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Validity analysis of Figma-CTLLM: Figma-based CTL learning media on Poaceae diversity through morphological approach

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ABSTRACT

Education and ICT cannot be separated and are mutually integrated into a whole. One example of integrating ICT in education is the development of Figma-based CTL Learning Media (Figma-CTLLM), which is very much needed to provide a concrete and modern learning experience. The research aims to develop Figma-CTLLM related to Poaceae diversity through morphological approach and to test the level of validity of Figma-CTLLM related to Poaceae diversity through morphological system. The type of research is Research and Development (R&D) research using the 4D model method (Define, Design, Develop and Disseminate). The research instrument is a validation sheet containing seven aspects: material content, systematics, language, graphics, media simplicity, media presentation, integration and emphasis on media appearance. The data analysis techniques in this research are descriptive qualitative and descriptive quantitative. The validation test analysis results obtained an average value of 86.86% with a very valid category. Based on these results, the designed Figma-CTLLM has been tested validly and will then be tested in the classroom for practicality and effectiveness testing.

INTRODUCTION

Contextual learning is learning that takes daily life events and then elevates them into learning concepts so that it can build actual knowledge and make learning meaningful (Budiman et al., 2020; Hwang et al., 2023; Wulandari, 2023; Yani et al., 2021). Contextual learning is inherently more accessible for students to accept because learning is more interesting for them. Besides, contextual learning can encourage them to apply the material in life, improving their learning skills (Saputro et al., 2023; Xiao, 2023). Contextual learning makes students have local wisdom and can maintain the local potential of their region (Budiarti et al., 2022; Budiarto et al., 2020; Na'imah et al., 2022; Sobiatin et al., 2020; Wulandari & Djukri, 2021). Contextual learning certainly requires contextual learning media by utilizing the local potential of an area (Agusty et al., 2021; Hafizha et al., 2022; Hasanah et al., 2022; Imtihana & Djukri, 2020; Saadah et al., 2022; Sam et al., 2023). One of the abundant local potentials that can be exploited is the diversity of Poaceae in the campus area.

Poaceae is a family of flowering plants consisting of 12 subfamilies, 11,000 species and 600 to 770 genera (Carballo et al., 2019; Hodkinson, 2018; Lee et al., 2020; Soreng et al., 2022). The Poaceae family is known as true grasses and includes annual Angiosperm plants that have a solid vegetative growth type (Ghirardello et al., 2022; Gupta & Ranjan, 2020; Huang et al., 2022; Keshavarzi, 2020; Majeed et al., 2020; Ullah et al., 2021). Diversity is the total number of species in a geographic area, which shows the distribution relationship of each individual (Khan et al., 2020, 2022; Salami et al., 2021). Poaceae diversity includes species, communities and habitats that dominate ecosystems (Favaretto et al., 2018; Majeed et al., 2022; Muller et al., 2021; Rocha et al., 2021). Factors influencing Poaceae diversity include temperature, rainfall and climate change (Fatima et al., 2021; Pellegrini et al., 2021). The diversity of Poaceae is classified as very high in Indonesia, so it is essential to study it (Azizah et al., 2023). The Poaceae diversity study can be integrated with ICT to develop contextual learning media. This follows Sarwinda et al. (2020), who state that contextual learning usually uses a Contextual Teaching-Learning (CTL) approach using ICT-based learning media.

ICT-based contextual learning media is an essential element of learning that needs to be developed today, generally in the form of audio, visual and audiovisual media (Ediyani et al., 2020; Mufidah et al., 2020; Sari et al., 2022; Sulistyanto et al., 2022). As is known, we are now living in the era of Industrial Revolution 4.0, where the rapid development of ICT in Indonesia has penetrated all levels of society (Boari et al., 2023; Gajewska & Walczyk, 2023; Purwono et al., 2023; Tikhonova & Raitskaya, 2023; Verawati et al., 2022). In the current era, education and ICT cannot be separated and are integrated. Many lecturers are facilitators who provide ICT-based learning media and innovative and exciting evaluation tools; this is an effort to support effective learning for students to improve critical and creative thinking skills. Them so that feedback occurs between lecturers and students (Alifteria et al., 2023; Falcão et al., 2023; Gois et al., 2023; Ilham et al., 2022; Kustyarini et al., 2020; Nawawi & Wardhani, 2023; Nurmalisa et al., 2023; Rahmatika et al., 2021; Ramadhan, 2021; Rezi & Mudinilllah, 2022; Sulistyo & Kurniawan, 2020). Even though ICT developments are beneficial in the world of education, this does not make ICT a solution to educational problems because, in reality, ICT also causes problems in the world of education.

