# DEVELOPMENT OF AN E-MODULE BASED ON THE SAVI LEARNING MODEL ON THE TOPIC OF BUFFER SOLUTIONS

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| Article Info | Abstract |
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| | This research aims to develop an electronic module (e-module) utilizing the SAVI (Somatic, Auditory, Visual, and Intellectual) learning model on the topic of buffer solutions for high school students. The study employs a 4-D development model, involving the stages of define, design, and develop. A needs analysis conducted at SMA Negeri 1 Pancur Batu revealed limited application of electronic learning media, highlighting the necessity for interactive and student-centered resources. The developed e-module consists of 39 pages, integrating multimedia components to address different student learning preferences. The feasibility of the e-module was evaluated through expert validation, involving two material experts and two media experts. The material validation achieved an average score of 78.37%, while media validation scored 88.3%. In addition, practical trials involving teachers and students showed positive responses, with teacher evaluations averaging 90.75% and student evaluations averaging 89%. The results indicate that the e-module is highly feasible and effective in enhancing student engagement and understanding of buffer solution concepts. This study concludes that integrating technology-based learning resources aligned with learning styles can improve the quality of chemistry education and foster more interactive learning experiences.<br><br>**Keywords:** Development, E-module, Buffer solution, SAVI |

## 1. Introduction

Students' critical thinking abilities are influenced by their individual learning styles. It is essential for educators to provide engaging instruction that fosters comprehension and stimulates students'

thoughts. The development of this understanding is shaped by the unique learning preferences of each student. An appropriate educational model can empower students to independently build their knowledge, as constructivist theory posits that the teacher's role is to facilitate the discovery of meaningful information, allowing students to formulate new ideas or concepts grounded in their personal experiences (Rasheed. F., Wahid. A, 2021).

The SAVI learning model is a notable approach that can be utilized in the education of children. The acronym SAVI stands for Somatic, Auditory, Visual, and Intellectual, which represent the various modalities of learning. According to Meier, the effectiveness and engagement of the learning experience are enhanced when all components of SAVI are incorporated.

Every student possesses a distinct method of acquiring, interpreting, and utilizing information, which leads to varying degrees of success in learning. This highlights the importance of educational models that cater to individual learning styles. Successful learning requires an acknowledgment of personal learning preferences and the implementation of strategies that correspond with each learner's inclinations. In light of this principle, the Somatic Auditory Visualization Intellectually (SAVI) learning model was created to identify personal learning preferences and develop strategies specifically designed for each student's characteristics. By integrating these three approaches, the SAVI learning model enhances comprehension and retention of information (Natsir, 2023).

The SAVI learning model offers several significant benefits. Firstly, it engages students' comprehensive intelligence by merging physical activity with cognitive tasks, thereby creating an enjoyable and stimulating learning environment that enhances retention. Secondly, it fosters creativity, enhances psychomotor skills, and optimizes student focus. Additionally, it boosts motivation for learning and encourages students to express their thoughts, as well as to ask and respond to questions. A notable advantage of this approach is its adaptability, making it suitable for various learning styles.

The advancements in technology have the potential to transform the traditional use of printed materials into digital format books that feature more appealing designs, enhanced interactivity, and cost-saving benefits. Consequently, there is a need to integrate these materials with electronic media, referred to as electronic modules (e-modules). E-modules are educational resources that are organized in accordance with the curriculum and are delivered through electronic devices such as computers and smart-phones. These modules can make the learning experience more engaging by incorporating images and videos, thereby facilitating a better understanding of the content for students. Additionally, e-modules include structured learning instructions, assessment methods, and conceptual explanations that are presented in a logical sequence, allowing students to review or revisit the material as needed (Rahman. L., Silaban. R & Nur. N, 2021).

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Based on the results of the interview, the teacher stated that some students were less active in the learning process. Most students did not listen and pay attention to the ongoing presentation. Students lack interaction and cooperation in groups with only some people dominating discussions and questions and answers with the teacher. The learning process carried out at school is still conventional and has a teacher center approach, where the teacher acts as the main driver in the learning process and the teacher does not utilize technology-based learning modules. So that most of the learning only applies auditory or listening learning styles.

Therefore, the author decided to develop an e-module as a form of utilizing technological developments. e-modules are developed based on SAVI and are expected to be used according to the needs of students.

