*International Journal of Research and Review*
*[Indexed, Peer-Reviewed Journal]*
*Volume 12; Issue: 12; December 2025*
*Website: www.ijrrjournal.com*
*Research Paper* *E-ISSN: 2349-9788; P-ISSN: 2454-2237*

# Development of Android Based Learning Media to Increase the Learning Motivation of Social Studies for Inclusive Students of Class X

**Wildan Sayuthi Mahatma[1], Nugroho Trisnu Brata[2]**

[1]Master Program of Social Studies Education, Faculty of Social and Political Sciences. Universitas Negeri Semarang, Central Java, Indonesia
[2]Department Sociology and Anthropology, Faculty of Social and Political Sciences. Universitas Negeri Semarang, Central Java, Indonesia

Corresponding Author: Wildan Sayuthi Mahatma

**DOI: https://doi.org/10.52403/ijrr.20251298**

## ABSTRACT

The development of digital technology in education requires interactive and adaptive learning media to support student motivation and inclusive learning. However, the use of Android based learning media in vocational high schools remains limited, particularly in science learning. This study aims to develop and evaluate an Android based IPAS learning media to increase the learning motivation of Class X students, including inclusive learners. The study employed a Research and Development approach integrated with the ADDIE model. The developed media was validated by media and material experts, obtaining feasibility scores of 97.33% and 96%, respectively, categorized as highly valid. The effectiveness of the media was tested using a pre-test and post-test design involving 30 students. The results showed a significant increase in students' learning motivation, with average scores rising from 61.33 to 92.30. The N-Gain score of 0.792 indicated a high level of effectiveness. The findings demonstrate that Android-based learning media with interactive and inclusive features effectively enhances student motivation, supports independent learning, and provides an accessible learning environment for diverse learners.

***Keywords:*** learning motivation, Android based media, IPAS

## INTRODUCTION

Natural and Social Sciences (IPAS) is an interdisciplinary field that connects fundamental scientific and social concepts to explain natural phenomena and their relationship to human life. Social studies teaching aims not only to develop students' factual knowledge but also to build the science process skills, inquiry competencies, and dispositions necessary for scientific literacy so that learners can solve real-world problems. Recent work emphasizes that science education must foster procedural research skills, critical thinking, and an awareness of the goals of socio environmental and technological issues that are closely aligned with the definition of contemporary scientific literacy and the goals of the modern science curriculum[1]. In addition, social studies learning also aims to improve students' scientific literacy so that they can play an active role in a science-based society. The effectiveness of social studies learning is not only determined by the planning of teaching strategies, but also by the learning tools and media used by teachers in the classroom. According to [2] learning tools include instructional planning, material presentation, and learning media that support

the teaching and learning process. Effective learning is achieved not only when instructional objectives are met but also when student engagement, motivation, and learning outcomes are increased. Therefore, choosing and developing the right learning media that is tailored to the characteristics of the content and the needs of learners is essential to foster understanding and participation. Research shows that appropriately chosen learning media can stimulate motivation and improve academic outcomes by making abstract concepts more concrete and the learning experience more engaging for students.

Learning media refers to tools or means used to facilitate the delivery of information and instructional content to students, including visual, audio, and audiovisual formats that support the teaching learning process. In educational research, media is seen as a channel or intermediary that helps present material in a way that makes abstract concepts more accessible, increases student engagement, and stimulates understanding[3]. Learning media can consist of hardware and software designed to support the learning process by increasing interaction, facilitating understanding of concepts, and stimulating student engagement. Evidence from recent educational research shows that digital and interactive learning media including mobile based apps, web accessible tools, and multimedia content can create a more active, interactive, and communicative learning environment that positively impacts student motivation and achievement[4]. The main objective of this research is to understand the extent to which communities are involved in preventive measures and assess the effectiveness of mitigation efforts that have been made against disaster risks.