Currently, ICT is often misused in the world of education; as we know, many students do not only use ICT for learning needs but focus on entertainment needs, which as a result, affects their academic grades (Al Rashid et al., 2023; Xu & Hopkins, 2023). This is because the learning media from lecturers could be more interesting and exciting, so they choose to use ICT for other things. Also, ICT and contextual learning need to be more consistent and complex to integrate for some lecturers. If ICT is developed well as a contextual learning media, it can provide a concrete and modern learning experience in line with current developments. Using ICT as a contextual learning media is expected to create an authentic, innovative and exciting learning atmosphere. Therefore,

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in answering this problem, we carried out a novelty to integrate local potential in Poaceae diversity in the campus area through morphological approach with the results of currently popular ICT developments in the form of Figma to develop Figma-based CTL learning media (Figma-CTLLM). Figma is an answer to problems that could have been more effective and creative in developing contextual learning media to be applied to today's learning.

Figma is a web-based software for designing mobile, website and desktop applications with collaborative and real-time displays in developing interactive and responsive interface design (Hariyadi et al., 2023; Jaya et al., 2023 ; Sato & Hazeyama, 2023; Surianto et al., 2023; Wardhanie & Lebdaningrum, 2023; Zengeni et al., 2023). Figma has many plugins that support users in designing UI/UX displays, prototypes, and brainstorming ideas (Delcourt et al., 2023; Lazo-Amado & Andrade-Arenas, 2023; Zhu & Zhang, 2023). Ginting et al. (2023) explained the advantages of Figma in application wireframes, application and website UI, prototypes and design mock-ups. Apart from that, there are superior features of Figma, such as a mirror for viewing design files on various devices and cloud-based autosave so that users do not worry about losing design files (Isnain et al., 2023; Jain, 2023). Figma has a collection of ready-to-use icons and animations with visual capabilities to attract an audience, making it suitable as a learning media (Tepe, 2022).

Several researchers have used Figma to develop their innovations in various fields, such as Shafa et al. (2023), who created a Figma-based cosmetology learning e-module. Furthermore, de Sousa et al. (2022) developed a Figma-based mobile application for self-care. Pangestu et al. (2023) who create Figma-based informatics learning media for class VII. Figma was used to design prototypes by Sumantri et al. (2023) to train vocational school students and Maulidatur et al. (2022) for Purwodadi Botanical Garden tourism. The use of Figma to design UI/UX is also widely used, such as Suryani et al. (2023) on pharmacy mobile applications, Saputra et al. (2023) on a mobile app for middle school students, Minarni & Juliana (2023) on traditional games in East Kotawaringin; Pramudita et al. (2021) in STMIK Tasikmalaya informatics engineering studies; Dafitri et al. (2023) on the MSME website; and Hidayanti et al. (2023) on online tickets for Situ Pasing Maung Tourism.

Based on several studies that have been carried out on the use of Figma and the need for contextual learning media, the research question is how to develop Figma-CTLLM related to Poaceae diversity through morphological approach? and how is the level of validity of Figma-CTLLM related to Poaceae diversity through morphological approach? The research objectives to be achieved are to develop Figma-CTLLM related to Poaceae diversity through morphological approach and to test the validity of Figma-CTLLM regarding Poaceae diversity through morphological approach.

METHODS

The type of research is Research and Development (R&D) research. In this case, the research product developed is in the form of Figma-based CTL learning media (Figma-CTLLM) related to Poaceae diversity through morphological approach. The R&D research uses the 4D model method as shown in Figure 1 (Widiyanti & Kurniawan, 2021).

The research products developed and tested for validity continue beyond the dissemination stage and stop at the development stage. In the dissemination stage, further research must be carried out to test the practicality and effectiveness of the research product's application in learning. There are two types of data obtained in this research: (1) qualitative data in the form of exposure to revised research products in the form of criticism and suggestions by validators; (2) quantitative data in the form of scores from validation tests by validators.

The research instrument is the validation sheet. The validation sheet contains seven aspects: material content, systematics, language, graphics, media simplicity, media presentation, integration and emphasis on media appearance. Each element includes a column for criticism and suggestions. The validators in this research consisted of four biology education lecturers.

