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EXPLORING MULTISENSORY LEARNING: INTERACTIVE MEDIA ON ELEMENTARY STUDENTS' SCIENCE EDUCATION

Sumarlin Mangandar Marianus [1)], Edy Surya [2)], Eva Faridah [3)], Nurdin Bukit [4)]
Fakultas Keguruan & Ilmu Pendidikan Universitas Katolik Santo Thomas, Medan, Indonesia [1)]
Fakultas Ilmu Pendidikan Universitas Negeri Medan, Medan, Indonesia [2,3,4)]
Corresponding Author:
sumarlinmm.sinaga@gmail.com [1)], *evafaridah@unimed.ac.id* [2)], *edy_surya71@yahoo.com* [3)], *nurdinbukit5@gmail.com* [4)]

Abstract

This study examines how elementary school students' scientific learning outcomes are affected when pop-up book media is combined with human sensory organs. The study presents pop-up books as a novel option and emphasizes the need of effective learning medium. The study, which used a quantitative methodology with pretest and posttest assessments, finds that students' science learning outcomes have improved statistically significantly. To be more precise, the average score on the pretest is 56.74, but the average score on the posttest increases significantly to 77.79. A two-tailed t-test with a p-value of 0.000 confirms the significant difference of 21.05 between the pretest and posttest results, which leads to the acceptance of the alternative hypothesis and the rejection of the null hypothesis. These statistical results provide strong evidence for the beneficial effects of utilizing pop-up book media in conjunction with human sensory organs to enhance scientific learning outcomes for elementary school students.

Keywords: Multisensory Learning, Interactive Learning Media, Pop-up Books Media, Science Learning, Elementary Students

INTRODUCTION

The goal of education is to shape people into what society expects of them. In schools, education takes the shape of exchanges between teachers and pupils or the learning process itself (Leithwood et al., 2021). It is claimed that if kids demonstrate daily improvement and the educational goals are met, then the schooling they receive is successful. Learning is made much more successful when media is used in the process. Because it relays knowledge information from teachers to students, learning media occupy a critical place in the learning process (Madani, 2019; Prayuda et al., 2022, 2023).

Students' behavior shifts from ignorance to knowledge as a result of their learning efforts are known as learning outcomes. behavioral changes encompassing a variety of elements, such as cognitive (knowledge), emotional (domains pertaining to attitudes and values), and psychomotor (domains pertaining to skills and the capacity for independent action). Three categories of factors can be identified that impact students'

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learning: internal factors, which include their physical and spiritual well-being; external factors, which include their surroundings; and learning approach factors, which are the various ways that students learn, including their strategies and methods for completing lesson activities. Science is an endeavor by humans to comprehend the cosmos by making exact observations on objects, employing methods, and providing explanations based on logic to draw conclusions (Chairueang, 2022). Simple investigations are used to teach science in elementary schools rather than having students memorize a list of scientific ideas. Students' attitudes toward science can be developed through this kind of learning, as demonstrated by their ability to formulate issues and draw conclusions and think critically about the science they are learning. The learning outcomes of grade IV pupils on the subject of human sensory organs are challenging since they consistently fall short of the 70 KKM that the school has set. The reason for this is because when a teacher does not employ educational resources, the students become bored and become less focused on what they are studying.

The researcher offers a remedy based on the background information above by utilizing learning media to enhance student learning outcomes. Pop-up books are a type of visual media that is to be employed. A three-dimensional print medium is a pop-up book. A pop-up book is a book that, when a page is opened, moves or contains three-dimensional features. The utility of pop-up book media for students' education and amusement is evident when one considers the narrative within. Pop-up book media helps enhance student learning outcomes by encouraging students' imaginations to comprehend the material. Additionally, because pop-up book media involves pulling, pushing, folding, opening, and closing, it helps strengthen children' motor nerves.

The researcher has proposed a fresh approach to educational practices by using pop-up books as a learning medium to improve student learning outcomes. The integration of three-dimensional pop-up books with traditional teaching methods adds a multimodal element to the learning process, whereas traditional methods frequently depend on two-dimensional materials like textbooks and flat visual aids. This divergence from traditional teaching aids creates a significant research vacuum because pop-up books' ability to enhance learning outcomes has not been thoroughly studied in the body of current literature (*Interactive Books: Playful Media before Pop-Ups - Jacqueline Reid-Walsh - Google Buku*, n.d.).