## 2. Methods

The development of SAVI-based e-modules on the topic of buffer solution was developed using the research & development (R&D) method by applying the 4D model which refers to Thiagarajan (1974) with 4 stages, namely defining, designing, developing, and disseminating. In this study, the 4D model was adapted into 3 stages, namely defining, designing, and developing. This research was limited and carried out only up to the development stage and feasibility validation by material experts and media experts. feasibility assessment was carried out by 4 chemistry lecturers, of which 2 were material experts and 2 were media experts. Data collection techniques in this study were interviews, questionnaires, and documentation. The questionnaire used is a validation sheet to see the feasibility of learning media assessed by experts or practitioners. The rating scale on the validation sheet uses a Likert scale as in the table. Data collection from the results of learning media validation assessed by experts is obtained using a questionnaire method which contains a list of feasibility, suggestions, and input as improvements in improving the learning media that has been developed. The questionnaire assessment scale consists of five alternative answers, namely strongly disagree, disagree, less agree, agree and strongly agree. The total score and the final ideal score obtained from each validator will be converted into percentages. The percentage results of the data are then converted into a percentage form, then categorized based on the criteria in Table 1.

**Table 1.**

*Eligibility's Percentage*

| No | Achievement level (%) | Qualification | Description |
|:---:|:---:|:---:|:---:|
| 1 | 80 – 100 | Very good | Very good, no need to revise |
| 2 | 60 – 79,9 | Good | Good, no need to revise |
| 3 | 40 – 59,9 | Good enough | Good enough, no need to revise |
| 4 | 20 – 39,9 | Not good | Not feasible, needs revision |
| 5 | 1 – 19,9 | Very unfavorable | Not feasible, needs revision |

(Sari et al, 2020)

The aspects assessed by material experts focus on three main categories. The first category is **material suitability**, which examines whether the content aligns with the Core Competencies (KI), Basic Competencies (KD), and the specific learning objectives of the curriculum. This ensures that the material presented in the learning media is relevant and appropriate for the intended educational outcomes.

The second category is **media appropriateness**, which evaluates the compatibility of the learning media with the cognitive development level and characteristics of the students. This includes assessing whether the media is easy to use during classroom activities, whether the learning topics are presented clearly, and whether the media effectively motivates students to engage in the learning process.

The third category is **material quality**, which focuses on the clarity and comprehensibility of the content within the media. This involves assessing the clarity of the learning material, its effectiveness in helping students understand the concept of buffer solutions, and the overall ease of understanding the content. Additionally, this category evaluates the appropriateness of language used in the media and whether it contributes to increasing students' knowledge and comprehension of the subject matter.

The aspects assessed by media experts cover three main components: visual design, media material, and learning effectiveness. **The visual design** aspect evaluates the overall visual presentation of the learning media, including the attractiveness of the cover design, clarity and engagement of illustrations, and the structured presentation of visual elements. It also assesses the relevance of illustrations to the learning material, consistency in character and background design, the appropriateness of color proportions, and the balance between text and images. Furthermore, this

aspect considers the suitability of font type and size, the proper selection of supportive images, and the use of simple, easily understandable sentences throughout the media.

The media material aspect focuses on the practicality of the learning media, emphasizing ease and safety of operation, as well as portability. This ensures that students and teachers can access and use the media conveniently in various learning environments.

The learning aspect assesses how well the media aligns with the cognitive development level of students and its ability to motivate students during learning activities. This includes evaluating whether the media promotes engagement, facilitates understanding, and supports an interactive and enjoyable learning experience. By covering these three aspects, the validation ensures that the developed media is effective, user-friendly, and educationally impactful.

The aspects of student assessment include several key points. First, the ease of using learning media through mobile phones or laptops is considered. Second, the appearance and design of the learning media are evaluated. Third, the relevance of the teaching materials in the media to the learning objectives is assessed. Fourth, the suitability of the provided materials with the learning goals is examined. Fifth, the content of the media must align with the subject matter. Sixth, the language used in the media should be clear and easy to understand. Seventh, the problems presented in the media should be related to everyday life situations. Eighth, the learning media should facilitate chemistry activities, such as identifying problems, seeking information, and solving problems. Ninth, the presentation of materials within the media should significantly support students in strengthening their understanding of concepts. Tenth, the learning media should assist students in solving problems that arise during chemistry lessons. Eleventh, the attractiveness of images and storytelling within the media is also considered. Twelfth, the availability of evaluation tools within the learning media is important. Thirteenth, the alignment of evaluation questions with learning objectives is reviewed. Fourteenth, the learning media should be appropriate for the cognitive development level of students. Lastly, the learning media should motivate students in their learning activities.

