



EFFECTIVENESS OF ANDROID-BASED PROMBOT MEDIA THROUGH THE COOPERATIVE SCRIPT METHOD ON THE PRONUNCIATION OF SCIENTIFIC NAMES OF PLANTS

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ABSTRACT: The pronunciation of scientific plant names in the Plant Taxonomy course is a challenging topic for students. Traditional teaching methods that rely on rote memorization hinder students' understanding of the course material; furthermore, limited technology in the program reduces students' active engagement. This study aims to improve students' ability to pronounce scientific plant names by integrating the Android-based Prombot app with the Cooperative Script method. The study was conducted in the Biology Education program at the University of Jember with two groups: an experimental group and a control group. The results showed that the experimental group demonstrated a significant improvement in pronunciation compared to the control group. The developed learning medium received high validity scores (89.58% for content, 83.33% for learning, and 94.56% for the medium itself). An ANCOVA test revealed a significant difference in the effect of the learning media, with a p-value of 0.00, a value less than 0.05 indicating that, after controlling for pretest scores, the A-Props-Prono Mobile media significantly influenced students' final motivation.

ABSTRAK: Pelafalan nama ilmiah tumbuhan dalam mata kuliah Taksonomi Tumbuhan menjadi topik yang sulit dipelajari mahasiswa. Metode pembelajaran tradisional dengan pendekatan hafalan mengurangi pemahaman mahasiswa terhadap isi materi pembelajaran, selain itu teknologi yang terbatas di program studi mengurangi keterlibatan aktif mahasiswa. Penelitian ini bertujuan meningkatkan kemampuan pelafalan nama ilmiah tumbuhan pada mahasiswa dengan mengintegrasikan aplikasi Prombot berbasis Android dan metode *Cooperative Script*. Penelitian dilakukan pada program studi pendidikan biologi Universitas Jember dengan dua kelompok, terdiri atas kelompok eksperimen dan kelompok kontrol. Hasil menunjukkan bahwa pada kelompok eksperimen terdapat peningkatan pelafalan yang signifikan dibandingkan kelompok

kontrol. Media pembelajaran yang dikembangkan mendapat validitas tinggi (89,58% materi, 83,33% pembelajaran, 94,56% media). Uji ANAKOVA menunjukkan adanya perbedaan signifikan pada perlakuan media pembelajaran, dengan nilai probabilitas $p = 0,00$, dengan nilai lebih kecil dari 0,05, yang menunjukkan bahwa setelah mengontrol nilai pretest, media A-Props-Prono Mobile secara signifikan mempengaruhi motivasi akhir mahasiswa.

INTRODUCTION

Indonesia has the fourth largest biodiversity in the world, with around 38,000 plant species spread in forests throughout Indonesia (Hidayat *et al.*, 2017). The high diversity of plants requires identity so that plants can be recognized globally and utilized according to their designation. One of the sciences that regulate plant identity is taxonomy. Plant taxonomy is a system of classification, description, and naming of plant species using Latin or its Latin form in accordance with the rules in the Plant Names Code. However, in its use, the scientific name of plants is often considered difficult to pronounce and spell (Tjitrosoepomo, 1998). Although taxonomy plays a crucial role in the identification and classification of plants, understanding and pronouncing scientific names remain challenges in learning, particularly for college students. The availability of learning materials that systematically and interactively integrate morphological characteristics with plant nomenclature remains limited. This situation indicates a gap in the provision of taxonomic learning materials that are tailored to students' needs. Therefore, research is needed that introduces innovation through the development of learning materials that systematically and interactively integrate morphological characteristics and plant nomenclature to improve students' understanding of plant taxonomy.

The difficulty pronouncing scientific names is a challenge faced by Biology Education students at the University of Jember. The naming and pronunciation of scientific names of plants is new material obtained at the Strata (S1) level of the Biology Study Program. Based on the survey results, 74% of students who take the Plant Taxonomy course feel that learning in class is less interesting, so students tend to be passive and less focused on the material. In addition, learning still uses simple media, without the support of information technology, to help pronounce the scientific names of plants properly and correctly.

Plant Taxonomy lecturers have used various methods in learning, such as the assessment of memorizing 100 scientific names of plants delivered during the final exam, giving pocketbooks, and training. However, this method is not optimal, several students still do not pass the Plant Taxonomy course, while the course is a prerequisite course. This situation encourages the author to focus on creating innovation by developing a more fun and effective Cooperative Script learning method. Various efforts have been made to teach the scientific names of plants, including activities such as memorizing scientific names, using pocket guides, and pronunciation training. However, these approaches have not fully addressed students' difficulties in understanding and correctly pronouncing scientific names, as evidenced by the fact that some students still struggle with the course on Plant Taxonomy. Furthermore, the use of technology as a tool to support the pronunciation of scientific names has not yet been optimized. Consequently, it remains unclear to what extent the use of collaborative and interactive learning methods can improve students' ability to understand and pronounce the scientific names of plants.

This gap served as the basis for the development of the Cooperative Script method as a learning innovation that is expected to be more effective and engaging for students. Cooperative Script is a learning method that involves students working in pairs and taking turns delivering an oral summary of the material (Huda, 2013). This activity is designed to encourage more efficient and effective group work in learning. The Cooperative Script method is proven to improve students' memory and is effective in helping them achieve academic and social success. In addition, this method also contributes to increased achievement, self-confidence, as well as positive interpersonal

relationships between students (A'la, 2011). With this approach, students gain experience diverse reading skills, which are strengthened by the speed of the activity in identifying the main idea or important information from the material studied (Zamzani & Munoto, 2013).

However, the Cooperative Script method also has several disadvantages, requiring quite complex preparations and providing materials, funding, and energy. In addition, teachers often face challenges in managing classes with this method. Based on this, the author has developed an innovative Android-based application called A Props-Prono Mobile (Prombot). This application is designed to facilitate the pronunciation of scientific plant names through a voice feature that provides guidance and pronunciation exercises, allowing users to practice independently and evaluate their learning outcomes.