However, some learning problems are still found in the school environment, especially in social studies subjects at the vocational level. Preliminary observations show that: 1) the teaching materials used by teachers are still limited to textbooks and worksheets; 2) the learning process tends to be teacher-centered so that student interaction is relatively low; 3) social studies learning time allocated in limited classes; and 4) digital learning media have not been optimally utilized in supporting learning activities. In addition, heterogeneous student characteristics, including the existence of inclusive students with diverse learning needs, have not been fully facilitated by the available learning media. This condition has an impact on low active student involvement, limited independent learning opportunities, and decreased student motivation to learn in social studies learning. Research on vocational education highlights that these barriers, especially limited teaching resources and inadequate integration of digital learning tools, continue to hinder effective student engagement and motivation, calling for increased variety of resources and the use of technology in teaching practices[5]. Therefore, the development of learning media that is relevant to the needs of students is very necessary. Digital media, especially Android-based, is considered to be able to increase concept understanding, student involvement, and facilitate independent learning because it presents a combination of text, images, animations, and interactivity in one platform. Recent research shows that the use of mobile-based learning media, including Android apps, has a much greater effect on students' understanding of the subject matter compared to traditional verbal instruction alone. This greater impact is particularly relevant for vocational school learners who are familiar with mobile technology and digital devices, allowing for a more interactive and self-paced learning experience that better supports concept mastery[6]. Android-based learning is a subset of mobile learning, which provides high flexibility, enables anytime and anywhere, and supports the delivery of up to-date and easily accessible instructional materials across multiple devices. Recent studies show that mobile learning environments increase interactivity, promote learner autonomy, and strengthen student

motivation by offering personalized and technology-rich learning experiences. These characteristics are aligned with vocational school students, who are generally familiar with smartphones and mobile technologies[7].

The effectiveness of Android-based learning media has been proven by various previous studies. For example: 1). [8] found that Android media significantly improved motivation and science learning outcomes; 2). [9] report that Android-based applications are feasible to use and effective in increasing student engagement; and 3). [10] explain that Android media helps students learn independently and improve their understanding of concepts more optimally.

This study aims to develop and evaluate an Android-based IPAS learning media for Class X vocational high school students to address the limited use of interactive and inclusive digital learning media in science learning. The specific objectives are to: 1) produce an Android based learning media that meets validity and feasibility standards based on expert evaluations of content accuracy, instructional design, and technical quality; 2) examine the effectiveness of the developed media in increasing students' learning motivation through pre-test and post-test analysis using the N-Gain index; and 3) analyze the role of interactive features and adaptive feedback mechanisms in supporting student motivation, independent learning, and inclusive learning environments based on the principles of the ARCS motivational model, Cybernetic learning theory, and Universal Design for Learning (UDL). Through the development of engaging, interactive, and accessible digital learning materials, this study seeks to contribute an effective solution for enhancing learning motivation and supporting diverse learner needs in vocational education contexts.

## MATERIALS & METHODS

The development stage of this research was carried out at SMK N 8 Semarang which is located in South Semarang District, Semarang City. A school environment is a learning environment where students are accustomed to using mobile devices but have limited access to interactive learning media, especially for science subjects. This location was chosen because preliminary observations showed that students' motivation to learn in social studies subjects tended to be low, and teachers had not fully utilized digital-based media during classroom learning. The research activities will be carried out from September to November 2025.

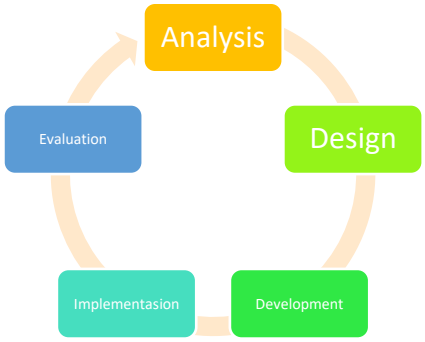


**Figure 1. ADDIE Development Model Schema**

The approach used in this study follows the *Research and Development* (R&D) model which is integrated with the ADDIE (*Analysis, Design, Development, Implementation, Evaluation)* framework. The ADDIE model is used as an instructional development framework because it provides a systematic and continuous workflow in designing, developing, implementing, and evaluating learning products. Branch emphasized that ADDIE is a generic approach that is flexible and oriented towards solving learning problems through five main interrelated stages [11]. In line with that, the R&D approach is used because it focuses on the development of educational products accompanied by a validation and effectiveness testing process, as stated by Sugiyono that research and development aims to produce a specific product and test the feasibility and effectiveness of the product before it is widely applied [12].

