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The Development of 'CATRA' Android-Based Learning Module with Gamification Approach for Students: A Research and Development on Learning Media

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Abstract: CATRA learning media is an Android-based learning module with a gamification approach. This study is motivated by the dominance of conventional methods in Senior High Schools, which shows the need for an innovative approach to learning. CATRA is designed as a multidimensional projection instrument to present the Four Noble Truths (*Cattari Arya Saccani*) material to create a more interactive and motivating learning environment. The methodology applied is research and development (R&D), with data collection procedures including observation, interviews, literature studies, and validation. The validation results from media experts, material experts, and Buddhist religious education teachers showed a very high level of feasibility, with a total score of 334, an average of 4.4, and a percentage of 88%. Based on these parameters, CATRA is classified as "Very feasible" and should be implemented in learning in senior high schools. Statistical analysis using the Paired Sample T Test showed a significant difference between learning outcomes before and after the use of media, with a calculated t value (-8.428) smaller than the t table (-2.2009) and a P value (0.00) smaller than 0.05. These findings indicate the effectiveness of CATRA in improving students' understanding of the material being taught. The significant difference between the average pre-test and post-test scores validates the positive impact of this learning media. Based on the study's results, further studies are recommended to explore the development of similar media for other learning materials to expand the scope and improve the effectiveness of educational innovation in a broader learning context.

Keywords: CATRA Application, Mobile Learning, Gamification, Android-based, Module Learning Media

1. Introduction

The rapid development of information and communication technology has changed various aspects of life, especially in education. Based on the We Are Social report in January 2024, Indonesia has recorded a stable increase in internet users, reaching 185 million users, showing a growth of 0.8% from January 2023 [1]. This digital transformation has created new opportunities in the learning process, shifting the educational paradigm beyond the boundaries of traditional classrooms to online learning

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platforms [2] Integrating technology-based learning media has become increasingly important in modern education [3] [4]. Recent research has shown the significant potential of technology-based learning media in improving students' understanding of educational materials [5]. However, the current implementation of technology in education faces several challenges, especially regarding how teachers effectively utilize technology in their teaching methods. Although PowerPoint presentations have become a standard teaching tool, their use is often limited to an information transmission model, resulting in minimal two-way interaction during learning [6] [7].

The emergence of gamification-based learning media is a promising solution to address these challenges [8]. Gamification in education involves applying game elements to create an engaging learning environment, aiming to increase student motivation in the teaching and learning process [9], [10]. Previous studies have shown promising results in this area. Research by [11]showed that Android-based learning media achieved a validity level of 91.04% and a practicality level of 80.28%, with students showing learning independence of 83.56%. Likewise, [12]reported a feasibility level of 92.37% for their Android-based learning platform. Recent observations at Bodhisattva High School in July 2024 revealed several significant challenges in the learning process, including limited innovation in the development of learning media, minimal student participation, and the dominant use of smartphones for social media rather than for educational purposes. These findings highlight a clear gap between the technology available and its practical use in the teaching and learning process. This research gap indicates an opportunity to develop more interactive and engaging learning solutions [13].

This research aims to overcome these challenges by developing and implementing "CATRA," an Android-based learning module with a gamification approach. This research specifically focuses on two main objectives: (1) determining the steps in developing CATRA learning media with a gamification approach and (2) assessing the suitability of this learning media as a learning resource. The significance of this research lies in its innovative approach to combining mobile technology with gamification elements, particularly in religious education, a field where such applications are still limited. This research contributes to the existing body of knowledge by providing practical solutions to improve student engagement and learning outcomes through technology-facilitated learning experiences and gamification [14]. The novelty of this study lies in the unique application of gamification principles in religious education, particularly in teaching the Four Noble Truths (*Cattari Ariya Saccani*) [15]. Unlike previous studies that have mainly focused on science, programming, and literacy, this study explores the intersection of traditional Buddhist teachings with modern educational technology, offering a new perspective on the delivery of religious education in the digital age [16] [17].

2. Method

The development of this android-based learning media uses research and development methods. Research and development is a method used to produce specific products and test the effectiveness of those products. Research and development aims to create new

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products through the development process [18]. So, in general, research and development aims to produce new products and test their effectiveness. Procedures used in Research and Development research (R&D) are researching and testing to create products that do not yet exist" using the theory developed by [19] [20]. The research procedures presented in Chart 3.1 are as follows.

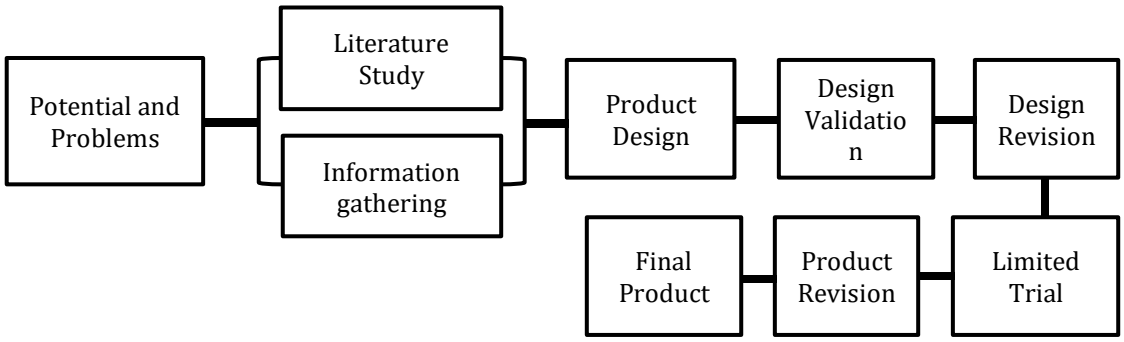

Figure 1. Research and Development Research (R & D) Procedures
(Source: Sugiyono, 2021: 768)

