

DEVELOPMENT OF INNOVATIVE INSTRUCTIONAL MEDIA BASED ON LECTORA FOR ELEMENTARY SCHOOL STUDENTS

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Abstract This research is motivated by the problem of the lack of use of school facilities and technology-based learning media in learning activities. This study aims to develop learning media in the form of innovative learning media based on Lectora applications and determine the quality of the media based on assessments by media experts, material experts, class teachers and students. This development research uses a 4D development model that is tailored to the needs of the research so it is only carried out until the third stage, namely define, design, and development. The subject of this product was conducted to 1 media expert, 1 material expert, 1 class teacher and 30 grade IV students at SDN Harjasari 01 with analysis of the research techniques used were quantitative and qualitative. Data collection in this study was carried out by observation, interview, documentation and questionnaire. Based on the analysis of research results in the form of Lectora-based innovative learning media applications which were assessed by 1 learning media expert, 1 mathematical material expert, 1 class teacher and 30 students produced conclusions worthy of use. Analysis of the feasibility assessment by mathematicians gained an average of 4.35, indicating a very good category, evaluations by instructors of instructional media obtained an average of 4.2 aimed at good categories, then an assessment by the class teacher obtained an average of 4.8 indicating very good and learning media developed were tested on 30 students and produced an average of 113.9 showing good categories. Development research that has been done can be concluded that innovative learning media based on Lectora in Mathematics Subjects of Fractional Class IV material is feasible to be used in learning in good categories according to media experts, very good according to material experts, very good according to class teachers and good according to students.

Keywords: innovative; lectora; learning media; 4D development model

1. INTRODUCTION

Education is an effort to humanize humanity, shape character, noble character and expand knowledge and insight in accordance with educational goals. This statement is strengthened by the Law of the Republic of Indonesia Number 20 of Year 2003 concerning the National Education System that is conscious and planned effort functions to develop capabilities and shape the character and civilization of a dignified nation in the context of educating the life of the nation, aiming at developing the potential of students so that they can become people of faith and devotion to God Almighty, noble, healthy, knowledgeable, capable, creative, independent and become democratic and responsible citizens (Kemendikbud, 2016).

The curriculum is a learning device that is a reference to the continuity of the learning process to be directed. Educators are given the authority to conduct learning activities ranging from the selection of models, media and developing teaching materials that are tailored to the characteristics and needs of students.

According to (Ben-Hur, 1994) the characteristics of students include cognitive functions, which include the level of intelligence and creativity, communication skills, fantasy power and others. Conative-dynamic functions include the character of desire, will, motivation to learn attention, concentration. Affective functions, including temperament, feelings, attitudes, interests. Sensory-motor functions and other functions such as individuality, mental condition, psychological vitality, and personality development (Asyhar, 2012).

The age of elementary school children (SD) lasts between the ages of 6-7 years until the age of 12-13 years consisting of low classes and high classes. At this age, children experience many developments ranging from cognitive development, physical development, language development, and morals. Characteristics and needs of elementary school children are usually happy to play, like to learn with interesting pictures, like to move, like working in groups, like to demonstrate directly. Piaget also suggested that the learning process must be adapted to the stages of cognitive development that students go through. In this context there are four stages, namely the sensorimotor stage (1.5-2 years old), the preoperational stage (2-8 years), the concrete operational stage (7-8 to 12-14 years old), and the formal operational stage of age 14 years or more (Piaget, 1964). Teachers should pay attention to the cognitive stages of students, as well as provide content, methods and learning media that are appropriate to these stages. The age of elementary school class IV is at a concrete operational stage so the learning activities must use concrete media. If seen from physical, language and moral development, the learning activities must also involve students who encourage students to actively participate in learning activities.

As the development of Science and Technology, especially in the world of education has a positive impact on the progress of education itself. This development is not only at the elementary school level, but at the level of junior high, high school and equivalent even to the level of tertiary institutions such as educational innovations in learning Blended learning can facilitate the learning process (Prasetyo, Widyasari, & Hartono, 2017).