The development stage includes creating applications according to the planned design,

integrating learning materials, illustrations, quizzes, and interactive features to support concept understanding and increase student learning motivation. In addition, this stage also includes technical testing to ensure that learning media can operate optimally on Android devices commonly used by students. The development process begins with compiling social studies learning materials that are in harmony with the curriculum and converting them into a digital format suitable for mobile learning. Visual elements, graphics, and interface components are structured to create an engaging user experience. Android apps are created using mobile development software, and continuous revisions are made during the development phase to adjust the layout, navigation flow, and instructional components. Expert validation is conducted by subject matter experts and media experts using structured validation sheets to evaluate content accuracy, presentation suitability, interface quality, and overall product viability. Feedback from experts forms the basis for further refinement before being implemented in the classroom. The implementation stage was carried out directly in the learning environment of SMK N 8 Semarang. Class X students are involved in the use of Android based media that has been developed during science learning. This implementation aims to observe how students interact with the app, how its features support their learning activities, and how media affects their motivation. Data collection during the implementation used observation sheets, student response questionnaires, and motivational questionnaires given before and after the use of media. During implementation, students are guided to access learning materials, complete quizzes, and explore interactive components in the app. Observations were made to identify student engagement, ease of use, and the extent to which media encourages independent learning. The motivation questionnaire given at the beginning was used to find out the initial level of motivation of students, while the post-use questionnaire provided information about the change in their motivation after using Android based learning media. Through this approach, comprehensive insights are obtained regarding the practicality, usefulness, and effectiveness of media in supporting the social studies learning process.

## STATISTICAL ANALYSIS

The test subjects in this development research were media expert validators, material expert validators, and all 30 class X students of SMKN 8 Semarang. The subject of the trial is the party who can rationally test the feasibility of the product. The results of validation data (assessment scores from experts) are processed using the formula:

$$P = \frac{f}{n} \text{ x } 100\%$$

From the formula above, a percentage of scores or scores that can be obtained from experts will be obtained. Furthermore, the final score obtained was adjusted to the table of validation and eligibility criteria adapted from [13].

**Table 1. Validation and Eligibility Criteria**

| Percentage% | Validity Level | Information |
|---|---|---|
| 80% < skor ≤ 100% | Highly Valid | No Revision |
| 60% < skor ≤ 80% | Valid | No Revision |
| 40% < skor ≤ 60% | Less Valid | Partial Revision |
| 20% < skor ≤ 40% | Invalid | Revision |
| 0% < skor ≤ 20% | Highly Invalid | Revision |

Furthermore, to measure student learning success using the formula:

$$P = \frac{f}{n} \text{ x } 100\%$$

The score of the learning completeness criteria set by the researcher was adjusted to the school curriculum standards, which were 80. After obtaining the percentage of completeness score, the researcher will adjust the results obtained to the student's success rate criteria. The criteria for student learning success refer to the following table:

**Table 2. Criteria for Increasing Learning Motivation**

| Number of Students Increase Motivation | Predikat |
|---|---|
| 80% < skor ≤ 100% | Highly Effective |
| 60% < skor ≤ 80% | Effective |
| 40% < skor ≤ 60% | Less Effective |
| 20% < skor ≤ 40% | Ineffective |
| 0% < skor ≤ 20% | Highly Ineffective |

**Source: Navirida, (2017)**

## RESULT & DISCUSSION

This research and development resulted in products in the form of Android based IPAS learning media. Media development uses PHP 7.5 and Mysql's data-driven coding base. This learning media can be accessed through an Android based application or used on laptops, laptops, tablets and the like that are connected to the internet. This learning media was developed to overcome the problem of low levels of student learning motivation in class X PPLG SMKN 8 Semarang in classroom learning. The learning media tested on students is a learning media that is tested and declared feasible by the expert validator of the learning media and the validator of the material expert.

