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Developing an e-module to learn addition and substraction using Genially for students with special needs

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Abstract
Deaf children have auditory limitations and therefore rely more heavily on visual cues in their daily lives. For this reason, there is a need for media that can visualize mathematical concepts or materials. The aim of this study is to develop a learning modul for addition and subtraction topics and to assess the validity and practicality of the developed electronic module. We used the ADDIE R&D model which consists of five stages—analysis, design, development, implementation, and evaluation. We developed the e-module using Genially platform. The validity of the module was assessed by experts in mathematics education and inclusive education. Then, we tried out the module to seven fifth-grade deaf students at SLB Negeri 2 Bantul—a public school for students with special needs. The result of the validation by content experts got an average score of 4.2 (good), the validation by media expert got an average score of 4.16 (good), and the validation by teacher got an average score of 4.38 (very good). Moreover, the practicality testing got the average score of the students' response at 4.2 (small group) and 4.33 (field testing), which means the module is practical.

Keywords: deaf children, e-module, Genially platform, students with special needs

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INTRODUCTION

Children are blessings granted by the Almighty to parents. However, not all children are born with typical developmental conditions; some are identified as children with special needs (Putra et al., 2020; Rezieka et al., 2021; Ambarsari, 2022). Children with special needs have distinct characteristics and requirements compared to typically developing children, both in interaction and treatment. This group is often referred to as persons with disabilities. The term "disability" refers to the inability to use bodily functions optimally, while "differently-abled" emphasizes the diversity in how individuals' function (Syafrudin & Sujarwo, 2019). According to Maftuhin (2016), children with special needs may perform tasks in unique ways, though not in conventional forms. Common terms associated with special needs include disability, impairment, and handicap.

One prevalent type of disability among children is hearing impairment. Deaf children experience partial or complete loss of hearing function (Leton et al., 2021; Widinarsih, 2019). Physically, they appear similar to hearing peers, but communication reveals their impairment. It is essential to differentiate deafness from mutism; although many deaf children also experience speech delays due to limited language acquisition particularly vocabulary (Leton, 2018).

Mathematics, as an abstract subject, is often disliked even by hearing students, making its instruction to communication-impaired learners a unique challenge (Syafrudin & Sujarwo, 2019; Saputro & Febriani, 2023; Nurhanifah & Utami, 2021). Mathematics involves not only computation but also the understanding of mathematical symbols and their meanings (Rahmawati, 2024; Mustofa, 2021). The abstract nature of mathematics makes it difficult to comprehend for many students (Safira, 2018; Juliyanti & Pujiastuti, 2020). For deaf students, this challenge is exacerbated by the difficulty in communicating abstract ideas due to their limited vocabulary (Siregar, 2017; Mursalat et al., 2023).

Deaf students primarily rely on visual learning due to auditory limitations, earning the label "visual learners" due to their tendency to learn through visual and kinesthetic means (Yuniarsih, 2022; Dalimunthe, 2024; Syafarina et al., 2024). While auditory and speech limitations exist, these can be overcome by visualizing presented content. One method to address these challenges is the integration of media technology capable of illustrating abstract concepts.

Visual-based instructional materials can help deaf students identify objects and understand concepts through presented images. Such resources encourage analysis and interpretation, thus improving understanding in mathematics instruction (Syafrudin & Sujarwo, 2019; Muslimah, 2024; Pangestuti, 2023). Despite the effectiveness of visual aids, there is a notable scarcity of tailored instructional materials for deaf students. Therefore, it is necessary to develop contextual and specific visual-based learning modules.

RESEARCH METHOD

This study employs a research and development (R&D) approach. The development of the electronic module for the addition and subtraction of whole numbers was guided by the ADDIE model introduced by Robert Maribe Branch, which consists of five interconnected phases: Analysis, Design, Development, Implementation, and Evaluation. These phases are sequential and must be conducted comprehensively.

The research subjects consisted of seven fifth-grade deaf students from SLB Negeri 2 Bantul. The ADDIE model was implemented through the following steps:

(1) Analysis; we conducted interviews and observations to identify educational performance problems in order to create a product to address these issues. The analysis included curriculum analysis, material analysis, and needs analysis.
(2) Design; at this stage, learning objectives and goals for the electronic module were set. Teaching materials were designed using Microsoft Word, videos, animations, evaluations, stimulus questions, and illustrations related to whole numbers that are suitable for visual and kinesthetic learning.
(3) Development; materials were transferred from Microsoft Word to the Genially platform. Validation was conducted by subject matter experts and media experts, followed by revisions based on expert feedback.
(4) Implementation; the electronic module was piloted with a small group of students, followed by full implementation in an actual classroom setting with seven students. Practicality was assessed through student response sheets and teacher evaluation forms.
(5) Evaluation; the final phase involved evaluating the validity and practicality of the electronic module.