The assessment aspects used by the teacher are as follows. The first aspect is Content Feasibility, which includes the suitability of the material presented in the media with the basic competencies and learning indicators, the relevance of the material to students' needs, the alignment of the material with teaching resources, and the appropriateness of the material to the characteristics of the students.

The second aspect is Language, which focuses on the clarity of information presented in the media and the appropriateness of the language used.
The third aspect is Material, which assesses the ease with which students can understand the concepts, the motivation generated after learning with the media, the clarity of the learning topics, and the scope of the material covered in the media.

The fourth aspect is Media Design, which includes the clarity of font types and sizes, the accuracy of layout and organization, the use of engaging illustrations, graphics, images, and photos, the attractiveness of the media, and the safety and comfort of using the media in the learning process.

## 3. Result and Discussion

### 3.1 Develop E-Module
The developed learning media is an e-module based on the SAVI Learning Model. The e-module has a file size of 4.55 MB and consists of 39 pages. The SAVI-based e-module was created through several stages, following the Four-D (4D) development model, which has been adapted into the stages of define, design, and develop.

The define stage represents the initial phase aimed at analyzing the needs of both students and teachers. The data collected will serve to formulate appropriate media content and the necessary features to enhance student comprehension. During this phase, the researcher conducts a needs analysis for both teachers and students. The selected topic is buffer solutions. Observations and interviews revealed that the use of electronic learning media is still infrequent at SMA Negeri 1 Pancur Batu. Furthermore, the development of SAVI-based e-modules is anticipated to support and accommodate the diverse learning styles of students. Consequently, the researchers have decided to develop an electronic learning module (e-module) based on the SAVI approach for the topic of buffer solutions.

Design stage, the selection of media occurs after identifying the problems and solutions, as well as reviewing the stages preceding the design phase. In this research, the chosen media is the e-module. The e-module was selected to address the issues associated with traditional textbooks, which are often bulky and less effective. Furthermore, the widespread use of smartphones among students, along with the varying learning styles and types of intelligence among learners, necessitates this choice. The e-module incorporates the concept of multiple intelligences, which is expected to facilitate students' understanding of the complex subject matter of chemical elements, characterized by an extensive vocabulary. Additionally, the e-module is equipped with various features and activities that cater to different types of intelligence and learning styles of the students.

Development stage involves the development of the e-module learning media in accordance with the flowchart and storyboard created during the design phase. Subsequently, an assessment instrument for the feasibility of the e-module, along with a scoring rubric, is prepared to serve as a reference for evaluation. This assessment instrument and rubric are then validated by a validator to determine their suitability. Once validated and deemed appropriate for use, the instrument is employed to evaluate the e-module's feasibility by media and content experts, as well as by teachers and students.At this stage, the product will be assessed for its feasibility and receive feedback from media and content experts. Additionally, responses will be gathered from the learners, with a total

of 29 participants providing input. The critiques and suggestions received will guide the revision of the final product. The final e-module product is presented in PDF format, with a file size of 4.55 MB and a total of 39 pages.

## 3.2 Eligibility of E-Module

The validation of the e-module conducted by the researchers involves assessment and evaluation performed by experts in the relevant field to ensure that the e-module meets the standards of quality, accuracy, relevance, and alignment with the established learning objectives. The validation process utilizes instruments in the form of questionnaires. The e-module as a learning medium undergoes validation by two subject matter lecturers, two media validation lecturers.

The validation of materials involves a systematic assessment and evaluation conducted by experts in the relevant field to ensure that the material meets quality standards, accuracy, relevance, and alignment with established objectives. This process aims to test the suitability of the material prior to its use or publication, thereby ensuring that it is appropriate, effective, and free from errors. Material validation encompasses the evaluation of various aspects, including educational and content-related factors. The experts conducting the validation provide feedback, suggestions, or recommendations for improvement, which are then utilized to refine the material. In this instance, the validation of the material was carried out by two chemistry lecturers. The outcomes of the validation may conclude that the material is suitable for use, requires minor revisions, or is deemed unsuitable and needs to be restructured. Therefore, material validation is a crucial step in ensuring that the developed content is of high quality, effective, and meets the needs of the users or audience, thefollowingresults were obtained on figure 1:

**Figure 1.**
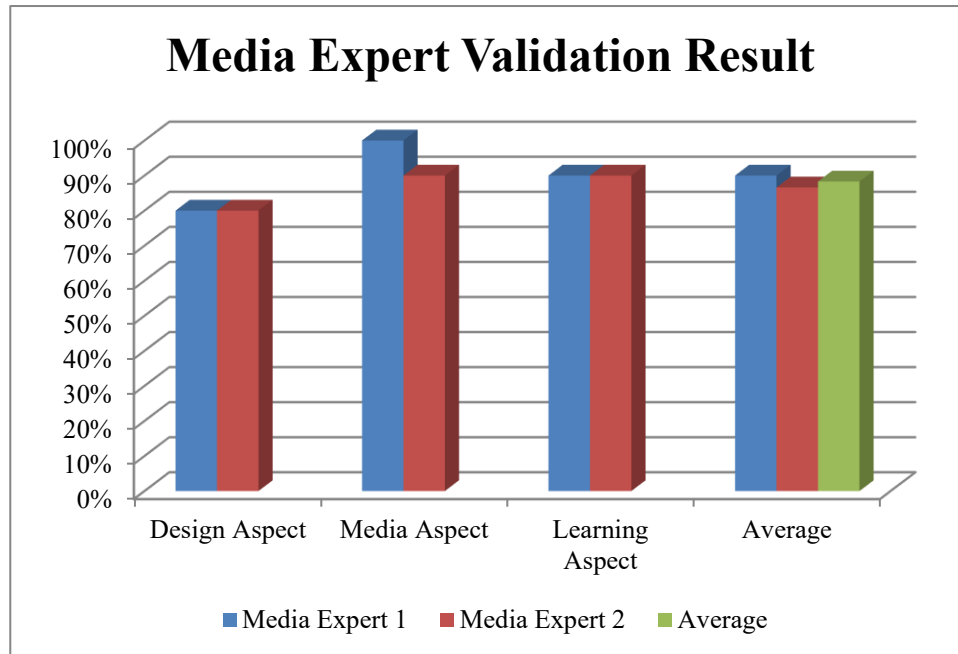
*Material Expert Validation Result*
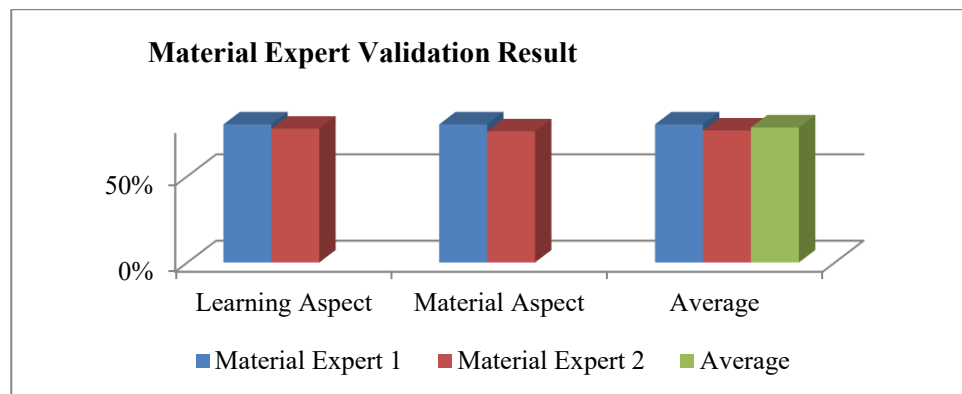
Based on the results diagram above, the results of validation by material expert 1 obtained an average percentage of 80% which means that the e-module developed is very good and does not need to be revised. Based on the results above, the learning aspect gets an average of 80% of the assessment with the aspects assessed in the form of material suitability, material clarity and material completeness. The material aspect gets 80% of the average assessment with the aspects assessed in the form of material content, language use and material presentation. Learning aspects and material aspects get an average percentage from material expert 1 which is 80%. From the results of validation by material experts 2, an average score of 76.75% was obtained, which means that the e-module developed is good and does not need to be revised. With details of the eligibility percentage of 77.5% in the learning aspect and 76% in the material aspect.So, from the average assessment of material experts 1 and 2, a total average score of 78.25% is obtained.

