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Science learning development for the deaf: A digital literacy-based learning design

Rina Dwi Kurniawati *, Asri Wijiastuti, Yuliyati
Department Special Education, Graduate School, Universitas Negeri Surabaya. Jl. Lidah Wetan Surabaya, 60213, Indonesia
*Coressponding Author. E-mail: rina.19005@mhs.unesa.ac.id

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Abstract: Digital literacy-based learning is needed for deaf students in understanding style and motion topics. Application assisted learning in the form of e-books is specially designed for the deaf with an attractive design, accompanied by visual animations of the application of style and motion in everyday life. Thus, the understanding of the topic obtained is not only through text. But animations of every kind of style and examples. This research aims to develop and determine the feasibility of digital literacy-based learning designs for deaf teenagers. The development method used in this research is the Dick, Carey and Carey development model with nine stages. The results of this research are a digital literacy-based learning design for style and motion topics for deaf adolescents referring to the 2013 curriculum. 80% percentage, topic expert validation shows 83,5% percentage, and 82.25% special education expert validation. So, the development of digital literacy-based learning designs for the deaf meets the feasibility needs.
Keywords: Science learning, learning design, digital literacy

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INTRODUCTION

The Covid-19 pandemic has become a history that all people, including Indonesia, will never forget. The Indonesian government, both central and regional, are currently busy with efforts to break the chain of the spread of Covid-19 by inviting all elements of society to implement the 5M health protocol (wearing masks, maintaining distance, washing hands, avoiding crowds, and reducing mobility). In addition, the government has also implemented the Enforcement of Community Activity Restrictions (PPKM), which in this case dramatically impacts all cross-activities, including the economic, education, health and other sectors (Putri et al., 2021). This restriction was also followed by the government's move to ask all schools at the education level from PAUD to Higher Education to be carried out online. Supported by (Oktawirawan, 2020), this changes the learning pattern that was initially done conventionally and has to change online (online). The readiness and seriousness of teachers and facilities that help the learning process at home are the primary needs that must be considered, especially with students who have special needs, such as deaf adolescent students (Imania & Bariah, 2019).

Deaf, individuals with hearing problems, either partially (hard of hearing) or thoroughly, cause their sense of hearing to have no functional value in everyday life (Badiah et al., 2020). The problems faced by deaf adolescent students during learning during the Covid-19 period are the duties and responsibilities of all parties, including parents, in terms of the problems experienced by deaf adolescent students when learning online, namely understanding complex topics and limited learning resources accompanied by common vocabulary and instructions given by the teacher in teaching.

Understanding the topic by deaf adolescent students is influenced by their language skills, including listening, speaking, reading and writing. (Kotowicz, 2020) carried out the accumulation of reading levels for deaf adolescents that the accumulated reading levels of deaf adolescent students with severe hearing loss reached the maximum level equivalent to fourth-grade elementary school, and only 15% of deaf adolescents reached that level. The reading skill level of deaf students is in a low category, and this is because they have different word recognition from hearing friends, as evidenced by

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phonological coding and awareness skills and is related to the reading ability of deaf students (Indah, 2015).

The fact occurred directly in the preliminary study conducted by online teachers in science learning, especially on the force and motion topic. Deaf adolescent students faced difficulties understanding the topic from student books they had studied at home. Likewise, looking for learning resources on the internet makes much information difficult for them to understand. Visual learning resources designed concretely are needed by deaf adolescent students so that the learning they get can be understood well. (Mardina, 2017) applies the use of digital-based visual media adapted to the characteristics of the deaf for more effective and efficient learning and can motivate students and stimulate students' attention and interest in digital literacy. One of the sources of visual learning is e-books. E-book media was developed for the deaf because the media provides many benefits in supporting the learning process. The benefits of E-Books in the learning process, according to (Purwandari, 2020), are: (1) the learning process becomes more meaningful, (2) students can combine previous knowledge with new ideas, and (3) enable students to be active, enthusiastic, and trying to achieve the goals to be achieved.

