3), sometimes (2), and never (1). The questionnaire items are developed based on five aspects of sustainable social attitudes, namely 1) empathy and social solidarity, 2) concern for the environment, 3) cooperation and responsibility, 4) tolerance and social diversity, and 5) reflection and social awareness (Mauluya et al., 2024). Although the number of items was relatively limited, the instrument was designed to represent key dimensions of sustainable social attitudes relevant to elementary social studies. Content validity is ensured through expert judgment from two social studies experts, who evaluated the relevance and clarity of each item with respect to the constructs being measured. Prior to the main study, the instrument was tested in a pilot study involving 44 elementary students from a different school with characteristics similar to those of the research participants. This pilot test was conducted separately from the

main research sample to evaluate the instrument's validity and reliability. The results of the pilot test indicate that the questionnaire items met acceptable standards of validity and internal consistency reliability before being administered to the research participants.

The research was conducted over four weeks, comprising eight social studies sessions. The research procedure consists of the following stages. **First**, in a pre-test stage at the beginning of the study, both the experimental and control groups completed a questionnaire to measure their initial level of sustainable social attitudes. **Second**, in the treatment stage, the experimental group received instruction using a differentiation-based social studies integrated with hypermedia e-modules. The hypermedia e-modules contained interactive learning materials, multimedia elements, and differentiated activities designed to accommodate students' diverse learning needs, interests, and readiness levels. Meanwhile, the control group received differentiated instruction using conventional teaching materials, such as textbooks and teacher explanations, without hypermedia e-modules. **Third**, in the post-test stage, after the learning intervention, both groups completed the same questionnaire again to measure changes in students' sustainable social attitudes.

The collected data were analyzed quantitatively to assess improvements in students' sustainable social attitudes before and after the intervention. Data analysis was conducted using Microsoft Excel and SPSS version 26. The analysis procedures include 1) a normality test to determine whether the data were normally distributed, 2) a homogeneity test to examine whether the variance between the experimental and control groups was equal, and 3) independent samples t-test to determine whether there was a statistically significant difference in the mean scores of sustainable social attitudes between the experimental and control groups after the treatment. These statistical tests were conducted to ensure that the data meet the assumptions required for parametric analysis and to determine the effectiveness of the learning intervention.

Ethical Considerations, because the participants in this study were elementary school students, ethical considerations were carefully addressed. Permission to conduct the research was obtained from the school administration. In addition, informed consent was obtained from students' parents or guardians prior to participation. The confidentiality of participants' identities and responses was maintained, and all data were used solely for research purposes.

3. Results

The validity test of the ten questionnaire items was conducted to determine the extent to which the instrument was able to measure aspects of sustainable social attitudes among elementary students. The results of the validity test are presented in **Table 2**.

Table 2. Test the validity of the instrument of sustainable social attitudes

Categories	Item Numbers	R-Table	R-Count	Result
Moderate	1, 3, 4, 5, 6, 7, 9, 10	0.2975	0.368, 0.594, 0.544, 0.595, 0.546, 0.591, 0.432, 0.544	Valid
High	2, 8		0.680, 0.677	Valid

The validity test uses *Pearson's Product-Moment correlation*, with an r-table value of 0.2975 at a significance level of $\alpha = 0.05$, based on 44 respondents in the pilot test. As described in Table 2, two items (items 2 and 8) are classified as highly valid, while the remaining items are classified as moderately valid. The highest correlation coefficient is observed for item 2 ($r = 0.680$), while

the lowest is for item 1 ($r = 0.368$). Since all r -count values exceed the r -table value ($r > 0.2975$), all items are considered valid and suitable for use in the main study.

To examine the instrument's consistency, a reliability test using Cronbach's Alpha was conducted. The results are presented in **Table 3**.

Table 3. Instrument reliability test

Cronbach's Alpha	N of Items
.744	10

The reliability coefficient of 0.744 indicates an acceptable level of internal consistency, suggesting that the instrument is sufficiently reliable for measuring students' sustainable social attitudes.

Assumption testing, before conducting inferential analysis, the data were tested for normality and homogeneity to ensure that the assumptions for parametric statistical analysis were met. The normality test was conducted using the Shapiro–Wilk test, and the results are presented in Table 4.

Table 4. Normality test

Variables	Kolmogorov-Smirnov Sig.	Shapiro-Wilk Sig.
Pre-test Control	0.059	0.309
Post-test Control	0.007	0.051
Pre-test Experiment	0.131	0.449
Post-test Experiment	0.019	0.075

As illustrated in Table 4, the Shapiro–Wilk significance values exceed 0.05, indicating that the data are normally distributed.