This method is unusual because it combines tactile and visual cues to create a more dynamic and captivating learning environment. By encouraging hands-on exploration, pop-up books not only hold students' interest but also stimulate their cognitive processes. Students are not just passive consumers of information; by interacting with the pop-up elements, they actively participate in the content and foster a deeper comprehension of the subject. Thus, the area of unmet research need is the scant examination of three-dimensional learning materials, including pop-up books, and how they affect academic performance and cognitive growth.

Additionally, the suggested solution takes into account kids' developing motor skills in addition to cognitive components of learning. The pop-up elements demand fine motor movements to manipulate, which helps children's motor abilities become more refined. This element adds another level of complexity to the research gap since, in the context of pop-up books, the relationship between motor skill development and multisensory learning has not received enough attention in the field of educational research (Anggraini et al., 2019).

To sum up, the researcher's suggestion to employ pop-up books as a teaching tool presents a fresh and comprehensive method of teaching. The paucity of study on three-dimensional learning media and their all-encompassing effects on the development of motor and cognitive skills is glaring. The innovation is in the way that tactile and visual components are combined, offering a special way to improve student learning outcomes. By deepening our knowledge of effective learning media and their impact on students' academic and motor skill development, this research has the potential to make a substantial contribution to educational practices.

Pop-up book media was chosen by the author because it has a significant impact on raising student learning results(Ahmadi et al., 2018). According to earlier research by Dewanti et al. (2018), pop-up books are used as an engaging, inventive, and creative learning tool in addition to being an instructional medium for students. This helps students learn the material more effectively because they can comprehend it more quickly and won't get bored (Dewanti et al., 2018). Additionally, research by Bernardi et al. (2018) demonstrated that students are more engaged in their studies and have higher average activity levels when using pop-up book media, which supports the idea that pop-up book media is a useful teaching tool for elementary school students. This study set out to ascertain how pop-up book media (human sensory organs) affected science learning objectives (Bernardi et al., 2018).

METHOD

This research employs a quantitative methodology using an experimental design consisting of a pretest and posttest for a single group. This study was carried out in one class, the experimental class, which was taught utilizing pop-up books and other artificial learning environments (human sensory organs). In this study, student learning outcomes were measured using the pre- and post-tests. This study uses two different kinds of variables: learning results, which are dependent, and pop up book medium, which is an independent variable. Validity, reliability, prerequisite, and hypothesis testing are all included in the SPSS data analysis technique.

The investigation's rigor and impartiality are improved by the selected study design, which uses a quantitative technique with an experimental design that includes pretest and posttest measures. It is crucial to recognize the possible drawbacks of a single-group design, such as the lack of a control group. The absence of a comparative group

may result in the introduction of confounding variables and restrict the capacity to conclusively prove causality. This could be a research gap because it could be difficult to discern the efficacy of pop-up books from other artificial learning environments on their own. The study provides a nuanced view of the effects of these interventions on student learning outcomes since it focuses on a single experimental class that integrates pop-up books and artificial learning environments. But considering the small sample size, it would be problematic to extrapolate the results to larger educational settings. This calls into doubt the study's external validity and emphasizes the necessity of repeating the experiment in different demographics and contexts in future studies.

The study's internal validity is enhanced by the well-defined independent variable—pop-up books as a learning medium—and dependent variable—student learning results. The utilization of pop-up books is one aspect of the research that makes it new, but another is the integration of various artificial learning environments, including human sensory organs. This is a significant research gap since there isn't a thorough examination in the literature of how different learning stimuli work together to affect academic outcomes.

A careful approach to statistical analysis is shown in the use of SPSS for data analysis, including validity, reliability, prerequisite, and hypothesis testing. It is imperative to take into account any potential experimenter effects or biases and restrictions related to self-report assessments. The thorough data analysis conducted with SPSS enhances the methodological strength of the study; nonetheless, a research gap still exists regarding the more extensive investigation of the joint impact of pop-up books and artificial learning environments on several domains of cognitive and motor skills.

In conclusion, there are significant research gaps relating to the lack of a control group, the small sample size, and the requirement for more generalizability, even though the research design and methodology show strengths in its precision and statistical rigor. The incorporation of several artificial learning environments, encompassing human sensory organs, introduces intricacy to the study and provides an innovative viewpoint. Subsequent investigations ought to endeavor to bridge these gaps, possibly utilizing a variety of research approaches and greater sample sizes to augment the validity and relevance of the results.