There are many subjects that must be studied by students, and this requires the teacher to be able to convey it well to students especially on subjects such as mathematics which are compulsory subjects to study because there are national examinations and besides in our daily lives we do not can be separated with things that smell count. Taylor & Brickhill (2018) in interpreting mathematics is an exact study that is deductive and functions as a collection of deductive structured systems which are also commonly called queens and or stewards of knowledge (Rahayu, Rasmitadila, & Makarim, 2018). For this reason students are required to be able to learn mathematics. However, not a few students assume mathematics is a subject that is very difficult to learn, and boring compared to other subjects even mathematics is a scary subject. Indonesian students' fear of mathematics lessons can be seen from the results of the 2015 PISA survey (Program For International For Student Assessment)

which shows the achievement of average mathematics scores shows the lowest position among other subjects such as science and literacy (Kemendikbud, 2016).

Based on the results of preliminary studies that have been carried out, there are several problems that occur including: teachers prefer to use learning media which they consider to be more practical and efficient such as blackboards, markers and erasers and textbooks, the lack of innovation in developing learning media makes students quickly feel bored and have an impact on students' learning attitudes towards the learning process of mathematics and also affect the learning outcomes.

The problem that researchers found during the learning process, namely the classroom atmosphere is full of noise, and there are only a small proportion of students who can participate in learning well. The rest are students who are busy talking about things that have nothing to do with the material, do other tasks, can not sit in their seats quietly, often go out and enter the classroom with various reasons, can not focus on learning, there are also sleepy students and students have difficulty understanding the explanation from the teacher. This happens because the learning process takes place using the lecture method, exercises using manuals and textbooks of teachers and students, blackboards, and markers. Learning activities take place without involving learning media and interesting learning methods so that it causes students to be bored and bored, do not have a positive attitude in learning and ultimately have an impact on student learning outcomes.

In addition, the results of interviews with class teachers at the research site revealed that the abstract concept of mathematics subjects made teachers feel difficult what ways should they convey mathematical material tailored to the characteristics of different students such as the level of student motivation to learn, differences in learning attitudes in learners themselves, classroom conditions difficult to control, students' attention is easily diverted, different levels of initial knowledge, and low average math ability. Because of these difficulties, in the end the teacher returns to teaching mathematics with one-way communication, ready material and this causes students to feel bored because students are not included directly and the media used is less able to attract the attention of students so that eventually students switch attention to other things that have nothing to do with learning.

Based on the problems found, an understanding of the characteristics and needs that can be seen from the behavior and attitudes of students when learning mathematics takes place shows that learning must use media that attract students' attention, involve hearing, vision such as pictorial media has been proven to improve student learning outcomes students (Susanti & Kurniawati, 2017) then learning must involve children's motor movements so that learning can be conveyed properly so that learning becomes more meaningful.

In this regard, Dale (1969) explained the results of his research on memories of learning associated with the type of presentation through lectures by 25% (after 3 hours) and 10-20% after 3 days, then through writing / reading by 72% after 3 hours and 10% after 3 days, if through visual and verbal (teaching using illustrations) by 80% after 3 hours and 65% after 3 days, then the last through participatory is 90% after 3 hours and 70% after 3 days (Warsono & Hariyanto, 2012).

In utilizing media as a tool, Dale classifies according to the level from the most concrete to the most abstract. This classification came to be known as the "cone of experience" from Dale and at that time was widely adopted in determining the most appropriate aids for the learning experience (Susilana, Si, & Riyana, 2008).

Lectora inspire is the right software to be developed as a learning media in overcoming this problem because Lectora is a learning media that can involve several learning media such as visual media, and audio-visual. Lectora learning media is one of the interactive learning media that can make learning more interesting and active because it involves flash animation, audio, video, images and others in accordance with the characteristics of elementary school students. Lectora strongly supports the development of instructional media because it can create and present teaching materials without having to do programming. The material presented can be in the form of text, graphics, animation, and video. For teachers or instructors, Lectora's presence can make learning media easier. The features provided by Lectora make it very easy for beginners to create media. However, this software is still minimal because there are not many users who have developed Lectora-based media, especially in mathematics subject matter fractions.

This research aims to be able to develop innovative and interesting learning media as well as feasible to use in hopes of being able to build positive learning attitudes of students and students' interest in learning mathematics and then can make it easier to understand the material and can improve student learning outcomes especially in mathematics subject matter fractions and can make learning more efficient and effective. In addition, this research is also expected to be able to inspire teachers in making learning media keep abreast of the times by paying attention to the characteristics and needs of students.

