JPPIPA 12(1) (2026)

Jurnal Penelitian Pendidikan IPA

http://jppipa.unram.ac.id/index.php/jppipa/index

Development of an Eye Health Literacy Module to Prevent the Negative Impacts of Gadget Use among Elementary School Students

Tasrif[1*], Arifuddin[1]

[1] Department of Sociology Education, Faculty of Teacher Training and Education, Nggusuwaru University, Bima, Indonesia.

Received: September 21, 2025
Revised: December 20, 2025
Accepted: January 25, 2026
Published: January 31, 2026

Corresponding Author:
Tasrif
tasrifaziz@gmail.com

DOI: 10.29303/jppipa.v12i1.12915

Open Access

Abstract: This study aims to develop and evaluate an eye health literacy module based on the ADDIE model and a Problem-Based Learning (PBL) approach to strengthen elementary school students' understanding of the negative impacts of gadget use. The research employed a research and development (R&D) design consisting of needs analysis, design, expert validation, implementation, and evaluation. A total of 72 students participated, selected purposively based on their high daily exposure to digital devices. The instruments, namely, an eye health literacy test and expert validation sheets were reviewed by specialists in education, health, and instructional media. Validation results yielded an average score of 87.6%, categorized as highly feasible. The effectiveness test demonstrated a significant improvement in literacy scores, increasing from 61.4 (pre-test) to 83.7 (post-test) ($t = 9.84$; $p < 0.001$). Indicator-based analysis showed consistent enhancement across basic eye-health knowledge, awareness of gadget-related risks, eye-care habits, preventive strategies, and positive health attitudes. These findings confirm that the module not only strengthens conceptual understanding but also fosters preventive behavioral change. The novelty of this study lies in integrating PBL with eye-health literacy materials tailored to students' digital routines, offering a contextual, interactive, and practice-oriented learning resource. Thus, this module is feasible, practical, and effective as an innovative educational medium and a preventive strategy to mitigate visual health risks associated with prolonged gadget use among elementary school students.

Keywords: Elementary school students; Eye health literacy; Gadget use; Learning modules; Problem-based learning

Introduction

The rapid growth of digital technology has transformed learning habits among elementary school students, who now rely heavily on gadgets for academic tasks and entertainment. Earlier national reports, including APJII data (Kuntarto et al., 2020), already showed substantial digital-device use among young learners even before the pandemic, indicating that current exposure is likely much higher. Excessive daily gadget use has been associated with several visual health problems such as eye strain, computer vision syndrome, and an increased risk of early-onset myopia (Sinurat et al., 2022; Syafi'in et al., 2021). These findings correspond with Shafa et al. (2025), who reported that children's awareness of eye-health risks remains low, leading to unhealthy visual habits that may persist into adolescence.

The increasing prevalence of visual impairment among school-aged children strengthens the urgency for systematic educational intervention. Various studies show that visual acuity problems in children range from 28% to 57% (Almahmoud et al., 2025; Karim et al., 2023), with children aged 7–12 being the most vulnerable due to the ongoing development of the visual system (Talebnejad et al., 2022). Preliminary observations at

How to Cite:
Tasrif, & Arifuddin. (2026). Development of an Eye Health Literacy Module to Prevent the Negative Impacts of Gadget Use among Elementary School Students. *Jurnal Penelitian Pendidikan IPA*, *12*(1), 666-672. https://doi.org/10.29303/jppipa.v12i1.12915

SDIT Uswatun Hasanah Woha and SDN Inpres Sakuru confirm these findings at the local level, where many students use gadgets for more than four hours per day and report symptoms such as tired eyes, headaches, and reduced clarity of vision. These patterns indicate that visual health issues caused by prolonged gadget use are not only theoretical concerns but also real challenges within the elementary school environment.

Educational intervention is therefore necessary to build students' understanding of eye health and promote preventive behaviors. Problem-Based Learning (PBL) offers a relevant pedagogical approach because it guides students to identify and analyze real-world health issues through inquiry and problem solving (Aulia et al., 2024). The integration of health literacy into primary education is strongly recommended in earlier research (König et al., 2022; Paakkari et al., 2019), while Mederer-Hengstl et al. (2024) demonstrate that PBL-based health instruction improves students' critical thinking, engagement, and preventive practices. However, studies examining the impact of gadget use on eye health (Pang et al., 2024; Sinurat et al., 2022) focus predominantly on medical and clinical perspectives and rarely propose structured, developmentally appropriate learning materials for elementary school students.