The development of e-book media in science learning based on digital literacy is designed differently. The e-book media is designed for the deaf in the form of an Application Package File (APK) which can be installed on the Smartphone/Android of each deaf student. The display on the e-book is in the form of an application containing four menus, namely the table of contents, the topic menu, the worksheet menu, and the review menu. The development of e-book media generally only displays text, sound, and images. Meanwhile, the development of e-book media in the form of applications for digital literacy-based science learning for the deaf is modified according to their learning needs. Namely, the topic is made shorter. The text or vocabulary is shorter so that it is easy to understand, and the images are designed in the form of video animations so that they help the deaf in understanding the topic with the examples shown (Rahmah, 2018). After observing the topic in the e-book, deaf students can directly work on worksheets connected to Google Forms. Learning resources such as e-books in the form of applications can be easily installed and available on the school website without being installed by deaf students. The development of science learning based on digital literacy is expected to help them learn better during the pandemic or face-to-face learning.

Science learning of style and motion topics using the website is a form of implementing digital literacy-based learning. Gilster (1997) in his book entitled Digital Literacy. Digital literacy is an individual's ability to recognise and use information from various references or extensive learning resources through the help of computer devices. Related to this, digital literacy competencies need to be mastered by deaf teenagers so that they can create, communicate, and collaborate on topics using technology in learning.

The benefits of technology-based learning include (1) disciplines that today's deaf teenagers must master, (2) learning aids, and (3) guiding students in mastering competencies (Andri, 2017). In line with that, the importance of understanding topic through technological media are: (1) students can access topic quickly, (2) allow for independent learning, and (3) provide a scientific basis for learning to avoid much inaccurate information (Khasanah et al. ., 2021). The use of technology in learning can provide an injection of motivation and reinforcement of the pattern of changing learning paradigms. The use of an e-learning system is a form of implementing technology-based learning that is not limited by space and time. The use of multimedia information technology is an effective and efficient solution to deliver learning topics in certain subjects (Hekmah et al., 2019).

Natural Sciences (IPA) is a process of discovery. In this case, science is not only a series of knowledge about principles, designs or truths. Nevertheless, the knowledge that discusses natural events where science is mainly in the form of abstract concepts. Through learning science, deaf students can use skills in solving problems in everyday life with digital media to obtain all forms of information related to science and observational studies about Nature (Maison et al., 2020). Seeing the characteristics of deaf adolescent students, it is necessary to increase educators' knowledge in designing learning with meaningful and targeted learning concepts. Therefore, success in learning is primarily determined by the teacher's skills in designing learning. Gagne, Robert, Briggs, & Leslie (1974) stated that the concept of instructional design is a learning process that includes immediate and long-term stages accompanied by internal and external learning conditions. Internal conditions include the ability and readiness of

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learners, while external conditions are in the form of environmental arrangements designed. This external preparation in the form of an environment is referred to as learning design.

According to the needs of deaf students, it is necessary to design a digital literacy-based style and movement learning design for deaf adolescents. The learning design includes several stages. First, assessment activities include technology literacy, referring to understanding using technology and information literacy, referring to aspects of knowledge, the ability to identify, map, process, and make optimal use of digital information. Second, conducting a Planning Metrix, which discusses the characteristics of deaf adolescents in learning, the strategies used in learning, and the impact obtained. Third, formulate a development program for learning style and motion topics, including short-term programs consisting of digital competence (skills, concepts, approaches, and attitudes) and long-term programs consisting of digital usage and digital transformation following the developing digital literacy learning principles. Fourth, after going through various stages, the digital literacy-based style and motion topic learning program can be implemented to improve the understanding and digital literacy skills of deaf adolescent students in learning.

This learning design facilitates the delivery of style and motion topics in science learning for deaf adolescent students. So based on the explanation above, the researchers conducted research on the design of learning styles and motion topics based on digital literacy for deaf teenagers. The purpose of this study was to develop and determine the feasibility of learning design for style and movement topics for deaf adolescents. It is hoped that the learning design for style and motion topics can be a source of learning to improve the digital literacy skills of deaf teenagers in the digital era and the conditions of the Covid-19 pandemic.