This Android based learning media is designed with eight main menus that are integrated with each other to support the learning process independently and interactively. The eight menus include: 1) the user login menu, which serves as early access for students and teachers to enter the application; 2) the home menu, which displays general information as well as the main navigation of the application; 3) a menu of learning materials, which presents IPAS content in accordance with basic competencies and learning objectives; 4) a learning video menu, which contains material explanations in audiovisual form to strengthen understanding of concepts; 5) quiz and evaluation menus, which are used to measure student understanding through interactive questions; 6) a practice and feedback menu, which provides a direct response to student answers as a form of learning reinforcement; 7) user profile menu, which contains user data and learning activity history; and 8) the help menu or user guide, which functions as a *user manual* to make it easier for users to operate learning media. The existence of this usage guide is expected to increase the ease of access, learning independence, and effectiveness of the use of Android based learning media in learning activities.

**Analysis Stage**. Researchers identified problem findings in the field through interviews and observations. Interview activities are carried out in a structured manner with the deputy head of curriculum and subject teachers. The purpose of the interview with the vice principal of the curriculum school is to obtain initial data regarding the research object, and also as an initial communication regarding the application for research permits in schools. Meanwhile, the purpose of the interview with the subject teacher is to find out the problems during the learning process. At this stage, researchers observed 30 students. Based on initial observations, some information was found about the condition of the students, namely: (a) The research subjects are very heterogeneous, both in terms of affective and cognitive. (b) students' learning motivation is still lacking in social studies learning. (c) the majority of students have different learning style interests between ordinary students and students with special needs. (d) the majority of students have visual and audio-visual learning styles. (e) The teacher explained that most students felt bored with printed learning media such as package books and worksheets. And (f) the media used by teachers to deliver material for students to study at home is still limited in optimization through WhatsApp groups and in this school the overflow of students makes a lack of classrooms for learning.

**Design stage.** The researcher collects data according to the core competencies and basic competencies. The stages of the activity are the preparation of learning applications, media features, media content, learning videos, which will be used as supporting materials, exams, quizzes, and others. At this stage.

**Development Stage**. At this stage, the researcher focuses on the development of website-based learning media that will be piloted on students. The stages carried out by the researcher are as follows: (a) developing the appearance and media framework of IPAS android using the PHP 7.3 Code programming language and MySQL database; (b) design the video with the most attractive appearance; (c) ensure that student learning facilities are available in the media; (d) formulate learning objectives; (d) incorporate material into the media; (e) develop student learning evaluation tools; (f) production and evaluation of learning media.

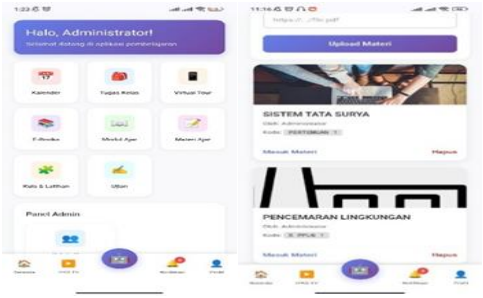


**Figure 1. Android based learning application media**

**Implementation Stage**. After the development of the media prototype is completed, it is necessary to carry out a trial stage to get suggestions and inputs related to the development that has been carried out. The developed product is piloted to each expert validator. Experts at this stage are people who have linear competencies in the field of learning media development, and IPAS learning.

The results of the validation of media experts showed a score of 73 out of a maximum score of 75, so that the eligibility percentage was obtained at 97.33%. Based on the validation criteria, the value is in the category of being very valid. This means that the Android based learning media developed has met the aspects of display quality, ease of use, and technical feasibility, so that it can be used in the learning process without the need to make major revisions, the following is presented an assessment table that has been filled in by the validator.

**Tabel 3. Media Design Validation Results**

| No | Aspects That Are Assessed | Skor |
|---|---|---|
| 1. | The guidebook is clear and easy to understand. | 5 |
| 2. | The design of the media display is in accordance with the user's goals. | 5 |
| 3. | The images and illustrations used are appropriate for each discussion. | 5 |
| 4. | Accuracy of the layout of each page. | 5 |
| 5. | Precision of navigation button layout. | 4 |
| 6. | Accuracy of background selection. | 5 |
| 7. | Color suitability of text and images. | 5 |
| 8. | The image quality is obvious. | 5 |
| 9. | The text used is clearly visible. | 5 |
| 10. | Precision of font type and size selection. | 5 |
| 11. | The Audio sound is audible. | 5 |
| 12. | The attractiveness of the supporting video material. | 5 |
| 13. | The length of the video. | 5 |
| 14. | The language used is according to the needs of the user. | 4 |
| 15. | The product is easy to use. | 5 |
| Amount Score | | 73 |
| Maximum Score | | 75% |
| | | 97.33% |

