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Development of Video Learning Materials on Computational Thinking in Class XI Students of Private High School Tunas Kelapa Samarinda Academic Year 2024/2025

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***Abstract*—**In the digital era, science and technologies are developing so fast, it's also influences developments of students' mindset and character in learning. so, the Indonesian governments try to improve the existing curriculum of the name "Kurikulum Merdeka". In this curriculum, students are required to have high order thinking skill levels to support their lives in keeping up with changing times. Of course, it's also requiring teachers to be more creative and provide innovation in the teaching and learning process. The aim of the research is to develop learning media products in the form of videos learning and see the eligibility of the product being developed and implement the product for students whose result is the form of pretest and posttest scores and N-*Gain* scores to determine whether it's works to improve student learning outcomes. The method used in this research is Research and Development (R&D) with the ASSURE model (Analyze, State, Select, Utilize, Require, Evaluate, and Revise). The results of the eligibility test carried out by three media and one material expert were analyzed using a Likert scale. For the respective results obtained of the three media expert were 93%, 92%, 96% with an average of 93% which was included in the very eligible category, and the result from the material experts is 98% with "very eligible" category. Then for the results of the product implementation in the form of a pretest score with an average of 38, a posttest score with an average of 96, an average N-*Gain* Score of 0,95 and a percent of N-*Gain* is 95% which was included in the "high" dan "effective" category. Based on the results of this assessment, it can be concluded that the development of video learning materials on computational thinking in 11th grade class at Private High School Tunas Kelapa Samarinda is "very eligible" to be used in the learning process and is effective in improving student learning outcomes.

***Keywords*—**Video Learning, Computational Thinking, Instructional Media, Assure, Science and Technology, Kurikulum Merdeka

I. INTRODUCTION

Education is one of the main pillars in developing quality human resources. In the current digital era, technology has become an inseparable part of everyday life, and education is not immune from the impact. Science and Technology (IPTEK) are becoming one unit, so that education has undergone a significant transformation and experienced rapid progress, it's happened in education throughout the world, including education in Indonesia. Digital transformation in the education sector with utilizing technology as a catalyst is one of the strategic steps to produce finer human resources who are able to compete globally in realizing the vision of a Golden Indonesia 2045 (Kemendikdasmen, 2025). Science and technology is one of the mandatory lessons for secondary schools which is named informatics in the current curriculum. According to the Minister of Education and Culture Regulation Number 12 of 2024, which stipulates the "Kurikulum Merdeka" regulations as the national curriculum in Indonesia. The "Kurikulum Merdeka" is one of the four curriculum options that can be adopted by educational units in the context learning recovery after pandemic, which means that the independent curriculum is a curriculum that is refined from the existing curriculum to be able to adapt to the modern era (Kemendikbudristek, 2021).

Some of the principles that are the basis of the "Kurikulum Merdeka" are a simple, flexible, easy to understand and implement (Kemendikbudristek, 2021). In line with that The Ministry of Education Research and Technology stated within the "Kurikulum Merdeka" they simplify learning materials by reduced 30-40% of mandatory material, so it's making a teacher had more time to use in-depth, interactive and project-based learning. That's make the textbooks in "Kurikulum Merdeka" to contain more activities designed to sharpen reasoning powers (Kemendikbudristek, 2023). They hope that this way learning can be more adapted to the conditions at school but the policy of reducing almost half the material in textbooks, the books currently circulating present materials which are

less complete because it's lacks depth because just general, it's means the textbook are unable to meet students' learning needs optimally. And then, that's going to be a problem because it is difficult for many students to understand important concepts in learning subjects. Teachers and students are required to be more active in seeking additional literacy or more adequate facilities for their teaching and learning activities. However, as an archipelagic country with a large and diverse population, Indonesia faces several challenges, one of which is equal access to education. Many remote areas still do not have adequate educational facilities, which is a crucial issue that affects the teaching and learning process (OECD, 2020). The matter is reinforced by the Ipsos Education Monitor research report that 59% of respondents from Indonesia consider that unequal access to education is one of the biggest challenges to education in Indonesia (Ipsos, 2024). Additionally, based on the latest Program for International Students Assessment (PISA) in 2022, which is held every 3 years by the Organization for Economic Co-Operation and Development (OECD), shows that in an international survey to measure literacy levels, Indonesia is in the bottom 11th position out of 80 participating countries. The average reading ability of Indonesian students is 359 points, which is still below the achievements of students in ASEAN countries, namely in 6th position (PISA, 2022). The Research and Development and Books Agency of the Ministry of Education, Culture, Research and Technology also released the results of its study based on PISA 2018, stating that at least 40% of Indonesian students agreed or strongly agreed that they read only if required by their teachers (Puslitjakdikbud, 2021). Therefore, there is a need to continue to develop innovation in learning to keep up with the needs of educational transformation so that the teaching and learning process can meet learning outcomes.

