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Development of E-module on *Classification Game* (SIGAME) as Student Learning Resource

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Abstract

This study aims to develop an e-module integrated into the educational game named Classification Game (SIGAME) and to analyze validation results from experts and practitioners. The research employed a Research and Development (R&D) method using the ADDIE model, limited to the stages of Analysis, Design, and Development. The final product was an e-module on living things classification for seventh-grade students, designed as a component of the educational game. Research instruments included needs analysis questionnaires, validation guidelines, and product assessment sheets. The data were analyzed descriptively through both qualitative feedback and quantitative scoring from validators. Findings revealed that the e-module contained complete components such as interactive materials, exercises, answer keys, and summaries. Subject matter experts rated the module as excellent in terms of language, presentation, and content accuracy, although the scope of material remained limited. Media experts evaluated graphical design, interactivity, and layout as highly suitable for junior high school students. Practitioners rated the e-module as highly effective and contextually relevant for classroom use. The e-module serves as a self-learning resource that strengthens students' understanding before playing the game. Interactive components and evaluation exercises allow students to independently measure their achievements while increasing their motivation to learn through integration with technology-based applications. It can be concluded that the SIGAME e-module is "Very Adequate" for use in the next development stage, namely testing its practicality and implementing learning in schools, as an independent learning resource that supports mastery of the concept of classifying living things.

Keywords: *E-module; Educational Game; Learning Resources; Junior High School Students*

Abstrak

Penelitian ini bertujuan mengembangkan e-modul pada game edukasi *Classification Game* (SIGAME) serta menganalisis hasil validasi dari ahli dan praktisi. Model penelitian yang digunakan adalah Research and Development (R&D) dengan pendekatan ADDIE yang dibatasi hingga tahap Analysis, Design, dan Development. Produk yang dihasilkan berupa e-modul materi klasifikasi makhluk hidup untuk siswa SMP kelas VII yang diintegrasikan ke dalam game edukasi. Instrumen penelitian berupa angket analisis kebutuhan, pedoman validasi, dan lembar penilaian produk. Data dianalisis secara deskriptif kualitatif dan kuantitatif melalui masukan validator serta skor hasil penilaian. Hasil penelitian menunjukkan e-modul memiliki struktur lengkap berupa materi interaktif, latihan soal, kunci jawaban, dan rangkuman. Ahli materi menilai e-modul "Sangat Layak" dari aspek kebahasaan, penyajian, dan kebenaran konsep meskipun cakupan materi masih terbatas. Ahli media menilai kualitas kegrafikan, interaktivitas, dan desain e-modul "Sangat Layak" serta sesuai karakteristik siswa SMP. Praktisi memberikan penilaian "Sangat Layak" dari segi kontekstualitas dan kebermanfaatan untuk pembelajaran. E-modul berfungsi menjadi sumber belajar mandiri yang memperkuat pemahaman siswa sebelum memainkan game. Komponen interaktif dan latihan evaluasi memungkinkan siswa mengukur capaian secara mandiri sekaligus meningkatkan motivasi belajar melalui integrasi dengan aplikasi berbasis teknologi. Dapat disimpulkan bahwa e-modul SIGAME layak digunakan pada tahap pengembangan selanjutnya, yaitu uji kepraktisan dan implementasi pembelajaran di sekolah, sebagai sumber belajar mandiri yang mendukung penguasaan konsep klasifikasi makhluk hidup.

Kata Kunci: *E-module, Game Edukasi, Sumber Belajar, Siswa SMP*

1. INTRODUCTION

Classification of living things in biology is often a challenge for students and junior high school teachers. This material requires careful observation skills. Understanding the concepts in this material cannot be obtained instantly, but rather through systematic reasoning stages. Students must be able to distinguish the characteristics of living things, group them based on the similarities and differences found, classify them at the taxonomic level, and even name each species. This process requires a fairly high analytical ability for junior high school students (Sari et al., 2023). In addition to students, several junior high school teachers even stated that classification material is the most difficult material to understand. The results of Insani (2016) study of science teachers in Malang City showed that the classification of living things is the most difficult material compared to other materials.

Preliminary research at a high school in Sragen Regency indicates that this material is classified as difficult in biology. Twenty-seven percent of 344 students in the 2017/2018 academic year stated that this material was difficult. This statement is supported by the learning outcomes of these students, which fell short of the Minimum Completion Criteria (KKM). Therefore, special models, methods, strategies, and learning media are needed to facilitate the learning process for this material (Kurniawan & Risnani, 2021; Masykhur & Risnani, 2020).