**Table 4. Material Validation Results**

| No | Aspects That Are Assessed | Skor |
|---|---|---|
| 1. | Suitability of the material with basic competencies. | 5 |
| 2. | Compatibility of the material with the indicators. | 5 |
| 3. | Suitability of the material with the learning objectives. | 5 |
| 4. | Suitability of the material to the target user. | 5 |
| 5. | Have clear clues on each topic discussed. | 5 |

| | | |
|---|---|---|
| 6. | Able to represent the material as a whole. | 4 |
| 7. | The material presented is easy to understand. | 5 |
| 8. | The material is arranged systematically | 4 |
| 9. | The images presented have relevance to the discussion in the material. | 5 |
| 10. | Clarity of the text used. | 5 |
| 11. | The relationship of material things to daily life. | 4 |
| 12. | Use simple and easy to understand sentences. | 5 |
| 13. | Student interactivity with the media. | 5 |
| 14. | Evaluation according to the material. | 5 |
| 15. | Products can help increase interest in learning. | 5 |
| Amount Score | | 72 |
| Maximum Score | | 75% |
| | | 96% |

The results of the validation of the material experts showed that the developed learning media obtained a total score of 72 out of a maximum score of 75, resulting in a 96% eligibility percentage. This percentage falls into the category of being very valid, which means that the media has met the content eligibility criteria very well. Expert assessments include aspects of the suitability of the material with basic competencies, the accuracy of the presentation of concepts, the relevance of the material to the learning context, and the clarity of the language used. High scores on almost all indicators indicate that the material in the learning media has been arranged accurately, systematically, and easily understood by students. In addition, the consistency of high scores on most assessment items indicates that these media have met the quality standards of learning content and are suitable for use without the need for major revisions. Thus, the results of the validation of the material experts strengthen that this Android based learning media is ready to be implemented in the learning process and has the potential to support the improvement of students' understanding of IPAS materials.

Furthermore, products that have been validated by experts and obtained scores that meet the eligibility criteria are then tested on students. Android based learning media was given to 30 students of class X PPLG 1 SMKN 8 Semarang to find out its effectiveness in increasing learning motivation. The trial process is carried out through the provision of pretests and posttests to students. The pretest is given before students use learning media to find out the initial condition of their learning motivation, while the posttest is given after students use Android based IPAS learning media.

Data from the trial showed that there was a significant difference in pretest and posttest scores. Pretest scores represent the initial level of motivation of students who are still in the low to medium category, while posttest scores describe the motivation conditions after using the developed learning media. The increase seen from the comparison of the two values is an indicator that Android based learning media is able to provide a positive stimulus for student learning motivation. The results of the pretest and posttest of students are as follows:

**Table 5. Pretest and Posttest Results**

| No | Name | Pretest | Posttest |
|---|---|---|---|
| 1 | AB | 66 | 98 |
| 2 | AWP | 60 | 90 |
| 3 | BC | 68 | 95 |
| 4 | BAP | 72 | 94 |
| 5 | CA | 75 | 92 |
| 6 | DP | 68 | 88 |
| 7 | DM | 75 | 95 |
| 8 | DSP | 65 | 88 |

| | | | |
|---|---|---|---|
| 9 | EM | 60 | 98 |
| 10 | ESN | 70 | 90 |
| 11 | FP | 68 | 88 |
| 12 | FTJ | 50 | 95 |
| 13 | FSP | 62 | 89 |
| 14 | GH | 64 | 90 |
| 15 | HP | 68 | 95 |
| 16 | IDS | 68 | 89 |
| 17 | IP | 43 | 90 |
| 18 | JA | 50 | 96 |
| 19 | KA | 45 | 90 |
| 20 | LM | 58 | 93 |
| 21 | NN | 48 | 92 |
| 22 | NF | 58 | 94 |
| 23 | OSP | 49 | 88 |
| 24 | PW | 68 | 91 |
| 25 | PAS | 64 | 95 |
| 26 | RMG | 63 | 92 |
| 27 | RPS | 70 | 94 |
| 28 | SNB | 48 | 91 |
| 29 | SN | 58 | 93 |
| 30 | WDP | 59 | 96 |
| Score | | **61.33** | **92.30** |
| N-Gain Score | | | 0,792 |