The interviews with researchers with informatics teachers at Private High School Tunas Kelapa Samarinda, showed that informatics lessons are very popular, learning is usually responded to in a fun way, especially when teachers use audiovisual media. The said finding is reinforced by the results of the researcher's interviews with students in class XI IPA and class XI IPS Private High School Tunas Kelapa Samarinda, which show that 10 out of 14 students are interested in learning informatics and the digital world. They also don't seem to care about those who don't have textbooks for learning, which shows their literacy level.

The development of information technology provides an opportunity to improve this situation by providing alternative learning media that are more interactive, detailed, flexible and easily accessible like one of aspect in the stages of implementing the independent curriculum is the use and development of teaching tools (Kemendikbudristek, 2022). The said point encourages the importance of developing learning resources that are more innovative and adaptive to students' needs because with changing times and increasingly rapid technological developments, there is a shift in changes in behavior, thought patterns and learning that must be adapted to exposure to technology and communication science, one of which is by using video learning media.

Compared to other media learning, video learning as interactive multimedia has the advantage of being able to convey information in various forms at once, such as text, images, audio, and animations. This advantage is what makes learning videos a learning medium that can facilitate the diversity of students' characters and can stimulate student activity (Fitriani et al., 2021). Where the stimulus involves many senses in the learning process. The involvement of various senses in the learning process can make it easier for students to understand the learning material, the more senses involved in the learning process, the more effective the learning process will be (Marina Angraini et al., 2022). By adopting the right approach, such as integrating video with interactive learning methods, it can be providing training to students and creating optimal learning potential. By balancing combining sophisticated technology with a strategic learning approach, it has been proven to create a more dynamic, engaging and meaningful learning environment for students. Through collaborative efforts video learning and creative thinking, the challenges in teaching and learning process in schools can be overcome with utilizing video learning media, and its benefits can be expanded to improve optimal learning outcomes for all learners and of course can be implemented in all subjects and levels of education (Zaski & Ratnawati, 2024).

The learning videos are equipped with the ability to be operated by students anywhere and anytime, so that they can adjust the process carried out sequentially according to the speed of student understanding. With this, students are accustomed to thinking according to the algorithm by sequencing the steps in solving problems so that they are logical, sequential, orderly, and easy to understand. This is in line with computational thinking material that can train the brain to get used to thinking logically, structured, and critically. Computational thinking is thinking with algorithms where we think by sequencing the steps in solving problems to make them logical, sequential, orderly, and easy for others to understand (Marina Angraini et al., 2022).

This has also been conveyed by several studies that have examined the development of learning videos, where the problems that occur in the learning process are less than optimal delivery material, the learning media used is less varied, the lack of availability of learning media in schools, and the lack of student motivation in participating in learning (Aulia et al., 2024). Students need tools in the form of learning media that can help clarify what the teacher will convey so that students understand and understand it more quickly. By using media, students can see and hear lesson material more clearly. Learning by using the senses of sight and hearing provides many benefits for students. Students will learn more than if the lesson material was presented only with visual stimuli or only with hearing stimuli (Hilmi et al., 2021). However, most research only focuses on the technical aspects of development, without considering eligibility and implementation. In contrast to previous research which only included technical aspects of development, this research focuses on the feasibility and implementation aspects of the product being developed. By using an approach to using video in the field, this research

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provides a more statistical perspective regarding the use of instructional video media in the teaching and learning process in schools.

Based on the explanation of the problem above, concrete steps are needed to overcome limited facilities and reduced material in textbooks, the lack of student awareness of additional literacy to support learning and student interest in the world of technology, especially audiovisual learning media. Therefore, researchers are intrigued in conducting research on learning video media on computational thinking material which is the initial basis for the 8 elements of class XI informatics lessons with the aim of being a solution to these problems and making it easier for teachers and students to carry out learning activities.

II. Literature Review

A. Learning Media

Media comes from Latin and is the plural of the word “medium” which means between. In communication science, "medium" is interpreted as something that can act as an intermediary in the communication process. The word “medium” can also be interpreted as something that can help convey messages and information from the message source (communicator) to the message recipient (communicant) (Pagarra et al., 2022). Media can also be said to be a means of transferring or conveying messages. (Hasan et al., 2021). Therefore, concluding from the meaning and origin of the word media that has been conveyed, it can be concluded that media is an absorption word from the word “medium” which can be interpreted as a means or container that is used as an intermediary or contact person between the source and recipient to provide information or a message that wants to be conveyed.