Independent learning resources are a crucial component in learning the classification of living things. Learning activities in this subject are difficult to achieve solely through brief teacher explanations in class. Students need additional learning resources that they can access independently. Independent learning resources allow students to repeat explanations, read the material more coherently, and reinforce their understanding through exercises. This type of independent learning helps students adjust their learning pace to their individual abilities. Therefore, the availability of independent learning resources relevant to the classification of living things is essential to improving mastery of concepts and applications of the material (Adawiyah & Kartika, 2021; Prastowo, 2013).

The subject of classification of living things also requires engaging media to prevent students from getting bored easily. Fun and interactive media can help students understand the concept of classification more easily (Smaldino, 2017). Educational games are one of the appropriate media because they can present learning in the form of easy-to-understand simulations. Through games, students feel challenged to achieve high scores in the game but remain motivated to learn the material of classification of living things in a fun way (Hirumi, 2014; Lantzouni et al., 2024). One effort to address this need is by developing a game as an innovative learning medium for the material of classification of living things, named SIGAME (Classification Game). The presence of this game is expected to make the learning process more effective, interesting, and at the same time improve students' understanding of concepts.

games are often not developed without e-modules. Most researchers simply add a "materials" menu to help students learn the material. However, the material presented is usually in-depth. Examples include Syafruddin et al. (2021), who developed a game about the environment and presented the material concisely. Second, Prayitno et al. (2022), who developed a biology game on the circulatory system, with one of the main menus being the "materials" menu, but the discussion of the material is very brief. Third, Kurniawan & Risnani (2021) also presented very brief material on the development of a game related to plants. Fourth, the educational game on the topic of Animalia, developed by Masykhur & Risnani (2020), also only presented the material in summary form, thus lacking depth. Unlike these four learning media developments and several other related studies, the material in SIGAME is presented in e-module form with a more comprehensive discussion and accompanied by e-module components.

E-modules are crucial to develop alongside educational games. They need to be studied before playing educational games. E-modules serve as a foundation for students to understand classification concepts coherently and systematically. The understanding gained from e-modules allows students to more easily connect the material to the game activities in SI GAME. This allows students to learn meaningfully, not just play. Furthermore, e-modules foster independent learning

because students become accustomed to reading, understanding, and mastering the material independently. This approach allows educational games to function optimally to strengthen and evaluate understanding, while also providing enjoyable entertainment for students. Based on this background, this study was conducted with the objectives of 1) developing an e-module for the SIGAME educational game, and 2) analyzing the validation results from experts and practitioners on the development of the e-module for the SIGAME educational game.

2. METHOD

2.1. Research Design

The qualitative research, such as classroom action research, case studies, and so forth, need to mention the researcher attendance, research subject, and participated informants, as well as the methods used to explore the data, research location, research duration, and the description of research results validation. It is suggested that the authors avoid organizing the article content into the smaller parts than second subheading in this section. However, in the case of unavoidable factors, the writing style must follow the "Results and Discussion" section.

2.3. Research Procedure

This research is a research and development (R&D) using the ADDIE (Analysis, Design, Development, Implementation, Evaluation) development model (Aldoobie, 2015). However, the research was only conducted up to the ADD stage, while the Implementation and Evaluation stages were not carried out as shown by the Research Flow in Figure 1.