Data Collection Instruments. Data were obtained through research instruments in the form of observation and interviews. Observation is a biological and psychological observation process related to human behavior, work processes, and natural phenomena, especially if the number of respondents observed is not too many [21]. Then, the interview is a data collection method where researchers collect information by asking questions of those interviewed [20], [22]. This data collection technique is used to identify problems at the preliminary study stage in high schools. The research stage uses Data collection using an instrument in the form of a questionnaire as a measurement tool. This evaluative instrument aims to measure the quality of the media developed by involving assessments from validators consisting of learning media experts, material experts, Buddhist religious education teachers, and researchers as internal evaluators in the learning media development process. This study used the Likert Scale to measure the feasibility level of the Android-based "CATRA" mobile application with a gamification approach. According to Riduwan (2008: 12), in the research of [23], the Likert Scale is a measurement instrument used to quantify the attitudes, opinions, and perceptions of individuals or groups toward certain social phenomena [24]. This instrument uses a gradation of assessment with five categories, namely: very feasible (score 5), possible (score 4), quite feasible (score 3), less feasible (score 2), and not viable (score 1), which shows the gradation of answers from very positive to very negative [25]. The data analysis technique used to manage data from the results of validator analysis and trials in developing Android-based "CATRA" learning media with a gamification approach uses descriptive percentage analysis using a Likert scale [26].

3. Results

Based on a preliminary study conducted in Senior High Schools, it was found that there was a lack of innovation in the development of learning media, with the majority of teachers still relying on conventional methods that are less interesting to students, active

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student participation in learning is very limited with class interactions dominated by teachers and many students tend to be passive, the use of smartphones by students is more focused on social media activities, ignoring its potential as a learning tool so that researchers have innovations to develop learning media [27]. The preliminary study results are the basis for determining the direction of the development of learning media design. Creating a learning media design is a stage of a design application with the program. This program is based on a carefully designed pre-design, and necessary programming is done in Microsoft PowerPoint. The following is a display of the CATRA learning media that was developed.

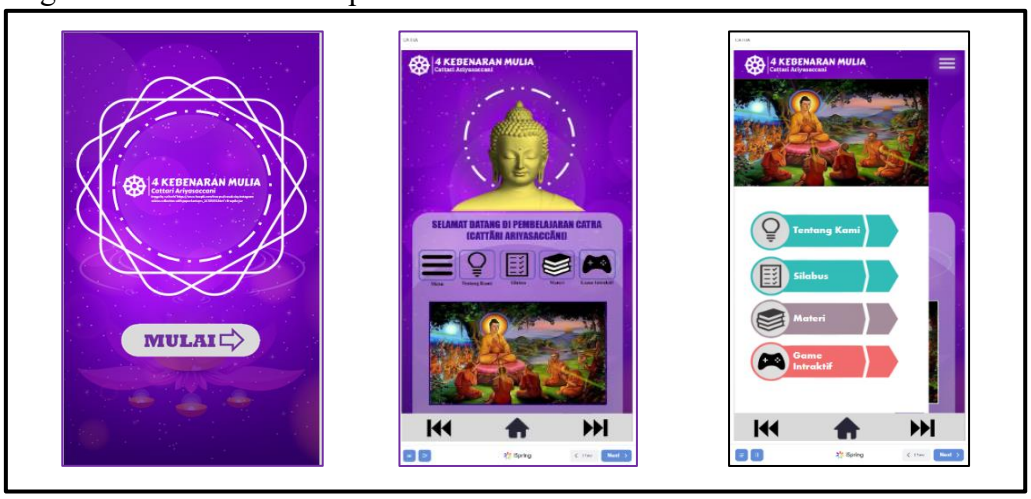

Figure 2. Android-Based Learning Media

The application of media in this research includes carrying out media validation tests, which are carried out by testing by learning media experts, Buddhist education material experts, and validation by Buddhist teachers. After product validation tests by three experts, product revisions were carried out to address product deficiencies. The results of the validation test of media experts, material experts, and validation of Buddhist religious education teachers. Based on the results of media expert validation, researchers have obtained data on the assessment of the design of learning media products that have been created. The evaluation results from media experts are calculated based on the question items in the observation questionnaire in product validation.

Table 1. Recapitulation of Media Expert Validation Results

No	Indicator	$\bar{X}$
1	Rules	4.1
2	Governance	4.7
3	CATRA Application	4.3
4	Content Relevance	4.3
Amount		17
Average		4.4

(Source: Processed from the results of distributing questionnaires in September 2024)

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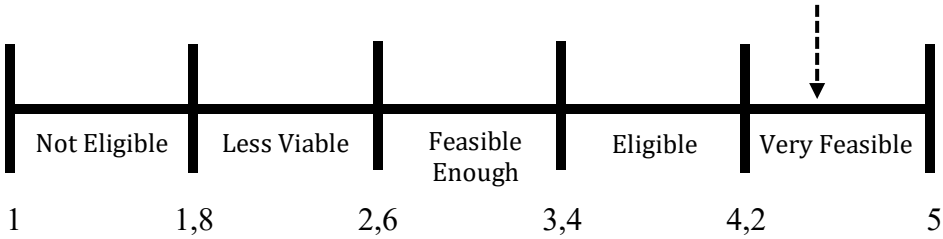

