
Academia Open



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Academia Open

Vol. 11 No. 1 (2026): June
DOI: 10.21070/acopen.11.2026.13311

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Academia Open

Vol. 11 No. 1 (2026): June
DOI: 10.21070/acopen.11.2026.13311

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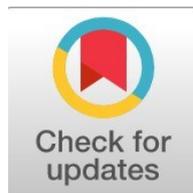
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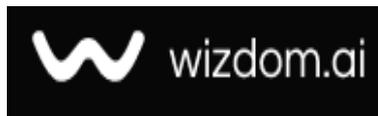
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DOI: 10.21070/acopen.11.2026.13311

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Science Experiment Book Validated for Interpersonal Intelligence Development

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Abstract

General Background: Early childhood education requires learning media that not only support cognitive development but also stimulate multiple intelligences, particularly interpersonal intelligence, which is essential for children's social growth. **Specific Background:** Science learning activities in early childhood settings are often limited to teacher-centered approaches and lack instructional media that encourage active social interaction among children. **Knowledge Gap:** There is limited availability of science-based instructional media specifically designed to stimulate interpersonal intelligence through collaborative experimental activities for children aged 5–6 years. **Aims:** This study aims to develop a science experiment book as an instructional medium to stimulate multiple intelligences, particularly interpersonal intelligence, among children aged 5–6 years at TK Idhata Beka. **Results:** Using a Research and Development approach involving needs analysis, product design, expert validation, and limited field trials, the findings show that the developed science experiment book was categorized as very feasible in terms of media and content quality, and its implementation led to improvements in children's interpersonal abilities, including cooperation, communication, and peer interaction during science-based experimental activities, indicating that the science experiment book has strong potential as an effective learning medium for supporting the development of interpersonal intelligence in early childhood education.

Highlights:

- ♦ Expert appraisal classified the developed learning resource as very valid in content and media aspects.
- ♦ Group-based experimental sessions increased children's peer dialogue and shared task completion.
- ♦ Structured hands-on activities supported observable progress across social interaction indicators.

Keywords: Science Experiment Book, Multiple Intelligences, Interpersonal Intelligence, Early Childhood.

Academia Open

Vol. 11 No. 1 (2026): June
DOI: 10.21070/acopen.11.2026.13311

Published date: 2026-03-03

Introduction

It is crucial for children's social, emotional, and cognitive development to have a solid foundation laid by early childhood education. Interpersonal multiple intelligence is a developmental domain that deserves special focus, as skills associated with interaction, cooperation, and communication are essential for the growth of social competence in later life stages [1], [2]. Environments that offer few chances for social engagement can hinder the growth of interpersonal intelligence, particularly when teaching methods are mainly based on a teacher-centered approach that involves only a one-way communication of information [3], [4].

Initial observations at TK Idhata Beka Sigi indicate that science learning activities are primarily carried out through teachers' verbal explanations, with little use of diverse instructional media. Given these circumstances, children's involvement in activities organized in groups seems to be suboptimal [5], [6]. During the learning process, many children tend to take on passive roles and show limited involvement in discussions and collaborative tasks. Nevertheless, science learning in early childhood contexts offers considerable potential to be enriched through simple experimental activities that can promote social interaction and communication among peers [7], [8].

A growing body of literature indicates that concrete and activity-based instructional media may enhance children's engagement in learning [9]. Play-based and experimental activities conducted in group settings have been reported to support children's curiosity, cognitive development, and social skills [4], [10]. Additionally, previous studies suggest that interpersonal multiple intelligence can be fostered more effectively through learning experiences that emphasize cooperation, communication, and respect for peers' roles [11], [12].

Despite these findings, prior research has largely focused on the use of educational play materials or experimental tools as isolated learning media [13], [14]. Instructional books, in many cases, function primarily as visual information resources and are seldom designed to intentionally facilitate social interaction during learning activities. However, structured instructional media are widely recognized as essential in supporting educators to organize learning experiences in a systematic and meaningful manner [8], [15].

Accordingly, a research gap can be identified in the limited development of science experiment book media that are specifically designed to stimulate interpersonal multiple intelligence in early childhood education [9], [13], [14], [16]. While numerous studies have explored the development of children's creativity and intelligence through play and experimental approaches [7], [17], the integration of science experiment activities with instructional book design that explicitly foregrounds social interaction remains insufficiently examined. This gap highlights the necessity for creative teaching media that cater to children's social development needs more thoroughly.

To address this gap, it is suggested to create a science experiment book as a possible remedy for the learning challenges faced at TK Idhata Beka Sigi. This science experiment book aims to foster experiential learning among children through group activities, straightforward discussions, and teamwork. Such an approach is consistent with perspectives emphasizing that early childhood development is most effectively supported through learning experiences that integrate play, social interaction, and emotional engagement [18], [19].