The use of Android-based technology in education has been widely developed to enhance accessibility, engagement, and independent learning, including in biology education. However, research on the use of technology specifically to facilitate the pronunciation of scientific plant names remains limited. Unlike previous educational media, which generally focused on presenting content, Prombot prioritizes pronunciation practice and guidance for scientific plant names as its core features. Since Prombot is a new application that has not been extensively tested in the context of biology education, its effectiveness and the impact of its use on students' pronunciation skills and learning outcomes remain unknown. Therefore, this study is important to obtain empirical evidence regarding the impact of using Prombot during the Plant Taxonomy learning process.

METHOD

The research was conducted from April to July 2018 at the Zoology Laboratory, Faculty of Teacher Training and Education, and Faculty of Computer Science, University of Jember. This research uses a Research and Development (R&D) using the ADDIE model (Analysis, Design, Development, Implementation, Evaluation) approach to develop products in Mobile Props-Prono Tools by applying the Cooperative Script learning method.

This method is applied to produce educational products that support the learning process and evaluate the effectiveness of their use. The study population consisted of all 4th-semester Biology Education students at the University of Jember who took the Plant Taxonomy course. The homogeneity test was selected from 58 students from classes A and E research samples. The selection of the experimental group and control group was done by randomization through drawing.

Analysis

The analysis stage was conducted to identify needs and issues in teaching plant taxonomy. An initial analysis was performed by reviewing students' learning outcomes from the previous semester as a basis for evaluation and consideration in determining the need for developing learning media. Subsequently, a survey was conducted among students to gather information regarding difficulties in learning and pronouncing the scientific names of plants, as well as their needs for technology-based learning media.

Design

The design phase included formulating the research design, designing the learning media, and developing research instruments. From the five available classes, two were randomly selected to serve as the experimental and control groups. Additionally, during this phase, the concept for the Prombot application was designed, encompassing the application's structure, learning materials, pronunciation features, exercises, and a user interface tailored to user needs.

Development

The development phase involved turning the design into a user-friendly Prombot application that could be applied in the learning process. After the application was developed, validation testing was conducted by experts including subject matter experts, instructional material

developers, and media specialists to assess the appropriateness of the content, the quality of the instructional materials, technical aspects, and the suitability of the application for use in learning. Based on the validation results and feedback from the experts, revisions and refinements were made to the application, including the addition and improvement of several necessary features and learning materials.

Implementation

The implementation phase involved using the Prombot application with the experimental group in their Plant Taxonomy course. Meanwhile, the control group continued learning using the conventional methods and instructional materials that had been used previously. Both approaches were implemented to gather empirical data on the effectiveness of Prombot in supporting the learning process.

Evaluation

The evaluation phase was conducted to determine the results of Prombot's implementation by comparing learning outcomes between the experimental and control groups. The evaluation included students' learning outcomes after participating in the course as well as their responses to the app's use. The data obtained was used to assess Prombot's effectiveness and served as the basis for product improvements. Based on all these stages, the final product the Prombot app was developed through a process of needs analysis, design, development, validation, revision, implementation, and evaluation. It can now be used as a learning aid for plant taxonomy, specifically to help students learn and pronounce the scientific names of plants.

Several stages of the method are used for media development. This research was conducted in five (5) stages, namely: Analysis stage, using a literature and field studies approach, design phase, development stage, testing phase and final revision and drafting. The literature study aims to understand the perspectives of technology experts and practitioners who play a role in technology development. The field study was conducted to observe the direct impact on the research environment. The absence of application products designed based on the results of literature studies is why the author makes this product the object of research.

The needs analysis shows that many students have difficulty pronouncing the scientific names of plants, which is one of the main reasons for developing this product. In analyzing system needs, the author uses case tools. Using cases is to identify and analysis needs in-depth to develop a model that describes users' needs from their point of view. This model focuses on functional requirements without being tied to the technical details of how the system will be built and implemented.

Development design includes the creation of objectives, test items, and strategies, as well as developing evaluation models. It involves gathering information about learner characteristics, instructional needs, content, expected outcomes, and methods and then communicating that information to relevant parties (Winaryati *et al.*, 2012). Unified Modelling Language (UML) is a "language" that has become an industry standard for software system visualization, design, and documentation. Using UML, models can be created for various software applications that can run on various hardware, operating systems, and networks and written in any programming language (Sulistiyorini, 2009).

Flowchart

The processes and steps that occur in interactive multimedia learning applications are described using flowchart symbols to map the flow of the application.

Storyboard

The serialized areas in a sketchbook used as a planning tool visually depict how a story's flow of action develops (Rozanda & Maisaroh, 2012).

Interface Design (UI)

The user interface is a communication mechanism between users and computers. Along with the user interface in the mobile application, it is expected to convey information to the user to help direct the flow of tracing the problem until a solution is found.

The development stage translates the design results into physical and logical form in computer program code. At this stage, the flowchart, storyboard, UML, and UI designs are implemented into lines of code in A Props-Prono Mobile application, using the Integrated Development Environment (IDE) and Android SDK, which provides various libraries needed in application design. In addition, this stage also involves gathering content from experts and available media sources and summarizing the information into production documents and prototypes. After that, the validity of production specifications and prototypes is verified by involving teachers, principals, experts, project teams, and learners (Winaryati *et al.*, 2012). The steps of the development procedure of the Gall *et al.* (1989) development model are depicted in Figure 1.