Figure 3. Rating Scale Continuum Line Recapitulation of Media Expert Validation Results (Source: Researcher Data, 2024)

Based on Table 4.5 regarding the validation recapitulation by media experts, it can be seen that the average value of 4.4 includes the aspect of rules: 4.1, the Aspect of implementation: 4.7, the Aspect of CATRA application: 4.3, the Aspect of content relevance: 4.3, and the percentage is following the continuum line above, including in the very feasible category. However, there are revision notes: "Adjust the symbols and replace the buttons that match the application in general, then get suggestions to adjust the appropriate font and to be consistent and reduce buttons that do not work." Based on comments and suggestions from media experts, revisions were made to the layout and display change scheme in the learning media as follows.

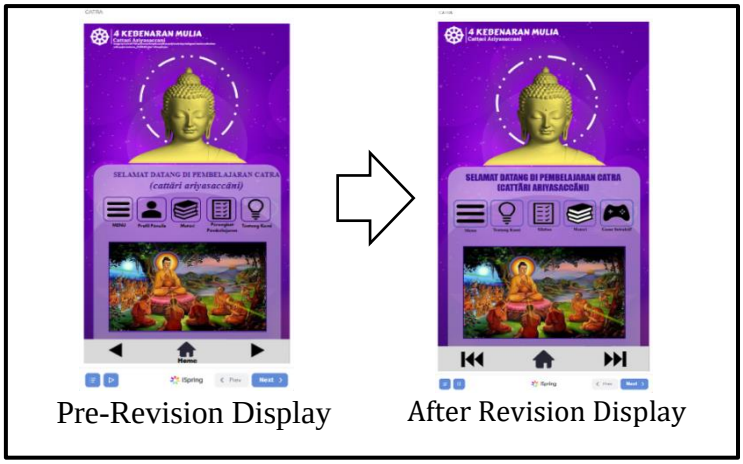

Figure 4. Display Change Scheme

The revisions were to adjust the writing and replace the appropriate buttons. The button before the revision showed that the Nexs button was used the same way as the play button in general. Furthermore, based on the results of the material expert validation, the researcher obtained data on the assessment of the material concept in the learning media created. The results of the material expert's recapitulation of the validation results are based on three indicators, the indicator components analyzed, and the results described in the table below.

Table 2. Recapitulation of Material Expert Validation Results

N0	Indicator	$\overline{X}$
1	Rules	4.8
2	Governance	4.5
3	Content Relevance	4.6
Amount		13.9

Average	4.6

(Source: Processed from Expert Validation Results in September 2024)

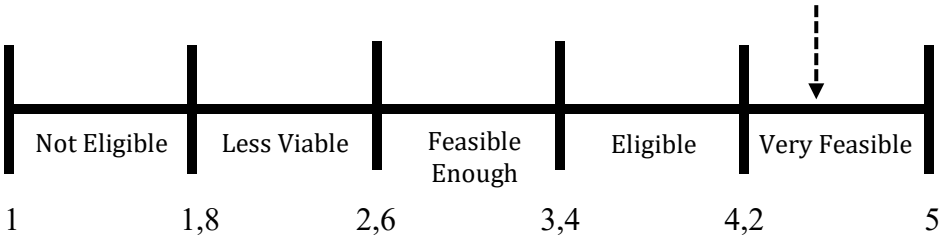

Figure 5. Rating Scale Continuum Line Recapitulation of Material Expert Validation Results (Source: Researcher Data, 2024)

Based on Table 4.9 regarding the validation recapitulation by material experts, it can be seen that the average value of 4.6 includes the aspect of rules: 4.8, the Aspect of implementation: 4.5, the Aspect of content relevance: 4.6, and the percentage is included in the very feasible category. Based on the validation review by learning material experts, comments and notes were found regarding this CATRA media, and comments given by material experts revealed that. The material must be made simpler, create appropriate distractor questions, and add images that follow the material discussed in the application to attract students' interest in learning.

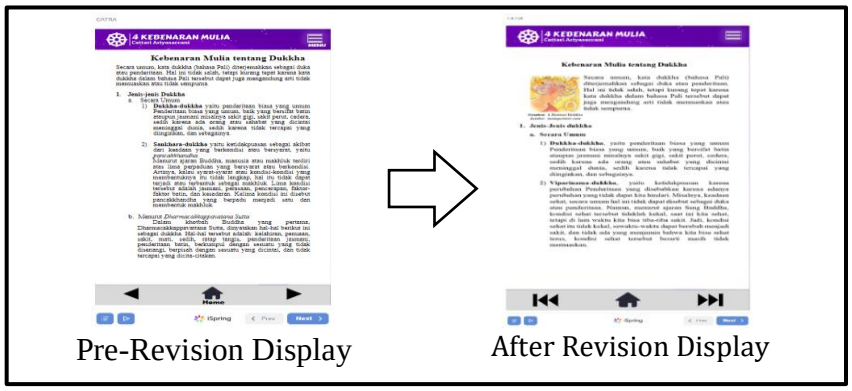

Figure 6. Display Change Scheme

The revisions made were adding images to make it look attractive and making appropriate question distractors. The material before the revision looked plain and less appealing. Furthermore, based on the results of the validation of the Buddhist religious teacher, the researcher has obtained assessment data on the concept of the material and learning media that have been developed. The results of the recapitulation of the validation results by the Buddhist religious education teacher are based on four indicators, the indicator components analyzed, and the results described in the table below.