A “medium” can be said as educational media if the "medium" transfers messages in a learning process (Hasan et al., 2021). Learning media is a means for the teaching and learning process in conveying learning messages related to the direct learning model, namely through the teacher acting as a provider of information and in this case the teacher must use various appropriate media (Ramadani et al., 2023). Thus, it can be concluded that learning media include various equipment used by teachers as intermediaries to convey learning material with the aim of conveying the material to the learning students and can function effectively (Pagarra et al., 2022).

Media is utilized to stimulate students' thoughts, feelings, attention and abilities or skills in order to stimulate the learning process (Ramadani et al., 2023). The impacts of using media in communication and learning are (1) the delivery of learning becomes more standardized; (2) the learning process can be more interesting; (3) the learning process becomes more interactive; (4) the length of time required for learning can be shortened; (5) the quality of learning outcomes can be improved; (6) the learning process can be provided whenever desired or needed; (7) create a positive attitude in students towards what is being learned; and (8) the role of educators can change in a more positive direction (Hasan et al., 2021).

B. Learning Video

Learning video media is an alternative used in learning. Learning videos include a combination of sound, images or animation that can be visualized so that students are happier and more motivated to learn. The utilization of learning videos can aid the educators to be more creative in creating an attractive display of the learning process because it is supported by a video display that is easier for students to understand (Khairani et al., 2019).

Audio visual media has a function which can attract attention and focus students' concentration on the material. Learning goals can be achieved more quickly by understanding and remembering the message in the video and can overcome passive students by using appropriate and varied media. The use of videos in the learning process aims to make students capture and understand the material presented more quickly. Apart from that, delivering material via video media will be easier for educators or teachers. Video media has the ability to present information, explain complex concepts, explain processes, teach skills, shorten or lengthen time, and can influence attitudes. Using videos as teaching aids can provide new experiences to students. The influence of this video media will penetrate into humans more quickly than other media, because the display is in the form of light at a focal point, and it can influence human thoughts and emotions. (Putri Marliani, 2021).

C. Computational thinking

Informatics has a consist of 8 elements as depicted in a "house" and computational thinking is one of the elements of informatics, that’s a initial foundation of informatics learning. Computational thinking is a framework and thinking process that includes hardware, software, and reasoning about systems and problems. Computational thinking has several concepts and thinking strategies that are commonly used in solving computational problems such as:

1. Recursion, which is defined as “something” that contains “something” itself, a problem can be decomposed into similar, but smaller, problems. This strategy we use most often in our daily lives.
2. Greedy algorithm, where Greedy literally means greedy or greedy. Even though in everyday terms the words “greedy” and “greedy” are used, in the context of Informatics, we interpret greedy in the context as a problem-solving strategy that can be useful in designing an algorithm or solution to a computational problem.
3. Dynamic programming (DP) contains two main elements, namely, Optimization (looking for the smallest/largest value) through a series of choices or similar to greedy techniques and the optimal value desired for the problem can usually be expressed as an optimal combination of the same sub-problems, but with a smaller size (or in other words, it can be stated recursively). Therefore, dynamic programming is a combination or combination of two previous thinking strategies, namely recursion and greedy algorithms (Asfarian et al., 2021).

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III. METHODS

A. Research

The research was carried out in the even semester of the 2024/2025 academic year at Private High School Tunas Kelapa Samarinda which is located at Jl. M. Yamin, No. 06, Gunung Kelua, Samarinda Ulu District, Samarinda City, East Kalimantan Province (75243). The subjects in this research were class XI IPA-IPS students at Private High School Tunas Kelapa Samarinda as users of informatics tutorial videos on computational thinking material. And data collection techniques in this research used 4 types of techniques, namely, interviews, observation, questionnaires, and data processing carried out independently using Microsoft Excel.

B. Data and Equipment

The method used in this research is Research and Development (R&D) with the ASSURE model (Analyze, State, Select, Utilize, Require, Evaluate, and Revise) with the following steps:

1. Analyze learners
   The stage contains the researcher analyzing the characteristics of the students, such as habits, learning styles, etc. This is done to understand who the learning target is so that the media and strategies used are appropriate.
2. State standards and objectives
   This stage aims to determine what students must achieve after learning is complete.
3. Select strategies, technology, media, and materials
   At this stage the researcher chooses the methods, media and materials that best suit the students' characteristics and learning objectives.
4. Utilize technology, media, and materials
   At this stage the researcher will implement the product developed for students.
5. Require learner participation
   At this stage the researcher ensures that students participate actively in learning.
6. Evaluate and revise
   At this stage the researcher processes the data obtained in the research where the results will answer the research objectives

From the explanation above, the graph in the process of ASSURE model can be seen in Figure 1 ASSURE.