The product testing used a one-shot case study design, in which a treatment is given to a single group followed by observation. In the preliminary stage, four students were involved in the small group trial, after which revisions were made based on their feedback. The final product was tested with the full class of seven students to assess student responses to the developed media.

Both qualitative and quantitative data were collected. A Likert-scale questionnaire was used as the primary instrument for data collection, administered to media and material experts, teachers, and students. Descriptive qualitative analysis was used to interpret the quantitative scores. Expert validation and student feedback were analyzed to evaluate the electronic module's validity and practicality.

The module's validity and practicality were assessed using expert ratings following Widiyoko's (2018) classification system (See Table 1).

Table 1. The experts' judgement and response scoring

No	Score from experts	Criteria
1	$\underline{X} > 4.2$	Very good
2	$3.4 < \underline{X} \leq 4.2$	Good
3	$2.6 < \underline{X} \leq 3.4$	Not enough
4	$1.8 < \underline{X} \leq 2.6$	Poor
5	$\underline{X} \leq 1.8$	Very poor

From Table 1, we set the criteria that the module is valid and practical if the average score reaches at least at the "Good" criteria.

RESULTS AND DISCUSSION

Analysis

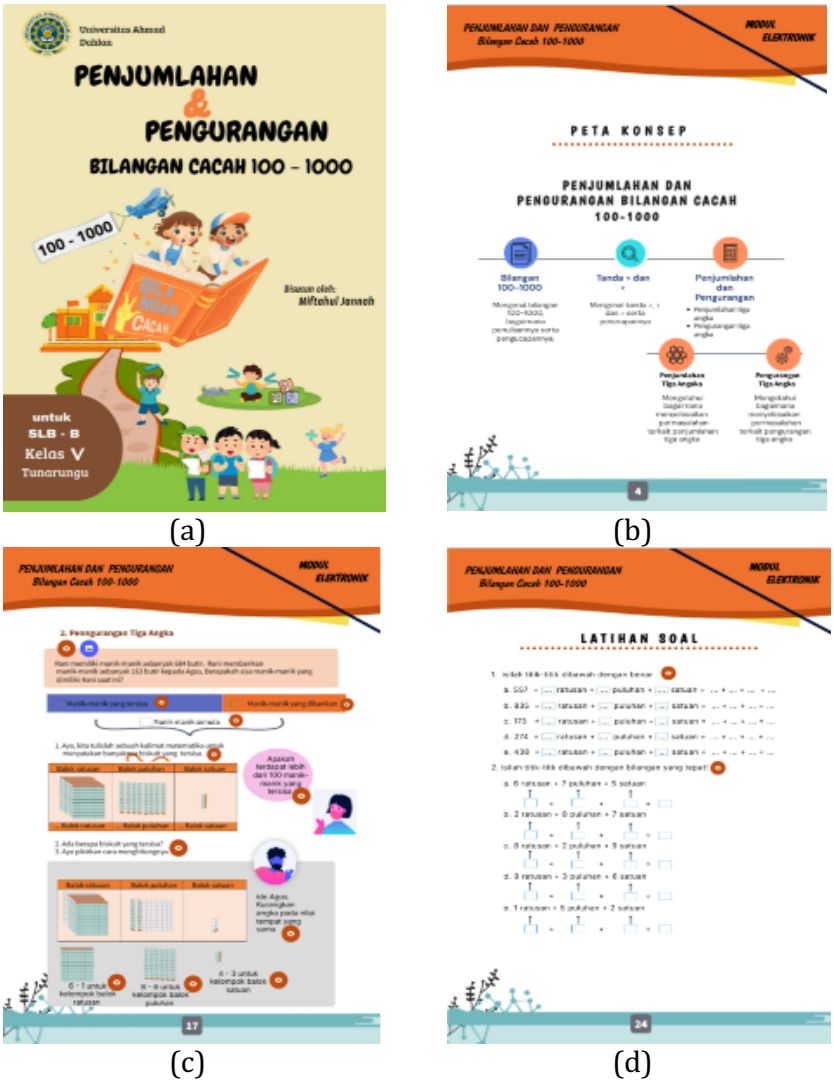
We identified that teachers require instructional media in the form of electronic modules capable of visualizing mathematical concepts. Consequently, a visual-based electronic learning module focusing on the topic of addition and subtraction of whole numbers (ranging from 100 to 1000) will be developed and implemented to meet the needs of deaf students, who are categorized as visual learners.