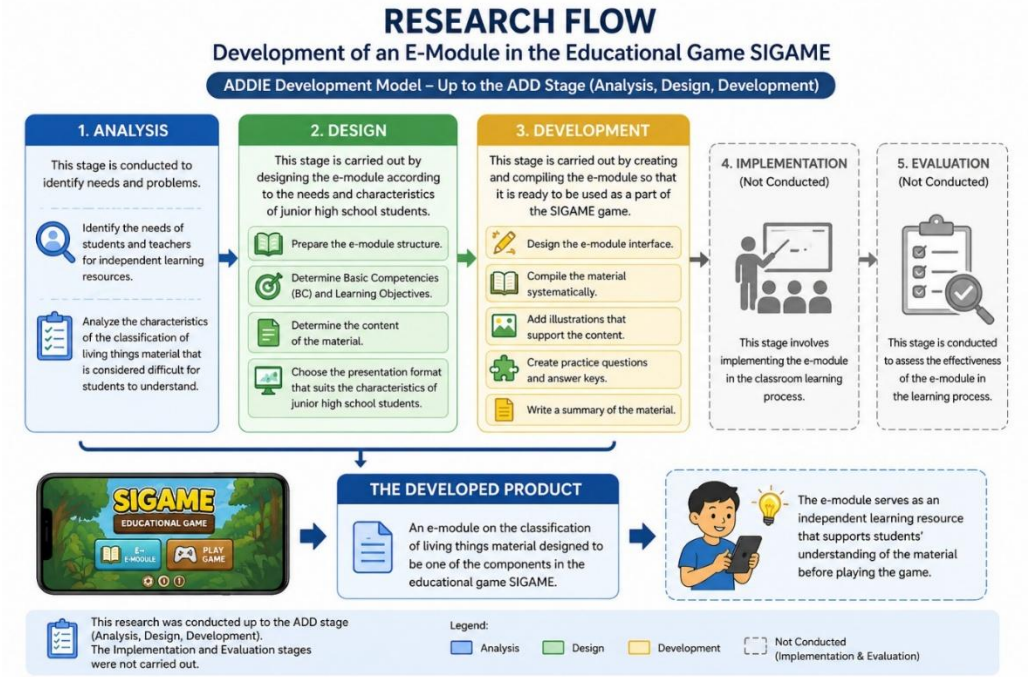


Figure 1. Research Flow

The product developed is an e-module on the material of classification of living things designed to be one of the components in the educational game SIGAME. The analysis stage was carried out to identify the needs of students and teachers for independent learning resources and to analyze the characteristics of the classification of living things material that was considered difficult to understand. Next, the design stage was carried out by compiling the e-module structure, determining basic competencies, learning objectives, material content, and choosing the material presentation format to suit the characteristics of junior high school students. The design stage included designing the e-module, systematically compiling the material, adding illustrations, creating practice questions along with answer keys, and writing a summary. This e-module was prepared so that it could be included in the SIGAME educational game, so that it

functions as an independent learning resource that supports students' understanding before playing the game.

2.4. Instrument Research

The research instruments used consisted of a needs analysis sheet, validation guidelines, and a product assessment sheet. The needs analysis sheet was compiled in the form of a questionnaire to gather information regarding student difficulties and teacher expectations regarding learning media. The validation guidelines were used by material experts, media experts, and learning practitioners to assess the developed e-module. Aspects assessed by the experts and practitioners are shown in the Table 1. The product assessment sheet also included a suggestion column so validators could provide input for improvements before the e-module was integrated with the SIGAME educational game.

Table 1. E-Module Assessment Aspects by Experts and Practitioners

Validator	Aspect	Indicator
Subject Matter Expert	Material Validity	• Alignment of the material with the Core Competencies (KD) • Correctness of the concept of classification of living things • Accuracy of scientific terminology
	Grammar	• Consistency of material presentation in learning activities • Summary alignment with material content
	Presentation	• Depth and breadth of the material • Clarity of the language used
Media Expert	Design	• Design suitability to the characteristics of junior high school students • Attractiveness of illustrations and graphics • Layout consistency
	Interactivity	• Clarity of navigation between menus • Ease of access to practice questions and answer keys
Practitioner	Graphics	• Integration of color, text, and images
	Content Suitability	• The suitability of the material to students' needs • The suitability of examples and illustrations to everyday life • The ease of student understanding
	Presentation	• The interest of learning activities • The clarity of learning objectives • The usefulness of summaries for students
	Utility	• The benefits of e-modules in supporting independent learning

(Kale et al., 2021; A. Sari et al., 2023; Wahyuningtyas et al., 2021)

2.5. Data Analysis

The data obtained were analyzed descriptively using qualitative and quantitative methods. Qualitative data, including input, criticism, and suggestions from expert validators and practitioners, were analyzed to improve the e-module during the development stage. Meanwhile, quantitative data, including scores from the validation questionnaire, were analyzed using descriptive statistical analysis by calculating the average score for each aspect. The aspects assessed by each expert. This analysis was used to confirm the role of the e-module in the SIGAME educational game as a suitable independent learning resource for junior high school students.
The results of the analysis are compared with the eligibility criteria shown in Table 2, so that an overview of the quality of the e-module being developed is obtained.

Table 2. E-Module Eligibility Criteria

Eligibility Criteria	Eligibility Category
4.21 – 5.00	Very Adequate
3.41 – 4.20	Adequate
2.61 – 3.40	Quite Adequate
1.81 – 2.60	Less Adequate
1.00 – 1.80	Not Adequate