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Table 3. Recapitulation of Validation Results of Buddhist Religious Education Teachers

N0	Indicator	$\bar{X}$
1	Rules	4.4
2	Governance	4.3
3	CATRA Application	4.4
4	Content Relevance	4.1
Amount		17.2
Average		4.3

(Source: Processed from Expert Validation Results in September 2024)

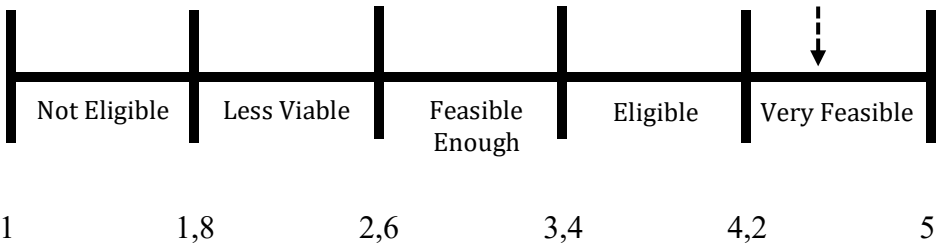

Figure 7. Continuum Line of Rating Scale Recapitulation of Validation Results of Buddhist Religious Education Teachers (Source: Researcher Data, 2024)

Based on Table 3 regarding the recapitulation of validation by Buddhist religious education teachers, it can be seen that the average value of 4.3 includes the aspect of rules: 4.4, the aspect of implementation: 4.3, the Aspect of CATRA application: 4.4, the Aspect of content relevance: 4.1, and the percentage is included in the very feasible category.

Product Trial Results.

The test design will be conducted on 11 students in class XI of SMA Bodhisattva Bandar Lampung. Data from the results of the trial usage will be used as a basis for revising the 'CATRA' learning media product and is the final result in the development of the 'CATRA' teaching media. The results of the product trial are described below.

Table 4 Pretest and Posttest Values of Trial Implementation

No	Pretest	Posttest
1	30	90
2	40	80
3	30	100
4	50	80
5	50	100
6	30	80
7	50	70
8	40	100
9	70	100
10	80	100
11	40	100
Amount	510	1000
Average	46	91
Min	30	70
Max	80	100

(Source: Researcher data)

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The results of the product trial from 11 students obtained a score before using the media getting a total score of 510 with an average score of 46 and the most miniature score of 30 obtained by students with serial numbers 1 and 3, and the most significant score obtained by 80 then the researcher applied the media to Buddhist religious learning in the hope of increasing the scores obtained by students. The media applied to 11 grade XI students did not differentiate between genders. The scores obtained after using the press got a total of 1000, with an average of 91, and the highest score obtained by students was 70, with the most significant score being 100. The difference in the number of scores obtained was 490 from 510-1000 = 490. The researcher used the Paired Sample t-test to determine the critical difference between the scores obtained before and after using the media. Determining Hypothesis

H $_0$: CATRA learning media is not suitable for use as learning media in Senior High Schools.

H $_a$: CATRA learning media is suitable for learning media in Senior High Schools.

The test uses a two-sided test with a significance level of a = 5%. The level of significance, in this case, means that the researcher risks being wrong in deciding to reject the correct hypothesis as much as 5% (importance of 5% or 0.05 is a standard measure often used in research) [28], [29]. The results are obtained in the table below.

Table 5. Paired Samples Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before being given treatment	46.36	11	16.29	4.91
	After being given treatment	90.90	11	11.36	3.42

(Source: SPSS data processing for Windows)

Based on Table 4.16, the data processing results in the paired samples statistics table show the standard deviations before and after using 16.29 and 11.36 with a sample size of 11, an average of 46.36 and 90.90. The correlation table is then described:

Table 6. Paired Samples Correlations

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Before being given treatment & after being given treatment	11	,236	,485

(Source: SPSS data processing for Windows)

Based on Table 4.17, the results of data processing before and after the use of media are described. The correlation value is 0.236 with a significance of 0.485, so it can be said that between the two variables, The result of 0.236 means a solid and positive relationship with a significance level of 0.05, which is greater than 0.000 in the table.

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Table 7. Paired Samples Test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	Before being given treatment treatment	-44.54	17.52	5.28	-56.32	-32.76	-8,428	10	,000

(Source: SPSS data processing for Windows)

Table 7 shows the results of the t-value test. From the table above, the calculated t-value is -8.428. The t-distribution table is searched at a=5%: 2 = 2.5% (2-sided test) with degrees of freedom (df) n-1 or 11-1 = 10. With a 2-sided test (significance = 0.025), the results obtained for the t table were 2.2009.

Testing criteria:

H_0 is accepted if $-t^{table} \leq t^{count} \leq t^{table}$

H_0 is rejected if $-t^{count} < -t^{table}$ or $t^{count} > t^{table}$

Based on probability:

$H_{0\ is}$ accepted if P value > 0.05

H_0 is rejected if P value < 0.05

Next, to compare the calculated t with the t table and the probability according to the testing criteria with the computed t value < t table (-8.428 <-2.2009) and P value (0.00 < 0.05), then H_0 is rejected, and Ha_{is} accepted. Therefore, from the test results based on the criteria that have been made with the comparative value of -t calculated < -t table (-8.428 < -2.2009) and P value (0.00 < 0.05), it can be concluded that there is a difference between the average value before using the media and the average value after using the press.