2. METHODS

This research uses the Research and Development (R&D) method with the 4D model developed by (Thiagarajan, Semmel, & Semmel, 1974). The research method conducted aims to produce products and test the effectiveness of these products, especially in the field of education (Sugiyono, 2017). The product developed is a lectora-based audio visual learning media with a focus on fractional material. This development model consists of four stages, namely the defining stage (define), the design phase (design), the stage of development (develop), and the stage of dissemination (disseminate) (Trianto, 2009). The 4D model in this study is used as needed, so it only reaches the develop or design stage.

2.1.Data Collection

There are threetechniques and instruments for collecting data, namely observation, interviews and questionnaires. The first data collection technique used was observation. Observation is carried out by observing a phenomenon which is the object of study, namely school facilities and infrastructure, and the state of students in the classroom.

The second technique is interview. Interview is a form of verbal communication or a kind of conversation aimed at obtaining information carried out between two or more people (Sugiyono, 2017). In this study unstructured interviews were conducted, interviews that did not use interview guidelines that had been arranged systematically. This interview was conducted to the principal, teacher grade IV SDN Harjasari 01. The purpose of the interview in this study was to obtain data analysis of the needs of students in each learning, and to find out the problems that exist when learning takes place. This method aims to clarify and deepen the results of observations that have been made previously.

The third data collection technique is a questionnaire. Questionnaire or questionnaire is a data collection technique that is done by giving a set of questions or statements to respondents for the answer (Sugiyono, 2017). The questionnaire (questionnaire) in this study was used with the aim to determine the assessment of students of the mathematics learning media that had been developed, the evaluation of the validator of media experts and material experts on the quality of instructional media, and the assessment questionnaire from the material and media aspects for the teacher or homeroom teacher. The questionnaire or questionnaire of the feasibility of innovative learning media based on Lectora uses a Likert scale with five alternative answers namely very good, good, sufficient, less, very less.

Table 1 Likert scale table

Question / Statement	Score
Very good	5
Good	4
Fair	3
Poor enough	2
Very Poor	1

2.2. Data Analysis

In developing research, data research techniques are needed that are used to analyze the data after the research is done. The data research technique was carried out by examining all data that had been generated from various sources after conducting the research through observation, interviews and questionnaires in the form of assessment sheets from experts and students as the subjects tested. The analysis used in this research development can support the achievement of the objectives of the development research activities, namely to determine the composition and validity or the feasibility of using instructional media.

Analysis Data used in this study are qualitative and quantitative data. Qualitative data in the form of comments and suggestions from experts and teachers are used for consideration of product validation. Quantitative data is used to measure product quality.

The product valuation data is the average product valuation score calculated, i.e. the total score divided by the number of evaluators ".

$$\bar{X} = \Sigma x / n$$

Note:

\bar{x} = average score

Σx = number of scores

n = number of evaluators

Compares the average total score of each component with the following criteria: (Widyoko, 2014).

Table 2 Quality categories

Range of Scores	Quality	Classification
$X > \bar{X}_i + 1.8 \times S_{bi}$	> 4.2	Very Good (SB)
$\bar{X}_i + 0.6 \times s_{bi} < X \leq \bar{X}_i + 1.8 \times S_{bi}$	$> 3.4 - 4.2$	Good (B)
$\bar{X}_i - 0.6 \times s_{bi} < X \leq \bar{X}_i + 0.6 \times S_{bi}$	$> 2.6 - 3.4$	Sufficient (C)
$\bar{X}_i - 1.8 \times s_{bi} < X \leq \bar{X}_i - 0.6 \times S_{bi}$	$> 1.8 - 2.6$	Less (K)
$X \leq \bar{X}_i - 1.8 \times S_{bi}$	≤ 1.8	Very Poor

Note:

$$\bar{X}_i \text{ (Average average)} = \frac{1}{2} \text{ (maximum idealscore + ideal minimum score).}$$

$$S_{bi} \text{ (ideal standard deviation)} = \frac{1}{6} \text{ (maximum Idealscore - ideal minimum score).}$$

$$X = \text{Empirical Score}$$

3. RESULTS AND DISCUSSION

3.1. Results

The results of this research and development are in the form of Lectora-based Innovative Learning Media. The development of instructional media uses the 4D model that is adjusted to the needs, that is, only to the develop stage.