Based on table 5 above, the effectiveness of increasing learning motivation is clearly reflected in the results of statistical analysis. An N-Gain score of 0.792 which is in the "High" category shows that the learning media developed is able to have a strong impact on students' learning motivation. This value shows that the increase that occurred was not a coincidence, but was the result of the use of media that really helped students to be more actively involved in the learning process. These findings are in line with a meta-analysis that shows that Android based learning media has a significant effect on student achievement with an effect size g = 0.73, indicating the high effectiveness of mobile learning in the context of science education.

The average student learning motivation increased from 61.33 in the pretest to 92.30 in the posttest, illustrating a significant shift from the initial motivation that was in the medium category to a very high level of motivation after the use of media. This 50.5% surge shows that the majority of students experience increased interest, readiness, and involvement in learning more independently. These results are reinforced by the research of Sujarwo, Herawati SN, Setyaringtyas T, et al which found that Android based interactive media has a significant positive effect on students' learning motivation, increasing interest and understanding of subject matter.

**Perspectives of Cybernetic Theory: Adaptive Feedback Systems**

The application of Android based learning media that provides dynamic interaction and real-time feedback is in line with Cybernetic Theory, where the learning process is seen as a continuous and adaptive feedback system. Cybernetic theory refers to the study of systems that are goal oriented and have self-regulating capabilities, in which the system includes goals, reference values, feedback, and sensory mechanisms to guide the system's efforts in achieving its goals[14]. Along with advancements in cyber technology, these cybernetic principles have evolved from conventional digital learning environments into more immersive systems, such as Virtual Reality (VR). VR based learning environments extend cybernetic learning by enabling continuous perception action feedback loops, where learners

actively explore, interact with, and respond to virtual stimuli in real time, thereby enhancing orientation, engagement, and exploratory behaviors within learning systems[15]. In the context of this study, the "Instant Feedback" feature in the quiz allowed students to set their own learning strategies, create a closed-loop feedback system for students to take action, the system responded immediately, and students adjusted their learning behavior based on that feedback. This mechanism strengthens the effectiveness of digital learning and accelerates the mastery of concepts. The cybernetic approach uses regulatory mechanisms to suggest actions that produce specific outcomes and manage various disruptions in the learning process. In this study, students who scored low on the first quiz were able to immediately receive a more detailed explanation of concepts and repeat the exercises with an adjusted level of difficulty, forming an adaptive learning pathway that is responsive to individual needs.

**ARCS Model: Structured Motivational Design**

In terms of motivation, the ARCS (Attention, Relevance, Confidence, Satisfaction) Model explains the psychological mechanisms behind the success of this learning medium. The ARCS model has been shown to be effective in improving student learning achievement, with meta-analytical research showing a significant positive effect size, especially when integrated with learning technologies. This model is applied in learning media developed through four components:

**Attention:** This component is fulfilled through perceptual arousal with a 360° Virtual Tour feature that allows students to explore the learning environment in an immersive way. Attention can be aroused in tswo ways: 1) perceptual arousal which uses surprising or unexpected elements to attract interest, and 2) arousal inquiry which stimulates curiosity by asking challenging questions or problems to be solved[16]. The developed media combines these two strategies through interactive animations, engaging learning videos, and varied multimedia elements.

**Relevance:** Relevance is achieved because the content is tailored to the vocational context (SMK) and local environmental issues that are familiar to students. The IPAS learning materials developed not only present theoretical concepts, but also integrate applicable examples from industry and daily life that are relevant to the PPLG (Software and Game Development) major. This is in accordance with the principle of relevance which emphasizes that learning content must have a strong connection with students' prior knowledge and the context of their lives.

**Confidence:** Confidence increases when students receive immediate feedback from the system, allowing them to correct mistakes privately without social pressure or embarrassment in front of classmates. The confidence component in the ARCS model helps students build confidence to achieve learning goals through gradual success experiences and constructive feedbac. The easy-medium-hard quiz system provides scaffolding that helps students build competencies progressively.