3. RESULT AND DISCUSSION

3.1. *E-module Development Results*

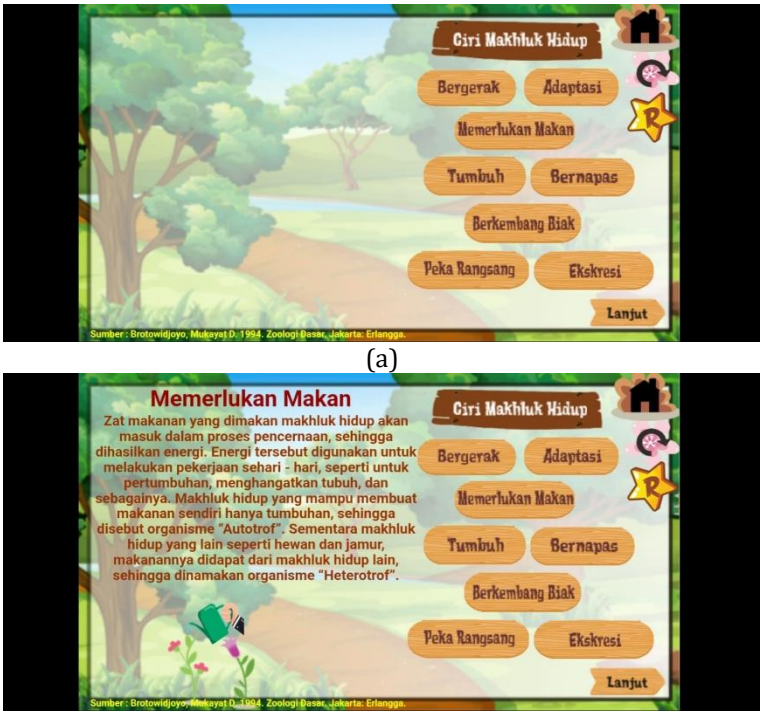
The e-module developed in this study is part of the SIGAME educational game. The e-module is one of the menus in the SI GAME application as shown in Figure 2. The position of the "Module" menu is also placed before the "Game" menu. These two things are intended so that the e-module can be a guide for students before playing SIGAME. This information is also conveyed in the "Instructions for Use" section displayed at the beginning of the application opening by stating that the "Module" must be read first before playing the "Game" menu.

Figure 2. *E-module* Part of SI *GAME Application*

There are several menus in the E- module. Among them are the "KI and Learning Objectives" menu which contains Core Learning Competencies and Learning Objectives, as well as six e-module packages as shown in Figure 3. The number of e-modules is adjusted to the number of game levels in SIGAME. Considering that SIGAME has six game levels that are adjusted to the Classification of Living Things material in the Science subject for grade VII, the number of e-modules is also six. This means that before playing the game at level 1, students are directed to read and work on module 1 first. The sequence of learning activities is carried out until the learning activities in e-module 6 and game level 6 are completed.

Figure 3. Anatomy of *the E-module*

E-modules are presented interactively to engage students. Each e-module is not only text-based but also includes supporting images and animations. Each e-module is presented in a different format with different sub-menus. This aims to prevent students from getting bored with boring learning materials, such as structured text. Therefore, the e-modules in this application development are designed in such a way. This includes hiding the text first and then revealing the information when the desired sub-material is clicked. For example, in E-module 1, there is material on the characteristics of living things. These characteristics are not immediately displayed in their entirety, but only when one of the characteristics is clicked, as shown in Figure 4.



(a)

(b)

Figure 4. Interactive Display of E-module Material, (a) Before and (b) after the Button is Clicked

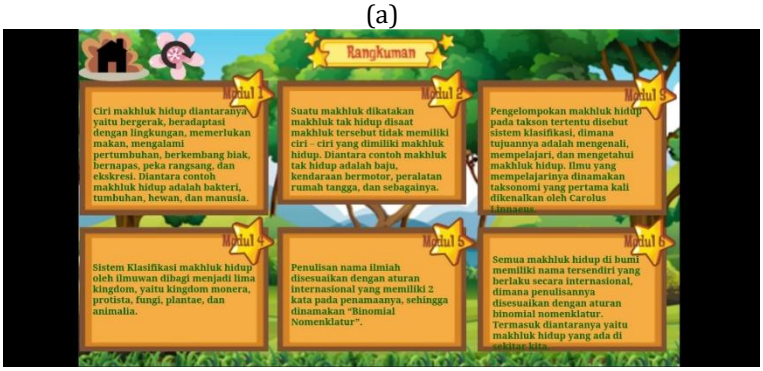
The e-module in this study contains several components. First, the material. The material in this e-module is presented concisely, easily understood, and interactively. Second, the practice questions. The practice questions, titled "Understanding Test," test students' understanding of the material. The practice questions are presented in the form of a crossword puzzle, as shown in Figure 5. The results of completing the crossword puzzle will receive feedback in the form of a score and further learning activities that students must complete. If students are able to complete the task and achieve a high score, they will receive feedback that they are eligible to proceed to the next stage, and vice versa, as shown in Figure 6.