This gap highlights the need for educational resources that do not merely provide information but also actively train students to adopt healthier visual habits. Although several preventive strategies have been recommended, such as the 20-20-20 rule (Kaur et al., 2022), these have not yet been integrated into a comprehensive, student-centered learning module for the elementary level. Existing literature shows no evidence of a learning module that simultaneously addresses (1) real-life gadget-use problems, (2) eye-health literacy for children, (3) PBL-based learning activities, and (4) systematic development using the ADDIE model.

The novelty of this research lies in developing an Eye Health Literacy Module that integrates PBL with contextual eye-care practices derived from students' daily gadget use, supported by expert-validated content and evidence-based preventive strategies. Unlike conventional materials that focus solely on conceptual knowledge, this module incorporates reflective activities, hands-on routines, and problem-solving tasks designed to build sustained preventive behavior.

This research is important because the rapid increase in digital-device use among children is not matched by growth in their eye-health awareness or preventive practices. A structured, contextual, and developmentally appropriate module is therefore essential to bridge this gap and support both students' visual well-being and their long-term learning capacity in a digital era.

Method

Research Design

This study employed a Research and Development (R&D) design using the ADDIE model, consisting of Analysis, Design, Development, Implementation, and Evaluation. The model was selected due to its systematic structure and established effectiveness in guiding instructional material development (Yanti et al., 2025). The procedural flow used in this study is illustrated in Figure 1.

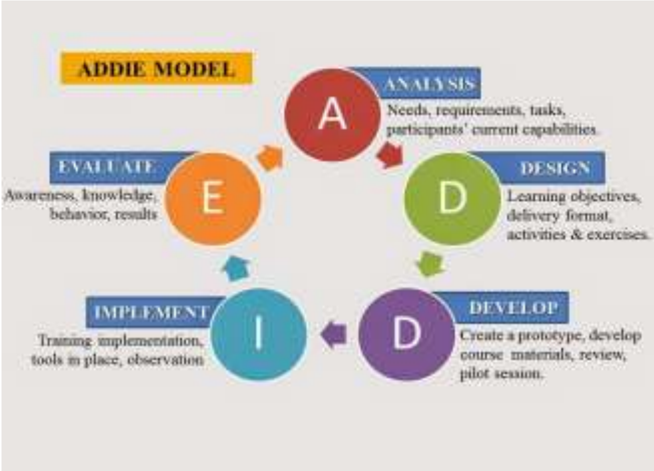

Figure 1. ADDIE model stage flow

Research Site and Participants

The study was conducted at SDIT Uswatun Hasanah Woha and SDN Inpres Sakuru. A total of 72 fourth- and fifth-grade students were selected using purposive sampling based on the following criteria: (1) High daily digital-device use (≥ 3 hours per day). (2) The presence of visual symptoms (tired eyes, headaches, blurred vision). (3) School reports indicating increasing eye-health complaints. (4) Age range 9–11 years, aligned with cognitive characteristics requiring contextual and visual learning (Thompson, 2018). (5) Teachers' confirmation of the absence of eye-health learning materials in the existing curriculum. Teachers and school medical personnel served as supporting informants during the needs assessment and validation phases.

Research Procedure

The research followed the complete ADDIE sequence:

Analysis

a) Identification of students' eye-health literacy needs through observations, questionnaires, interviews, and curriculum analysis.

b) Documentation of gadget-use patterns and visual-health concerns.

Design
a) Formulation of learning objectives.
b) Selection of Problem-Based Learning (PBL) as the instructional model.
c) Preparation of module structure, content outline, visual layout, and assessment instruments.

Development
a) Drafting the Eye-Health Literacy Module, including: conceptual content, case-based problems, illustrations, preventive strategies (e.g., 20-20-20 rule), and reflective tasks.
b) Expert validation by education specialists, eye-health professionals, and instructional-media experts.
c) Revision based on expert feedback.