METHOD

This research is included in the Research and Development (R & D) category, referring to the system approach model. This research aims to develop and determine the feasibility of learning design for style and motion topics based on digital literacy. An essential point in the process of developing the learning design for style and motion topic is through a process of stages (1) digital literacy assessment, (2) planning matrix, (3) implementation of long and short-term programs. The research subjects were eight deaf adolescent students of class VII SMPLB (Junior High School Extraordinary) with different learning characteristics. All of them have smartphones and good digital literacy skills. Every day during the pandemic, they use digital media to learn, so learning is designed to be meaningful and easily accessible to them.

This study uses the development stages proposed by (Dick & Carrey, 2009) with ten stages, namely (1) identification of learning objectives (Access need to identify instructional goals), (2) instructional analysis (conduct instructional analysis), (3) analysis learner and environment (analyse learner and contexts), (4) formulate performance objectives (write performance objectives), (5) development of benchmark reference tests (develop assessment instruments), (6) development of learning strategies (develop an instructional strategy), (7) development and selection of learning topics (develop and select an instructional topic), (8) designing and carrying out the formative evaluation (design and conduct a formative evaluation of instruction), (9) instructional revision (revise instruction), and (10) designing and conducting summative evaluations (design and conduct summative evaluation). However, only nine stages were used in this study, namely the revision instruction stage. This development model can be adapted to several subjects, one of which is science learning. Dick & Carrey's learning model is appropriate for applying process and skill-based learning. The advantages of this development model in developing a subject are that (1) at the beginning of the learning process, students can do things related to the topic at the end of learning, (2) link each component, especially learning strategies and learning outcomes that have been desired, and (c) steps need to be taken in carrying out a learning design planning process (Aji, 2020).

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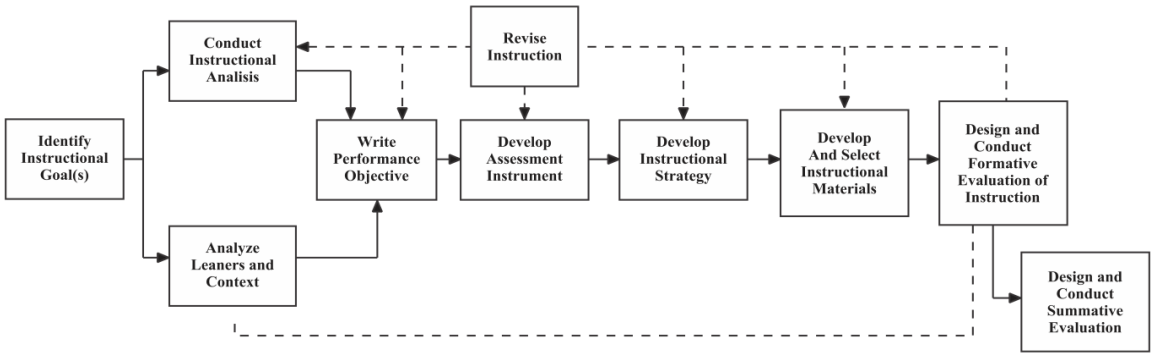

Figure 1. Development Model Dick, Carey, and Carey (2009)

The first stage identifies the general objectives of learning. The activities carried out detail the essential competencies of learning science in style and motion topics. The results of these details show what competencies must be modified according to essential competencies in cognitive, affective and psychomotor aspects. The second stage is learning analysis. At this stage, analysis is carried out to identify the skills that need to be mastered to achieve practical learning objectives. The third stage is to analyse the learner and the environment. At this stage, identification is carried out as a process of planning effective learning methods and media according to current conditions and the needs of deaf adolescent students. The fourth stage is to formulate performance goals. At this stage, students are expected to use digital media to study the topic given by the teacher based on long and short-term goals. The fifth stage is developing test items. Is there an understanding when deaf adolescent students are given an e-book of force and motion topics? The sixth stage, developing learning strategies.