The first stage is the define stage. At the Define stage, the researcher makes observations on the state of facilities and infrastructure at school, and the activities of students in learning in class and then analyzes the curriculum. Also in this stage the researcher conducted interviews with the principal, and the homeroom teacher. The results of observations and interviews that have been conducted can be concluded that SDN Harjasari 01 has used K13, has adequate learning facilities such as already having several computers in the laboratory, infocus and infrastructure that support the development of this media. However, when learning takes place teachers very rarely utilize these technological facilities in learning because they prefer learning media that he thinks are practical and easy to use such as textbooks, markers, and blackboards, but also because of the limited human resources of teachers in operating software technology based in learning. Then the lack of innovative learning media at SDN Harjasari 01 causes learning to become monotonous, ineffective learning, students are less active and participate in learning and this has a negative impact on learning outcomes, especially in mathematics subjects only 7% of the 30 students who have reached mastery learning.

Based on the results of observations of students in class IV C when learning takes place noisy classroom atmosphere, students are difficult to control, only a small proportion of students can participate in learning well, the average mathematical value is always low, students find it difficult to concentrate, students often in and out of the classroom with the reason to go to the bathroom, there are students who are passive and often sleepy even almost all students do not listen to the teacher's explanation. The problems found provide ideas for researchers to streamline learning by using interactive and innovative digital-based learning media in the form of lectora-based learning media development.

Then, the researcher follows up on the results of the curriculum analysis in the form of the k-13 syllabus, and the k-13 lesson plan starting from KI, KD, indicators, objectives and learning material developed and the steps of its activities. This analysis aims to systematically arrange relevant concepts to be taught. Mathematical material in K-13 has a small presentation, so teachers must be able to develop learning materials that support the achievement of KI and KD which are adjusted to the characteristics and needs of students. The material in this study is fraction material sourced from teacher books and 2013 curriculum student books combined with KTSP mathematics books.

After that the researchers conducted an analysis of the task used to determine the students' skills and comprehension of the material that was delivered by the teacher. At this stage the researcher analyzes the tasks that correspond to the material presented. The material presented was sourced from the 1st 2018 printed mathematics book of the 2013 curriculum written by Hobri et al., Published by the Center for Curriculum and Bookkeeping, Balitbang, Kemendikbud. In addition, researchers took

material from the KTSP mathematics book written by Aep Saepudin et al., Published by the Center for Bookkeeping of the Ministry of National Education, in 2009. The researcher conducted an analysis of the material and then made 10 items of fraction evaluation material with multiple choice and true-false types to be loaded on learning objectives.

After analyzing the task, researchers formulate goals that are tailored to the results of the analysis that has been done such as concept analysis and task analysis. To achieve the desired final goal, the lectors-based innovative learning media is adjusted to the 2013 syllabus and curriculum, then adjusted to the characteristics of students.

The second stage is the Design stage. At this stage the researcher begins to design the media in accordance with the data that has been produced in the previous stages. At this stage the design was carried out starting from the preparation of the draft of the fractional material then evaluating the learning in the form of 10 items of multiple choice and true-false types. Then after that make a flowchart and storyboard. The learning media are designed as attractive as possible by supplemented with still images and motion pictures and explanatory videos of material stored in mov format. This define phase consists of the preparation of a benchmark reference test (constructing criterion-referenced test). Benchmark reference tests refer to the draft material that has been prepared in accordance with the learning objectives and the results of the analysis of student characteristics. Tests are provided in the form of exercises and final evaluations with a weight of 10, then the compiled tests contain problems that are commonly found in daily life and in accordance with the contents of the material that has been compiled. Then after compiling the benchmark reference test, the researcher makes a media selection. The selected media in the form of innovative learning media that are tailored to the characteristics of students and supporting facilities in schools where research is in the form of lectors learning media applications. This media is presented interactively which is operated by the teacher by involving students in learning.

The third stage is the Develop stage. At this stage the researcher involved the research subjects which involved experts, class teachers and students. The first thing to do is an expert appraisal followed by a revision.