Implementation

Implementation consisted of two testing stages:
a) Limited Trial: (a) Conducted with 15–20 students. (b) Focused on readability, clarity, feasibility of tasks, and general user response. (c) Followed by module refinement.
b) Field Trial: (a) Conducted with all 72 students. (b) Assessed module effectiveness, practicality, and usability in the actual classroom environment.

Evaluation
a) Formative evaluation throughout all stages.
b) Summative evaluation after the field trial to determine final module quality and performance.

Data Collection Instruments

Data were collected using: (a) Eye-health literacy tests (pretest and posttest), (b) Student and teacher questionnaires (practicality and responses), (c) Observation sheets, (d) Interviews, (e) Expert validation forms.

Data Analysis

Validity and Reliability

Validity testing was used to ensure that the research instrument actually measures the construct or aspect it is intended to measure. A valid instrument will produce accurate, consistent, and reliable data in describing students' eye health literacy skills. In this study, validity testing was conducted through expert judgment, including experts in the fields of education, eye health, and learning media. Each component of the instrument was assessed based on aspects of content suitability, indicator clarity, relevance to learning objectives, and appropriate language use. Expert assessment scores were then analyzed using the Content Validity Index formula to determine the level of validity of each instrument item. The validity formula can be seen below.

$$r_{XY} = \frac{N\sum XY-(\sum X)(\sum Y)}{\sqrt{(N\sum X^2-(\sum X)^2).(N\sum Y^2-(\sum Y)^2)}} \quad (1)$$

Information:
r_{xy} : Correlation coefficient
N : Number of respondents
XY : Product of item score (X) and total score (Y)
X : Item score
Y : Total score (sum of all items)
X^2 : Square of the item score
Y^2 : Square of the total score

The decision criteria for the validity test are as follows:
a) if $r_{count} > r_{table}$, the item is considered valid;
b) if $r_{count} < r_{table}$, the item is considered invalid.

Reliability testing is a method used to test the relationship between research variables. Instrument reliability testing can be conducted externally or internally. Externally, it can be conducted using test-retest, equivalent, and combined methods. Internally, it can be measured by analyzing the consistency of the components of the research instrument using specific techniques. The formula commonly used in conducting reliability testing is the KR-20 formula, as follows:

$$r_{11} = \left(\frac{n}{n-1}\right)\left(\frac{s^2-\sum pq}{s^2}\right) \quad (2)$$

information:
r_{11} : correlation coefficient of the entire test (reliability of the entire test),
n : number of items,
S : standard deviation of the test,
p : proportion of subjects who answered the item correctly,
q : proportion of subjects who answered an item incorrectly,
$\sum pq$: the sum of the results of multiplying p and q

Practicality Analysis

According to the Indonesian Dictionary, practicality refers to something efficient or easy to use. Arikunto (2019) defines practicality in educational evaluation as the degree of ease an instrument provides in preparation, use, interpretation, obtaining results, and storage. In this study, practicality was assessed through questionnaires administered to lecturers and students, using a four-point response scale ranging from "strongly disagree" to "strongly agree." The results were analyzed quantitatively by calculating the percentage of obtained scores based on the total ideal score, following the standard formula for practicality measurement.

$$p = \frac{f}{N} \text{ x } 100\% \quad (3)$$

Description:
p = posttest score
f = score obtained
N = maximum score

The calculation results are then categorized using the following table:

Table 1. Practicality Criteria

Percentage	Practicality Criteria
0 ≤ 20	Not Practical
21 ≤ x ≤ 40	less Practical
41 ≤ x ≤ 60	Quite Practical
61 ≤ x ≤ 80	Practical
81 ≤ x ≤ 100	Very Practical

Effectiveness Analysis

The effectiveness of the developed product in this study was analyzed using the N-Gain test, which provides an overview of the improvement in learning outcomes before and after the implementation of the product. The effectiveness of the Kaffah learning intervention can be evaluated through the normalized N-Gain value. The N-Gain is calculated using the formula proposed by Hake.

$$\text{N} - \text{gain} = \frac{S_{post} - S_{pre}}{S_{max} - S_{min}} \quad (4)$$

Information:
N-gain = Score gain
Spost = Score *post-test*
Spre = Score *pre-test*
Smax = Score maximal ideal

The N-gain values are categorized into high, medium, and low levels. The criteria for N-gain classification are presented in the following table.