Figure 1. ASSURE
(Source : *Figure ASSURE*, 2024)

C. Data Collection and Processing

Data collection in this research used 3 types of techniques, namely: interviews, observation, and questionnaires. Interviews were conducted during pre-research with the informatics teacher and all class XI IPA-IPS students of Private High School Tunas Kelapa Samarinda to find out the use of teaching materials used, as well as problems that occurred during class learning. Observations are carried out to find out how the learning process takes place in the classroom, then to find out the technological facilities provided by the school and find out what materials and lessons they learn in the classroom. The researcher made observations during the KKN-PLP & Teaching Assistance activities in the period July-October 2024. The questionnaire was used as a means to determine whether the computational thinking learning video media aimed at expert validators was appropriate.

Then the data obtained in the research is processed to answer the research problems. The process includes:

1. Eligibility of The Media Developed

To determine the eligibility of the media developed, the product in the form of a video learning must be validated by experts, namely three media expert validation and one material expert validation. So, the process is as follows:

a. Expert Validation

The expert validation is measured using a Likert scale with tabulation of data obtained for each aspect of the assessment and media assessment items from each assessor, namely as in the Table 1 assessment score.

Table 1. Assessment Score

Score	Criterion
5	Very Agree
4	Agree
3	Quite Agree
2	Barely Agree
1	Disagree

(Source :Saputra et al., 2020).

Then first the scores on the items for each aspect are added up to find out the results from each expert. After that, changing the results of the validator questionnaire into a percentage of validity, then calculating the total average number using equation (1):

$$P = \frac{\sum x}{\sum x_i} \times 100\% \quad (1)$$

Where (1):
P = Validity Percentage
$\sum x$ = Total Score
$\sum x_i$ = Total Ideal Score.

(Source : Uko et al., 2022).

After obtaining the validity percentage based on the indicators, then calculate the total average number using equation (2):

$$\text{Average} = \frac{\text{Total Validity Percentage}}{\text{Number of Indicator}} \quad (2)$$

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Afterward, the average value is observed in the reference table for media suitability criteria, then the result is the level of product suitability.

b. Suitability Criteria of Eligibility

As for determining the reference table interval for eligibility criteria in media validation, it is necessary to change the percentage score data into media expert scores using qualitative analysis (3) as follows:

Highest Score = 5
Lowest Score = 1
Number of Criteria = 5
Number of Panelists = x people (3)

Then, carry out descriptive percentage steps to determine the reference table interval for eligibility criteria in media validation. The first step is to determine maximum score, using equation (4):

Maximum Score = Number of Panelists × Highest Score
= x × 5
= y (4)
(Source : Auliya & N, 2020).

After obtaining the maximum score, the next step is to determine the minimum score, using equation (5):

Minimum Score = Number of Panelists × Lowest Score
= x × 1
= z (5)
(Source : Auliya & N, 2020).

After obtaining the minimum score, the next step is to determine the maximum percentage, using equation (6):

$$\text{Maximum Percentage} = \frac{\text{Max Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{y}{y} \times 100\%$$
$$\text{Maximum Percentage} = 100\% \quad (6)$$
(Source : Auliya & N, 2020).

After obtaining the maximum percentage, the next step is to determine the minimum percentage, using equation (7):

$$\text{Maximum Percentage} = \frac{\text{Min Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{z}{y} \times 100\%$$
$$\text{Maximum Percentage} = P\% \quad (7)$$
(Source : Auliya & N, 2020).

After obtaining the minimum percentage, the next step is to determine the range, using equation (8):

Range = Max Percentage – Min Percentage
= 100% - P%
= R% (8)
(Source : Auliya & N, 2020).

After obtaining the range, the next step is to determine the percentage interval, using equation (9):

Percentage Interval = Range ÷ Number of Criteria
= R% ÷ 5
= Q% (9)
(Source : Auliya & N, 2020).

So, from these calculations, the product eligibility criteria are known which can be seen in the Table 2 Criterion Score Interval:

Table 2. Criterion Score Interval

No	Percentage%	Criterion
1	(100% - Q%) ≤ x ≤ 100%	Very Eligible
2	(100% - (2 × Q%)) ≤ x ≤ (100% - Q%) – 0,01%	Eligible
3	(100% - (3 × Q%)) ≤ x ≤ (100% - (2 × Q%)) -0,01%	Quite Eligible
4	(100% - (4 × Q%)) ≤ x ≤ (100% - (3 × Q%)) -0,01%	Barely Eligible
5	(100% - (5 × Q%)) ≤ x ≤ (100% - (4 × Q%)) -0,01%	Not Eligible

(Source : Saputra et al., 2020 & Aulia et al., 2024)