The primary objective of this study is to develop instructional media in the form of a science experiment book that is both feasible and effective in stimulating the interpersonal multiple intelligence of children aged 5–6 years at TK Idhata Beka Sigi. The novelty of the study lies in the integration of science experiment activities with an instructional book design that explicitly positions social interaction as a central component of the learning process. This contribution is expected to enrich the body of research on early childhood instructional media by extending the focus beyond cognitive outcomes to include the development of children's social competencies.

Method

This study employed a research and development (R&D) approach using the ADDIE model, which comprises five stages: analysis, design, development, implementation, and evaluation [20]. The ADDIE model was selected because it facilitates the systematic and iterative development of instructional media in accordance with educational needs and research objectives [21].

The research subjects were 19 children aged 5–6 years enrolled in Group B at TK Idhata Beka. The participants included both boys and girls with diverse characteristics of social development. Teachers were involved as users of the instructional media and as evaluators of learning implementation during the product trial phase. The study was conducted during the first semester of the 2024/2025 academic year at TK Idhata Beka.

Data were collected through observation, questionnaires, and documentation. Observations were conducted to examine children's social interactions during science experiment activities. Questionnaires were administered to obtain feasibility assessments from media experts and subject-matter experts. Documentation was used to record the stages of product development and the implementation of learning activities using the science experiment book. The research instruments were developed based on indicators of interpersonal multiple intelligence and media feasibility aspects and were validated by experts prior to use.

Data analysis was conducted using descriptive quantitative and qualitative techniques. Quantitative data were analyzed by

calculating the percentage of product validity through a comparison between empirical scores and maximum possible scores, which were then classified into feasibility categories, namely very valid, sufficiently valid, less valid, and invalid. Qualitative data were analyzed through data reduction, data display, and conclusion drawing to describe changes in children's social interaction abilities during the implementation of the science experiment book.

Results and Discussion

A. Result

The results of the study indicate that the developed science experiment book met the established feasibility criteria based on expert evaluations and demonstrated a positive contribution to stimulating the interpersonal multiple intelligence of children aged 5–6 years [22]. These findings were obtained through expert validation stages and limited implementation involving Group B children at TK Idhata Beka. The presentation of results focuses on the feasibility of the instructional media and the attainment of children's interpersonal development indicators during the learning process.



Figure 1. Science Experiment Book.

Table 1. Summary of Validation Results for the Science Experiment Book.

No.	Validator	Validity Percentage	Criteria
1	Dr. Supriyatman (Material Expert)	93.1%	Very Valid
2	Dr. Besse Nirmala (Media Expert)	98.2%	Very Valid

Results from the expert validation show that the created science experiment book is classified as very valid. Dr. Supriyatman's validation as a material expert yielded a feasibility percentage of 93.1%, and Dr. Besse Nirmala's validation as a media expert resulted in a feasibility percentage of 98.2%. The evaluations covered media practicality, visual aesthetics, appropriateness of content for early childhood characteristics, and the media's relevance to the development of children's interpersonal multiple intelligence [23].

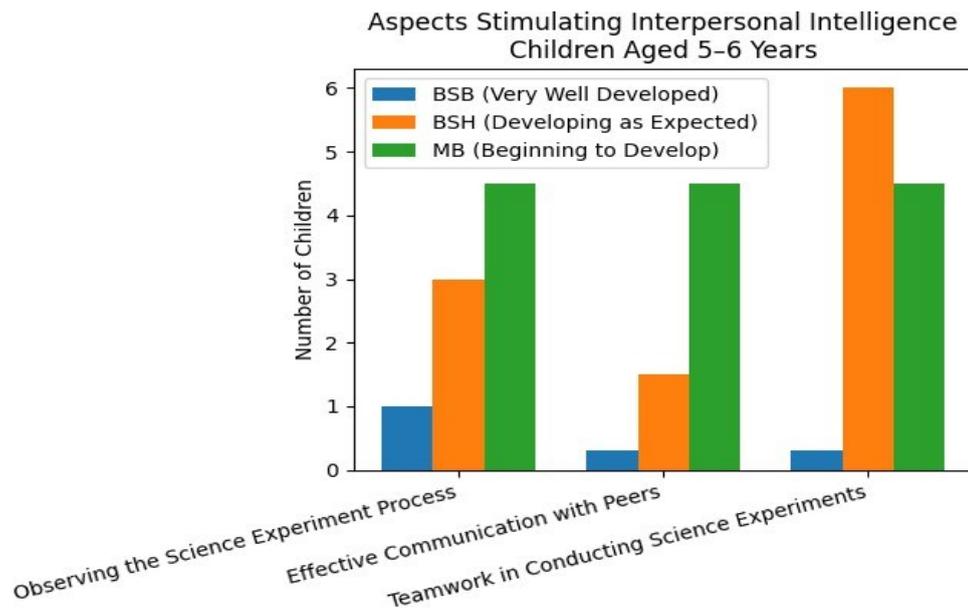


Figure 2. Summary of Aspects Influencing Multiple Intelligences.