Table 2. Gain Score Categories

N-gain value	Category of increasing score
>70%	High
30% - 70%	Medium
<30%	Low

a) A paired-sample t-test was conducted to compare pretest and posttest results.
b) The N-Gain Store was used to categorize learning improvement (high, moderate, low).
c) Effectiveness was determined by N-Gain ≥ 0.30 and a significant t-value ($p < 0.01$).

Result and Discussion

Result

Need Analysis Phase

The results of the needs analysis regarding gadget use and students' eye health complaints can be seen in Table 3.

Table 3. Intensity of Gadget Use and Students' Eye Health Complaints (N=72)

Indicator	Number of Students	Percentage
Gadget use > 4 hours/day	30	41.7%
Eyes get tired quickly	27	37.5%
Headaches	18	25.0%
Decreased visual acuity	9	12.5%

The needs analysis results indicate that the majority of elementary school students in the study area have a high level of gadget use. Of the 72 respondents, 41% used gadgets for more than four hours per day. The main symptoms experienced by students included eyestrain (37.5%), headaches (25%), and visual impairment (12.5%). Teachers, classroom teachers, and school medical staff also confirmed that students lack adequate awareness of the importance of maintaining eye health. This data underscores the urgency of developing contextual and applicable eye health literacy modules.

Module Design Stage

In the design stage, the module was constructed using a Problem-Based Learning (PBL) approach, incorporating five core components: introduction to real-life problems, conceptual understanding of eye health, practical activities such as the 20-20-20 rule, reflective exercises, and evaluations. The content was developed using simple narrative explanations, visual illustrations, and interactive activities to match students' developmental levels.

Validation Stage of the Eye Health Literacy Module

The developed module was validated by three experts: an education expert, an eye health expert, and an instructional media expert. The validation results showed an average score of 87.6% (very suitable), with the following details: content (90%), language (85%), presentation (88%), and illustration (87%). Several minor improvements were made to the use of medical terms to better suit students' understanding levels. The expert validation results are shown in Table 4.

Table 4. Results of the Eye Health Literacy Module Validation

Aspects Assessed	Score (%	Categor
Aspects Assessed	90,	Very Goo
Content	85,	Very Goo
Language	88,	Very Goo
Presentation	87,	Very Goo
Average	87,	Very Goo

Module Effectiveness Testing Stage

The pre-test results showed an average student eye health literacy score of 61.4, while the post-test results after using the module increased to 83.7. The paired t-test showed a value of $t = 9.84$, $p < 0.001$, which means there is a significant difference between the pre-test and post-test results. This proves that the eye health literacy module is effective because this module aims to improve elementary school students' knowledge and skills in maintaining eye health while using gadgets. The module's effectiveness was tested through pre- and post-tests. The results are shown in Table 5.

Table 5. Results of the Pre-test and Post-test of Eye Health Literacy (N=72)

Test Type	Mean Score	Description
Pre-test	61.4	Initial literacy score
Post-test	83.7	Score after module implementation

The analysis results showed a significant difference ($p < 0.001$), thus the module was declared effective in improving eye health literacy. The next step was to calculate the increase in eye health literacy per indicator: basic eye health knowledge, the impact of gadget use on health, eye health habits, and efforts to prevent eye disorders, as shown in Figure 2 with the average eye health literacy value per indicator.

