Development of Digital Teaching Material for Mathematics Using Canva with a Differentiated Learning Approach

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Article Info	Abstract
	Differentiated learning emphasizes that teachers must consider students' diverse learning styles. Utilizing Canva serves as an effective solution to support differentiated learning, accommodating auditory, visual, and kinesthetic learning preferences. Present study aims to produce a valid, practical, and effective digital mathematics teaching material using Canva. The type of research conducted is R&D development using the 4-D model, which includes 1) Define, 2) Design, 3) Develop, and 4) Disseminate. Based on the analysis, the material validator test scored 82.1%, categorized as highly valid. The media validator test scored 88%, also categorized as highly valid, making the average validation test results meet the validity criteria. Additionally, the student response questionnaire regarding the digital teaching materials showed 82.9% positive responses, categorized as practical, and the evaluation test results showed that 80,44 of students achieved mastery, categorized as effective. Therefore, the digital teaching materials based on differentiated learning assisted by Canva meet the criteria of being valid, practical, and effective of digital mathematics teaching material.

1. Introduction

Teaching mathematics is one of the greatest challenges in meeting the diverse needs of students in the classroom. Each student has a unique learning style, level of understanding, and pace of learning (Puspitasari et al., 2024). Addressing these varying learning styles can be achieved through the differentiated instruction method. Differentiated instruction allows teachers the flexibility to design teaching strategies tailored to the needs and learning styles of students in the classroom (Purnawanto, 2023; Nurjanah et al., 2023; Ekaningtiass et al., 2023): Wulandari, 2022). This approach emphasizes the teacher's ability to adapt to student needs when delivering lesson content (Purba et al., 2021)

Additionally, differentiated instruction enhances students' critical thinking skills, numeracy abilities, and learning outcomes ((Rahmah et al., 2022 ; Surat, 2019;Putra, 2021) Teachers must be aware of the importance of differentiated instruction to address student needs, including their learning styles (Ekaningtiass et al., 2023). Teachers must accommodate the diverse learning needs of students based on their individual styles. For instance, visual learners benefit from lessons presented through diagrams, PowerPoint presentations, notes, maps, or charts. Auditory learners excel with lessons that emphasize listening activities, such as explanations, audiovisual materials, or music. Kinesthetic learners, on the other hand, thrive in activity-based learning (learning by doing) (Tamsiruddin, 2024). Therefore, there is a need for instructional materials that cater to all learning styles.

The use of Canva-based digital materials is one solution because Canva is an engaging application that facilitates student understanding by integrating text, videos, animations, audio, images, graphics, and more (Tambunan & Tambunan, 2023); Asriati et al., 2024); Kuway et al., 2023). By leveraging Canva, teachers can effectively support differentiated instruction (Ridwan, 2024). Research by Tanama et al., (2023) shows that e-modules utilizing Canva significantly boost students' enthusiasm for learning. Moreover, research by Taufan et al., (2023) highlights students' positive responses to interactive e-modules created with Canva.

According to Tambunan & Tambunan (2023) and Dewi et al., (2023), Canva, as a visual and interactive tool, greatly aids the process of teaching mathematics. Research findings reveal that such teaching materials effectively support mathematics instruction by engaging students more actively through appealing media. Almahera et al., (2023) and Tanama et al., (2023) also state that digital teaching materials increase students' interest and motivation to learn. One such digital teaching material is the e-module supported by Canva(Putri et al., 2023). In the study byAzizah et al., (2024), the development of differentiated instructional modules supported by Canva improved learning quality, there by optimizing student well-being. The material validation for Canva-supported differentiated modules achieved a validity percentage of 94.33%, categorized as highly valid, while media expert evaluations scored 97.73% in the same category. Practitioner validation results scored 95.50%, also classified as highly valid. Furthermore, effectiveness tests demonstrated that Canva-supported differentiated modules effectively enhanced student well-being in the classroom.

Referring to previous studies, no development of Canva-supported differentiated instructional materials has been conducted, particularly in the context of teaching the topics of Relations and Functions.