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Validators were selected based on their expertise in biology education and ICT-based learning media development. The validation procedure during the development stage involved contacting each validator, providing them with a link to the Figma-CTLLM prototype, an online validation sheet via Google Forms, and product usage guidelines. Validators carried out data collection techniques by filling out validation sheets to measure the validity level of the developed Figma-CTLLM. The validator then provides quantitative assessments and qualitative input independently.

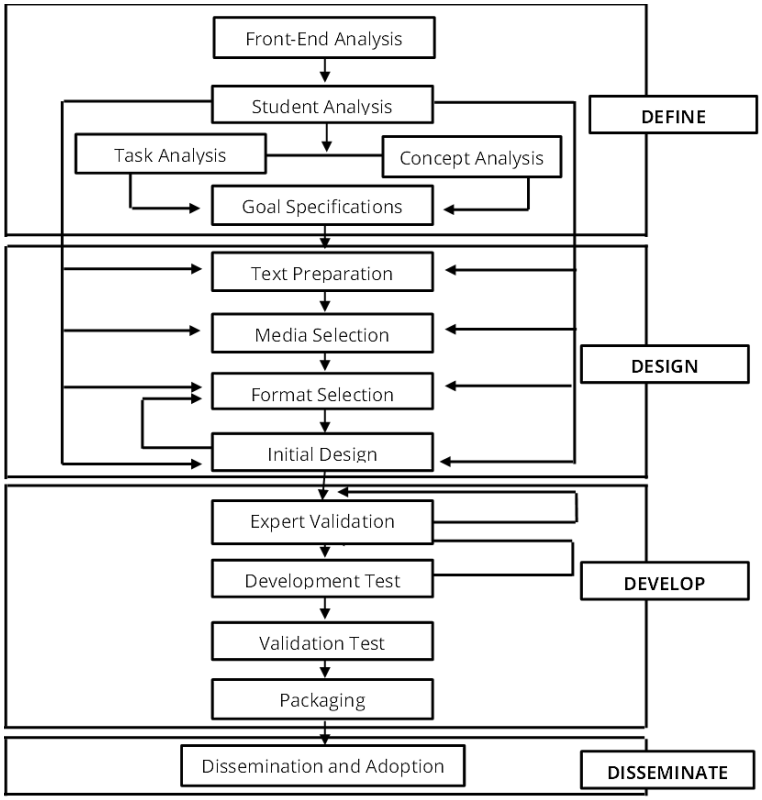

Figure 1. Procedures of 4D model development research

The data analysis techniques used in this research are descriptive qualitative and quantitative. Qualitative descriptive analysis is used in the define stage, while quantitative descriptive analysis is used in the develop stage. The assessment scale in this research Is the Likert scale in Table 1 (Ponsiglione et al., 2022).

Table 1. Scores and criteria given on the validation sheet

Score	Criteria
5	Very valid
4	Valid
3	Valid enough
2	Invalid
1	Very invalid

The results of the validity values that have been obtained are then analyzed using the formula as follows (Utami et al., 2023).

$$\text{Validity percentage} = \frac{\text{Total validation score from validators}}{\text{Total expected maximum score}} \text{ x } 100\%$$

The results of the validity analysis that have been calculated are then categorized according to the level of validity in Table 2 (Santi et al., 2023; Utami et al., 2023).

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Table 2. Interpretation of validity percentage results

Validity percentage (%)	Category	Description
81-100	Very valid	No need for revision
61-80	Valid	Minor revision
41-60	Valid enough	Moderate revision
21-40	Invalid	Major revision
0-20	Very invalid	Total revision

RESULTS AND DISCUSSION

Define stage

The results of studies analyzing student characteristics show that students tend to experience difficulties in learning diversity. This is because they need help understanding the concept of Poaceae diversity taught by the lecturer; the material load given by the lecturer is very high. Another factor is the need for more contextual learning media provided by lecturers regarding Poaceae diversity material. Regarding this issue, contextual learning media is needed as a companion tool for students to understand Poaceae's diverse learning material from lecturers.