**Satisfaction:** Satisfaction arises from gamification elements such as scores, achievement badges, and leaderboards that provide recognition for students' efforts. Satisfaction includes the right mix of intrinsic and extrinsic rewards that support desired learning behaviors. This study found that 87% of students feel motivated to complete all learning modules because of the existence of a clear and achievable reward system.

Based on the results of application to students, Android based media fosters a learning climate where goals are optimally achieved. This is in line with the findings of research Nurfadhilah and Susilo, who stated

that Android based media can significantly increase student interest[17]. Students not only understand the material better but also become more active in discussions, being able to relate theoretical concepts (such as forms of energy, ecosystems, or planetary systems) to everyday life and the applications of the technologies they use. The use of mobile-based learning media has a much greater impact on students' understanding of the subject matter compared to traditional verbal instruction alone. In this study, observations showed an increase in students' active participation in class discussions from an average of 40% to 78% after the implementation of Android learning media. Students who were previously passive began to ask critical questions and share their understanding of the natural phenomena they learned about through the app.

An important aspect of this research is the ability of media to support inclusivity. Observations show that students with special needs can take advantage of the flexibility of the medium to learn at their own pace (self-paced learning), reducing the anxiety often felt in conventional classrooms. Universal Design for Learning (UDL) is a philosophical framework based on cognitive neuroscience research that investigates how the human brain learns, and has been shown to be effective in providing an educational environment that is accessible to all diverse learners, including students with disabilities[18].

Digital technology is a key enabler in UDL implementation, with research showing that digital technology affordances have been successfully leveraged for UDL enactment, particularly in the principle of Representation where educators offer choices about how learners access content[19]. In this study, 3 students with special needs (1 student with dyslexia, 1 student with ADHD, and 1 student with mild visual impairment) showed a higher increase in motivation (mean N-Gain 0.85) than regular students (N-Gain 0.78), suggesting that inclusive design provides greater benefits to the population most in need of support.

This development is a form of learning innovation in the Industry 4.0 era (Ningrum et al., 2021), where technology makes learning flexible, accessible anywhere, and efficient. By optimizing the visual and auditory senses through a multimedia approach, this medium ensures that students, regardless of their learning style, remain directly and actively engaged with the subject matter. The characteristics of mobile learning that offer high flexibility, allow learning anytime and anywhere, and support the delivery of up to date and easily accessible instructional materials across multiple devices, are well aligned with the needs of vocational school students who are generally familiar with smartphones and mobile technologies (Crompton & Burke, 2022).

In this study, 89% of students reported that they accessed learning materials outside of school hours, with the average self-study time increasing from 30 minutes/day to 65 minutes/day. Analytics data from the app showed peak usage occurred at night (19:00-22:00), suggesting that students took advantage of the flexibility of mobile learning to learn at a time they deemed optimal.

## CONCLUSION

This study resulted in the development of an Android-based IPAS learning media that is proven to be valid and effective for Class X vocational high school students. Validation results from media experts (97.33%) and material experts (96%) indicate that the developed product meets high validity standards in terms of content quality, instructional design, and technical aspects. The implementation of the media demonstrated a significant improvement in students' learning motivation, with average scores increasing from 61.33 in the pre-test to 92.30 in the post-test, and an N-Gain score of 0.792 categorized as high. Furthermore, the integration of Universal Design for Learning (UDL) principles enables the media

to support inclusive learning by accommodating diverse learner needs. Therefore, the developed Android-based learning media can be considered an effective and inclusive learning solution for enhancing student motivation in vocational education contexts.

## *Declaration by Authors*

**Acknowledgement:** None
**Source of Funding:** None
**Conflict of Interest:** The authors declare no conflict of interest.