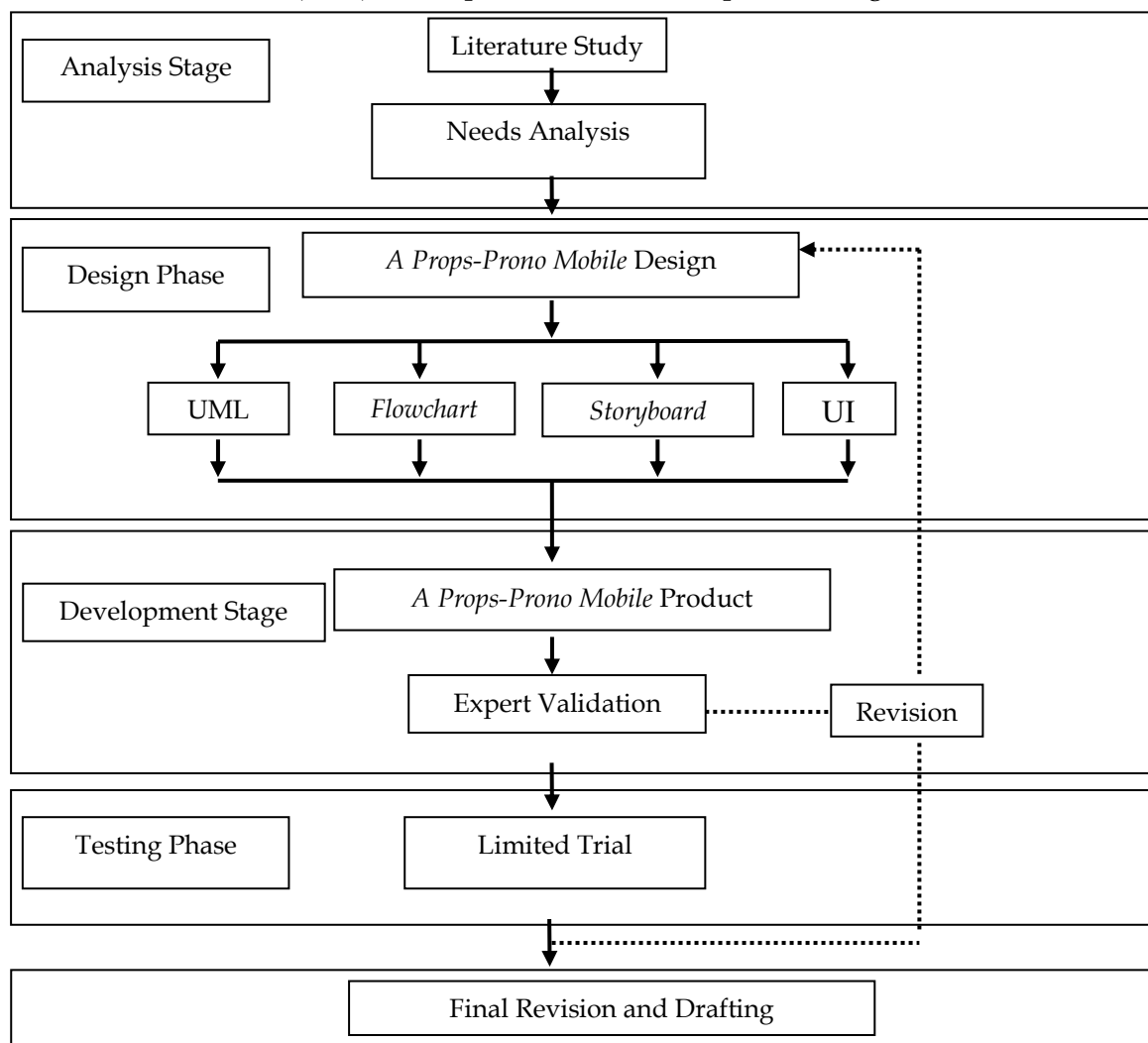


Figure 1. Research flow

The testing stage was carried out by testing the application on emulators and mobile devices. Researchers completed the initial testing stage independently to ensure the product met the desired objectives. After the product passed the test, the application then entered the field trial stage to evaluate the direct impact of using the application by users. The trial conducted was a limited trial, in which the instrument design that had been developed was validated first by experts. These namely lecturers are experts in the field of evaluation and educational research (material) and

experts in learning technology, one person each, along with users. This process involves testing interactive learning multimedia applications in the Biology Education environment at the University of Jember, including testing the suitability of applications with scenarios and storyboards that have been compiled. Testing uses the black box method and user acceptance test to assess the application's acceptance, ease of use, and effectiveness. The test results will be evaluated to determine the following action, whether improvement or redesign is needed. Furthermore, the research results will be tested using ANACOVA.

RESULTS AND DISCUSSION

Based on the research findings, the use of information and communication technology (ICT) plays a role in producing interactive learning resources for the Plant Taxonomy course, one example being the development of A-Props-Prono Mobile (Prombot). The International Commission on Education for the Twenty-First Century, which set out four pillars of lifelong education: learning to know, learning to do, learning to be, and learning to live together. These four pillars emphasise the importance of mastering knowledge, skills, personal development, and the ability to interact and collaborate. In the context of learning, the use of ICT can support the achievement of these pillars by providing flexible and interactive learning resources. Jamun (2018) also emphasise the importance of educators' mastery and utilisation of ICT in supporting the learning process.