Task analysis in contextual learning is adjusted to Learning Achievements (CP) based on the Kurikulum Merdeka in Indonesia. Verawati et al. (2022) explained that the development of educational unit curricula includes developing learning tools such as lesson plans, LKM, THB and learning media. By Manalu et al. (2022), the Kurikulum Merdeka learning changes learning methods in the classroom to outside the classroom. Developing contextual learning media will likely provide a contextual learning experience. Concept analysis aims to identify and systematically compile concepts relevant to the Kurikulum Merdeka. This research was carried out by analyzing Learning Achievements (CP) in the Poaceae diversity material in the higher plant botany course. By considering the focus of the material developed in this research, the learning outcomes of this Poaceae diversity material can be seen in Table 3.

Table 3. Learning Achievements (CP) regarding Poaceae diversity material in Kurikulum Merdeka

Knowledge Aspect Learning Achievements	Skill Aspect Learning Achievements
• Students can conclude and provide reasons regarding the morphological characteristics of the Poaceae family. • Students can conclude and provide reasons regarding the level of diversity of the Poaceae family.	• Students can observe, make judgments and consider the morphological characteristics of the Poaceae family. • Students can observe, make judgments and consider the level of diversity of the Poaceae family.

Contextual learning media as a research product is explicitly aimed at biology education students taking higher plant botany courses with four objectives, namely so that students can conclude and provide reasons regarding the morphological characteristics of the Poaceae family; can complete and provide reasons regarding the level of diversity of the Poaceae family; can observe, make decisions and consider the morphological characteristics of the Poaceae family; can observe, make decisions and evaluate the level of diversity of the Poaceae family.

Design stage

The text material used in developing Figma-CTLLM is based on preliminary research results in Yudhistian & Cintamulya (2025) and combined with the theoretical basis in several recent references. The media design has an outdoor learning theme combining green, blue and cream as the primary colours.

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The initial design of this learning media consists of an initial display (homepage) as in Figure 2 and a start button leading to the main menu as in Figure 3. Several features in the main menu section have been adapted to the seven components of CTL learning model in Nur et al. (2020), including the constructive component in Figure 4, the modelling component in Figure 5, the inquiry component and the learning community component in Figure 6, the reflection component in Figure 7, the authentic assessment component in Figure 8, and the questioning component in Figure 9.