Based on the above explanation, the author is interested in conducting research titled, **"Development of Digital Teaching Materials Based on Differentiated Instruction Using Canva for Mathematics Subjects in Schools."**
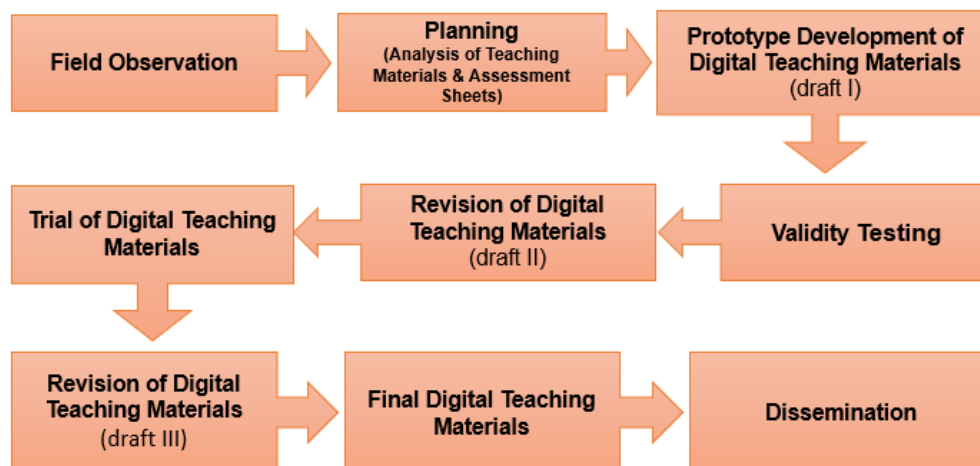
2. Methods

This study employed four steps of the R&D development model, commonly referred to as the 4-D model, which consists of define, design, development, and dissemination (Sugiyono, 2017). The following are the 4-D steps applied in this research:

Figure1
flow-chart diagram for development of digital material

2.1 Define

This stage is conducted to establish and define the requirements for development based on the objectives and problems, commonly referred to as needs analysis.
- Conduct observations.
- Conduct interviews with teachers.
- Analyze the teaching materials used by teachers during classroom learning. These teaching materials help the author formulate learning materials for developing digital teaching materials assisted by the Canva application.
- Prepare assessment sheets: this will be used for the validity test of the digital teaching materials to be conducted by experts in the field.

2.2 Design

The goal of this stage is to prepare a prototype (initial product) of digital teaching materials assisted by the Canva application. The developed digital teaching materials are designed to be engaging for students and easy to understand. The digital teaching materials presented will include reading texts, animations, images, and videos based on differentiated learning.

2.3 Develop
In this activity, validity testing is conducted by experts in the field to test the effectiveness of the digital teaching materials. Suggestions provided are used to improve the content and design of the digital teaching materials that have been created. After making improvements, a development test is conducted, which is a trial of the digital teaching materials aimed at students of SMPN 2 Kota Ternate. After the trial is conducted, data regarding responses, reactions, and comments from the target audience using these digital teaching materials are collected. The results of this trial are used to refine the digital teaching materials until effective results are achieved.

2.3.1 Validation
The criteria for selecting expert validators are: 1) having experience in the field, 2) holding a minimum of a master's degree or currently pursuing a master's degree. The validation or assessment of the feasibility of the media and materials is conducted by two Mathematics lecturers from Universitas Khairun. The assessment of the material aspect is conducted in three aspects: content presented, language, and differentiated learning, while the assessment of the media aspect is conducted in two aspects: appearance and content characteristics. The validation sheet uses a Likert scale (1-5). The assessment results are analyzed using the formula (Riduwan & Akdon, 2013):

$$NA = \frac{Score\ Obtained}{total\ point} \times 100\%$$

Table 1
Category of validation

No.	percentage of score obtained	Category
1	0%-20%	Very invalid
2	21%-40%	invalid
3	41%-60%	Fairly Valid
4	61%-80%	Valid
5	81%-100%	Very Valid

Based on the reviewers' assessment, all aspects meet the very valid criteria. The average validation level for the Content Aspect is 82.1% (very valid), and for the Media Aspect, it is 88% (very valid). However, even though it is in the very valid category, there are still some notes from the validators to revise the differentiated learning materials that have been made. From the validation sheet given to the validators, there are some notes that suggest improvements in several parts of the developed materials. In the questionnaire, student responses were measured using a Likert scale ranging from 1 to 5. The criteria for practicality refer to Hakim (2021) as outlined in Table 2.