Table 3 Results of Expert Media Evaluation

Aspect	Score		Percentage	
	Score	Average	(%)	Category
Benefits of media	18	4.5	90%	very good
Media design	27	3.8	77%	Good
Operation	13	4.3	87%	very good
Total	58	4.2	83 %	good

The results of the assessment of media experts namely lectors learning media products have been declared worthy of use with revisions. Some parts that must be revised are the font type selection, type consistency, font size and color, main button position and image selection. Products in the form of media are categorized as having good quality because X is in the range of scores $47.58 < X < 58.74$ with the acquisition of a total score of 58 and an average of 4.2 and a percentage of 83%.

Then the material that has been compiled in the form of a draft is assessed by the material expert and declared to be feasible, then the material is included in the learning media. Media validation is done once and is declared eligible to be used with prior revisions. The total score can be seen in table 4 as follows.

Table 4 Results of Expert Material Assessment

Aspect	Score	Average	Percentage (%)	Category
Material quality	31	4.4	88%	very good
Learning	43	4.3	86%	very good
Total	74	4.35	87%	very good

From table 4 it can be seen that the material on the developed learning media was declared valid and feasible to use and categorized very well because it was in the range of scores $X > 71.34$ with a score of 74, an average of 4.35 and a percentage of 87%.

After the assessment of the experts is completed, the learning media are assessed by the class teacher and trialled to the students. This trial includes a limited trial in the form of an assessment of the class teacher aimed to find out the weaknesses and shortcomings of the material aspects and aspects of the media. Then the field trials conducted on 30 students aimed to find out weaknesses and shortcomings based on the assessment of students.

Table 5 Teacher Rating Results Class

Aspect	Score	Average	Percentage (%)	Category
Learning	25	5	100%	very good
Material	24	4.8	96%	very good
Audio visual display	39	4.3	97%	very good
Software engineering	15	5	100%	very good
Total	103	4.8	100%	very good

From table 5 it can be seen that the results of the teacher's assessment of the developed learning media products are declared valid and feasible to use without revision with a score of 103, and an average of 4.8 and the acquisition of scores and the average is in the range of scores $X > (\bar{X}) + 1.8 \times SBI$ so it is categorized very well. Complete calculations can be seen in the appendix.

After being given an assessment by the teacher, then the product is given an assessment by students. The following assessment results can be seen in table 4.4.

Table 6 Student Assessment Results

No.	Indicators	Score	average	score mak	Category
1	Enables students understand learning materials	450	15	20	Good
2	Attract the attention of learners	709	23.6	35	Good
3	Give clarity about the material	577	19.2	25	Good
4	Neat appearance on learning media	260	8.7	10	Good
5	Accuracy in background selection	245	8.2	10	Good
6	Integration of color selection	203	6.8	10	Good
7	Accuracy in selection of images	132	4.4	5	Good
8	Accuracy in selection of text types	240	8	10	Good
9	Readability of text and spelling	341	11.4	15	Good
10	Accuracy in video selection	259	8.6	10	Good
Total:		3416	113.9	150	Good

The field trial subject in this learning media development research involved 30 students of Class IV C. The trial was conducted on Saturday, April 6, 2019 from the hour 10:00 to 11:45 WIB. This trial step begins with reading the prayer first and then short questions from researchers such as "how are you today?", "Still enthusiastic?" Then after that the researcher immediately teaches the material with fractions completed with examples of questions. Learners prepare a book to record important parts and take notes as well as counting practice questions. Students are very enthusiastic, especially when answering practice and evaluation questions. From practice questions students can

immediately find out the results of the feedback they receive then through the student's final evaluation can see the score they have obtained when answering questions. Then the students then fill out an assessment questionnaire from students that have been compiled by researchers with a range of scores 1-5. From the student assessment questionnaire it can be seen that the learning media developed are in the range of scores $(X_i)^- + 0.6 \times S_{bi} < X < (X_i)^- + 1.8 \times S_{bi}$ with the acquisition of a score of 3416, and an average of 113, 9 so that it is categorized as good and suitable for use in learning.

The fourth stage is the Disseminate stage (distribution). Based on the limitation of the problem that has been explained in the introduction that this research is focused on the Development of Lectora-Based Innovative Learning Media in Mathematics Subjects for Fraction Class IV Elementary Schools.