Figure 5. Crossword-based Comprehension Test

Figure 6. Feedback After Working on Practice Questions

Third, the answer key. The answer key serves to show the correct answers to the practice questions presented. Fourth, the summary. The summary contains concise information about the material taught in the e-module. The Answer Key and Summary are shown in Figure 7. The four e-module components described indicate that this e-module has quite comprehensive components in terms of its size as material integrated with the educational game application. The e-module developed in this study has more comprehensive components compared to the presentation of material in other educational game developments. Examples include those conducted by Dwiyono (2017), Sari et al. (2023), and Syafruddin et al. (2021), where the material development was presented only briefly.

(a)



(b)

Figure 7. (a) Answer Key and (b) *E-module Summary*

3.2. *E-module Validation Results*

The e-module was validated by experts and practitioners after being developed. Validation aims to determine the quality of the developed e-module based on expert and practitioner assessments. Experts have adequate competence in their fields and are therefore eligible to assess the e-module. The experts who provided the assessment in this study were material experts who have competence in biology, specifically the classification of living things, and media experts who have adequate skills related to the development of learning media. In addition, the e-module was also assessed by practitioners because practitioners have adequate experience related to the use of learning media in schools. The practitioners in this study were Natural Sciences (IPA) teachers.

Material experts generally assessed the e-module as having “Very Adequate” quality as shown in Figure 8. Two aspects assessed, namely grammar and presentation, received scores in the "Very Adequate" category with the maximum score, while the aspect of material accuracy was also categorized as "Very Adequate" but with a score of 4.7. These results indicate that the material presented in the e-module is appropriate and easy to understand for junior high school students, in accordance with the basic competencies that students must achieve, and in accordance with the correct material concept. However, the material is presented quite concisely, so it is not broad and in-depth.

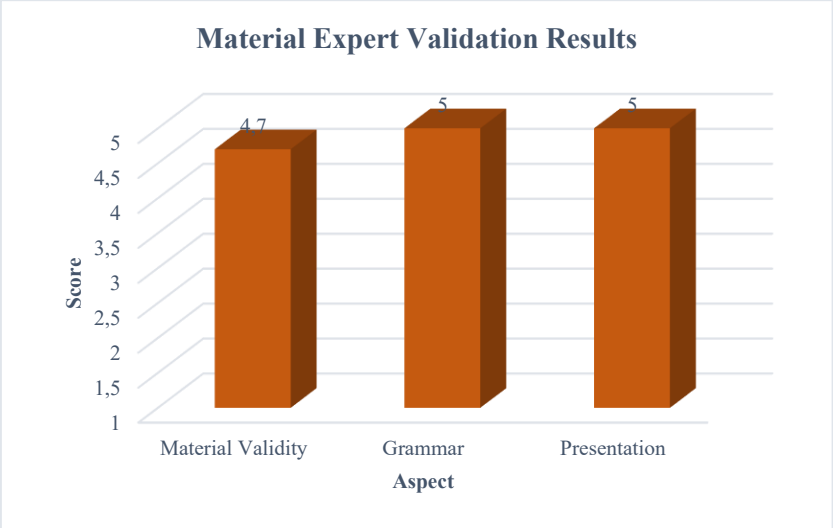


Figure 8. Results of Material Expert Validation Based on Assessment Aspects

Media experts generally stated that the e-module has a "Very Adequate" quality as shown in Figure 9. The three assessed aspects received a score of ≥ 3.8, indicating that the developed e-module is very adequate in terms of media. Graphically, the e-module has adequate color composition, font type, font color, images, and animation. The e-module is also interactive with students and has various buttons that are easy for students to use. The e-module also has clear instructions in each section so that students can use it easily. The e-module also has an attractive design, a consistent and clear layout, and is in accordance with the characteristics of junior high school students.