The learning strategy was developed at this stage by designing digital literacy-based style and motion learning topics for deaf teenagers individually through the Contextual Teaching and Learning method, considering the Covid-19 pandemic conditions. The seventh stage is the development and selection of learning topics. At this stage, the essential competencies that deaf adolescent students must master consist of seven indicators, so modifications are needed to achieve the indicators of these competencies. Deaf adolescent students have difficulty understanding the force and motion topic in student books due to students' different languages and abilities.

For this reason, at this stage, the teacher designs style and motion topics using an animated visual e-book that can be easily accessed via the website by deaf adolescent students. The eighth stage is designing and implementing formative assessments. At this stage, a one-to-one assessment is carried out by validators, design experts, topic experts, and special education experts. The ninth stage is revising the assessment results, suggestions, and experts' comments to produce a proper design for learning styles and motion topics based on digital literacy for deaf teenagers.

The research was carried out in December 2020 at SLB AB Kemala Bhayangkari 2 Gresik, East Java, with the number of research subjects being eight deaf students in class VII SMPLB. Data collection techniques were obtained through questionnaires/questionnaires and interviews with teachers and deaf students. The data collection instruments used in this study were digital literacy ability instruments and instruments for the feasibility of designing digital literacy-based style and motion learning topics for deaf teenagers in terms of design experts, topics experts and special education experts—types of data obtained in the form of qualitative and quantitative data. Quantitative data were obtained by scoring design experts, topics experts and special education experts. At the same time, the qualitative data was obtained from the analysis of the design development stages.

The data analysis technique performed must meet the eligibility criteria. The appropriate criteria referred to in this study are the results of instrument score analysis from expert validation (topic, design and extraordinary education) and the practicality of the responses of teachers and deaf students after using e-books in the form of applications that have been accessed either through the website or installed applications. Smartphone. The criteria for assessing the feasibility of science learning designs for digital literacy-based style and motion topics for the deaf are using a Likert scale with four categories: very feasible (5), feasible (4), quite feasible (3), less feasible (2), not feasible (1). The assessment results are then calculated using the formula for the percentage of results equal to the total score obtained,

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multiplied by 100% and then divided by the maximum score. Then the percentage of the results is categorised based on the table of eligibility assessment criteria.

$$\text{Yield \% Formula} = \frac{\text{Selected Total Score}}{\text{Maximum Score}} \times 100\%$$

Table 1. Design Feasibility Assessment Criteria

Hose	Assessment criteria
85%-100%	Very worth it
75%-84%	Worthy
65%-74%	Decent enough
55%-64%	Not worth it
0-54%	Not feasible

Table 2. Practical Criteria for Teacher and Student Responses

Percentage (%)	Criteria
81-100	Very practical
61-80	Practical
41-60	Practical enough
21-40	Less practical
0-20	Not practical

Cumulatively if the results are obtained with the criterion of 75%, the science learning design for digital literacy-based style and motion topics for deaf students at the SMPLB level is declared feasible and practical.

RESULT AND DISCUSSION

The product developed in this study was in the form of a force and motion topic for deaf adolescent students in the SMPLB education unit using the procedure (Dick & Carrey, 2009). Identification of learning goals (Identify instructional goals). Based on research findings in the field and literature studies of digital literacy-based style and motion learning topics, a teacher needs to recognise deaf adolescent students' initial abilities before determining the learning objectives to be achieved. This is done as an effort so that deaf adolescent students understand what to do after participating in learning activities (Suwarto, 2017). The objectives in learning style and motion topic based on digital literacy include (1) deaf adolescent students can understand style and motion topic, and (2) deaf adolescent students can use technology well.