2. Improving Learning Outcomes

To determine the improving learning outcomes if use the media developed, the product in the form of video learning must be used by students. Then students take tests in the formative test, namely pretest and posttest. The pretest is a formative test that is carried out before using the developed learning video, then after using the developed learning video, students are invited to fill out the same formative test again, which is called the posttest, to find out the students' learning outcomes after using the developed learning video. After that, the student learning outcome data obtained will be processed using the *N-Gian* formula to determine the increase in student learning outcomes, which can indicate the effectiveness of the learning videos developed. So, the process as follows:

a. N-Gain

N-Gain stands for "normalized gain". The *N-Gain* test is a method commonly used to measure the effectiveness of learning or intervention in improving student learning outcomes. This method provides a strong foundation for evaluating the extent to which a learning program has contributed to student understanding. The *N-Gain* approach measures the relative change between the level of student understanding before and after learning. By making this comparison, the *N-Gain* analysis provides results that can quantitatively describe the extent to which students have mastered the subject matter being taught. More than just providing numbers, this approach allows observation of learning outcomes with an orientation to the center of the group or group center. This means that the *N-Gain* analysis not only looks at individual development but also provides an overall effectiveness of learning. Thus, the N-*Gain* method is not only an evaluation tool, but also a valuable guide for educators in optimizing their learning methods, creating a more effective learning environment, and improving the overall quality of education (Sukarelawan et al., 2024).

As explained above, *N-Gian* is generated from the results of students' pretests and posttests, which are then calculated using equation (10):

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$$N\text{-}Gain = \frac{\text{Posttest Score - Pretest Score}}{\text{Maximum Ideal Score - Pretest Score}} \quad (10)$$

(Source :Sukarelawan et al., 2024).

Next, look at these values in the reference table for the *N-Gain* score criteria, then the result is the increase in student learning outcomes by learning using the product being developed. The N-*Gain* score criterion can be seen in Table 3 Normalized N-*Gain* Criteria:

Table 3. Normalized N-Gain Criteria

No	Coefficient Interval	Criteria
1	N-*Gain* ≥ 0,7	High
2	0,3 ≤ N-*Gain* < 0,7	Medium
3	N-*Gain* ≥ 0,3	Low
4	N-*Gain* = 0,0	No Increase Occurred
5	-1,0 ≤ N-*Gain* < 0,0	There Was A Decline

(Source :Sukarelawan et al., 2024).

Then, convert the N-*Gain* score to be a percent it's using equation (11):

$$\text{N-}Gain\,(\%) = \text{N-}Gain \times 100\% \quad (11)$$

Afterward, see the N-*Gain* percentage in reference table for Criteria for determining the level of effectiveness, so the result is the increase in student learning outcomes by learning using the product being developed. Criteria for determining the level of effectiveness can be seen in Table 4 Criteria for determining the level of effectiveness:

Table 4. Criteria for Determining the Level of Effectiveness

No	Percentage of N-*Gain* (%)	Criteria
1	< 40%	Ineffective
2	40% - 55%	Less Effective
3	56% - 75&	Quite Effective
4	≥ 76%	Effective

(Source :Sukarelawan et al., 2024).

IV. Results and Discussion

This research produced a learning video on computational thinking material for class XI Private High School Tunas Kelapa Samarinda. The aim of this research is to create learning media in the form of videos and implement the product. The results of this research are as follows:

A. Analyze learners

The findings showed that there are 17 students in Class Learning at Private High School Tunas Kelapa Samarinda, especially in class XI, which still more often uses the lecture method, but students prefer to learn using audio-visual interactive media.

B. State standards and objectives

In order to determine the target which students must achieve after learning is completed, researchers use the ABCD formula so they can determine learning targets and objectives, which can be seen in the Table 5 Researcher's ABCD Formula:

Table 5. Researcher's ABCD Formula

Alphabet	Question Map	The Answer
A	Audience	Class XI students
B	Behaviors	Understanding computational thinking material
C	Condition	After watching the learning video
D	Degree	Learning outcomes increase as indicated by an increase in pre-test and post-test results

C. Select strategies, technology, media, and materials

The method used is learning using learning media in the form of learning videos on computational thinking material.

D. Utilize technology, media, and materials

Implementing the product being developed by researchers playing learning videos with a projector in the classroom and providing YouTube and Google Drive links for students when they want to play the video again.

E. Require learner participation

During the pre-and-post implementation of the video, students were asked to do a test in the form of questions and answers regarding the material presented.