These findings are reinforced by (Sangur *et al.*, 2025) through a systematic literature review of 66 studies, which showed that mobile learning in biology education has the potential to enhance engagement, motivation, skills and learning outcomes, whilst providing flexibility in access to learning. In this study, Prombot was specifically developed to help students recognise and pronounce the scientific names of plants through features such as educational content, audio and exercises that can be used repeatedly. The use of smartphones as a learning medium enables students to learn independently or as part of Cooperative Script learning activities. Thus, Prombot not only serves as a means of conveying information but also supports 'learning to know' through the mastery of scientific names, 'learning to do' through pronunciation practice, and 'learning to live together' through paired learning activities. This is in line with the findings of (Amien *et al.*, 2025), who demonstrated that Android-based mobile learning media can be developed as a biology learning tool to support improved learning outcomes. therefore, the development of Prombot demonstrates that the application of ICT, tailored to the characteristics of the subject matter and the needs of students, can serve as an innovation in Plant Taxonomy education, particularly in overcoming difficulties in pronouncing the scientific names of plants. Prombot Application Development uses a development model consisting of:

Analysis Stage

Findings from the literature study revealed that there are several factors that cause students to experience difficulties in learning biology. The main factor of difficulty experienced by students is the greatest learning difficulty, namely 88.01% due to too many Latin or scientific names, especially plants. Other factors include the lack of books as a learning resource, the lack of appropriate learning media, and several other things (Kameswari, 2022). This is in accordance with (Kameswari, 2022) which states that memorizing good Latin language or names is very important. This is because Latin is always used in stating a species, both plant and animal species. In his research, a percentage of 60.5% was obtained to improve understanding and mastery of Latin terminology by repeating memorization so that it can be applied in everyday life and achieve goals based on the majors they choose in college later.

Design Stage

Developing a development design, setting objectives, test items, and strategies, and developing an evaluation model. Collect information related to learner characteristics, instructional needs, content, expected outcomes, and methods, then communicate it to the parties involved

(Winaryati *et al.*,2012). This stage begins with creating an application design in the form of sketches. Stationery media in sketch form. Then, proceed with prototyping, which is done by making a rough sketch as a storyboard. The shape of a storyboard.

The next step is to create a logo in the form of a user interface using Adobe Photoshop and then apply data from the UI (User interface) for coding. Data from UI (User interface) for coding. In coding, three kinds of applications are used: HTML to create the core of the coding language and CSS, which is directly related to the UI (User interface) display for coding. Cascading Style Sheets (CSS) is directly related to the UI (User interface) and Javascript for button settings. Javascript for button settings. The result will be a zip converted into an APK form and applied to Android. The following are the results of developing the Prombot application used in learning. The results from the ZIP file are then further processed so they can be implemented in the system and developed into an application.

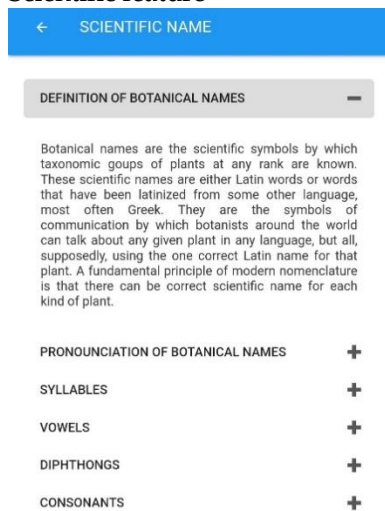
Development Stage

The development stage translates the physical and logical design results into computer program code. At this stage, the flowchart, storyboard, UML, and UI designs are converted into lines of code in A Props-Prono Mobile application using the Integrated Development Environment (IDE) and Android SDK (Winaryati *et al.*,2012). When installing the Prombot application, an icon will appear show at Table 1.

Table 1. Menu Prombot App

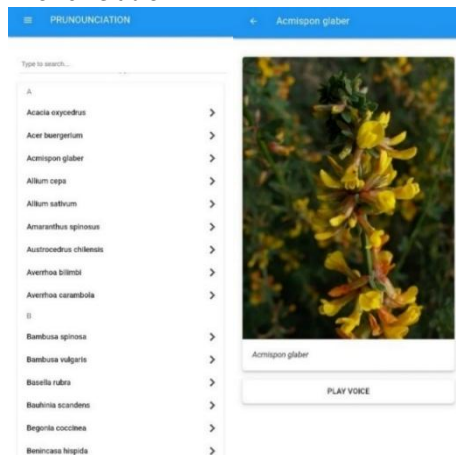
No	Menu name and appearance	Menu description
1.	Prombot icon 	Feature view in the Prombot app, which consists
2.	Main Menu (Home) 	This feature will display the Prombot icon and several menus that users can access within the app. Have 5 Features;

3. Scientific feature



Scientific name: This feature includes several menus that can be accessed by the user, which include: Definition of Botanical Names, Pronunciation of Botanical Name, Syllables, Vowels, Diphthongs, and Consonants. Some parts of this feature are arranged so that users can briefly understand what scientific names are, how to pronounce them, and some rules for pronouncing scientific names of plants before practicing directly, listening, and pronouncing scientific names with the help of the application. It is hoped that, besides gaining a basic understanding, users can better understand the pronunciation and pronunciation rules. Not only can users see and hear, but they can also learn the pronunciation and rules of the scientific names of plants. This application is designed in English to make it easier for users from Indonesia and other countries to use.

4. Pronunciation



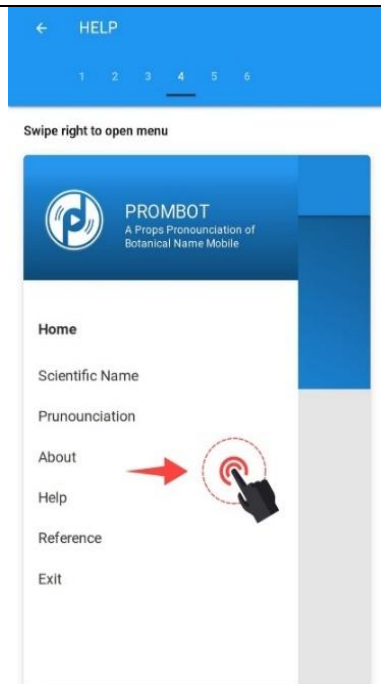
Pronunciation; This feature presents some scientific names of plants that have been compiled, accompanied by images, and audio for pronunciation

5.



Abaout Feature; This feature is all about what Prombot is and who the app developers

6.



Help; This feature contains application usage instructions to help users run the application. Instructions for use are displayed as quickly as possible

7.