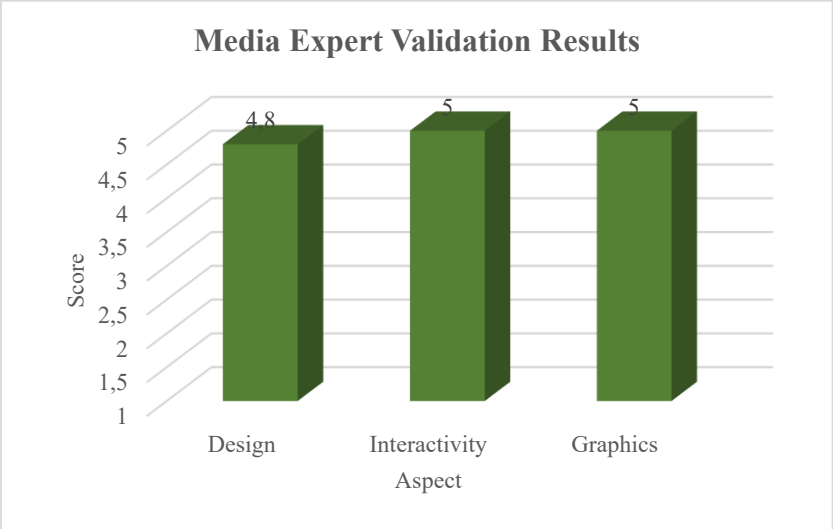


Figure 9. Media Expert Validation Results Based on Assessment Aspects

Practitioners also validated the development of this e-module. They validated its use in the field. Practitioners generally assessed it from a contextual perspective, namely whether the e-module could be used effectively in schools. The practitioners' validation results indicated that the e-module had a "Very Adequate" quality as shown in Figure 10. All three assessed aspects received maximum scores. This indicates that the e-module, overall, contained content deemed acceptable to junior high school students, was well-presented, and could be used as a learning resource for students on the classification of living things.

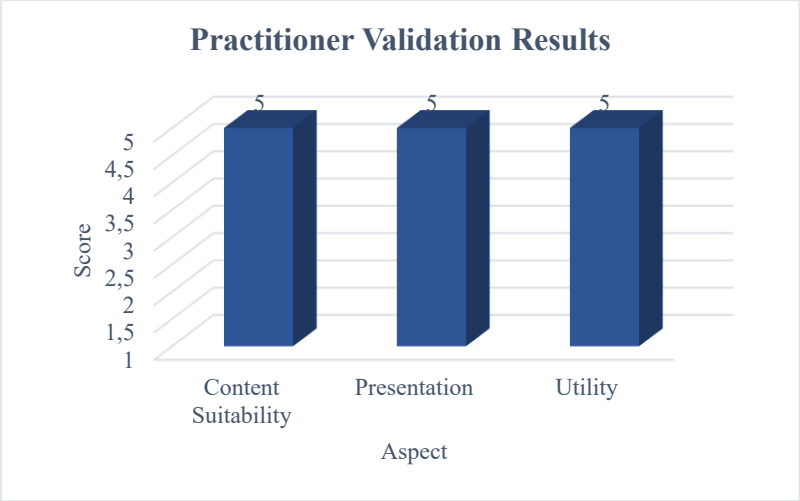


Figure 10. Practitioner Validation Results Based on Assessment Aspects

The results of the testing conducted indicate that the theoretical validation test results are in the "Very Feasible" category. However, the development stage that has been carried out has not yet reached the final stage. The e-module development has only reached the third stage, namely Development, after going through the Analysis and Design stages. Next, the resulting e-module product must first be tested for its practicality and effectiveness as a teaching material in the implementation of learning through the Implementation stage. If the e-module has been declared practical and effective, then the e-module can be used in the actual learning process in schools.

3.3. Discussion

The results of the study indicate that this development research has produced a product that meets the needs. The material on the classification of living things, which students consider difficult in the science subject at the junior high school level, can be assisted by the existence of independent learning resources in the form of e-modules presented together with the educational game SIGAME. The existence of e-modules greatly assists the student learning process in the material on the classification of living things (Sari et al., 2023) . The material on the classification of living things, which is quite complex, becomes simpler with the learning activities in the e-module. The existence of ability tests in each e-module enables students to continuously improve their abilities in sub-sub-materials in the material being studied as mentioned by Rusdi et al. (2025) and Suparno et al. (2019) . The existence of media that uses technology in the form of applications on smartphones also increases students' enthusiasm for learning as mentioned by Aroyandini & Aloysius (2021), Zaharah & Susilowati (2020), and Aroyandini et al. (2021) so that students are more interested in studying the material with more enthusiasm. In line with this, e-modules are also said to be able to improve critical thinking skills and scientific literacy (Hagma et al., 2024; Mardianti et al., 2020), and also instill a conservation spirit (Sari et al., 2020).

E-modules, with their comprehensive components, can serve as independent learning resources for students (Prastowo, 2013; Sholeh et al., 2023). The e-module developed in this study also has a comprehensive core component, including materials, practice questions, summaries, scores, feedback, and references, making it a viable independent learning resource. Independent learning resources allow students to easily access them anytime and anywhere without requiring a multitude of additional media. Furthermore, students can independently test their abilities and measure them directly using the answer key guide and feedback provided (Agustian et al., 2024; K. Sari & Azizah, 2023). Therefore, students can conduct evaluations based on their ability measurement results, allowing them to continuously improve their abilities independently (Arifin et al., 2024; Putra et al., 2023). Students can repeat studying the material and working on questions without waiting for instructions from the teacher, so that students truly understand the material on the classification of living things (Herlina & Abidin, 2024).