F. Evaluate and revise

1. Eligibility of The Media Developed

To determine the eligibility of the media developed, the product in the form of video learning must be validated by experts and suitability criteria of eligibility, so the result of the eligibility of media developed as follows:

a. Media Expert Validation Results

The results of the eligibility test by three media expert validators can be seen in Table 6 Media Expert Validation Results:

Table 6. Media Expert Validation Results

No	Assessment Aspect	Score Media Expert 1	Media Expert 2	Media Expert 3	Total Ideal Score
1	Layout & Layout Design	9	9	10	10
2	Text	20	19	18	20
3	Image	12	13	15	15
4	Animation	8	10	9	10
5	Audio	10	9	9	10
6	Practical	5	5	5	5
7	Portable	5	4	5	5

The validity percentage and average results of the eligibility test by three media expert validators can be seen in Table 7 Media Expert Validation Percentage Results:

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Table 7. Media Expert Validation Percentage Results

No	Assessment Aspect	Validity Percentage		
		Media Expert 1	Media Expert 2	Media Expert 3
1	Layout & Layout Design	90%	90%	100%
2	Text	100%	95%	90%
3	Image	80%	87%	100%
4	Animation	80%	100%	90%
5	Audio	100%	90%	90%
6	Practical	100%	100%	100%
7	Portable	100%	80%	100%
	Average	93%	92%	96%
	All Average		93%	

From table 7 on the top, the graph of the media expert validation percentage by three media experts can be seen in Figure 2 Media Expert Validation Percentage Results:

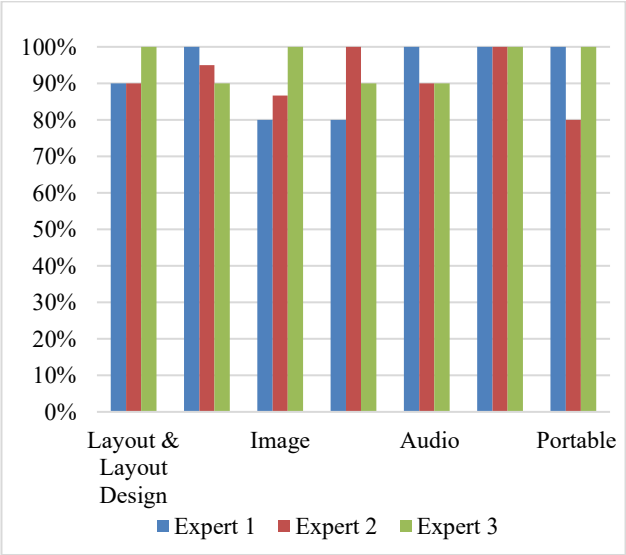

Figure 2. Media Expert Validation Percentage Results

The result of changing the percentage score data into media expert scores using qualitative analysis (3) as follows:

Highest Score = 5
Lowest Score = 1
Number of Criteria = 5
Number of Panelists =3 people (3)

Then, the result of descriptive percentage steps to determine the reference table interval for eligibility criteria in media validation. The first step is to determine maximum score, using equation (4):

$$\text{Maximum Score} = \text{Number of Panelists} \times \text{Highest Score}$$
$$= 3 \times 5$$
$$= 15 \quad (4)$$

After obtaining the maximum score, the next step is to determine the minimum score, using equation (5):

$$\text{Minimum Score} = \text{Number of Panelists} \times \text{Lowest Score}$$
$$= 3 \times 1$$
$$= 3 \quad (5)$$

After obtaining the minimum score, the next step is to determine the maximum percentage, using equation (6):

$$\text{Maximum Percentage} = \frac{\text{Max Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{15}{15} \times 100\%$$
$$\text{Maximum Percentage} = 100\% \quad (6)$$

After obtaining the maximum percentage, the next step is to determine the minimum percentage, using equation (7):

$$\text{Maximum Percentage} = \frac{\text{Min Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{3}{15} \times 100\%$$
$$\text{Maximum Percentage} = 20\% \quad (7)$$

After obtaining the minimum percentage, the next step is to determine the range, using equation (8):

$$\text{Range} = \text{Max Percentage} - \text{Min Percentage}$$
$$= 100\% - 20\%$$
$$= 80\% \quad (8)$$

After obtaining the range, the next step is to determine the percentage interval, using equation (9):

$$\text{Percentage Interval} = \text{Range} \div \text{Number of Criteria}$$
$$= 80\% \div 5$$
$$= 16\% \quad (9)$$

So, from these calculations, the product eligibility criteria are known as in the Table 8 Criterion Score Interval Media Expert Validation:

Table 8. Criterion Score Interval Media Expert Validation

No	Percentage%	Criterion
1	84,00% ≤ x ≤ 100%	Very Eligible
2	67,99% ≤ x ≤ 83,99%	Eligible
3	51,98% ≤ x ≤ 67,98%	Quite Eligible
4	35,97% ≤ x ≤ 51,97%%	Barely Eligible
5	19,96% ≤ x ≤ 35,96%	Not Eligible

The results of the eligibility test by media expert validators were that the first validator obtained an average score of 93% with the criteria predicate “Very Eligible”, then the second validator obtained an average score of 92% with the criteria predicate “Very Eligible”, and finally the third validator obtained an average score of 96% with the

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criteria predicate "Very Eligible". Then, if the average scores of the three validators are averaged again, it produces a score of 93% with the title "Very Eligible", therefore it can be concluded that the product developed, namely a learning video is very suitable for use.