RESULT AND DISCUSSION

The aforementioned data makes evident the distinction between learning outcomes prior to treatment (i.e., learning without the use of pop-up book media) and learning outcomes subsequent to treatment (i.e., learning with the use of pop-up book media). According to the pre-test results, the average score is 56.74, the greatest score is 80, and the lowest score is 40. According to the post-test findings, the average score is 77.79, the best score is 96, and the lowest score is 70. Therefore, it is evident that using pop-up

book media (human sensory organs) increases student learning outcomes. The findings of the prerequisite test analysis and the subsequent hypothesis test can be used to determine the learning outcomes of students:

1. Test of Normality
   The results of the Normality Test indicate that the α value is 0.05 and the significance value is 0.200, indicating that the significance value is more than α or 0.200> 0.05. Since Ho is acknowledged, it can be said that the distribution of the data is normal.
2. Examining Linearity
   According to the linearity test, the significance value of the departure from linearity is 0.764, and the α value is 0.05. This indicates that the significance value is greater than α, or 0.764 greater than 0.05. Thus, it can be said that the independent variable in this study, pop up book medium, and the dependent variable, learning outcomes, have a linear connection.
3. The Test of Homogeneity
   The significance value is 0.664 and the α value is 0.05, according to the homogeneity test, indicating that the significance value is greater than 0.05 or 0.664 greater than 0.05. Thus, it can be said that there is homogeneity in the data distribution. Thus, it can be said that there is homogeneity in the data distribution.
4. The t-test, or hypothesis test
   The purpose of the test is to ascertain whether the independent and dependent variables differ significantly from one another. The significant value (two-tailed) is 0.000 according to the t-test, and the α value is 0.05, indicating that the significance value is less than 0.05 or 0.000 less than 0.05. Ho is rejected while Ha is accepted according to the t-test hypothesis testing decision-making criteria. The use of pop-up book media as (human sensory organs) has been found to have an impact on science learning results.

It has been demonstrated that pop-up book media (human sensory organs) influence student learning outcomes. Research by Masturah et al. (2018) on the usage of pop-up book media, which is successful in raising third-grade kids' learning results, supports this (Masturah et al., 2018). That is supported by research (Yulianti Ningsih, 2019) that shows using pop-up book medium can enhance student learning results. This is driven by the fact that, as compared to studying through lectures, the usage of visual media in the form of pop-up books improves student learning results (NINGSIH, 2019).

According to this study, learning media can offer uniformed content, make the learning process clearer and more engaging so that students are not bored, be more efficient with their time and energy, and enhance the quality of learning outcomes for students, all of which have an effect on active student participation. This study is pertinent to the use of pop-up book media for writing skills, where the media enhances students' learning of creative writing.

Pop-up book media has the potential to stimulate students' interest in learning through captivating narratives. Students' tastes are taken into account while choosing font, color scheme, and drawing style to help them become more comfortable with the fictional characters. Pop-up book media is anticipated to be helpful in the science classroom, namely assisting teachers in providing pupils with content. Additionally, the utilization of pop-up book media can help children study science and can serve as a means of fostering a love of reading in them, which encourages them to read. Students' learning outcomes can be enhanced and their imaginations can be stimulated to comprehend the subject matter using pop-up book medium. Additionally, because pop-up book media involves pulling, pushing, folding, opening, and closing, it helps strengthen children' motor nerves.

It is a great idea to take into account students' preferences when choosing the typeface, color scheme, and drawing style for pop-up book media. This approach is in line with the concepts of personalized and student-centered learning. This incorporation of components focused on the needs of the learner not only improves comfort levels but also makes learning more immersive and interesting. The literature frequently lacks thorough investigation of the effects of design aspects on student engagement and comprehension within educational media, so this emphasis on personalization fills a possible study gap.

Pop-up book media's predicted utility in science classrooms adds a fresh perspective to the study. Although the literature now in publication recognizes the use of visual aids in science instruction, the particular emphasis on pop-up books as a means of imparting scientific knowledge constitutes a novel addition. One notable feature of this study is its potential to improve teachers' capacity to communicate difficult scientific ideas in an understandable and captivating way, as the researcher suggests.

Moreover, the notion that pop-up book media can function as an instrument for cultivating a passion for reading in kids presents an important point of thought. This claim is consistent with more general educational objectives that go beyond results related to a particular subject. Fostering a love of reading is a comprehensive goal that can have a positive effect on many aspects of a child's academic and psychological growth. This study's component fills a research vacuum since the relationship between pop-up book media, reading motivation, and general literacy abilities hasn't been thoroughly examined in the body of literature yet.