Table 2
Category of practicality

No.	percentage of score obtained	Category
1	0%-20%	Very not practical
2	21%-40%	Not practical
3	41%-60%	Fairly practical
4	61%-80%	Practical
5	81%-100%	Very practical

2.3.2   Limited Product Testing

After making improvements, developmental testing was conducted. This activity tests the teaching materials aimed at students of SMP Negeri 2 Kota Ternate. The limited trial will take place in the third week of September 2024. From this trial, data on responses, reactions, and comments from the users of these teaching materials were collected. The results of this trial are used to improve the teaching materials until an effective result is achieved, and this is called Draft 3. Draft 3 is the final product of the digital teaching materials based on differentiated learning using the Canva application for the subject of mathematics."

2.4 Disseminate

This stage is the final stage, which is the distribution of digital teaching materials based on differentiated learning using the Canva application. The researcher promotes these materials to math teachers and students through socialization at the research site. The wide distribution of teaching materials will take place after the product has a copyright certificate issued by the publishing institution."

3. Result and Discussion

Based on the stages of R&D research, the research results are as follows:

3.1 Define

- **Conducting Observations:** The observation was conducted on students of class 8 at SMP Negeri 2 Kota Ternate. The results showed that math learning at this school is teacher-centered, where the teacher is more active from the beginning to the end of the lesson. The math learning does not focus on differentiated learning, which means that teachers need to pay attention to

students' different learning styles and initial abilities. It is not easy for educators to teach in a class with varying student abilities and learning styles (visual, auditory, and kinesthetic). The current math learning does not effectively engage students. During lessons, students only listen to the material and examples, then complete exercises given by the teacher.

- **Conducting Interviews:** From interviews with teachers and students, it was found that some students prefer to read (visual learners), while others enjoy listening to the material (auditory learners). Some students need to learn by practicing or moving before they understand. Among the various learning styles, visual, auditory, and kinesthetic (VAK) are the easiest to understand because they can be measured and provide a quick overview of a person's learning style. This shows that the learning profiles of class 8 students are diverse. This aligns with previous research on the variety of learning styles in a classroom.

- **Analyzing Teaching Materials:** This analysis is done to identify the materials to be developed in the teaching tools. From interviews with the class 8 teacher, it was found that only government-provided materials were used, without any development. As a result, students often cannot learn according to their needs. The materials that need to be developed are relations and functions. Students struggle to differentiate between relations and functions and to use them in math lessons. Therefore, teaching materials based on the Canva application are needed, which should include not only text but also engaging features such as graphics, animations, audio, and images. This will make the presentation of materials more varied and help keep students interested in the learning process.

- **Preparing Assessment Sheets:** For the validity testing of the digital teaching materials to be conducted by experts in the field, assessment sheets are needed to improve the quality of the digital teaching materials.

3.2 Design

The goal of this stage is to prepare a prototype (initial product) of digital teaching materials using the Canva application. The steps taken include determining the concepts for the topics to be covered in the digital teaching materials. The developed digital materials are designed to be engaging for students and easy to understand. The digital teaching materials will include reading texts, animations, and images based on differentiated learning.

Figure 2.
Example of Content figural

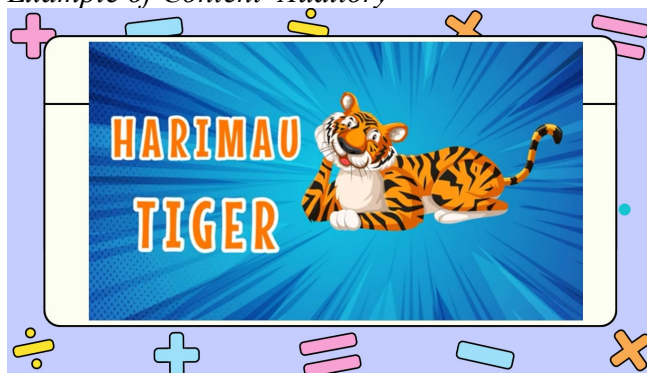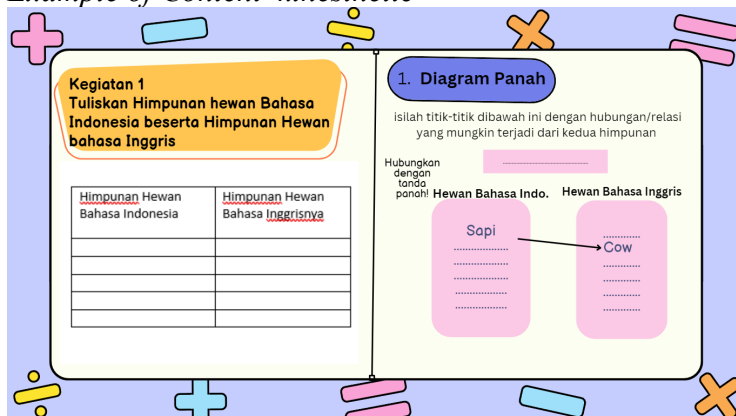**Figure 3.**
Example of Content Auditory