Reference; This feature contains reference sources taken from application development

Testing Phase

Prombot was validated prior to implementation to ensure the suitability of the content, teaching materials and technical aspects of the application. The validation process involved experts in plant taxonomy, teaching material development and Android media, ensuring that the assessment covered pedagogical, substantive and technical aspects. This stage is in line with research on the development of Android-based biology media, which identifies expert validation as a crucial stage prior to user testing (Yorenza *et al.*, 2024); (Amien *et al.*, 2025); (Rani, 2022). Consequently, the validation of Prombot ensures that the application contains content that is accurate, easy to understand, aligned with learning objectives, and suitable for use in the teaching of plant taxonomy.

Validation produces two data types, quantitative and qualitative, which are evaluated to determine the feasibility of the developed media products. Quantitative data is obtained from reviews given by validators, while qualitative data is obtained through input, suggestions, and

comments after completing the validation instrument. The results of the validator's assessment of Android-based A-Props-Prono Mobile media products can be understood through Table 2 (quantitative data) and Table 3 (qualitative data).

The validation process by material experts aims to assess the feasibility and deficiencies of the material used for the product that has been made. In this phase, the validator provides recommendations and helpful feedback for improving the material in the developed application. The following are the results that have been obtained (Table 2, 3, 4, 5).

Table 2. Results of material validation sheet

Sub-component	Items	Score
Material content	Compliance with general skills 1, 2, and 5	4
	Breadth of content	3
	Depth of material	4
	Completeness of the material presented	4
	Clarity of material description	3
	The order of the material presented	4
	Material/content is original work (not plagiarized)	3
Material accuracy	Factual accuracy	4
	Accuracy of concept/law/theory	4
Up-to-date and contextualized	Appropriateness with the latest developments in science concepts	3
	Suitability to student development	3
	Illustration update	4
Total score obtained		43
Maximum number of scores		48
The percentage results obtained		89.58%

Table 3. Results of the expert validation sheet for teaching material development

Sub-component	Items	Score
Presentation technique	Consistence of systematic presentation in subchapters	3
	Logicity of presentation and coherence of concepts	3
Presentation support	Appropriateness and accuracy of illustrations and materials	3
	Build motivation to learn at the beginning of the chapter.	3
Learning presentation	Create interactive communication and generate feedback.	3
	Develop scientific process skills.	4
	It has a variety of presentations.	3
Component	Illustrations support the material presented.	4
	Illustrations make it easier for students to understand the material.	4
Total score obtained		30
Maximum score		38
Percentage result obtained		83,3%

Table 4. Media expert validation sheet results

Subcomponents	Item	Score
Artistic and aesthetic	Harmony of color, text and images	1
	Images in the media are presented clearly	4
	Use the form of letters that have been read	4
	Text and sound help clarify the image	4
	Images clarify the material to be conveyed	4
Ease of navigation	Easy to follow material	3
	Media supports students in independent learning	4
	Use of text and graphics in proportional programs	4
	The attractiveness of the layout and layout	4
	Accuracy of color selection and interesting composition	3
	Background color with text	4
	Accuracy in choosing font type and size	4
	Simple application in operation	3
	The form and layout of navigation is consistent throughout the application	4
	The navigation created makes it easier for application users to operate it	3
	The navigation provided makes it easy for users to select the material presented	4
	The program can run well	4
	Clarity of program usage instructions	4
Language	The language used is easy for students to understand	3
	The sentences used are effective	4
	Use of the word appropriate	4
Overall function	The application helps users to be more curious about the material	4
	The application is developed with specifications that are accessible to smartphone users	4
Total score obtained		87
Maximum score		92
Percentage result obtained		94,56%

Table 5. Results of validator assessment of Android-based A-props-prono mobile

No	Validators	Aspect	Average assessment result (%)	Category
1	Subject matter expert	a. Coverage of material b. Accuracy of material c. Updated and contextual	89.58	Very valid
2	Teaching materials development expert	a. Presentation techniques b. Presentation support c. Learning presentation d. Presentation components	83.33	
3	Media expert	a. Artistic and aesthetic b. Ease of navigation c. Language d. Overall function	94,56	

Product validation activities of android-based learning media Prombot learning media before this media is used in learning. Validators in testing this media product consisted of three experts from Biology Education Lecturers at the University of Jember, consisting of material validators (pronunciation of scientific names of plants), development validators, and android-based media validators. The validation test results conducted by the three validators, namely material experts, teaching material developers, and media experts, showed significant results. The material expert gave an upbeat assessment regarding the suitability of the material content with the learning objectives. The validation results show that Prombot received excellent ratings from instructional material development experts and media experts. The instructional material development experts assessed that the tools and materials presented were aligned with the learning objectives, systematic and easy to understand, whilst the media experts assessed that the application's visual presentation, navigation, readability and ease of use met the feasibility criteria.

These results indicate that Prombot has met the content and technical feasibility requirements prior to its implementation in teaching. The findings of this study are consistent with those of (Hasanah & Risnasari, 2025) who developed an Android-based biology teaching resource using the ADDIE model and obtained a feasibility score of 82 per cent for the media aspect, 82 per cent for the content, and 85 per cent for the language, thereby categorising it as highly feasible. Similar results were reported by (Hasanah & Risnasari, 2025), who obtained a validity score of 91 per cent from media experts and 89 per cent from content experts in the development of Android-based biology learning media. Furthermore, emphasised the importance of validation by experts in design, content and language to ensure the quality of Android-based digital learning media before it is used by learners. Thus, the validation results for Prombot reinforce the view that the development of Android-based learning media must undergo multidimensional expert assessment to ensure that the product is not only visually appealing but also pedagogically appropriate, user-friendly and relevant to the learning objectives. This is in line with (Sangur *et al.*, 2025), who, through a systematic literature review, demonstrated that mobile learning is increasingly prevalent in biology education and has the potential to support more effective, engaging and flexible learning. See Table 6.