4. CONCLUSION

Based on the research questions, it can be concluded that this study has produced an e-module on the classification of living things for seventh-grade junior high school students presented together with an educational game. The e-module has been validated by material experts, media experts, and practitioners with a final assessment category of "Very Adequate". The e-module is suitable for use in the next development stage, namely the practicality test and implementation test of the e-module in the SIGAME educational game in learning activities. Based on the conclusion, further research can test the practicality of the e-module in the SIGAME educational game in implementing learning. which has been declared practical based on a practicality test can be implemented in the implementation of learning to determine its effectiveness in improving the quality of science learning in schools, especially in the material on the classification of living things.

5. REFERENCES

Adawiyah, R., & Kartika, I. (2021). Pengembangan Ensiklopedia IPA Berbasis Integrasi-Interkoneksi Islam-Sains sebagai Sumber Belajar Mandiri Peserta Didik Madrasah Tsanawiyah. *Edusains*, *13*(1), 34–44. https://doi.org/10.15408/es.v13i1.12970

Agustian, D., Wardoyo, S., Amartha, A., Anjani, T. A., Wulansari, T., & Marsanda, E. (2024). The Role of E-Module in the Teaching and Learning Process in Vocational Secondary Schools (SMK): a Literature Review. *Al Hikmah: Journal of Education*, *5*(2), 211. https://doi.org/10.54168/ahje.v5i2.345

Aldoobie, N. (2015). ADDIE Model. *American International Journal of Contemporary Research*, *5*(6), 68–72.

Arifin, N., Effendi, M. H., & Purwati, N. (2024). The Effect of Using E-modules in Biology Learning on Learning Outcomes of High School and University Students: Meta-Analysis. *Biota*, *17*(1), 35–46. https://doi.org/10.20414/jb.v17i1.498

Aroyandini, E. N., & Aloysius, S. (2021). Increasing students' learning motivation through android-base biology educational game with e-module during COVID-19 pandemic. *Proceedings of the 6th International Seminar on Science Education (ISSE 2020)*, *541*, 162–168.

Aroyandini, E. N., Anfa, Q., & Firanti, A. (2021). Penggunaan Media Pembelajaran Berbasis E-Learning Terhadap Motivasi Belajar Biologi Siswa. *BIO-EDU: Jurnal Pendidikan Biologi*, *6*(3), 198–208. https://doi.org/10.32938/jbe.v6i3.1352

Dwiyono. (2017). Pengembangan Game Edukasi sebagai Media Pembelajaran Interaktif pada Kompetensi Dasar Mendeskripsikan Penggunaan Peralatan Tangan (Hand Tools) dan Peralatan Bertenaga (Power Tools). *Jurnal Pendidikan Teknik Mekatronika*, *7*(4), 343–351. http://journal.student.uny.ac.id/ojs

Hagma, M. A. F., Ruswan, R., & Wijayanti, E. (2024). Development of an Islamic Integrated Biology E-Module on Class XI High School Excretory System Material to Empower Students ' Critical Thinking Skills. *Bio-Edu: Jurnal Pendidikan Biologi*, *09*(02), 122–131. https://doi.org/10.32938/jbe.v9i2.6575

Herlina, E., & Abidin, Z. (2024). Development of interactive e-modules to improve students' scientific literacy abilities: A literature review. *Jurnal Mangifera Edu*, *8*(2), 74–87. https://doi.org/10.31943/mangiferaedu.v8i2.181

Hirumi, A. (2014). *Bermain Game di Sekolah : Video Game dan Permainan Komputer Simulasi untuk Anak SD dan SMP*. Indeks.

Insani, M. D. (2016). Studi Pendahuluan Identifikasi Kesulitan dalam Pembelajaran pada Guru IPA SMP Se-Kota Malang. *Jurnal Pendidikan Biologi*, *7*(2), 81–93.

Kale, F., Situmorang, R. P., & Hastuti, S. P. (2021). Development of Mobile Learning-based Edugame on Respiratory System Material to Improve Students' Digital Literacy. *Formatif: Jurnal Ilmiah Pendidikan MIPA*, *11*(2), 151–160. https://doi.org/10.30998/formatif.v11i2.6237

Kurniawan, M. R., & Risnani, L. Y. (2021). Pengembangan Game Edukasi Digital dan Implementasi

Pada Pembelajaran Biologi Materi Plantae Siswa SMA Kelas X. *BIOEDUKASI (Jurnal Pendidikan Biologi)*, *12*(1), 1. https://doi.org/10.24127/bioedukasi.v12i1.3759

Lantzouni, M., Poulopoulos, V., & Wallace, M. (2024). Gaming for the Education of Biology in High Schools. *Encyclopedia*, *4*(2), 672–681. https://doi.org/10.3390/encyclopedia4020041