The bar chart illustrates the achievement of interpersonal multiple intelligence among children aged 5–6 years across three main aspects: observing the science experiment process, effective communication with peers, and cooperation during science experiment activities. Each aspect is assessed using three developmental categories, namely Very Well Developed, Developed as Expected, and Beginning to Develop.

B. Discussion

The findings of this study suggest that the science experiment book plays a meaningful role in stimulating the interpersonal multiple intelligence of children aged 5–6 years. This role is supported by the high feasibility level of the developed media, which indicates that its content, visual design, and experimental activities are appropriately aligned with the developmental needs of early childhood learners. Media that is developmentally appropriate not only supports cognitive understanding but also creates opportunities for social interaction during learning activities. This result is consistent with previous studies emphasizing that instructional media designed in accordance with early childhood characteristics can enhance children’s engagement and participation in the learning process [8].

Building on this feasibility, the implementation results further demonstrate improvements in children’s interpersonal abilities, as reflected in their capacity to observe experimental processes, communicate effectively with peers, and cooperate during science activities. These three aspects are interrelated and emerge naturally during collaborative experimental learning. Children appeared more actively involved in interaction, discussion, and collaborative work throughout the experimental sessions. These findings support those reported by Badriay et al. (2023), who noted that learning activities grounded in direct interaction can facilitate the optimal development of interpersonal intelligence in early childhood [24].

The rise in children’s involvement during science experiment activities can be interpreted in light of the concrete and contextual characteristics of science learning. Children are offered significant learning opportunities that foster attention, communication, and social interaction through practical experiences like trying, observing, and discussing experimental results. This viewpoint coincides with Izzuddin (2019), who contended that early childhood science education should focus on exploratory and straightforward experimental tasks to facilitate children’s active construction of understanding through interaction with peers [25].

Alongside practical involvement, the created science experiment book purposefully provides organized chances for social interaction via teamwork activities. While working in groups, children are prompted to take turns, share ideas, and value their peers’ input. This directly fosters the growth of communication and cooperation abilities. This discovery corresponds with the findings of Hariyati (2023), who stated that engaging and interactive teaching media can foster the growth of interpersonal intelligence in young children [5].

Overall, the results of this study confirm that the development of a science experiment book is not only feasible as an instructional medium but also effective in stimulating the interpersonal multiple intelligence of children aged 5–6 years. This overall effectiveness is further strengthened by evidence from previous studies highlighting the importance of science experiment-based media in supporting children’s social and interpersonal development [19], [22].

With regard to the aspect of observing the science experiment process, one child was classified as Very Well Developed, four children as Developed as Expected, and five children as Beginning to Develop. This distribution indicates that most children have begun to demonstrate the ability to pay attention to experimental procedures, observe changes occurring during experiments, and follow instructions throughout science activities. However, when linked to the overall findings, these

results also show that consistent focus during the learning process still requires guidance and repeated exposure to structured experimental activities.

Regarding effective communication with peers, two children were classified as Very Well Developed, three as Developed as Expected, and five as Beginning to Develop. The previous results are complemented by these findings, which demonstrate that science experiment activities promote children's initiation of interaction, expression of simple ideas, and responses to peers in group settings. However, the quite high amount of children in the Beginning to Develop category shows that communication skills are still in development and require ongoing stimulation via interactive learning experiences.

Regarding cooperation in conducting science experiments, two children were classified as Very Well Developed, six children as Developed as Expected, and five children as Beginning to Develop. The predominance of the Developed as Expected category reinforces earlier findings that collaborative experimental activities effectively facilitate children's ability to share roles, follow group rules, and complete tasks together. This cooperation is a direct outcome of structured group-based learning embedded in the science experiment book.

Overall, the pattern shown in the bar chart reveals that most children fall within the Beginning to Develop and Developed as Expected categories across the three aspects of interpersonal intelligence. When connected to the qualitative findings discussed earlier, this pattern underscores that the science experiment book provides meaningful social stimulation through collaborative and hands-on learning experiences. These results are consistent with the view of Jamaris (2014), who emphasized that interpersonal intelligence develops through structured and repeated social interactions, as well as with findings by Izzuddin (2019) and Santika et al. (2020), which highlight the role of experiment-based science learning in supporting children's communication and cooperation skills [16], [20], [25].

Conclusion

The development results indicate that the science experiment book meets the feasibility criteria based on evaluations by material experts and media experts, achieving a very valid category and thus being suitable for use in learning activities for children aged 5–6 years. The implementation of this media demonstrates improvements in children's interpersonal multiple intelligence, particularly in their ability to observe experimental processes, communicate effectively with peers, and cooperate during science activities. By providing direct and collaborative learning experiences, the science experiment book supports the stimulation of children's interpersonal intelligence in early childhood learning environments.

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