Table 6. Results of validator suggestions and comments on Android-based A-propos-prono mobile

No	Validator	Suggestions and Comments	Detail
1	Media expert	-	-
2	Teaching material Development expert	The validation instrument is already simple	The product is ready to be used in learning without any revisions to the product
3	Media expert	The product has been made successfully The product can be operated on fluently Sound samples can be heard clearly	The product is ready to be used in learning without any revisions to the product.

The data results in Table 6 and Table 7 serve as a reference for making improvements to the media products that have been made. This change aims to ensure that the product is feasible and can be used effectively in learning. Media product testing is carried out through a quasi-experimental approach because not all experimental variables and conditions can be fully controlled or regulated. This method allows researchers to test the effectiveness of the

product in a more realistic situation, although there are some constraints in controlling existing variables.

The validation process results include two types of data, namely quantitative and qualitative. The data was analysis to assess the feasibility of the media products designed. Quantitative data was obtained through assessments given by validators, while qualitative data was obtained based on input and comments from validators when filling out the validation instrument. The validation results explain that the application is feasible for learning, as evidenced by the following validation scores: material expert 89.58, teaching material development expert 83.33, and media expert 94.56. Qualitative results from media experts stated that the media was well organized, the operation was smooth, and the sound provided could be heard clearly. In addition, teaching material development experts assessed that the instruments have simplicity, making it easier for users to access the material.

The results showed the Cooperative Script learning method's application through the A-Props-Prono Mobile application. The Cooperative Script method is a learning approach in which students work in pairs, alternating roles as readers and listeners, to summarize the material studied (Harefa *et al.*, 2020). The research was applied to two classes, the experimental and control classes. Media product testing is done with a quasi-experimental approach because not all variables and conditions in the experiment can be strictly controlled. The research sample population was students of the Biology Education Study Program at the University of Jember who took the Plant Taxonomy Course in the Even Semester of the Academic Year, divided into three classes. The samples used in this study consisted of classes A and C, which were selected based on the homogeneity test results using the Levene test ($p > 0.05$). The homogeneity test results showed that the three classes were similar, so the selection of experimental and control classes used the random sampling method (drawing). Class C was selected as the control class and A as the experimental class. Such an approach ensures that comparisons between experimental and control classes are conducted under equivalent conditions, providing a solid basis for assessing the effectiveness of the applied method.

Learning outcomes were analysed by comparing pre-test and post-test scores, as well as using N-Gain (normalised gain), to determine the extent of improvement in learning outcomes following instruction. N-Gain provides a measure of relative improvement by taking into account the initial score and the maximum score achievable, and can therefore be used to evaluate the effectiveness of instruction more objectively. The recent research indicates that pretest-posttest analysis and N-Gain can provide a quantitative picture of the improvement in conceptual understanding following a learning intervention (Rumapea *et al.*, 2026). These results can be further detailed show Table 7, which compares pretest, post-test, and N-Gain scores for each group, thus providing a clear picture of the effectiveness of the applied learning.

Table 7. Student learning outcomes

Class	Total (n)	Pretest average
Control	29	50.34
Experiment	29	55.17

The data in Table 7 shows that the comparison of the average difference in post-test and pretest scores in the experimental class is higher than in the control class, which indicates a more significant increase in learning outcomes in the experimental class. The normality test results show that the pretest value is 0.358, and the post-test is 0.076, which has a probability greater than 0.05. The data can be considered normally distributed. Once the data met the assumption of normality and other prerequisite assumptions, the analysis continued using

Analysis of Covariance (ANCOVA). This analysis was used to test for differences in post-test scores between the experimental and control groups, whilst controlling for pre-test scores as a covariate, so that differences in initial ability between the groups could be taken into account in the analysis (Schwarz, 2025). The results of the analysis of the covariance test are presented in detail in Table 8, which provides a clearer picture of the effect of treatment on student learning outcomes.

Table 8. Results of covariance analysis of student motivation in both classes

Source	Type III sum of squares	Df	Mean square	f	P
Corrected Model	6235.555 ^a	2	3162.777	12.956	0.000
Intersep	16640.414	1	16640.414	68.167	0.000
Pretest	118.658	1	118.658	0.486	0.489
Group	6048.366	1	6048.366	24.777	0.000
Error	13426.170	55	244.112		
Total	321000.000	58			
Corrected Total	19751.724	57			

The ANCOVA (Analysis of Covarians) results showed that the use of instructional media had a significant effect on post-test scores after pre-test scores were controlled for as a covariate ($p < 0.001$; $p < 0.05$). The higher post-test scores in the experimental group indicate that the use of A-Props-Prono Mobile (Prombot) combined with Cooperative Script is more effective in improving learning outcomes than conventional instruction. This finding is consistent with (Tamanolies *et al.*, 2024), who reported that Android-based learning media had a significant effect on biology learning outcomes ($p = 0.003$), with the experimental group's average post-test score of 83.81 compared to the control group's score of 76.67. The use of mobile learning applications had a significant effect on biological conceptual knowledge based on ANCOVA analysis. The improvement in learning outcomes in this study is believed to be related to Prombot's features, which provide interactive and flexible materials and exercises for pronouncing scientific names. The integration of Prombot with Cooperative Script also encourages students to actively read, listen, memorize, and discuss the material, thereby creating a more active learning experience compared to conventional learning. As a new application, the results of this study provide preliminary evidence regarding Prombot's effectiveness in supporting the learning of plant taxonomy.