Based on the assessment results obtained, the E-module on the topic of buffer solution developed is considered feasible in terms of material and delivery of learning to be used as learning support media. The material in the e-module is presented with several models so that teachers can apply with several methods, namely lectures (auditory), barcodes (visual) which can be connected directly to learning support videos, group discussions (somatic) where the results of group discussions are presented in front of the class, and presentation of evaluation questions in the form of multiple choice (intelligence) equipped with answer keys and discussions, so that students can adjust the results of the work they do. The suggestions given by the material validator were used as an evaluation to improve the previously prepared material and the researcher improved the material based on the suggestions and improvements from the previous material validator. The material expert also gave a positive assessment of the developed e-module which supported the feasibility of the e-module to be used and developed further. Material experts also provide an assessment in the form of suggestions and improvements that can improve the e-module. As in the learning aspect, although both experts gave a good assessment, the material expert still gave suggestions in the form of providing answer keys and discussions, typing formats and providing strong and weak acid base information tables.

The validation results from media experts typically culminate in a conclusion regarding the media's suitability for use, which can serve as a basis for revisions or improvements before the media is implemented in the learning or communication process. Consequently, validation by media experts is a crucial step in ensuring that the developed media is of high quality, relevant, and capable of achieving the desired objectives. The validation is carried out by two faculty members, specifically a chemistry lecturer. Media expert validation was carried out by two chemistry lecturers, and the results are as follows on figure 2:

**Figure 2.**
*Media Expert Validation Result*



From the results of validation by media experts on diagram above, thee result from media expert 1 got an average percentage of 90% was obtained, which means that the e-module developed is very good and does not need to be revised. Based on the data above, it can be seen that the largest percentage of assessment received a score of 100%, namely in the media aspect, the display aspect received a percentage of interest of 80% and 90% in the learning aspect. From the results of validation by media experts 2, an average percentage of 86.6% was obtained, which means that the e-module developed is very good and does not need to be revised. Based on the data above, it can be seen that the largest percentage of assessments scored 90%, namely in the media aspect and learning aspect, and the display aspect received a percentage of attractiveness of 80%.The media validator assesses several aspects, including:

- Visual Aspect: In this aspect, the validator assesses the media interface design, including layout, use of color, typography, and other visual elements. The goal is to ensure that the media display is attractive, intuitive, and easy for users to navigate.
- Media Content Aspect: The validator evaluate show the content is presented in the media, including the use of text, images, audio, and video. The goal is to ensure that the content is presented clearly, concisely, and easily understood by users.
- Learning Aspect: In this aspect, the validator assesses how the media is designed to facilitate the learning process, including interactivity, feedback, and navigation. The goal is to ensure that the media is effective in conveying information and helping users achieve learning goals.

Based on the results above, the average value of the assessment of the two media validators is 88.3%. The validators also provided positive and supportive suggestions that can be used as a means of improving and perfecting the e-module.

## 4. Conclusion

Based on the research and development process of e-module-based learning media, it can be concluded that the need for electronic learning media in schools is still quite high. This can be seen from the results of interviews and observations which show that the use of conventional media such as physical books is still dominant, so learning tends to be teacher-centered. In addition, the diverse learning styles of students also require learning media that can support these needs. SAVI (Somatic, Auditory, Visual, Intellectual) based e-modules on buffer solution materials were developed using the 4-D model which was adjusted into three stages: Define, Design, and Develop. At the Define stage, the needs of students and teachers were analyzed through interviews. The Design stage involves designing e-modules with concept maps, while the Develop stage includes developing e-modules and preparing assessment instruments to evaluate feasibility and student interest.

The results of validation by material experts and media experts show that this e-module is included in the very feasible category, with a feasibility percentage of 78.37% by material experts and 88.3% by media experts. In addition, the responses from teachers and students to the developed e-modules were also very positive, with an average teacher assessment of 90.75% and students of 89%. Thus, this SAVI-based e-module is considered interesting and feasible to use in learning. Overall, this e-module can be a solution to support learning that is more interactive and in accordance with student learning styles, while reducing dependence on conventional learning media.

The dissemination stage was not conducted due to the limited scope and focus of the current development process, which prioritized the design, validation, and initial testing of the learning media. The primary objective was to ensure that the product met basic quality standards, such as content validity, usability, and alignment with learning objectives, before wider distribution.