The results of the product validation test by learning media and material experts and the validation of Buddhist religious education teachers have been carried out. The results of the recapitulation of the validation results by media experts are based on four indicators. This validation is intended to anticipate errors in users. Material experts provide assessments of learning aspects and material content; media experts assess appearance and programming aspects; and Buddhist religious education teachers assess the overall media.

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Table 8. Recapitulation of Validation Results

No	Aspect	Media Expert			Subject Matter Expert			Religion teacher			Total		
		Score	*Mean*	*KT*	*Score*	*Mean*	*KT*	*Score*	*Mean*	*KT*	*ST*	*MT*	*KT*
1	Rules	37	4.1	L	19	4.8	SL	61	4.4	SL	117	4.4	SL
2	Governance	14	4.7	SL	18	4.5	SL	13	4.3	SL	45	4.5	SL
3	CATRA Application	30	4.3	SL	-	-	-	35	4.4	SL	65	4.4	SL
4	Content Relevance	13	4.3	SL	65	4.6	SL	29	4.1	L	107	4.3	SL
		94	4.4	SL	102	4.6	SL	138	4.3	SL	334	4.4	SL

(Source: 2024 Researcher Data Processing Microsoft Excel 2019)

The results of the product validation test obtained the results for the validation test by media experts, who got an average score of 4.4 with a total score of 94 and a percentage of 88%. Meanwhile, the material expert test gave an average score of 5 with a total score of 102 with a rate of 92%, and the Buddhist religious education teacher gave an average score of 4.3 with a score of 138, with a percentage of 86%, from the three validation tests then totaled to get a comprehensive picture of the three internal tests that have been carried out. The results of the third number of tests received a total score of 334 with an average answer score of 4.4 with a percentage of 88%; then, the media passed the validation test with an average assessment that the media is classified as 'very decent.' The overview of the results of the analysis of indicators with the product validation test obtained results with 4.4 aspects that were analyzed with an average result of 88% test presentation included in the very feasible category. The feasibility aspect of the rules in the internal test of the product is included in the very feasible category with a percentage of 88%. so the developed media can be said to have an excellent category in the feasibility of the material aspect with a total score of 117 and an average of 4.4. So, there are indications that learning has shown comprehensive success in various aspects. The content presented is self-explanatory, making it easier for students to understand. Time management runs effectively, maximizing the learning process. The learning materials are proven to be appropriate and follow students' needs. Effective communication has been established between teachers and students, supported by easy-to-use learning media.

The attraction of the material succeeded in arousing interest in learning, encouraging active participation of students in each session. The enthusiasm and positive feedback reflect the high level of user satisfaction. Time efficiency is optimally achieved, allowing for a comprehensive coverage of material without sacrificing the quality of comprehension. This program has also encouraged students' independent learning ability, increasing independence in knowledge exploration. The examples presented are relevant and follow the material, reinforcing conceptual and practical understanding. The truth of the material is guaranteed, providing a solid foundation of knowledge. The ability of the media to convey information has proven to be very effective, increasing the retention and application of knowledge. This achievement has resulted in a comprehensive, practical, and meaningful learning experience for all students. The feasibility of the governance

aspect in the internal test of the product is included in the very feasible category (SL) with a percentage of 90%. So, the media developed can be said to have a very feasible category in the feasibility of the governance aspect, with a total score of 45 and an average of 4.5. There are indications that the learning objectives are well met, with effective indicators to support the achievement of the goals. Conformity with Basic Competencies (KD) is optimally realized, resulting in better mastery of competencies by students. The suitability of the content is achieved perfectly, presenting relevant material according to the needs of students. This success results in a more effective and efficient learning process, positively impacting overall student learning outcomes.

The feasibility of the CATRA application aspect in the internal test of the product is included in the excellent category with a percentage of 88%, so the media developed can be said to have a very feasible category in the feasibility of the CATRA application aspect with a total score of 65 and an average of 4.4. So, there are indications that the implementation of the learning system has achieved comprehensive excellence, characterized by ease of access, completeness of functions, and optimal operational efficiency. Effective system performance produces optimal learning outcomes with low operational costs. In his research on Android-based healthcare services with clear guidelines and consistent interface design, Rohman makes it easy to use, significantly improving the user experience[30]. The system blends accessibility, functionality, and efficiency, creating a productive and effective learning environment. This success meets and exceeds expectations, delivering superior and high-value learning solutions for all stakeholders while maintaining cost efficiency and ease of use[30], [31].

The feasibility of the relevance aspect of content in the internal test of the product is included in the category of very feasible with a percentage of 86%, So the media developed can be said to have a very feasible category in the feasibility of the content relevance aspect with a total score of 107 and an average of 4.3. So, there are indications that the learning design has achieved extraordinary excellence in various aspects. Clear instructions are the main foundation, making it easier for students to understand each stage of learning correctly. Engaging visual design successfully increases engagement and maintains learners' focus, while consistency with the topic ensures the relevance of every learning element. The clear structure provides a logical flow, making navigating the material accessible. Comprehensive coverage of the material ensures complete mastery of the subject being studied. Easy-to-read text improves information accessibility, supporting faster and more profound understanding [32]. The orderly arrangement of all learning components creates a cohesive and effective learning experience[33]. Overall, this achievement results in an optimal learning environment that supports an efficient and enjoyable learning process for all students with good learning conditions and increases motivation in learning [34]. The product development process in the form of *CATRA learning media* is carried out through a series of systematic stages to produce optimal learning media. These stages include a) Technical preparation, b) Data collection or preliminary study, and c) Analysis of data findings in the preliminary study. Furthermore, the implementation stage includes: a) Analysis of development needs, including identification of hardware, software, and media design b) Media design,

including the preparation of an outline of material content, creation of *flowcharts*, and writing of manuscripts or *storyboards* c) Realization of media design, including background creation and android application development.