Figure 4.
Example of Content kinesthetic

3.3 Develop

In this activity, evaluation is conducted by experts in the field to test the validity of Draft 1 and the limited trial of Draft 2, targeting students of SMP Negeri 2 Kota Ternate.

3.3.1 Validation

The criteria for selecting expert validators are: 1. experienced in their field, 2. holding at least a master's degree or currently pursuing a master's degree. Validation or assessment of the media and materials is conducted by two mathematics lecturers from Universitas Khairun. The assessment of material aspects is carried out in three areas: Content, Language, and Differentiated Learning, while the assessment of Media aspects is done in two areas: Appearance and Content Characteristics.

Table 2
Validation Results for Material Aspects

No.	validator	Assessment Aspect			Average	Category
		Content	Language	Differentiated Learning		
1	Validator 1	88 %	80%	80%	82,66%	Very Valid
2	Validator 2	88%	70%	86,7%	81,56%	Very Valid
	Overall Average				82,1%	Very Valid

Based on the results from Table 2 of the validation test analysis, the average score from Validator 1 is 82.66% and from Validator 2 is 81.56%. The average of both validators is 82.1%, which falls into the very valid category.

Table 3
Validation Results for Media Aspects

No.	Validator	Assessment Aspect		Average	Category
		Appearance	Characteristics		
1	Validator 1	84 %	93,3%	88,7%	Very Valid
2	Validator 2	88%	86,66%	87,3%	Very Valid
	Overall Average			88%	Very Valid

Based on Table 2, the analysis of the validation test shows that the average score from Validator 1 is 88.7% and from Validator 2 is 87.3%. The average of both is 88%, which is very valid. For the two aspects of material and media validation, the average is 85.05%, indicating that the developed digital teaching materials are valid. In addition to the quantitative assessment, the validators also provided comments and suggestions for improvement, which can be seen in Table 4.

Table 4

Comments and Suggestions from Validators

No	Type of Assessment	Validator I	Validator 2
1	Material Aspect	1. Avoid using abbreviations. 2. Pay attention to writing rules.	1. Revise sentences; some sentences do not follow the SPOK structure. 2. Add more animations. 3. The animated video is too long.
2	Media Aspect	It is better to use softer colors; some slides are too bright	Pay more attention to font and color usage in the media.

The suggestions provided above will be used to improve the materials and media in the teaching materials design, referred to as Draft 2.

3.3.2 Limited Product Testing

After making improvements from both validators, we did Developmental Testing. This is a test for teaching materials aimed at 23 students of SMP Negeri 2 Kota Ternate. The limited trial was held in the third week of September 2024. We gave a test to the students about Relations and Functions, and then the students filled out a response form. The results of this trial were used to improve the teaching materials until we got effective results, which we called Draft 3. Draft 3 is the final product of digital teaching materials based on differentiated learning using the Canva app for mathematics subjects. Below are the results of the limited trial of the teaching materials.

Table 5

Results of the student evaluation test based on learning styles.

No	Learning Style	Average	Category
1	Visual	74,64	Effective
2	Auditory	78,33	Effective
3	Kinesthetic	88,33	Very Effective
	Overall Average	80,43	Very Effective

The results from the evaluation test show that the average student completion rate is 80.44%. This means that 23 students scored above the minimum passing grade, which is very effective. For the questionnaire about student responses to the digital teaching materials, 82.9% of students gave positive feedback. From this analysis, we can see that the developed digital teaching materials are practical for student use.

Based on the comprehensive analysis conducted on the development of differentiated learning-based digital mathematics teaching materials, the results indicate that the materials are valid, practical, and effective. Consequently, the digital teaching materials can be implemented in classroom learning. These findings align with the study by Azizah et al. (2024), which also developed differentiated teaching modules assisted by Canva, yielding similarly valid, practical, and effective results for classroom implementation.