The focus on using pop-up book media to boost students' learning results and stimulate their imaginations highlights this approach's multifarious potential. The study highlights the possible influence on motor abilities in addition to acknowledging the cognitive benefits, particularly in understanding and imagination. This multimodal viewpoint adds to the research's uniqueness since it addresses a gap in the literature about the relationship between the development of motor and cognitive skills in the setting of pop-up books.

To sum up, this study is innovative because of the researcher's emphasis on personalization, the use of pop-up books in scientific classrooms, and the possibility of encouraging a love of reading. The specific use of pop-up books in science education, the limited investigation of design features in educational media, and the wider implications for reading motivation and literacy abilities are the areas of unmet research need. Our knowledge of the complex effects of pop-up book media on student engagement, learning outcomes, and holistic development could be greatly expanded by this study.

The purpose of this pop-up book media is to affect how well students learn about the human sensory organs. Students' behavior shifts from ignorance to knowledge as a result of their learning efforts are known as learning outcomes. Three dimensions of learning outcomes are discernible: cognitive, emotional, and psychomotor dimensions. This study only looked at cognitive learning outcomes to gauge students' comprehension. Both internal and external influences have an impact on the learning outcomes of students. One of the external variables is school, where the teacher's creation of knowledge has an impact. When pop-up books are utilized in the classroom, it can improve student learning outcomes, focus and interest in the topic, make it clearer and more engaging, and even encourage student engagement. In order to determine whether employing pop-up book media affects science learning results, consider the human senses.

CONCLUSION

The usage of pop-up book learning media (human sensory organs) on science learning outcomes in students has been found to have a good influence on boosting students' knowledge and learning outcomes. This conclusion is based on the findings of study conducted to address the formulation of the problem. Encouraging and interactive student participation in the classroom can effect enthusiasm and readiness to learn, which in turn affects student learning results. This is especially true when learning technology is used. This is evident from the student learning outcomes, which were 56.74 on the pretest and 77.79 on the posttest (which used pop-up books as instructional material). The difference between the pretest and posttest values was 21.05. Hypothesis testing confirms this difference; specifically, the t-test yielded a significant value (2-tailed) <0.05 or 0.000 <0.05, leading to the rejection of H0 and the acceptance of Ha. Therefore, it can be said that the use of pop-up book media in conjunction with human sensory organs has an impact on science learning results.

The study's empirical results highlight the beneficial effects of using pop-up book learning materials in conjunction with human senses on students' science learning outcomes. Because the study concentrated on solving the research topic that was defined, it made a substantial contribution to the body of information that already exists, especially in the area of technology-enhanced and interactive learning

approaches. The study fills a research void in the literature by highlighting the necessity of thorough studies into the effectiveness of certain learning media—like pop-up books—in conjunction with human sensory organs in order to enhance the results of science education. The pretest and posttest results show an increase in student learning outcomes, which suggests that pop-up books have the potential to be an effective teaching tool for improving students' knowledge acquisition. The statistical evidence of the efficacy of this novel strategy is provided by the significant difference of 21.05 seen between the pretest and posttest values. The robustness of the results is further supported by the use of hypothesis testing, more especially the t-test with a significant value <0.05. It is clear from the study's rejection of the null hypothesis (H0) in favor of the alternative hypothesis (Ha) that there is a causal link between better science learning outcomes and the use of pop-up book media.

The emphasis on student engagement and active learning strategies—which are supported by the combination of pop-up books and human senses—as well as their eagerness and readiness to learn are in line with current educational philosophies. This part of the research contributes to a deeper comprehension of the psychosocial variables affecting educational efficacy in addition to addressing the immediate learning objectives. As demonstrated by pop-up books, the creative fusion of tactile and sensory experiences in educational materials has a special opportunity to raise students' motivation and understanding of science.

The study's conclusions, taken together with human sensory organs, offer empirical evidence in favor of the beneficial effects of pop-up book learning media on science learning outcomes. The research's validity is strengthened by the statistically significant improvement in posttest scores and the meticulous use of hypothesis testing. This study adds to the body of knowledge by addressing a research void about the precise influence of pop-up books on science education results. It also emphasizes the significance of technology-enhanced and interactive learning approaches in modern educational environments.

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