The validation results show an excellent level of feasibility for *CATRA learning media.* The validation of media experts resulted in a score of 4.4 with a percentage of 88%, which is included in a very feasible category. The subject matter expert gave validation with a score of 4.6 and a rate of 92%, which was also included in the very feasible category. Buddhist teachers gave validation with a score of 4.3 and a percentage, also included in the very decent category. Overall, the validators gave an average score of 4.4, which is respectable. Therefore, this study's results align with several recent studies related to this research in improving student learning outcomes. Research by [35] indicates that the results of the validation of Android-based learning media have a feasibility level with a very feasible category from the detailed results of material validation experts with a score of 94%. The results of the validation of media experts with a score of 94% received very feasible criteria. The results of the validation of social studies teacher learning experts received very feasible criteria with a score of 92%. The results of the questionnaire on the attractiveness of Android-based learning media received very feasible criteria with a score of 98%. Decent media conditions learning more effectively and efficiently [36]

Based on research conducted [37]by with the title Development of android-based Ispring suite 10 learning media on adjustment journal materials at vocational school obtained a result of 92.37% with a very feasible interpretation from material, media, and language experts. The percentage of scores obtained from material experts was 99.28%, media experts 87.19%, and linguists 90.66%. Meanwhile, the results of the students' responses received a percentage score of 90.6%, which is a very feasible interpretation. These results strengthen the feasibility and potential of CATRA learning media in improving the quality of learning in Buddhist education. Improving the quality of learning also depends on more responsive and adaptive learning [38].

In the next stage, field testing uses the product revision results from experts and researchers to apply the product to actual conditions. The test design uses one group pretest and posttest. The data generated is used to determine the results before and after using the learning media to determine the significant difference between the scores obtained before and after using the press, and then the researcher uses the Paired Sample t-test. The test uses a double-sided test with a significance level of a=5%. In this case, the significance level means that the researcher risks making the wrong decision to reject the correct hypothesis by as much as 5% (a significance of 5% or 0.05 is the standard measure often used in research). So that the test results are obtained based on the criteria that have been made with the comparative value of -t calculation < -t table (-8.428 <-2.2009) and P value (0.00 < 0.05), then it can be concluded that there is a difference between the average score before using the media and the average value after using the press

4. Conclusion

Based on the comprehensive analysis described in Chapter IV regarding the research and development of CATRA learning media (Android-based learning modules with a

gamification approach) in Senior High Schools, the following conclusions can be drawn. The product development process in the form of CATRA learning media is carried out through a series of systematic stages to produce optimal learning media. These stages include: a) Technical preparation b) Data collection or preliminary studies, and c) Analysis of data findings in preliminary studies. Furthermore, the implementation stage includes: a) Analysis of development needs, including identification of hardware, software, and media design needs b) Designing media designs, including compiling outlines of material content, making flowcharts, and wri\ting scripts or storyboards c) Realization of media designs, including making backgrounds and developing Android applications. Media validation, product trial stages, and validation of learning media involve internal testing of the media developed and revisions based on input from media experts, material experts, and Buddhist religious education teachers in senior high schools. The results of the media expert validation were 4.4 with a percentage of 88% in the very feasible category, the results of the material expert validation were 4.6 with a rate of 92% in the very feasible category, and the results of the Buddhist religious teacher validation were 4.3 with a percentage of 86% in the very feasible category. Overall, the validator gave an average score of 4.4, a very feasible category. Although there were several revisions from the expert validator, the CATRA learning media comprehensively met the eligibility criteria with an average score of 4.4 and a percentage of 88%, which is included in the very high category. Based on the results of this evaluation, it can be concluded that the developed learning media is feasible to implement in the learning process according to the assessment of the expert validator. Furthermore, the results of the 'CATRA' learning media product trial proved feasible and effective for use in senior high schools. Field trials with a one-group pretest-posttest design on 11 Buddhist students showed a significant difference between the scores before and after using the media. They have paired Sample T-Test analysis produced $-t^{count}$ (-8.428) < t^{table} (-2.2009) and P^{value} (0.00) < 0.05, confirming the positive impact of media on student learning outcomes. This finding supports the acceptance of the hypothesis that 'CATRA' is worthy of being used as a learning medium, indicating the success of media development in improving the effectiveness of Buddhist learning, especially for high school students.

References

[1] C. M. Annur, Ada 185 Juta Pengguna Internet di Indonesia pada Januari 2024, *Databoks.Katadata.Co.Id*, vol. 2023, 2024.

[2] Y. Fitriyani, I. Fauzi, and M. Z. Sari, Motivasi Belajar Mahasiswa Pada Pembelajaran Daring Selama Pandemik Covid-19, *Profesi Pendidikan Dasar*, vol. 7, no. 1, 2020, doi: 10.23917/ppd.v7i1.10973.