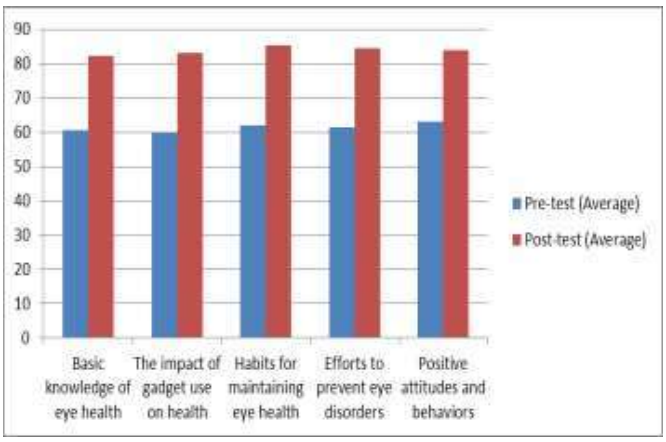

Figure 2. Average value of eye health literacy per indicator

Discussion

The findings of this study indicate that the development of an eye health literacy module based on the ADDIE model with a Problem-Based Learning (PBL) approach significantly improved the health literacy of elementary school students. The difference in pre-test and post-test scores confirms that the module is not only informative but also applicable and impacts behavioral change. PBL has been proven effective because it positions students as the primary actors who learn through real-life experiences and contextual problem-solving (Susilawati et al., 2025). This is crucial considering that eye health issues caused by gadget use are increasingly urgent to address in elementary schools, a critical phase of cognitive and social development.

The expert validation results, with a "very appropriate" rating, indicate that the module meets the standards for content, language, presentation, and illustration, appropriate to student characteristics. The developed module not only presents theoretical information but also integrates visualizations, reflective activities, and practical instructions relevant to students' daily lives. These results align with research by Liang et al. (2024), which confirms that presenting health materials through interactive media can increase children's cognitive and affective engagement. The integration of health literacy into primary education also adds to the academic contribution, as most previous research has focused on purely medical aspects, rather than school-based educational and preventive approaches (Januarti et al., 2024; Lee et al., 2024; Moon et al., 2022).

A more detailed discussion of each indicator reveals significant achievements. For the basic eye health knowledge indicator, the score increased from 60.5 to 82.3, indicating that the module effectively conveys information about the anatomy, function, and workings of the visual organs through simple language and engaging illustrations. This supports Vygotsky's view that learning media appropriate to students' zone of proximal development can accelerate the understanding of abstract concepts (Liang et al., 2025; Muliyadi et al., 2023).

The indicator for the impact of gadget use on eye health increased from 59.7 to 83.1. This demonstrates the module's success in raising students' awareness of the relationship between gadget use and physical symptoms such as eye fatigue, sleep disturbances, and decreased visual acuity. These findings align with Park et al. (2024), who emphasized that digital literacy integrated with health literacy can encourage children to be more critical in managing the duration of technology use.

For the eye health habits indicator, the score increased from 62.1 to 85.4, marking the highest achievement. This confirms that practice-based interventions are capable of encouraging preventive behavior changes, such as maintaining viewing distance, adjusting room lighting, and limiting the duration of gadget use. This improvement is in line with research by Rahman et al. (2024) which shows that learning strategies based on the context of everyday life are effective in forming healthy habits in early childhood students.

The indicator for eye disorder prevention efforts also increased significantly, from 61.4 to 84.6. The module provides practical understanding of the 20-20-20 rule, eye stretching exercises, and regular screen breaks. Students' ability to practice these strategies demonstrates the module's success in promoting experiential learning. This is consistent with the findings of Chen et al. (2023) which state that simple activity-based health education is more effective in developing preventive behaviors in children than conventional lecture approaches.

The final indicator, positive attitudes and behaviors toward eye health, increased from 63.0 to 83.9. These results demonstrate that the module not only emphasizes cognitive aspects but also fosters affective awareness in the form of discipline in maintaining eye health. This supports the opinion of Sari et al. (2024) who emphasized the importance of internalizing values through reflective and collaborative activities in health education. Thus, this module has proven to be able to integrate the dimensions of students' knowledge, skills, and attitudes in a balanced manner.

Thus, the results of this study not only enrich the academic literature but also have concrete implications for primary education policy. The developed module can serve as a reference for integrating health literacy into thematic curricula and as preventative strategy to mitigate the negative impacts of gadget use on primary school-aged children.