Figure 1. The homepage design

Figure 2. The main menu design

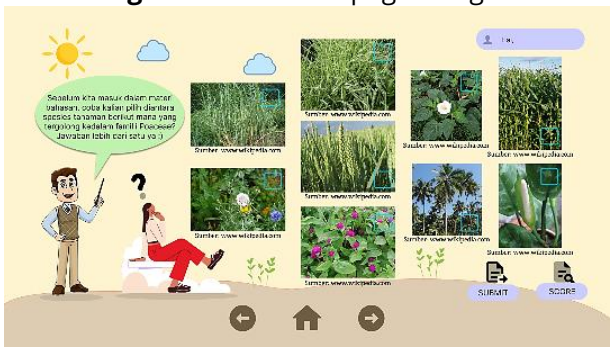

Figure 3. Constructive components design

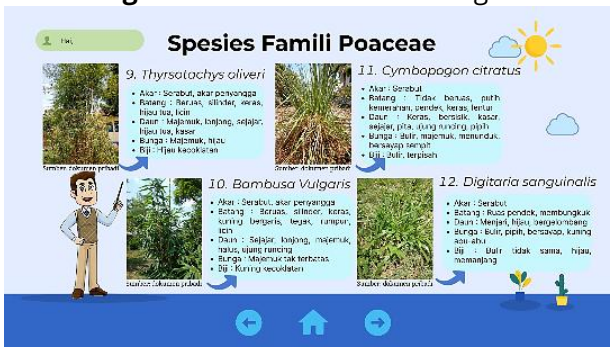

Figure 4. Modelling components design

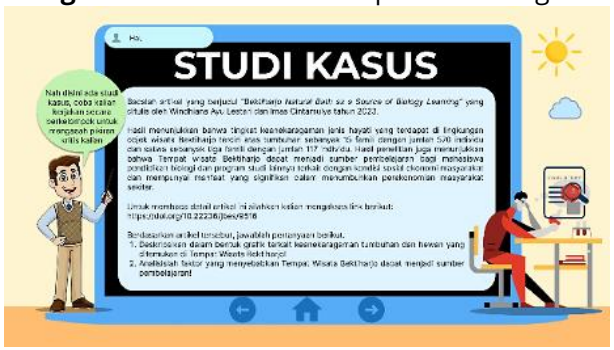

Figure 5. Inquiry learning design

Figure 6. Reflection components design

Figure 7. Authentic assessment design

Figure 8. The questioning component design

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Homepage display contains contextual learning media titles with name and school columns as user identity. The homepage section also has an assistant who is a learning guide explaining how to use the media. The main menu section consists of eight menus, namely learning outcomes, discussion material, case studies, reflections, evaluation exercises, asking questions, bibliography and developer profile, where each main menu component has been adapted to contextual learning components. At the bottom of each slide, there are back, home and next buttons for navigation to move each slide interactively. The constructive component contains questions and images to construct students' initial knowledge. In contrast, the modelling component contains images and explanations of material for students to study. The case study menu has an inquiry component and a learning community component, which contains articles and case study analysis questions to be analyzed by students in groups. The reflection menu component aims to reflect on students by carrying out a checklist on the sub-material they have studied and answering short reflection questions so that they can find out which sub-material they have understood. The practice questions menu contains an authentic assessment component, which contains multiple choice questions with ten questions of varying nature to review and improve understanding of the material studied and hone and test students' abilities in understanding the material. Lastly, the questioning menu component, where students can ask questions or discuss material they do not understand with the developer via the WhatsApp QR code listed.

Develop stage

The validation analysis score results obtained from the validator and analyzed using the validation formula are presented in Table 4.

Table 4. Validation test results for Figma-CTLLM

Aspect	Validator mean score				Average (%)	Category
	I	II	III	IV		
Contents of the material	4.00	4.71	3.86	4.71	86.40	Very valid
Systematics	4.00	4.88	3.75	4.63	86.30	Very valid
Language	4.13	5.00	4.00	4.50	88.15	Very valid
Graphics	3.71	4.86	3.29	4.57	82.15	Very valid
Media simplicity	4.50	5.00	2.50	5.00	85.00	Very valid
Media presentation	4.50	4.50	4.00	5.00	90.00	Very valid
Integration and emphasis on media display	4.00	5.00	4.00	5.00	90.00	Very valid
Average (%)					86.86	Very valid

The validation data in the form of criticisms and suggestions given by validators are presented in Table 5.

Overall, the Figma-CTLLM validation results obtained an average of 86.86% with a very valid category. This shows that aspects of Figma-CTLLM in material content, systematics, language, graphics, media simplicity, media presentation, integration and emphasis on media displays are valid and can be applied in learning. The validation test results from the four validators related to the content aspect of the material have obtained an average score of 86.4% with a very valid category. This shows that the titles and materials presented in Figma-CTLLM are based on learning outcomes. The material in the learning media follows the components of the CTL learning model, presented in a coherent, systematic and easy-to-understand way for readers. With coherent and systematic learning materials, students can master learning outcomes in an integrated manner (Ritonga et al., 2022). The questions in the evaluation exercise are also appropriate to the material presented. This is by Ulya (2021), who said that the evaluation exercise created must be adapted to the learning material.

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Table 5. The criticisms and suggestions by validators on Figma-CTLLM

Revised Sections	Before Revision	After Revision
Contens of the material	• There is no learning objectives • There are Poaceae species that do not have species characteristics	• There is learning objectives • All Poaceae species have species characteristics
Systematics	• There is no table of contents • There is no learning steps • Font size and type are inconsistent	• There is already a table of contents • There is learning steps • Font size and type are consistent
Language	• Some of the language used uses non-standard words	• All of the language used uses standard words
Graphics	• Some background colors are too contrasting and flashy	• The background colors have been changed so that they are not too contrasting and flashy
Media simplicity	• Some of the navigation buttons are less functional	• All navigation buttons have functioned properly
Media presentation	• The arrangement of the title could be neater, and some words overlap	• The arrangement of the title is neat so that there are no words that are overlapped
Integration and emphasis on media display	• The colors used for the navigation buttons are too contrasting	• The colors used for the navigation buttons are similar

The overall validity score of Figma-CTLLM is 86.86% (highly valid), which is in line with similar ICT-based media development research in the field of biology. Lestari & Cintamulya (2022) obtained an overall validity score of 86.8% in developing mobile learning-based practical instruction media. In addition, the development of ICT-based encyclopedia media by Yudhistian & Wulandari (2025) also obtained material expert validation of 91.11% and media expert validation of 87.70%. Specific development research using Figma software was also conducted to develop interactive website-based learning media and obtained an overall validation score of 92.13% (Rohmah et al., 2024). This comparison shows that the score achieved by Figma-CTLLM, which is 86.86%, is at a good level and is academically acceptable among ICT-based biology learning media that have been validated.