The research findings indicate that the implementation of the Cooperative Script, combined with the Android-based A-Props-Prono Mobile (Prombot) medium, has a significant effect on pupils' learning outcomes. The effectiveness of the Cooperative Script can be attributed to its learning characteristics, which pair pupils together to read, restate the material, listen, and respond to their partner's explanations. Research by (Rumbekwan *et al.*, 2018) revealed a significant difference in biology learning outcomes between students who learnt using the Cooperative Script and those who followed conventional teaching methods ($p = 0.000$). Similar findings were reported by (Situmorang, 2018), who demonstrated an increase in learning activity from 71 per cent to 97 per cent and an improvement in learning outcomes during the implementation of the Cooperative Script in biology lessons.

This effectiveness becomes even more relevant when the Cooperative Script is supported by technology-based learning media. The research findings indicate that the study by (Tamanolies *et al.*, 2024) shows that the use of Android-based learning media has a significant impact on biology learning outcomes. More recent findings by (Ina &

Ndjoeroemana, 2025) also indicate that media-assisted Cooperative Script can improve learning outcomes, with average learning outcomes rising from 57.9 in the pre-cycle stage to achieving classical mastery in the subsequent cycle.

In a broader context, (Sangur *et al.*, 2025), through a systematic literature review of 66 research articles, demonstrated that mobile learning is an effective medium in biology education. The use of mobile devices not only supports conceptual understanding but also enhances engagement, motivation and learning skills. Interestingly, 70 per cent of the studies reviewed focused on cognitive learning outcomes, whilst experimental research was one of the most commonly used approaches (27.3). This reinforces the relevance of using an experimental design to test the effectiveness of Prombot.

In this study, Prombot serves a specific purpose as it was developed to help students learn and pronounce the scientific names of plants through features such as learning materials, audio and exercises that can be used repeatedly. The use of mobile learning in biology education has been shown to have the potential to enhance engagement, motivation, skills and learning outcomes (Sangur *et al.*, 2025), whilst Android-based media have also been reported to support biology learning outcomes in a flexible (Amien, *et al.*, 2025);(Yorenza, *et al.*, 2024). Furthermore, the use of mobile devices in pronunciation learning can have a positive impact on pronunciation skills when supported by an appropriate pedagogical design. The integration of Prombot with Cooperative Script further strengthens the learning process through activities such as reading, listening, pronunciation, and providing feedback in pairs. Consequently, the effectiveness of Prombot is influenced not only by the use of Android technology but also by the suitability of the media's features to the characteristics of the Plant Taxonomy material and the learning model applied. These findings provide empirical evidence that Prombot has the potential to serve as an innovative medium that specifically supports the mastery and pronunciation of the scientific names of plants.

The cooperative script method has several advantages supporting the effectiveness of learning. One of them is the ability of students to summarize the material, which is then presented to their group mates. Through this process, students can develop their thoughts more clearly and systematically and communicate those ideas to listeners. In addition, this method encourages collaboration between students, where they help each other understand the material being studied. Listening to each other and giving feedback also allows students to correct misconceptions that arise during learning using teaching media, thus enriching their understanding of the material being studied and making it easier for students to remember and pronounce the scientific names of plants. According to (Sihotang *et al.*, 2025), these advantages make cooperative scripts effective for improving material understanding and strengthening students' social and communication skills, which are crucial in collaboration-based learning. With the use of Android-based A-Props-Prono Mobile application media, this method makes it easier for students to access and practice the pronunciation of the scientific names of plants in an interactive and fun way.

CONCLUSIONS AND SUGGESTIONS

The utilization of Android-based A-Props-Prono Mobile media combined with the cooperative script learning method significantly improves student learning outcomes. Applying this method not only improves students' understanding of the material but also encourages active involvement, collaboration, and communication, improving the overall quality of learning. Thus, this learning media is an effective tool in supporting the learning process, especially in improving students' ability to master the pronunciation of scientific names of plants.

Based on the research, the author suggests training lecturers to optimize the use of applications in the Cooperative Script method so that its implementation can run more effectively. In addition, further research is needed to assess the long-term impact of the application of this learning media on student learning outcomes. Increased collaboration between application developers and educational institutions is also crucial so that the application can continue to be adapted to the needs of the curriculum and the development of existing learning methods.

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REFERENCES

- A'la, M. (2011). *Quantum Teaching*. Yogyakarta: Diva press.
- Amien, M.F., Saptono, S., & Marianti, A. (2025). Development of Android-Based Mobile Learning Media on Cell Material to Improve Students' Learning Outcomes. *Journal of Biology Education*, 14(2), 177-187. <https://doi.org/10.15294/ujbe.v14i2.32768>
- Gall, W. D., Gall, J. P. Gall, & Borg, W. R. (2003). *Education Research: An Introduction*. (6th ed.). New York: Longman.
- Harefa, D., Gee, E., Ndruru, M., Sarumaha, M., Ndraha, L.D.M., Ndruru, K., Telaumbanua, T. (2020). Penerapan Model Pembelajaran Cooperative Script untuk Meningkatkan Hasil Belajar Matematika. *Jurnal Kajian Pendidikan Matematika*, 6(1), 13-20. <https://doi.org/10.30998/jkpm.v6i1.6602>
- Hasanah, A., & Risnasari, M. (2025). Android-based virtual laboratory with starter experiment approach for learning. *Jurnal Inovasi Teknologi Pendidikan*, 12(1), 68-81. <https://doi.org/10.21831/jitp.v12i1.78848>
- Hidayat, M., Laiyanah, L., Silvia, N., Putri, Y.A., dan Marhamah, N. (2017). Analisis Vegetasi Tumbuhan Menggunakan Metode Transek Garis (Line Transek) di Hutan Seulawah Agam Desa Pulo Kemukiman Lamteuba Kabupaten Aceh Besar. *Prosiding Biotik Biologi, Teknologi dan Kependidikan, yang diselenggarakan oleh Universitas Islam Negeri Ar-Raniry*. 4(1), 85-91. ISBN: 978-602- 60401-3-8. Banda Aceh: Universitas Islam Negeri Ar-Raniry.
- Huda, M. (2013). *Model-Model Pengajaran dan Pembelajaran*. Yogyakarta: Pustaka Pelajar.
- Ina, A. T., & Ndjoeroemana, Y. (2025). Peningkatan Hasil Belajar Siswa Dengan Model Pembelajaran Cooperative Script Berbantuan Media Kartu Berpasangan di SMP Negeri Satap Matawai Iwi. *Biodik: Jurnal Ilmiah Pendidikan Biologi*, 11(1), 253-261. <https://doi.org/10.22437/biodik.v11i1.41156>
- Jamun, Y.M. (2018). Dampak Teknologi Terhadap Pendidikan. *Jurnal Pendidikan dan Kebudayaan Missio*, 10(1), 1-136. <https://doi.org/10.36928/jpkm.v10i1.54>
- Kameswari, D. (2022). Pengetahuan Mahasiswa Biologi Terhadap Penggunaan Terminologi Bahasa Latin. *Research and Development Journal of Education*, 8(1), 256. <https://doi.org/10.30998/rdje.v8i1.11187>