3.4 Disseminate

After the limited product trial, the next step is dissemination. For widespread disseminate, this product needs legal protection, such as intellectual property rights (HKI). Once the HKI is published, the differentiated learning mathematics teaching materials will be ready for dissemination.
This study offers significant benefits for teaching and learning activities conducted by teachers and students, serving as an innovative alternative teaching material for differentiated learning. However, the development of this digital teaching material is not without limitations. One notable drawback is that this instructional tool is specifically designed for the topic of relations and functions at the junior high school level. It is recommended that future researchers conduct similar studies using different topics within mathematics instruction.

4. Conclusion

Based on the research conducted, it was found that the digital teaching material underwent a validation test assessed by two validators, resulting in a very high validity score for both evaluated aspects. The average score for the validation of content and media aspects was 85.05%, indicating that the developed digital teaching material is valid. It was also proven effective for students, as it achieved an average mastery score of 78.48%. Furthermore, a student response survey showed that 82.9% of students provided positive feedback on the digital teaching material, indicating that it falls into the category of practical teaching materials. These findings demonstrate that the differentiation-based digital teaching material, supported by the Canva application, is valid, practical, and effective for use by Grade VIII junior high school students in learning the topic of Relations and Functions.

5. References

Almahera, A. F., Jauhari, N., & Nafi'ah, U. (2023). E-modul Sejarah sebagai inovasi bahan ajar digital berbasis aplikasi Canva untuk meningkatkan minat belajar siswa. *Jurnal Integrasi Dan Harmoni Inovatif Ilmu-Ilmu Sosial (JIHI3S)*, *3*(2), 94–103. https://doi.org/10.17977/um063v3i2p94-103
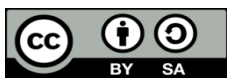
Asriati, A., Pangesthi, L. T., Widagdo, A. K., & Romadhoni, I. F. (2024). Pengembngan E-Modul Berbasis Canva Pada Materi Choux Paste Bagi Siswa SMK Kuliner. *Jurnal Ilmiah Profesi Pendidikan*, *9*(4), 3138–3146. https://doi.org/10.29303/jipp.v9i4.2731

Azizah, M. N., Maufur Maufur, & Basukiyatno Basukiyatno. (2024). Pengembangan Modul Ajar Berdiferensiasi Berbantuan Canva dalam Meningkatkan Student Well Being di Sekolah Dasar. *Journal of Education Research*, *5*(4), 6425–6437.

Dewi, O. A., Hayati, L., Hikmah, N., & Sarjana, K. (2023). Pengembangan Bahan Ajar Interaktif Berbasis Canva Pada Materi Lingkaran. *Journal of Classroom Action Research*, *5*(3).

Ekaningtiass, P., Fitriani, H., Nurudin, M. N., & Akhodiyah, S. (2023). Pengembangan Media Pembelajaran Berdiferensiasi Berbasis Teknologi pada Materi Teks Prosedur untuk Siswa Kelas VII SMP. *Journal on Education*, *6*(1), 841–847. https://doi.org/10.31004/joe.v6i1.3000

Hakim, L. (2021). PENGEMBANGAN LKPD BERBASIS PENEMUAN TERBIMBING DAN PEMAHAMAN KONSEP MATEMATIKA SISWA. *Indiktika : Jurnal Inovasi Pendidikan Matematika*, *3*(2), 198–207. https://doi.org/10.31851/indiktika.v3i2.5411

Kuway, N. P., Muhajir, M., & Wahid, A. (2023). Meningkatkan Minat Peserta Didik dalam Mata Pelajaran IPAS melalui Pembelajaran Diferensiasi Menggunakan Bahan Ajar Digital. *Jurnal Basicedu*, *7*(6), 3869–3877. https://doi.org/10.31004/basicedu.v7i6.6490

Nurjanah, Sutisnawati, A., & Nurasiah, I. (2023). PEMBELAJARAN DIFERENSIASI PADA KURIKULUM MERDEKA DI SEKOLAH DASAR BERBASIS MODUL DIGITAL. *Pendas: Jurnal Ilmiah Pendidikan Dasar*, *8*(1), 1669–1678.

Purba, M., Purnamasari, N., Soetantyo, S., Suwarma, I. . R., & Susanti, E. I. (2021). *Prinsip pengembangan pembelajaran berdiferensiasi (differentiated instruction) pada kurikulum fleksibel sebagai wujud merdeka belajar*. Badan Standar, Kurikulum, dan Asesmen Pendidikan, Kemdikbudristek.