The systematic aspect in Figma-CTLLM obtained an average validation value of 86.3% with a very valid category. This shows that the title of the learning media is presented interestingly with a systematic presentation of the material by the concept of CTL learning model. The material in Figma-CTLLM is also equipped with images that match the explanation of the material. Image media in learning materials can help students understand the material (Wulandari et al., 2023). Besides that, image media is a common language that is easy to understand (Niu, 2024). Learning outcomes have also been arranged systematically. This is because systematic learning outcomes can determine the realization of the expected learning (Yuliyawati, 2022). The precise location of the main menu is also organized. The clarity of learning steps is also by the CTL learning model. This is by Draditaswari (2022), who states that formulating learning steps well makes students continue to think critically and actively. Place the evaluation exercise slides right after the discussion material slides so that everything is clear and the concept of the material is understood. The correct location of the bibliography slide and developer profile are also placed at the end of the slide.

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The linguistic aspect in Figma-CTLLM obtained an average validation score of 88.15% with a very valid category. This is proven by using communicative sentences in Figma-CTLLM that are clear and easy to understand. Communicative language can increase students' abilities, motivation and activeness (Ayendi et al., 2022). The sentences used in Figma-CTLLM also do not contain SARA elements by paying attention to Indonesian Enhanced Spelling (EYD) rules. Using Indonesian EYD can increase consistency and strengthen understanding of the material (Piliang et al., 2023). Effective and efficient use of language in Figma-CTLLM so that it is comfortable to read. Conveying information in learning using effective and efficient sentences is easier to understand. The language used also arouses motivation when reading it, making it suitable for use as a learning media. Apart from that, writing scientific names also follows the rules of binomial nomenclature. Using binomial nomenclature rules can support better biology learning (Tsalatsatunnisa et al., 2020).

The graphic aspect in Figma-CTLLM obtained an average validation value of 82.15% with a very valid category. This proves that the use of background colours and icons is appropriate to the Figma-CTLLM so that it is easier to read. One of the conditions for using a good background is to adjust the background to the content of the text (Azhari et al., 2018). Choosing the right font size and type for letters and numbers in Figma-CTLLM is also easy and comfortable to read. The choice of size and font type must be appropriate so that it is easy to read clearly (Sidabutar & Reflina, 2022). Apart from that, the text's font size and distance or spacing in Figma-CTLLM are also consistent. The layout related to the form of the text and images is also proportional, so it does not look random. The placement of navigation buttons such as next, home and back is also consistent; apart from that, the animation is reasonable, so it does not confuse the user. Animation can help students understand complex concepts well (Melati et al., 2023).

Media simplicity in Figma-CTLLM has obtained an average validation value of 85% with a very valid category. This shows that navigation buttons such as next, home and back are interactive and easy to use; apart from that, the icon on the main menu is Figma-CTLLM and also easy to use. Easy navigation buttons can make learning more interactive (Agustina et al., 2021). Aspects of media presentation in Figma-CTLLM have obtained an average validation value of 90% with a very valid category. This is proven by each slide's attractive cover and background design in Figma-CTLLM. Attractive slides make interactive learning media to attract students' interest (Purnama & Pramudiani, 2021). The integration and emphasis on media displays in Figma-CTLLM have obtained an average validation value of 90% with a valid category. This shows that the background colour and text colour of the material are comfortable to read and do not contrast so that they do not disturb the reader when understanding the material. Using contrasting colours makes reading the material difficult.

Research products that have been validated are then packaged in website format. Students can easily access it by downloading the Figma application on the Google Play Store or App Store, which will then display learning media. The website format was chosen because it is easy to access media on various devices, does not require ample storage, and displays text and visuals that are easy to present in learning so that students become interested in learning it (Ledy & Syafryadin, 2023).

CONCLUSION

The study concluded that the validity analysis of Figma-CTLLM related to the diversity of Poaceae through a morphological approach is very valid. This includes the seven components of CTL learning model in Figma-CTLLM, which have also been validated by the four validators and declared very valid. The research implications can contribute by increasing students' insight regarding Poaceae diversity material through morphological approach through the use of Figma-

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CTLLM. Future research is needed to conduct a practicability test and an effectiveness test so that Figma-CTLLM can be applied as an alternative learning media in daily classroom learning.

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