Homogeneity Test, a Levene's Test for Equality of Variances, was conducted to determine whether the variance of the two groups was homogeneous. The results reveal that the significance value exceeds 0.05, indicating that the variances between the experimental and control groups are homogeneous and that the data meet the assumptions required for parametric statistical testing.

The descriptive statistics of the post-test scores for both groups are presented in Table 5.

Table 5. Independent samples t-test results

Group Statistics									
Classes				N	Mean	Std. Deviation	Std. Error Mean		
Score	Post-test control			30	80.90	9.110	1.663		
	Post-test experiment			30	85.60	8.657	1.580		
(a)									
Levene's Test for Equality of Variances					t-test for Equality of Means			95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper

Score	Equal variances assumed	.037	.847	- 2.048	58	.045	-4.700	2.294	- 9.293	-.107
	Equal variances not assumed			- 2.048	57.850	.045	-4.700	2.294	- 9.293	-.107

(b)

As shown in Table 5, the experimental group has a higher mean score ($M = 85.60$) than the control group ($M = 80.90$). This indicates that students who learned using differentiation-based hypermedia e-modules tend to show higher sustainable social attitude scores than those who learned using conventional differentiated instruction.

An Independent Samples t-test was conducted to determine whether the difference between the two groups was statistically significant. The results indicate a statistically significant difference between the experimental and control groups, $t(58) = 2.05$, $p = 0.045$. The mean difference between the two groups is 4.70 points, with a 95% confidence interval ranging from approximately 0.12 to 9.28. This result reveals that the improvement in sustainable social attitudes in the experimental group is slightly greater than that in the control group.

To evaluate the practical significance of the intervention, Cohen's d was calculated, yielding an effect size of approximately 0.53, indicating a moderate effect. This implies that integrating hypermedia e-modules into differentiated social studies has a moderate practical impact on students' sustainable social attitudes. Overall, these findings indicate that the use of differentiation-based hypermedia e-modules in social studies is associated with higher post-test scores in sustainable social attitudes than conventional differentiated instruction, although the magnitude of the difference is moderate.

4. Discussion

This study examined the effectiveness of differentiated social studies supported by hypermedia e-modules in fostering sustainable social attitudes among elementary students. The findings indicate that students in the experimental group who learned using differentiated hypermedia e-modules achieved higher post-test scores than students in the control group who learned using differentiated instruction with conventional textbooks. These results underline that integrating differentiated instruction and hypermedia-based learning resources can support the development of sustainable social attitudes in elementary social studies.

One possible explanation for this finding lies in how differentiated instruction was implemented in the learning process. In this context, differentiation was applied by providing learning activities that accommodated students' diverse readiness levels, learning preferences, and interests. Such an approach allowed students to engage with the learning material in ways that were more meaningful and relevant to their experiences. Previous studies have emphasized that differentiated learning creates opportunities for students to construct knowledge based on their own learning needs and cognitive readiness (Eikeland & Ohna, 2022; Kuhr, 2022; Tomlinson, 2017; Tomlinson & Jarvis, 2023; Tomlinson, 2011; Tomlinson, 2014). Differentiated learning is in line with the theory of constructivism that students can learn according to their abilities and find understanding from their experiences (Wibowo et al., 2025). Social studies using a differentiated approach can increase students' involvement and motivation in developing deeper social

understanding because the material is delivered in a relevant and personal manner (Haelermans, 2022; Tas & Minaz, 2024). In the context of social studies, this approach can help students connect social and environmental issues with their everyday experiences, thereby encouraging the development of empathy, responsibility, and environmental awareness.

Another factor explaining the results is the role of hypermedia features within the e-modules. The hypermedia e-modules used in this study integrated text, images, videos, and interactive learning activities, enabling students to explore social issues in a more contextual and engaging manner. From a cognitive perspective, multimedia learning environments can facilitate deeper understanding when students process information through multiple sensory channels (Mayer, 2024). For elementary students, visual and interactive elements such as digital stories, short videos, and contextual illustrations can help make abstract social values such as cooperation, tolerance, and environmental responsibility more concrete and easier to understand.

The combination of differentiated instruction and hypermedia-based materials, therefore, creates a more inclusive learning environment that supports both cognitive engagement and affective development. In the context of social studies, learning activities that involve discussion of social issues, collaborative tasks, and contextual case examples encourage students to reflect on social relationships and community responsibilities (Haryanti et al., 2025). Hypermedia e-modules can improve students' understanding of the material and attitudes (Reed et al., 1995). Similar findings have been reported in previous studies, indicating that digital learning media and interactive multimedia can enhance students' engagement and motivation in social studies (Ikram et al., 2024; Wiyanarti et al., 2024). However, the present study specifically highlights how such digital resources also support the development of sustainable social attitudes, particularly when combined with differentiated learning strategies.