Conclusion

This study demonstrates that the development of the eye health literacy module using the ADDIE model and the Problem-Based Learning (PBL) approach is valid, practical, and effective for elementary school students. The module achieved a high feasibility rating based on expert validation across content, language, presentation, and illustration criteria. The practicality test also indicated that both teachers and students found the module easy to use, understandable, and applicable to classroom learning activities. The effectiveness evaluation showed a significant improvement in students' eye-health literacy, with the pre-test score increasing from 61.4 to 83.7 in the post-test, supported by a high N-Gain score categorized as "effective," and further reinforced by a t-value of 9.84 ($p < 0.001$). These results confirm that the module not only enhances conceptual understanding but also facilitates the development of healthier habits and preventive behaviors related to gadget use. The findings imply that eye health literacy education should be integrated into elementary school curricula, and future research is encouraged to implement the module on a broader scale and refine it through digital learning platforms.

Acknowledgments

The authors would like to express their deepest gratitude to the elementary schools, teachers, and students who participated in this research. We also extend our gratitude to the experts in education, eye health, and learning media who provided valuable input during the module validation process. Their contributions were instrumental in improving the quality and relevance of the developed product.

Author Contributions

Conceptualization, Tasrif and Arifuddin; methodology, Tasrif; software, Tasrif; validation, Tasrif, Arifuddin, and Feby Ansumarwaty; formal analysis, Tasrif; investigation, Tasrif; resources, Tasrif; data curation, Tasrif; writing—original draft preparation, Tasrif; writing—review and editing, Arifuddin and Feby Ansumarwaty; visualization, Arifuddin; supervision, Feby Ansumarwaty; project administration, Tasrif; funding acquisition, Tasrif and Feby Ansumarwaty. All authors have read and agreed to the published version of the manuscript.

Funding

This research was funded by the Ministry of Higher Education, Science, and Technology (Kemendiktisaintek) of the Republic of Indonesia through the Basic Research Scheme for Early Career Lecturers (PDDP) in 2025.

Conflicts of Interest

The authors declare no conflicts of interest. The funding agency had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results of this study.

References

Almahmoud, O. H., Mahmmod, K. M., Mohtaseb, S. A., Totah, N. J., Nijem, D. F. A., & Hammoudeh, A. N. (2025). Assessment of digital eye strain and its associated factors among school children in Palestine. *BMC Ophthalmology*, *25*(1), 81. https://doi.org/10.1186/s12886-025-03919-x

Arikunto, S. (2019). *Penelitian Tindakan Kelas*. Jakarta: PT Bumi Aksara.

Aulia, A. F., Rohmah, A. M., & Rahmawan, S. (2024). Meta-Analysis Of The Effectiveness Of Problem-Based Learning (PBL) Models At The Middle School Level. *Jurnal Pembelajaran Sains*, *8*(1), 36. https://doi.org/10.17977/um033v8i1p36-44

Januarti, I. M., & Muliyadi, L. (2024). Development of Ethnoscience-Based Student Worksheet Using the Guided Inquiry Learning Model to Increase

Students' Learning Motivation and Scientific Literacy: A Review. *International Journal of Science Education and Science*, *1*(1), 13–18. https://doi.org/10.56566/ijses.v1i1.109

Karim, A. N., & Santosa, A. (2023). Factors of Decreased Visual Acuity in Primary and Junior High School Students Aged 6-15 Years in the Working Area of Cimareme Community Health Center, West Bandung Regency. *Journal La Medihealtico*, *4*(4), 185–197. https://doi.org/10.37899/journallamedihealtico.v4i4.931

Kaur, K., Gurnani, B., Nayak, S., Deori, N., Kaur, S., Jethani, J., Singh, D., Agarkar, S., Hussaindeen, J. R., Sukhija, J., & Mishra, D. (2022). Digital Eye Strain- A Comprehensive Review. *Ophthalmology and Therapy*, *11*(5), 1655–1680. https://doi.org/10.1007/s40123-022-00540-9

König, L., Marbach-Breitrück, E., Engler, A., & Suhr, R. (2022). The Development and Evaluation of an e-Learning Course That Promotes Digital Health Literacy in School-age Children: Pre-Post Measurement Study. *Journal of Medical Internet Research*, *24*(5), e37523. https://doi.org/10.2196/37523