[3] D. Veneri and E. Mongillo, Flop to Flip: Integrating Technology and Team-Based Learning to Improve Student Engagement, *Internet Journal of Allied Health Sciences and Practice*, 2021, doi: 10.46743/1540-580x/2021.2006.

[4] A. Asmara, L. Judijanto, I. P. A. D. Hita, and K. Saddhono, Media Pembelajaran Berbasis Teknologi: Apakah Memiliki Pengaruh terhadap Peningkatan Kreativitas pada Anak Usia Dini?, *Jurnal Obsesi: Jurnal Pendidikan Anak Usia*

Dini, vol. 7, no. 6, pp. 7253–7261, 2023.

[5] Jamaludin, Pengaruh Penggunaan Media Pembelajaran Berbasis Aplikasi Adroid Offline Terhadap Hasil Belajar Sejarah Siswa Kelas X Di Sman 5 Banjarmasin, *Jurnal Adabiya, Tahun 2015*, vol. Vol. 1 No., no. 5, pp. 1–11, 2020.

[6] Y. Gordani and Y. Khajavi, The impacts of multi-modal PowerPoint presentation on the EFL students' content knowledge attainment and retention over time, *Educ Inf Technol (Dordr)*, vol. 25, no. 1, 2020, doi: 10.1007/s10639-019-09979-z.

[7] I. Kertati *et al.*, *Model & metode pembelajaran inovatif era digital*. PT. Sonpedia Publishing Indonesia, 2023.

[8] S. P. Kusnanto, C. Gudiato, M. Kom, S. E. Usman, S. E. Blasius Manggu, and M. L. Sumarni, *Transformasi Era Digitalisasi Masyarakat Kontemporer*. Uwais Inspirasi Indonesia, 2024.

[9] S. Srimuliyani, Menggunakan teknik gamifikasi untuk meningkatkan pembelajaran dan keterlibatan siswa di kelas, *EDUCARE: Jurnal Pendidikan Dan Kesehatan*, vol. 1, no. 1, pp. 29–35, 2023.

[10] M. Takdir, Kepomath go 'penerapan konsep gamifikasi dalam pembelajaran matematika dalam meningkatkan motivasi belajar matematika siswa., *Penelitian Pendidikan INSANI*, vol. 20, no. 1, pp. 1–6, 2017.

[11] A. Aulia, R. Rahmi, and H. Jufri, Pengembangan Media Pembelajaran Berbasis Android Menggunakan MIP App Inventor pada Materi Barisan dan Deret Aritmatika Kelas X SMKN 1 Kinali, *Jurnal Cendekia: Jurnal Pendidikan Matematika*, vol. 6, no. 2, pp. 1475–1485, 2022, doi: 10.31004/cendekia.v6i2.1329.

[12] S. Sulistyorini and A. Listiadi, Pengembangan Media Pembelajaran Ispring Suite 10 Berbasis Android pada Materi Jurnal Penyesuaian di SMK, *Edukatif: Jurnal Ilmu Pendidikan*, vol. 4, no. 2, pp. 2116–2126, 2022, doi: 10.31004/edukatif.v4i2.2288.

[13] L. Nyanchoka, C. Tudur-Smith, V. N. Thu, V. Iversen, A. C. Tricco, and R. Porcher, A scoping review describes methods used to identify, prioritize and display gaps in health research, 2019. doi: 10.1016/j.jclinepi.2019.01.005.

[14] M. P. Trinh, R. J. Chico, and R. M. Reed, How Fun Overcame Fear: The Gamification of a Graduate-Level Statistics Course, *Journal of Management Education*, vol. 48, no. 4, 2024, doi: 10.1177/10525629231181120.

[15] I. C. Kawi and W. Pontjoharyo, Integrating Buddhist Principles Into Management Control Systems: A Cattari Ariya Saccani Approach, *APTISI Transactions on Technopreneurship*, vol. 5, no. 2Sp, 2023, doi: 10.34306/att.v5i2sp.326.

[16] A. Demirel Ucan and A. Wright, Improving the pedagogy of Islamic religious education through an application of critical religious education, variation theory and the learning study model, *British Journal of Religious Education*, vol. 41, no. 2, 2019, doi: 10.1080/01416200.2018.1484695.

[17] J. Kolb, Muslim diversity, religious formation and Islamic religious education. Everyday practical insights into Muslim parents' concepts of religious education in Austria, *British Journal of Religious Education*, vol. 45, no. 2, 2023, doi:

10.1080/01416200.2021.1911787.

[18] Sugiyono, *Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D dan Penelitian Pendidikan)*. Bandung: CV. ALFABETA, 2021.

[19] Torang Siregar, Stages of Research and Development Model Research and Development (R&D), *DIROSAT: Journal of Education, Social Sciences & Humanities*, vol. 1, no. 4, 2023, doi: 10.58355/dirosat.v1i4.48.

[20] Sugiyono, *Metode Penelitian Pendidikan (Kuantitatif, Kualitatif, Kombinasi, R&D dan Penelitian Pendidikan)*. Bandung: CV. ALFABETA, 2021.

[21] L. Zikriana, Novi Sari Liani, Desy Sary Ayunda, and Sharfina, Pengembangan Media Audio Visual Berbasis Aplikasi Canva Terhadap Pemahaman Konsep Dan Motivasi Belajar Mahasiswa Pada Mata Kuliah Fisika Dasar, *Jurnal Bionatural*, vol. 10, no. 2, 2023, doi: 10.61290/bio.v10i2.728.