Table 3. Identification of learning objectives for force and motion topic

Basic Competencies Indicators	Indicators	Learning objectives
3.3 Describe the relationship between force and motion and its application in everyday life	3.3.1 Communicating the meaning of force and motion	Students can name two changes resulting from motion's presence properly by observing the e-book topic on force and motion through the website.
4.3 Presenting a simple experiment about the relationship between force and motion	3.3.2 Mention 2 changes that result from motion	By observing the e-book topic on force and motion through the website, students communicate two types of motion based on their acceleration.
	3.3.3 Communicating two types of motion based on their acceleration	By observing the e-book topic on force and motion through the website, students can name two factors that can influence the motion of an object properly.
	3.3.4 Mention 2 factors that affect the motion of an object	By observing the e-book topic on force and motion through the website, students can name six types of forces correctly
	3.3.5 Mention 6 types of styles	By observing the e-book topic on force and motion through the website, students can practice

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Basic Competencies Indicators	Indicators	Learning objectives
		the application of force and motion in everyday life
	3.3.6 Practicing the application of force and motion in daily life	By observing the e-book topic on force and motion through the website, students can practice the application of force and motion in everyday life.
	3.3.7 Make a video of the application of style and movement in daily life	By observing examples of activities related to force and motion through e-books, students can make videos of the application of force and motion in everyday life.

Instructional analysis (instructional analysis), at this stage, the learning objectives that have been identified, it is necessary to analyse to find out the subordinates' skills that require students to learn and master them. Students need to do this to have subordinate skills related to the realm of learning objectives. The instructional analysis describes general competencies into sub-competencies, basic competencies, or special competencies arranged logically and systematically (Suparmana, 2017). Conducting instructional analysis is very important because the sub-competencies, knowledge, attitudes and skills must first be achieved by students from others (Asrizal et al., 2017). The learning objectives in the instructional analysis of science learning topics for force and motion based on digital literacy include the ability to access technology presented in the order of the required sub-competencies and the ability to understand the topic for force and motion in the order of sub-competencies of the topic as shown in Table 3. Analysis and order of sub-competencies It is made to make it easier for educators to achieve the learning objectives that have been set.

Table 4. Instructional Analysis

No	Ability to Access Technology Sequence	of Sub Competencies Ability to	Understand Topics Sequence of Sub	Understand Topics Sequence of Sub
1	Open the link topic style and motion	Open the worksheet link	1. Definition of force and motion	Video Applying force and motion
2	Open the style and motion topic view	Open the style and motion topic view	2. Changes caused by the style	Application of force and motion
3	Open the force and motion topic worksheet link	Open the link topic style and motion	3. Factors that can affect the motion of an object	Types of motion based on acceleration
		Open the link topic style and motion	4. Types of motion based on acceleration	Factors that affect the motion of an object
		Handphone/media komunikasi	5. Six kinds of styles	Six kinds of styles
			6. Application of force and motion	Changes caused by style
			7. Make a video of the application of force and motion	Definition of style

Analysis of learners and the environment (analyse of learners and contexts) at this stage, an analysis of the competence of deaf adolescent students with various characteristics is carried out. Learner and environmental analysis can be done by identifying the initial behaviour and characteristics of deaf students. Initial characteristics are the characteristics of students before participating in learning, which is needed to influence the success rate of achieving learning objectives. The methods used by educators in conducting learner and environmental analysis are: (1) collecting students' general and special competencies, (2) writing down specific behaviours obtained in learning analysis, (3) collecting data on students' initial behaviour, (4) collecting initial characteristics. Students (5) analysis of data

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collection to determine initial behaviour, and (6) arrange and rank competencies from the lowest to the highest (Kurniasari et al., 2020).

The early behaviour of deaf adolescents is very diverse. Knowing the extent of the competence, knowledge, attitudes and skills of deaf adolescents is very important. From this observation, learning activities can be designed and adapted for deaf adolescent students to understand the limitations of students in participating in learning. The purpose of analysing the learner and the environment and identifying initial behaviour in this activity can affect the success rate of achieving learning objectives. Due to the development of learning designs carried out during the pandemic, student and environmental analysis must pay attention to student characteristics, including (1) work motivation, (2) access to learning resources, (3) study habits, access to communication channels, and (4) domicile/residence. (Hidayat & Noeraida, 2020)