3.2. Discussion

This research was conducted using the 4D model. Lectora application-based learning media has been developed and stored in an executable (exc) format. The results of this study are in the form of Lectora-based learning media applications on fractions subject matter in fourth grade mathematics elementary school. The display of the results of the final media development can be seen in appendix 10. The

developed media can be used by teachers to teach students and can also be used directly by students if school facilities are adequate. The learning media developed have gone through several stages then have been validated by experts and given an evaluation by the teacher and 30 students of grade IV SDN Harjasari 01. Through the assessment given by experts and teachers and students this aims to determine the quality and feasibility of the product that has been developed. The resulting learning media have been declared feasible to use because they are in accordance with the principles and criteria of selection of good learning media including conformity with objectives, efficiency, student situation, availability, small fees, teacher skills, and technical quality (McQuail, 1992). The same opinion was expressed by Gerlack and Elly that there are five principles for media selection in general namely suitability, clarity of presentation, ease of access, affordability, and availability (Asyhar, 2012).

The learning media that researchers have developed is a Lectora-based learning media that has the characteristics of innovative media in the school where the research takes place, practical learning media can be used easily by teachers and can also be directly operated by students, the media consists of audio, visual and audio media visual, so that it can attract the attention of students and provide clarity of lesson offerings, then do not require a lot of costs because the media is developed on the basis of the use of facilities available in schools that are quite adequate, suitable with the target because it is intended for learning in large groups.

The developed learning media presents quite clearly and completely that is the media presenting KI-KD, learning objectives, material, sample questions, practice questions, biography of the media compilers, bibliography and final evaluation. The final results of the developed product have good quality according to media experts with a total score of 58 and an average of 4.2, then

categorized very well according to material experts with a total score of 74 and an average of 4.35, while the results of the teacher's assessment are categorized very good with a score of 103 and an average of 4.8 and very good according to students with a score of 3416 and an average of 113.9. The final results of the assessment of the developed media can be seen in the following table.

Table 7 Overall assessment results

Assessors	Average	Category
Media experts	4.2	Good
Material experts	4.4	excellent
Class teacher	4.8	excellent
Students	113.9	excellent The

The advantages gained from this learning media are: Generating positive learning attitudes of students, Generating students' learning motivation, Making the learning process effective, Making time efficient, Facilitating the teacher delivering the material, Facilitating students to understand the material, Being able to visualize abstract material.

While the shortcomings obtained from this media are: Not many teachers are able to make the learning media, Beginners will need a lot of time in preparing the Lectora-based media.

The advantages of the product are relevant to the results of research that has been carried out that Lectora learning media is feasible and effective to be used in learning activities with significant results (Akbarini, Murtini, & Rahmanto, 2018). In addition, the Lectora media can improve student learning outcomes (Faruk, 2014).

The product developed is expected to be used by teachers in supporting mathematics learning in fraction material because the product has more benefits that are not only felt by the teacher but are also felt by students.

4. CONCLUSION

The feasibility of this lectora-based innovative learning media developed has very good criteria and is suitable for use based on validation by material experts, media experts, product quality assessment by class teachers, and feasibility trials on grade IV students at Harjasari Elementary School 01. Quality of media developed then validated by media experts and categorized as having good quality because it is in the range of scores $(X_i) + 0.6 \times S_{bi} < X < (X_i) + 1.8 \times S_{bi}$ with a total score of 58 and an average of 4.2 . Based on the results of validation by material experts, the product was declared very good because X was in the range of scores $X > (X_i) + 1.8 \times S_{bi}$, a total score of 74 and an average of 4.35 was obtained so that it was categorized very well. The results of the validation conducted by the class teacher are in the range of scores $X > (X_i) + 1.8 \times S_{bi}$, obtained a score of 103 and an average of 4.8 so that it is categorized very well. The results of the field trials of 30 students were in

the range of scores $(X_i)^- + 0.6 \times S_{bi} < X < (X_i)^- + 1.8 \times S_{bi}$ with a score of 3416 and an average of 113.9 so categorized well. Development research that has been done can be concluded that the innovative learning media based on Lectora in Mathematics Subjects of Class IV Fractional Material is suitable for use in learning in good categories according to media experts, very good according to material experts, very good according to class teachers and good according to students.

The implication of this research is that teachers are expected to be able to use lectora-based learning media in delivering material as a support in learning mathematics in fractions of grade IV SD / MI. Then the teacher is advised to conduct training in making lectora-based learning media. Students are advised to use this media both as an independent learning facility and when learning in class with the guidance of the teacher.

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