[22] R. A. Saputra, Dampak Bermain Game Online Mobile Legends Terhadap Perilaku Toxic Remaja di Desa Sukaraja Nuban Kecamatan Batanghari Nuban Kabupaten Lampung Timur, 2023, *Universitas Muhammadiyah Metro*.

[23] Susanto, Burmansah, K. Sutawan, W. Seneru, and Rapiadi, Interactive Multimedia Based On Android Applications : Development Of Learning Media For Non-Formal Schools Susanto Buddhist Education Department , STIAB Jinarakkhita , Lampung , Indonesia Burmansah Buddhist Education Department , STIAB Jinarakkhita , Lam," vol. 17, no. 6, pp. 4273–4283, 2023.

[24] M. R. Bilondatu, Motivasi, persepsi, dan kepercayaan pengaruhnya terhadap keputusan pembelian konsumen pada sepeda motor Yamaha di Minahasa, *Jurnal EMBA: Jurnal Riset Ekonomi, Manajemen, Bisnis Dan Akuntansi*, vol. 1, no. 3, 2013.

[25] M. Sintawati, M. Rudiyanta, and M. Nuryanto, Pengembangan Media Magic Geometry pada Materi Bangun Ruang Kelas IV Sekolah Dasar, *Jurnal Tadris Matematika*, vol. 3, no. 1, pp. 77–88, 2020.

[26] M. Murdiono, Suyato, E. N. Rahmawati, and M. A. Aziz, Developing an android-based mobile application for civic education learning, *International Journal of Interactive Mobile Technologies*, vol. 14, no. 16, 2020, doi: 10.3991/ijim.v14i16.14967.

[27] K. Putri, Z. Muchtar, and A. Darmana, Develop an Android-Based Learning Media Integrated with a Scientific Approach to the Colligative Solution's Nature, *Budapest International Research and Critics in Linguistics and Education (BirLE) Journal*, vol. 4, no. 1, 2021, doi: 10.33258/birle.v4i1.1605.

[28] S. Suardi, Pengaruh Kepuasan Kerja Terhadap Kinerja Pegawai Pada Pt Bank Mandiri, Tbk Kantor Cabang Pontianak, *Business, Economics and Entrepreneurship*, vol. 1, no. 2, pp. 9–19, 2019.

[29] D. Darka, Pengaruh Penilaian Kinerja Terhadap Promosi Jabatan pada Credit Union Bina Seroja, Jakarta, *Innovative: Journal Of Social Science Research*, vol. 4, no. 1, pp. 5129–5139, 2024.

[30] A. T. Rohman, M. D. Yanti, and H. Maulana, Penerapan Teknologi Location Based Service (LBS) Untuk Menemukan Layanan Kesehatan Terdekat Berbasis Android, *Jurnal Sistem Informasi Galuh*, vol. 2, no. 1, 2024, doi:

10.25157/jsig.v2i1.3656.

[31] L. Zikriana, Novi Sari Liani, Desy Sary Ayunda, and Sharfina, Pengembangan Media Audio Visual Berbasis Aplikasi Canva Terhadap Pemahaman Konsep Dan Motivasi Belajar Mahasiswa Pada Mata Kuliah Fisika Dasar, *Jurnal Bionatural*, vol. 10, no. 2, 2023, doi: 10.61290/bio.v10i2.728.

[32] A. Nuraini *et al.*, Relevansi Media Virtual Reality dengan Teori Albert Bandura Pada Pembelajaran Ips Di Sekolah Dasar, *Journal of Educational and Language Research*, vol. 8721, 2023.

[33] I. Maharani and J. Hidayah Putri, Relevansi Pengembangan Media Pembelajaran Matematika, *EDUSAINTEK: Jurnal Pendidikan, Sains dan Teknologi*, vol. 10, no. 1, 2023, doi: 10.47668/edusaintek.v10i1.719.

[34] Sutiyono, W. Lestari, D. R. Sari, R. Astika, and K. Sutawan, Interaction Between Buddhist Sunday School Teacher Competence and Student Learning Motivation, *Journal of Education, Religious, and Instructions (JoERI)*, vol. 2, no. 1, pp. 21–36, 2024, [Online]. Available: https://ejournal.stiab-jinarakkhita.ac.id/index.php/joere

[35] F. Fitriana, Pengembangan Media Pembelajaran Berbasis Android Untuk Meningkatkan Hasil Belajar Siswa Pada Mata Pelajaran IPS DI SMP Negeri 1 Lawang Malang, pp. 1–23, 2023.

[36] A. L. Sachs, M. Becker-Peth, S. Minner, and U. W. Thonemann, Empirical newsvendor biases: Are target service levels achieved effectively and efficiently?, *Prod Oper Manag*, vol. 31, no. 4, 2022, doi: 10.1111/poms.13650.

[37] Y. Wang, X. Cao, Z. Xu, and H. Fang, Features and development trends of primary care research conducted by practice-based research networks from 1991 to 2023: a scoping review protocol, *Syst Rev*, vol. 12, no. 1, 2023, doi: 10.1186/s13643-023-02395-y.

[38] Susanto, Transformation Of Learner Learning: Improving Reasoning Skills Through Artificial Intelligence (AI), *Journal of Education, Religious, and Instructions (JoERI)*, vol. 1, no. 2, pp. 37–46, 2023, [Online]. Available: https://ejournal.stiab-jinarakkhita.ac.id/index.php/joeri