Purnawanto, A. T. (2023). Pembelajaran berdiferensiasi. *JURNAL PEDAGOGY*, *16*(1), 34–54.

Puspitasari, ita, Kusumaningrum, P. H., Ardiningsih, S., Dinarti, S., & Wahyuningsih, T. (2024). Implementasi Pembelajaran Diferensiasi dalam Mengatasi Keberagamaan Gaya Belajar Siswa di Sekolah Dasar. *Khatulistiwa: Jurnal Pendidikan Dan Sosial Humaniora*, *4*(1), 82–93. https://doi.org/10.55606/khatulistiwa.v4i1.2720

Putra, I. M. Y. T. (2021). Implementasi pembelajaran flipped classroom berbasis strategi diferensiasi untuk meningkatkan keterampilan berpikir kritis peserta didik. *Indonesian Journal of Educational Development*, *2*(3), 461–471.

Putri, E. S., Budiana, S., & Gani, R. A. (2023). PENGEMBANGAN BAHAN AJAR MENGGUNAKAN CANVA PADA SUBTEMA KEBERAGAMAN BUDAYA BANGSAKU. *Jurnal Elementary*, *6*(1), 104. https://doi.org/10.31764/elementary.v6i1.13464

Rahmah, S., Dalila, A. A., Liliawati, W., & Setiawan, A. (2022). Pendekatan Pembelajaran Diferensiasi dalam Model Inkuiri terhadap Kemampuan Numerasi Siswa. *Jurnal Imiah Pendidikan Dan Pembelajaran*, *6*(2), 393–401. https://doi.org/10.23887/jipp.v6i2.50838

Riduwan, & Akdon. (2013). *Rumus Dan Data Dalam Analisis Statistika*. Alfabeta.

Ridwan, S. L. (2024). Meningkatkan Literasi Digital Murid Melalui Pemanfaatan Akun Belajar. Id dan Canva dalam Pembelajaran Berdiferensiasi. *Jurnal Didaktika Pendidikan Dasar*, *8*(2), 715–736.

Sugiyono. (2017). *Metode Penelitian & Pengembangan (Research and Development/R&D)*. Alfabeta.

Surat, I. M. (2019). Penerapan Metode Pembelajaran Diferensiasi Progresif Berbantuan LKS untuk Meningkatkan Aktivitas dan Prestasi Belajar Matematika SIswa Kelas X MIPA 3 SM A Taman Rama Denpasar Tahun Pelajaran 2019/2020. *Widyadari: Jurnal Pendidikan*, *20*(2).

Tambunan, L., & Tambunan, J. (2023). Pengembangan Bahan Ajar E-Modul Matematika Berbantuan Aplikasi Canva pada Materi Grafik Fungsi Eksponen dan Logaritma. *Jurnal Cendekia : Jurnal Pendidikan Matematika*, *7*(2), 1029–1038. https://doi.org/10.31004/cendekia.v7i2.2212

Tamsiruddin. (2024). Implementasi Pembelajaran Berdiferensiasi Berbasis Digital dalam Menganalisis Struktur dan Kebahasaan Teks Prosedur. *Urnal Didaktika Pendidikan Dasar*, *8*(2), 533–558.

Tanama, J., Degeng, I. N. S., & Sitompul, N. C. (2023). Pengembangan E-Modul Sejarah Indonesia dengan Aplikasi Canva untuk Meningkatkan Semangat Belajar Siswa Kelas XI SMA. *Jurnal Teknologi Pendidikan : Jurnal Penelitian Dan Pengembangan Pembelajaran*, *8*(1), 71. https://doi.org/10.33394/jtp.v8i1.5648

Taufan, A., Astutik, S., Muhammad Asyroful Mujib, Elan Artono Nurdin, & Bejo Apriyanto. (2023). Pengembangan E-Modul Interaktif Berbasis Aplikasi Canva Pada Materi Pengelolaan Sumber Daya Alam Indonesia Siswa SMA. *Jurnal Pendidikan Geografi Undiksha*, *11*(2), 133–143. https://doi.org/10.23887/jjpg.v11i2.61947

Wulandari, A. S. (2022). Literature Review: Pendekatan Berdiferensiasi Solusi Pembelajaran dalam Keberagaman. *JURNAL PENDIDIKAN MIPA*, *12*(3), 682–689. https://doi.org/10.37630/jpm.v12i3.620