b. Material Expert Validation Results

The results of the eligibility test by materials expert validator can be seen in Table 9 Materials Expert Validation Results:

Table 9. Materials Expert Validation Results

No	Assessment Aspect	Score Materials Expert	Total Ideal Score
1	Contents	19	20
2	Image	20	20
3	Audio	20	20

The validity percentage and average results of the eligibility test by one materials expert validators can be seen in Table 10 Materials Expert Validation Percentage Results:

Table 10. Materials Expert Validation Percentage and Average Results

No	Assessment Aspect	Validity Percentage Materials expert
1	Contents	95%
2	Image	100%
3	Audio	100%
	Average	98%

The result of changing the percentage score data into materials expert scores using qualitative analysis (3) as follows:

Highest Score = 5
Lowest Score = 1
Number of Criteria = 5
Number of Panelists =3 people (3)

Then, the result of descriptive percentage steps to determine the reference table interval for eligibility criteria in media validation. The first step is to determine maximum score, using equation (4):

$$\text{Maximum Score} = \text{Number of Panelists} \times \text{Highest Score}$$
$$= 3 \times 5$$
$$= 15 \quad (4)$$

After obtaining the maximum score, the next step is to determine the minimum score, using equation (5):

$$\text{Minimum Score} = \text{Number of Panelists} \times \text{Lowest Score}$$
$$= 3 \times 1$$
$$= 3 \quad (5)$$

After obtaining the minimum score, the next step is to determine the maximum percentage, using equation (6):

$$\text{Maximum Percentage} = \frac{\text{Max Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{15}{15} \times 100\%$$
$$\text{Maximum Percentage} = 100\% \quad (6)$$

After obtaining the maximum percentage, the next step is to determine the minimum percentage, using equation (7):

$$\text{Maximum Percentage} = \frac{\text{Min Score}}{\text{Max Score}} \times 100\%$$
$$\text{Maximum Percentage} = \frac{3}{15} \times 100\%$$
$$\text{Maximum Percentage} = 20\% \quad (7)$$

After obtaining the minimum percentage, the next step is to determine the range, using equation (8):

$$\text{Range} = \text{Max Percentage} - \text{Min Percentage}$$
$$= 100\% - 20\%$$
$$= 80\% \quad (8)$$

After obtaining the range, the next step is to determine the percentage interval, using equation (9):

$$\text{Percentage Interval} = \text{Range} \div \text{Number of Criteria}$$
$$= 80\% \div 5$$
$$= 16\% \quad (9)$$

So, from these calculations, the product eligibility criteria are known which can be seen in the Table 11 Criterion Score Interval Materials Expert Validation:

Table 11. Criterion Score Interval Materials Expert Validation

No	Percentage%	Criterion
1	84,00% ≤ x ≤ 100%	Very Eligible
2	67,99% ≤ x ≤ 83,99%	Eligible
3	51,98% ≤ x ≤ 67,98%	Quite Eligible
4	35,97% ≤ x ≤ 51,97%%	Barely Eligible
5	19,96% ≤ x ≤ 35,96%	Not Eligible

The results of the eligibility test by materials expert validators were average score of 98% with the criteria predicate "Very Eligible", therefore it can be concluded that the product developed, namely a is very suitable for use.

2. Improving Learning Outcomes

To determine the improving learning outcomes if use the media developed, the product in the form of video learning must be used by students. to obtain formative test results in the form of pretests and posttests and *N-Gian* score as follows:

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a. Pretest-Postest Result

The results of the pretest-posttest by students of XI class Private High School Tunas Kelapa Samarinda academic year 2024/2025 can be seen in Table 12 Pretest-Posttest Results:

Table 12. Pretest-Posttest Results

No	Name	Formative Test	
		Pretest	Posttest
1	Student 1	40	100
2	Student 2	35	95
3	Student 3	40	95
4	Student 4	50	100
5	Student 5	35	95
6	Student 6	35	95
7	Student 7	15	95
8	Student 8	65	100
9	Student 9	30	100
10	Student 10	40	100
11	Student 11	45	95
12	Student 12	35	100
13	Student 13	50	90
14	Student 14	50	95
15	Student 15	25	100
16	Student 16	40	100
17	Student 17	20	90
All Average		38,24	96,76

From table 12 on the top, the graph of the pretest-post test results by students of XI class Private High School Tunas Kelapa Samarinda academic year 2024/2025 can be seen in Figure 3 Pretest-Posttest Results:

Figure 3. Pretest-Posttest Results

b. N-Gian and N-Gain Present

The results of the *N-Gian* score and *N-Gain* percentage by the result of formative test from students of XI class Private High School Tunas Kelapa Samarinda academic year 2024/2025 can be seen in Table 13 *N-Gian* Results:

Table 13. N-*Gian* Results

No	Name	N-*Gain*		Criterion	
		Score	Percentage (%)	Score	Percentage (%)
1	Student 1	1,00	100%	High	Effective
2	Student 2	0,92	92%	High	Effective
3	Student 3	0,92	92%	High	Effective
4	Student 4	1,00	100%	High	Effective
5	Student 5	0,92	92%	High	Effective
6	Student 6	0,92	92%	High	Effective
7	Student 7	94	94%	High	Effective
8	Student 8	1,00	100%	High	Effective
9	Student 9	1,00	100%	High	Effective
10	Student 10	1,00	100%	High	Effective
11	Student 11	0,91	91%	High	Effective
12	Student 12	1,00	100%	High	Effective
13	Student 13	0,80	80%	High	Effective
14	Student 14	0,90	90%	High	Effective
15	Student 15	1,00	100%	High	Effective
16	Student 16	1,00	100%	High	Effective
17	Student 17	0,88	88%	High	Effective
All Average		0,95	95%	High	Effective

The results of *N-Gian* score and N-*Gain* percentage by the result of formative test from students of XI class Private High School Tunas Kelapa Samarinda academic year 2024/2025 were that eight students obtained *N-Gian* score of 1,00 which is obtained N-*Gain* percentage 100% with the criteria predicate "High" dan "Effective", one student obtained *N-Gian* score of 0,94 which is obtained N-*Gain* percentage 94% with the criteria predicate "High" dan "Effective", four students obtained *N-Gian* score of 0,92 which is obtained N-*Gain* percentage 92% with the criteria predicate "High" dan "Effective", one student obtained *N-Gian* score of 0,91 which is obtained N-*Gain* percentage 91% with the criteria predicate "High" dan "Effective", one student obtained *N-Gian* score of 0,90 which is obtained N-*Gain* percentage 90% with the criteria predicate "High" dan "Effective", one student obtained *N-Gian* score of 0,88 which is obtained N-*Gain* percentage 88% with the criteria predicate "High" dan "Effective", and one student obtained *N-Gian* score of 0,80 which is obtained N-*Gain* percentage 80% with the criteria predicate "High" dan "Effective", Then, if the average *N-Gian* score of 0,95 which is obtained N-*Gain* percentage 95% with the criteria predicate "High" dan "Effective". Therefore, it can be concluded that the product developed, namely a learning video is very effective

for improving learning outcomes with pretest-posttest obtained average *N-Gian* score and N-*Gain* percentage of 0,95 which is obtained N-*Gain* percentage 95% with the criteria predicate "High" dan "Effective".

V. CONCLUSION

The results of research that has been carried out, the development of video computational thinking learning materials for class XI students at Private High School Tunas Kelapa Samarinda academic year 2024/2025 is very eligible to use. With the results of the video eligibility test by three media experts in a row, the first validator obtained an average score of 93% with the predicate criteria "very eligible", then the second validator obtained an average score of 92% with the predicate criteria "very eligible" and the last media validator obtained an average score of 96% with the predicate criteria "very eligible". If the average scores of the three validators are averaged again, it produces a score of 93% with the predicate "very eligible". And the video eligibility results according to materials experts obtained an average score of 98% with the predicate criteria of "very eligible". Then the video computational thinking learning materials for class XI students at Private High School Tunas Kelapa Samarinda academic year 2024/2025 is very effective for improving learning outcomes. With the results of *N-Gian* score and N-*Gain* percentage by the result of formative test from students were that eight students obtained *N-Gian* score of 1,00 which is obtained N-*Gain* percentage 100% with the criteria predicate "high" dan "effective", one student obtained *N-Gian* score of 0,94 which is obtained N-*Gain* percentage 94% with the criteria predicate "high" dan "effective", four students obtained *N-Gian* score of 0,92 which is obtained N-*Gain* percentage 92% with the criteria predicate "high" dan "effective", one student obtained *N-Gian* score of 0,91 which is obtained N-*Gain* percentage 91% with the criteria predicate "high" dan "effective", one student obtained *N-Gian* score of 0,90 which is obtained N-*Gain* percentage 90% with the criteria predicate "high" dan "effective", one student obtained *N-Gian* score of 0,88 which is obtained N-*Gain* percentage 88% with the criteria predicate "high" dan "effective", and one student obtained *N-Gian* score of 0,80 which is obtained N-*Gain* percentage 80% with the criteria predicate "high" dan "effective". It produces a score of average *N-Gian* score and N-*Gain* percentage of 0,95 which is obtained N-*Gain* percentage 95% with the criteria predicate "high" and "effective". Therefore, the product developed in the form of a video computational thinking learning material for class XI students at Private High School Tunas Kelapa Samarinda academic year 2024/2025 is very suitable for use in learning and effective for high improving learning outcomes.

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