Sustainable social attitudes are a crucial part of social studies. The use of hypermedia e-modules in social studies can present social and environmental issues in context, thereby improving students' social attitudes (Ahmar & Azzajjad, 2025; Ngongo & Sogen, 2025). The research by Muthi & Sujarwo (2025) reveals that social studies can foster an attitude of caring for the environment, for example, through human interaction materials, and that the environment can serve as a bridge to instill values of sustainability. Social studies based on student activities improves attitudes towards responsibility (Yalçın & Güleç, 2022) and cooperative attitudes (Aningsih et al., 2022). The use of digital multimedia helps visualize moral values such as honesty, responsibility, cooperation, and tolerance in an interesting and easy-to-understand manner for elementary students through digital stories, animations, and interactive simulations (Abdullah & Sadiyah, 2025).

Despite these findings, the results should be interpreted with caution. The difference in mean scores between the experimental and control groups was relatively moderate, indicating that the intervention contributed to improvement yet did not produce a large effect. In addition, the study involved a limited sample from a single elementary school, which restricted the generalizability of the findings. The duration of the intervention was also relatively short, consisting of several learning sessions, which did not fully capture long-term changes in students' social attitudes.

Nevertheless, this study offers several practical implications for elementary social studies teaching and teacher education. First, the findings underscore that integrating hypermedia-based learning materials into differentiated instruction can provide teachers with a practical strategy for addressing diverse learning needs in the classroom. Second, the use of contextual multimedia resources can help teachers present social and environmental issues in ways that are more engaging and meaningful for elementary students. Furthermore, teacher education

programs benefit from preparing pre-service teachers to design and implement technology-supported differentiated learning materials, particularly in subjects such as social studies that aim to develop social awareness and civic responsibility.

Future research may further explore the long-term impact of hypermedia-based differentiated learning on students' attitudes and behaviors. Studies with larger samples, longer intervention periods, and more comprehensive measures of social attitudes can provide deeper insights into how digital learning environments can contribute to the development of sustainable social values in elementary education.

5. Conclusion and implications

The research findings indicate that implementing differentiated social studies supported by hypermedia e-modules was associated with higher sustainable social attitude scores among elementary students than learning that relied on differentiated instruction using conventional textbooks. These results imply that integrating differentiated instruction with hypermedia-based learning resources can provide more engaging and relevant learning experiences for students with diverse characteristics, interests, and learning preferences. In the context of elementary social studies, the use of hypermedia elements such as text, images, audio, and video can help students better understand social values, including empathy, cooperation, social responsibility, and tolerance, by presenting social issues in a more contextual and interactive manner. When combined with differentiated learning strategies, these digital resources can help students engage more actively with social and environmental topics central to social studies.

From a practical perspective, these findings underscore that elementary school teachers can integrate hypermedia-based learning materials into differentiated instruction to support the development of students' social attitudes. Such integration can provide more flexible learning experiences that accommodate diverse student needs while making social studies more meaningful and engaging. However, the results should be interpreted with caution due to several limitations. The study involved a relatively small sample from a single elementary school and was conducted over a short instructional period. Therefore, the findings do not fully represent broader educational contexts or long-term changes in students' social attitudes. Future research should involve larger samples, longer intervention periods, and more comprehensive measures of social attitudes to further examine the potential of hypermedia-supported differentiated learning in elementary social studies.

Credit authorship contribution statement

Yuyun Dwi Haryanti: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing original draft, Visualization. **Mohamad Syarif Sumantri:** Supervision, Conceptualization, Methodology, Validation, Writing review & editing. **Hamdan Tri Atmaja:** Formal analysis, Validation, Writing review & editing. **Sapriya:** Supervision, Conceptualization, Writing review & editing. **I Gusti Agung Ayu Wulandari:** Resources, Investigation, Data curation. **Seah Siok Peh:** Validation, Writing review & editing, International perspective. **Rina Nengsih:** Investigation, Data curation, Project administration. **Rahma Halipah:** Investigation, Data curation, Project administration.

Declaration of competing interest

The authors declare no conflict of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request, subject to ethical and privacy considerations related to human participants.

Ethical Declaration

This study involved human participants (elementary school students) and was conducted in accordance with ethical research standards. Permission to conduct the study was obtained from the school authorities. Informed consent was obtained from the students' parents or legal guardians prior to participation. Participants were informed about the purpose of the study, the procedures involved, and their right to withdraw at any time without consequences. All data were treated confidentially and used solely for research purposes.

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Declaration of AI statement

Portions of this manuscript were drafted and edited using ChatGPT (OpenAI) to assist in improving grammar, clarity, and academic writing style. The AI tool was used only as a language support tool and not for generating original research content or data analysis. All outputs were critically reviewed, revised, and validated by the authors. The authors take full responsibility for the integrity and accuracy of the final manuscript.

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