Mardianti, I., Kasmantoni, K., & Walid, A. (2020). Pengembangan Modul Pembelajaran IPA Berbasis Etnosains Materi Pencemaran Lingkungan Untuk Melatih Literasi Sains Siswa Kelas VII di SMP. *Bio-Edu: Jurnal Pendidikan Biologi*, *5*(2), 97–106. https://doi.org/10.32938/jbe.v5i2.545

Masykhur, M. A., & Risnani, L. Y. (2020). Pengembangan dan Uji Kelayakan Game Edukasi Digitalsebagai Media Pembelajaran Biologi Siswa Sma Kelas X pada Materi Animalia. *Bioedukasi: Jurnal Pendidikan Biologi*, *11*(2), 90. https://doi.org/10.24127/bioedukasi.v11i2.3276

Prastowo, A. (2013). *Panduan Kreatif Membuat Bahan Ajar Inovatif*. DIVA Press.

Prayitno, Y. S., Arif, M., Dellia, P., Wijaya, E. Y., & Sari, A. K. (2022). Pengembangan Game Edukasi Berbasis Android Pada Mata Pelajaran Biologi Materi Sistem Peredaran Darah Untuk Siswa Kelas XI IPA Tingkat SMA. *Journal of Education and Informatics Research*, *1*(1), 10–17.

Putra, Y. I., Fadli, R., & Dahry, S. (2023). Meta analyzing the ease of use of e-modules in learning. *Jurnal Inovasi Teknologi Pendidikan*, *10*(4), 338–343. https://doi.org/10.21831/jitp.v10i4.62229

Rusdi, H., Ervianti, R., Adrias, A., & Zulkarnaini, A. P. (2025). Pengaruh Media Pembelajaran Digital terhadap Motivasi Belajar Siswa Sekolah Dasar. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *10*(2), 347–360.

Sari, A., Muhartati, E., Oprasmani, E., & Putri, A. N. (2023). Development of Science Learning E-Module Equipped with Game on Material Classification of Living Things for Grade VII Students. *Bioeduca : Journal of Biology Education*, *5*(1), 34–51. https://doi.org/10.21580/bioeduca.v5i1.14751

Sari, K., & Azizah, N. (2023). Literature Study: E-Module Development in Physics Learning. *2nd Annual International Conference on Islamic Education for Students (AICOIES 2023)*, *Aicoies*, 337–350.

Sari, N. P., Suhirman, S., & Walid, A. (2020). Pengembangan Modul Pembelajaran IPA Berbasis Etnosains Materi Interaksi Makhluk Hidup dengan Lingkungannya Untuk Menanamkan Jiwa Konservasi Siswa Kelas VII SMP. *Bio-Edu: Jurnal Pendidikan Biologi*, *5*(2), 62–73. https://doi.org/10.32938/jbe.v5i2.554

Sholeh, B., Hufad, A., & Fathurrohman, M. (2023). Pemanfaatan E-Modul Interaktif dalam Pembelajaran Mandiri Sesuai Kapasitas Siswa. *Risalah: Jurnal Pendidikan Dan Studi Islam*, *9*(2), 2614–3275. https://doi.org/10.31943/jurnal_risalah.v9i2.458.

Smaldino, S. E. (2017). *Instructional Technology & Media for Learning (Teknologi Pembelajaran dan Media untuk Belajar)*. Prenada Media.

Suparno, J., Sunarno, W., & Ashadi, A. (2019). Pengembangan Modul IPA Terpadu Untuk SMP/MTs Berbasis Problem Based Learning (PBL) dengan Tema Fotosintesis untuk Meningkatkan Kemampuan Berpikir Kritis. *Inkuiri: Jurnal Pendidikan IPA*, *8*(2), 119–129. https://doi.org/10.20961/inkuiri.v8i2.31828

Syafruddin, S., Lestari, I. D., Noviati, W., & Ramdhayani, E. (2021). Development of Learning Media for Educational Games Based on Adobe Flash in Biology. *Proceedings of the 2nd Annual Conference on Education and Social Science (ACCESS 2020)*, *556*(Access 2020), 107–111. https://doi.org/10.2991/assehr.k.210525.056

Wahyuningtyas, N., Ruja, I. N., & Yahya, M. H. (2021). Developing of a Learning Media for Smartphones for Disaster Mitigation Education. *International Journal of Emerging Technologies in Learning (IJET)*, *16*(7), 160–174.

Zaharah, Z., & Susilowati, A. (2020). Meningkatkan Motivasi Belajar Peserta Didik Dengan Menggunakan Media Modul Elektronik Di Era Revolusi Industri 4.0. *Biodik*, *6*(2), 39–52. https://doi.org/10.22437/bio.v6i2.8950