Design

In this stage, we designed the product as presented in Figure 1. Figure 1a shows the cover of the e-module which clearly states the topics of addition and substraction for whole number from 100 to 1000. It also suggests that the module is for 5^{th} grade students of elementary school, and specifically for students with hearing impairment.

Figure 1b shows the mapping of the topics discussed in the e-module, such as numbers from 100 to 1000, notation for "greater than" and "less than", addition and substraction operation, and the operation involving three digits number.

Figure 1c shows the example of the content page of the e-module, while Figure 1d shows the exercises for the students.



(a) (b) (c) (d)

Figure 1. The cover page (a), the content mapping (b), the sample of content page (c), and the exercises (d).

Develop

This stage involved the development of the instructional content initially designed in Microsoft Word into an interactive format using the Genially platform. Subsequently, a validation process was conducted by subject matter experts and media experts using pre-designed instruments.

Content validation

The content validation is presented in Table 2. The content expert evaluation yielded an average score of 4.2, categorized as "Good," with some suggested revisions.

Table 2. Content validation

Aspect	Score	Category
Content appropriateness	4	Good
Presentation appropriateness	4	Good
Language aspect	4.5	Very good
Average score	4.2	Good

Media validation
The media validation is presented in Table 3. The media expert validation resulted in an average score of 4.16, also classified as "Good," along with recommended improvements.

Table 3. Media validation

Aspect	Score	Category
Module size	4	Good
Layout	4.25	Very good
Design	4.4	Very good
Illustration	4	Good
Average score	4.16	Good

Practitionnaire validation
The module has also been validated by teacher (See Table 4). The evaluation conducted by the practitioner resulted in an average score of 4.38, classified as “very good,” with no revisions required.

Table 4. Teacher validation

Aspect	Score	Category
Content appropriateness	4.67	Very good
Presentation	4.25	Very good
Language	4.33	Very good
Graphic design	4.5	Very good
Average score	4.38	Very good

Implementation
This phase was carried out following the validation by experts. At this stage, the product was first piloted in a small group setting before being tested in the actual classroom. Subsequently, the practicality of the module was evaluated using student response sheets.

Small group testing
We tested the e-module to a small group consists of four students, and then asked them their testimonies using a questionnaire, with the results presented in Table 5.

Table 5. Small group testing results

Aspect	Score	Category
Benefit	4	Good
Material	4.5	Very good
Language	4.25	Very good
Presentation	4	Good
Attraction	4.25	Very good
Average Score	4.2	Good

Filed testing
We tested the e-module to a classroom consists of seven students, and then asked them their testimonies using a questionnaire, with the results presented in Table 6.

Table 6. Field testing results

Aspect	Score	Category
Benefit	4	Good
Material	4.38	Very good
Language	4.43	Very good
Presentation	4.07	Good
Attraction	4.79	Very good
Average Score	4.33	Good

Evaluation
The final stage involved conducting an evaluation. At this point, the researcher assessed the product that had been tested in the field. At the end of the stages, we found that the e-module still depends on the availability of the internet to be used. It is inline with the nature of the e-module that the students will access the video and pictures during the learning. Therefore, it makes a challenge for those who cannot access the internet at school. It creates a limitation in using the developed e-module.

Discussion
Genially is a website which enable us to create educative content, such as poster, video presentation, quiz, infographic, and games. When used as a platform to create electronic module, Genially offers various features to integrate visuals into the elearning. It helps the students—like the hearing impared—to process information by watching pictures and videos. Like the common modules, this e-module also enable the students to learn independently. Therefore, it is promising to implement it at the classroom to support the students with hearing impaired.

CONCLUSION
The development of the electronic mathematics module for fifth-grade deaf students at SLB Negeri 2 Bantul, using the ADDIE model and Genially platform, was found to be valid and practical. Validation scores from material and media experts, as well as practitioners, indicated a high level of quality. Student responses further confirmed the module's practicality for classroom use. It is recommended that future module development be enhanced using a premium Genially account for better quality and that the modules be distributed to students in PDF format for ease of access.

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