Kuntarto, H. B., & Prakash, A. (2020). DIGITAL Literacy Among Children In Elementary Schools. *Diakom : Jurnal Media Dan Komunikasi*, *3*(2), 157–170. https://doi.org/10.17933/diakom.v3i2.92

Lee, S., & Park, G. (2024). Development and validation of ChatGPT literacy scale. *Current Psychology*, *43*(21), 18992–19004. https://doi.org/10.1007/s12144-024-05723-0

Liang, J., Wang, J., & Yao, K. (2025). How Do Short-Form Video Creators Select Media Platforms? Research Based on the Extended UTAUT Model. *International Journal of Human–Computer Interaction*, *41*(14), 9083–9096. https://doi.org/10.1080/10447318.2024.2422762

Mederer-Hengstl, B., Núñez-Delgado, P., & Bueno-Cavanillas, A. (2024). Evaluation of Problem-Based Learning Experiences Addressing Health Promotion in the Fourth Grade of Primary School. *Children*, *11*(7), 807. https://doi.org/10.3390/children11070807

Moon, Z., Zuchowski, M., Moss-Morris, R., Hunter, M. S., Norton, S., & Hughes, L. D. (2022). Disparities in access to mobile devices and e-health literacy among breast cancer survivors. *Supportive Care in Cancer*, *30*(1), 117–126. https://doi.org/10.1007/s00520-021-06407-2

Muliyadi, L., Doyan, A., Susilawati, Hamidi, Hakim, S., & Munandar, H. (2023). Training on Using PhET Virtual Media on Newton's Law of Gravity for Class X Students at Islamic Senior High School of Syaikh Abdurrahman Kotaraja, East Lombok. *Unram Journal of Community Service*, *1*(1), 15–18. Retrieved from https://journals.balaipublikasi.id/index.php/jcss/article/view/68

Paakkari, L., & Okan, O. (2019). Health Literacy—Talking the Language of (School) Education. *HLRP: Health Literacy Research and Practice*, *3*(3), 161– 164. https://doi.org/10.3928/24748307-20190502-01

Pang, X., Wang, H., Qian, Y., Zhu, S., Hu, Y. A., Rozelle, S., Congdon, N., & Jiang, J. (2024). The association between visual impairment, educational outcomes, and mental health: insights from eyeglasses usage among junior high school students in rural China. *Scientific Reports*, *14*(1), 24244. https://doi.org/10.1038/s41598-024-72119-2

Shafa, A., Hafidz, Desti, A., Dikta, K., Dian, Z., Azzahra, A., Sagita, N., & Rahma, K. (2025). The Influence of Gadget Use on Early Childhood. *Bulletin of Islamic Research*, *3*(1), 165–176. https://doi.org/10.69526/bir.v3i1.181

Sinurat, B., Siahaan, P. B. C., Manalu, P., Hartono, H., & Sinaga, G. (2022). Gadget Use and Eye Fatigue on Students During COVID-19 Pandemic. *Jurnal Kesehatan Komunitas*, *8*(2), 285–292. https://doi.org/10.25311/keskom.Vol8.Iss2.1188

Susilawati, Doyan, A., Rokhmat, J., Muliyadi, L., Rizaldi, D. R., Fatimah, Z., Ikhsan, M., & Ardianti, N. R. (2025). Integration of Smartphone-Based Learning Media and Project-Based Learning to Enhance Creativity and Scientific Literacy in Physics. *International Journal of Information and Education Technology*, *15*(7), 1449–1459. https://doi.org/10.18178/ijiet.2025.15.7.2346

Syafi'in, S., & Suhita, B. M. (2021). Impaired Vision Function Due to Use of Gadget. *Journal for Quality in Public Health*, *4*(2), 83–86. https://doi.org/10.30994/jqph.v4i2.195

Talebnejad, M. R., Khalili, M. R., Tajbakhsh, Z., Masoumpour, M. B., Mahdaviazad, H., Mohammadi, E., Keshtkar, M., & Nowroozzadeh, M. H. (2022). The Prevalence and Causes of Low Vision and Visual Impairment in School-Aged Children. *Journal of Current Ophthalmology*, *34*(3), 333–340. https://doi.org/10.4103/joco.joco_153_21