- Rani, W. W. (2022). Pengembangan Media Pembelajaran Berbasis Aplikasi Android Menggunakan Software Smart Apps Creator 3 (Sac) Materi Sistem Tata Surya Kelas Vi Sekolah Dasar. *Jurnal Ilmiah Teknologi Infomasi Terapan*, 8(2), 291–299. <https://doi.org/10.33197/jitter.vol8.iss2.2022.798>.
- Rozanda, N. E., & Maisaroh. (2012). Perancangan Aplikasi Multimedia Sebagai Media Pembelajaran. *Jurnal Sains, Teknologi Dan Industri*, 9(2), 124–134. <https://doi.org/10.24014/sitekin.v9i2.599>
- Rumapea, L., Sinambela, M., & Silitonga, M. (2026). The Effectiveness of an Environment-Based Biodiversity Flipbook E-Module on Students' Biology Understanding and Scientific Process Skills in Grade X of SMA Negeri 21 Medan. *Bioscientist : Jurnal Ilmiah Biologi*, 14(1), 82–92. <https://doi.org/10.33394/bioscientist.v14i1.19762>
- Rumbekwan, Y. O., Yohanita, A. M., & Damopolii, I. (2018). Pengaruh Model Pembelajaran Cooperative Script Terhadap Hasil Belajar Biologi Di Kelas VIII SMP 11 Manokwari The Effect Of Cooperative Script Learning Model On Biology Students' Achievement In Class VII SMP 11 Manokwari. *Jurnal Pendidikan IPA Veteran*, 2(1):25-35. <https://doi.org/10.31331/jipva.v2i1.566>
- Sangur, K., Zubaidah, S., & Sulisetijono. (2025). A systematic literature review of mobile learning trends in biology education over ten years. *Social Sciences and Humanities Open*, 11(1), 101429. <https://doi.org/10.1016/j.ssaho.2025.101429>
- Schwarz, W. (2025). The Ancova model for comparing two groups: a tutorial emphasizing statistical distribution theory. *Frontiers in Psychology*, 16, 1-10 <https://doi.org/10.3389/fpsyg.2025.1600764>
- Sihotang, D., Mutia, E., Gulo, J.R.H., & Nainggolan R. (2025). Pemanfaatan Pembelajaran Interaktif dalam Meningkatkan Inovasi Pembelajaran di Era Digital. *Jurnal Bisnis Inovatif dan Digital*, 2(2), 21-29. <https://doi.org/10.61132/jubid.v2i3.669>
- Situmorang, M. (2018). Peningkatan Motivasi Dan Hasil Belajar Mata Pelajaran Biologi Melalui Metode Cooperative Script Pada Materi Metabolisme Di Kelas XII IA.A SMA N 1 Seberida. *Menara Ilmu: Jurnal Penelitian dan Kajian Ilmiah*, 12(10), 94–109.
- Sulistiyorini, P. (2009). Pemodelan Visual dengan Menggunakan UML dan Rational Rose. *Dinamik*, 14(1), 23-29. <https://doi.org/10.35315/dinamik.v14i1.87>
- Tamanolies, B. N., Hadiprayitno, G., & Ilhamdi, M. L. (2024). Pengaruh Media Pembelajaran Berbasis Android Terhadap Hasil Belajar Biologi Pada Siswa Lintas Minat. *Jurnal Ilmiah Profesi Pendidikan*, 9(3), 2083–2090. <https://doi.org/10.29303/jipp.v9i3.2643>
- Tjitrosoepomo, G. (1998). *Klasifikasi Tumbuhan*. Yogyakarta: Gajah Mada University Press.
- Winaryati, E., Handarsari, E., & Fathurohman, A. (2012). Analysis Pengembangan Model Pembelajaran “Wisata Lokal” pada Pembelajaran Sains. *Prosiding, Seminar nasional hasil penelitian Universitas Muhammadiyah Semarang*.
- Yorenza, D. P., Nirwana, A., Hutasuhut, M. A. (2024). Pengembangan Booklet Berbasis Android Sebagai Media Belajar Pada Materi Invertebrata Untuk Meningkatkan Hasil Belajar: Android-Based Booklet Development as Learning Media on Invertebrate Material To Improve Learning Outcomes. *Edu-Sains, Jurnal Pendidikan Matematika dan Ilmu Pengetahuan Alam*, 13(1):1-12. <https://doi.org/10.22437/jmpmipa.v13i1.28507>

Zamzani, R., & Munoto. (2013). Pengaruh Teknik Pembelajaran Cooperative Script Terhadap Hasil Belajar Siswa Pada Mata Diklat Menerapkan Dasar-Dasar Elektronika Pada Siswa Kelas X TAV di SMK Negeri 1 Sidoarjo. *Jurnal Pendidikan Teknik Elektro*, 2(1), 343-350. <https://doi.org/10.26740/jpte.v2n1.p%25p>