**Direction for Further Development:**
In future development stages, dissemination will be prioritized through a structured plan. This includes:
- Conducting broader trials involving multiple schools or educational institutions to gather more comprehensive feedback.
- Organizing workshops or training sessions for teachers on the effective use of the learning media.
- Enhancing the media based on feedback from larger and more diverse user groups to ensure general applicability and effectiveness.
- Collaborating with educational authorities to integrate the media into school curricula.

- Publishing the results in educational forums or journals to promote awareness and encourage adoption by a wider community of educators.

This approach ensures the learning media can be continuously improved and effectively utilized in real classroom settings on a wider scale.

## 5. Acknowledgments

## 6. References

Arvianto, F., Slamet, Y., Andayani. (2023). Designing an Instrument to Measure Digital Literacy Competence Using the 4D Model. *International Journal of Instruction* , 845-860.

Ismawanti et al. (2022). The Effect of SAVI Learning Model on Students' Critical Thinking Skills. *International Journal of Recent Educational Research* , 239-247.

Kusumaningrum. I & Kristyasari. M. (2022). Misconceptions About Buffer Solutions. *Journal of Educational Chemistry* , 99-108.

Nainggolan, M.,Tanjung, D., Simarmata, S. (2022). Pengaruh Model Pembelajaran SAVI terhadap Hasil Belajar Matematika Siswa di Sekolah Dasar . *JURNAL BASICEDU* , 2617 - 2625 .

Natsir, T.,Rasyid, A & Bassey, S. (2023). The SAVI Learning Model and the 21st Century Skills: Developing Critical Thinking, Collaboration, and Creativity in Students Vocational High School. *International Journal of Environment, Engineering and Education* , 27-34.

Ngalimun, M. F. (2017). *Strategi Dan Model Pembelajaran.* Banjarmasin: Aswaja Pressindo.

Rahman. L., Silaban. R & Nur. N. (2021). Development of E-Module Assisted Chemistry Flip Pdf Professional for Non-Metal Chemistry Learning on the Subject of Carbon and Silicon. *Duconomics Sci-meet (Education & Economics Science Meet)* , 185-191.

Rahmawati, K. (2022). Pengaruh Model Pembelajaran SAVI (Somatic, Auditory, Visual, Intelectual) Berbantuan Media Power point Terhadap Hasil Belajar Bahasa Indonesia Siswa Kelas IV. *JURNALBASICEDU* , 4574-4581.

Rasheed. F., Wahid. A. (2021). Learning style detection in E-learning systems using machine learning techniques. *Expert Systems With Applications* , 1-12.

Riyanti, E. (2021). Penentuan Sifat Larutan Asam, Basa, Dan Garam Dengan Indikator Ekstrak Daun Tanaman Hias. *Academia : Jurnal Inovasi Riset Akademik, 1* (2), 177-183.

Sari, M.Z., Ginawan A., Fitriyani, Y., Hilaliyah, N. (2020). Pengaruh Minat Baca SiswaTerhadap Hasil Belajar Pada Pelajaran Bahasa .*Jurnal Dwija Cendekia* , 197-205.

Silaban, R., Sitorus, M., Panggabean, F. (2022). The Development of Electronic Module Based on Scientific Literacy on Colloidal Topic. *International Journal of Computer Applications Technology and Research* , 223-230.

Siregar, T. (2023). Tahapan Model Penelitian Dan Pengembangan Research And Development (R&D). *Journal of Education, Social Sciences & Humanities* , 142-158.

Sugiyono. (2019). *Metode PenelitianKuantitatif.* Jawa Timur: Alfabeta.

Sujana, I. (2019). Fungsi Dan Tujuan Pendidikan Indonesia . *Adi Widya: Jurnal Pendidikan Dasar* , 29-39.

Usman, J and Ibrahim, L. (2023). Augmenting the Quality of Acehnese Knowledge-Based EFL Material through a 4D Model. *Studies in English Language and Education* , 1342-1357.

Virliantari, D., Maharani, A., Lestari, U., Ismiyati . (2018). Pembuatan Indikator Alami Asam-Basa Dari Ekstrak Kulit Bawang Merah (Allium ascalonicum L.) . *Jurnal Universitas Muhammadiyah Jakarta* , 1-6.

Yusuf, M. (2023). Development of Arabic Language Teaching Materials With 4D Model for the Second Semester at STAI Al-Furqan Makassar. *Bulletin of Science Education* , 152-170.