## REFERENCES

1. Cortes ST, Lorca AS, Pineda HA, et al. Strengthening Science Education in Basic Education through a Professional Development Program on Participatory Action Research for Science Teachers. Soc Sci Humanit Open 2024; 10:101194. https://doi.org/10.1016/j.ssaho.2024.101194.
2. Nurazizah S. Pentingnya Media dalam Pembelajaran untuk Meningkatkan Hasil Belajar Siswa. Karimah Tauhid 2024; 3:5666–70. https://doi.org/10.30997/karimahtauhid.v3i5.13195.
3. Haptanti FS, Hikmah M, Basuki IA. Peran Media Pembelajaran dalam Pendidikan Bahasa Indonesia. J Lang Lit Arts 2024; 4:972–80. https://doi.org/10.17977/um064v4i92024p972-980.
4. Ariaty E, Ariandini N, Alfira E, et al. Pengaruh Media Digital Interaktif terhadap Motivasi Belajar Siswa Sekolah Menengah. J Kependidikan Media 2025; 14:88–95.
5. Zaki KI, Iskandar R, Naryanto RF. Pengaruh Media Pembelajaran terhadap Motivasi Belajar Siswa SMK: Meta Analisis. Panthera J Ilm Pendidik Sains Dan Terap 2025; 5:1122–40. https://doi.org/10.36312/panthera.v5i4.701.
6. Siahaan KWA, Manurung HM, Siahaan MM. Android-Based Learning Media Development Strategies During Pandemic Times to Improve Student Science Literacy. Int J Educ Humanit 2021;1. https://doi.org/10.58557/ijeh.v1i1.4.
7. Bygstad B, Øvrelid E, Ludvigsen S, et al. From dual digitalization to digital learning space: Exploring the digital transformation of higher education. Comput Educ 2022; 182:104463. https://doi.org/https://doi.org/10.1016/j.compedu.2022.104463.
8. Sujarwo, Herawati SN, Setyaringtyas T, et al. Android-Based Interactive Media to Raise Student Learning Outcomes in Social Science. Int J Interact Mob Technol 2022; 16:4–21. https://doi.org/10.3991/ijim.v16i07.25739.
9. Abdullah WD, Afikah A, Apino E, et al. Moderator Effect of Mobile Learning on Students' Achievement in Physics: A Meta-Analysis. J Balt Sci Educ 2024; 23:187–207. https://doi.org/10.33225/jbse/24.23.187.
10. Anuyahong B, Pucharoen C. Exploring the Effectiveness of Mobile Learning Technologies in Enhancing Student Engagement and Learning Outcomes. Int J Emerg Technol Learn 2023; 18:50–63. https://doi.org/10.3991/ijet.v18i18.40445.
11. Branch RM. Instructional Design: The ADDIE Approach. New York: Springer; 2009.
12. Sugiyono. Metode Penelitian Kuantitatif, Kualitatif dan R&D. Bandung: Alfabeta; 2020.
13. Navirida E. Pengembangan Bahan Ajar Matematika dengan Siswa Kelas V. Simki-Pedagogik 2017;01.
14. Peña-Ayala A, Cárdenas-Robledo LA. A cybernetic method to regulate learning through learning strategies: A proactive and reactive mechanism applied in U-learning settings. Comput Human Behav 2019; 98:196–209.
15. Joomi L, Allison E, David RE, et al. Seeing possibilities for action: Orienting and exploratory behaviors in VR. Comput Hum Behav 2019; 98:158–65. https://doi.org/10.1016/j.chb.2019.03.040.
16. Li K, Keller JM. Use of the ARCS Model in Education: A Literature Review. Comput Educ 2018; 122:54–62. https://doi.org/10.1016/j.compedu.2018.03.019.
17. Nurfadhilah N, Susilo MJ. Development of an Android-Based Al-Qur'an Edu-Game to Improve Al-Qur'an Memorization for Elementary School Students. Briliant J Ris Dan Konseptual 2024; 9:829–40.
18. Almeqdad QI, Alodat AM, Alquraan MF, et al. The effectiveness of universal design for learning: A systematic review of the

literature and meta-analysis. Cogent Educ 2023; 10:2218191. https://doi.org/10.1080/2331186X.2023.2218191.

19. Bray A, Devitt A, Banks J, Sanchez Fuentes S, Sandoval M, Riviou K, et al. What Next for Universal Design for Learning? A Systematic Literature Review of Technology in UDL Implementations at Second Level. Br J Educ Technol 2024; 55:113–38. https://doi.org/10.1111/bjet.13328.

How to cite this article: Wildan Sayuthi Mahatma, Nugroho Trisnu Brata. Development of android based learning media to increase the learning motivation of social studies for inclusive students of class X. *International Journal of Research and Review*. 2025; 12(12): 986-997. DOI: *https://doi.org/10.52403/ijrr.20251298*

******