Formulating performance objectives (write performance objectives), formulating performance goals for deaf adolescent students contains four components: A (Audience), which is students who are ready to learn both physically and psychologically. The students in question are deaf teenagers who will take science lessons on applying force and motion in everyday life. B (Behavior) is a specific behaviour that students raise after completing the learning process. C (Condition) is the limit given by the student when the concerned is tested. The condition does not mean the state when students learn. Rather, the components that students must display in demonstrating behaviour related to the topic are examples of applying force and motion in everyday life. D (Degree), namely, students' level of success in achieving behavior. The success rate of students is indicated by the minimum limit of behaviour, whereas if students are below the minimum limit, it means that students have not achieved the specific goals set. By formulating the performance objectives above, educators are expected to immediately determine various other components in learning, including measuring tools for learning outcomes and learning content (Uno & Ma'ruf, 2016). The following are the results of the formulation of the performance objectives of deaf adolescent students in Table 5.

Table 5. Results of the Formulation of Deaf Students' Performance Goals

No	Student Name	Performance Objective Formulation	ABCD
1	AR	Mention practice	a. AR can name two changes resulting from motion's presence properly by observing the e-book topic on force and motion through the website. b. By observing the e-book topic on force and motion through the website, AR can practice the application of force and motion
2	AH	Communicating Make Mention practice	a. By observing force and motion e-books through the website, AH can communicate force and motion b. By observing the e-book topic on force and motion through the website, AH could properly name two changes that result from the presence of motion. a. By observing force and motion e-books through the website, AH can make videos of force and motion b. By observing the e-book topic on force and motion through the website, AH can practice the application of force and motion
3	AF	Communicating	a. By observing force and motion e-books on the website, AF can communicate force and motion
4	DC	Communicating Mention	a. a. By observing force and motion e-books through the website, DC can communicate force and motion b. b. By observing the e-book topic on force and motion through the website, DC was able to properly name 2 changes caused by motion.
5	DW	Mention	a. By observing the e-book topic on force and motion through the website, DW was able to properly name two changes that result from the presence of motion.
6	DI	Communicate Mention	a. By observing the e-book topic on force and motion through the website, SI can communicate force and motion

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No	Student Name	Performance Objective Formulation	ABCD
			b. By observing the e-book topic on force and motion through the website, SI can name two changes resulting from motion's presence properly.
7	SY	Communicating Mention practice	a. By observing the e-book topic on force and motion through the website, SY is able to communicate force and motion b. By observing the e-book topic on force and motion through the website, SY can name two changes that result from the presence of motion well.
8	YD	Communicating Mention	a. By observing the e-book topic on force and motion through the website, YD is able to communicate force and motion b. By observing the e-book topic on force and motion through the website, YD could properly name 2 changes that result from the presence of motion. c. By observing the e-book topic on force and motion through the website, YD can practice the application of force and motion

Test Development (Develop Assessment Instrument), at this stage, to measure students' success in mastering science learning topic application of force and motion in everyday life, educators need to develop a learning assessment tool that is in the learning objectives. The method used is based on the percentage of scores achieved by students with the maximum score (Purnomo & Wilujeng, 2016). Thus, the interpretation of the test results reflects the level of student mastery of all competencies contained in the learning objectives.

Learning outcomes assessment tools can be in the form of tests. The test is included in the cognitive, affective, and psychomotor taxonomy areas (Prihatni et al., 2016). In developing the learning design for style and motion topics using an online learning outcome assessment tool that can be accessed via Google Forms with the link: http://bit.ly/lksgayagerak. Besides being accessible through the website, another advantage of the science learning design for style and motion topics can be accessed through the android package (.apk). Files in .apk format are files required for application installation on Android devices. So, when the file is opened on an Android device, it will be automatically installed on the device (Yektyastuti & Ikhsan, 2016).

Development of Learning Strategy (Develop Instructional Strategy), at this stage, the learning strategy uses the Contextual Teaching and Learning (CTL) method. This method is used to help teachers relate the topic to students' real situations during the pandemic and encourage students to make connections between their knowledge and its application in everyday life. Even in a pandemic condition and the topic provided in digital form, the CTL method is expected to help deaf students explore all their abilities in science learning, the topic of applying force and motion in everyday life.

Following the conditions of students during the pandemic Contextual Teaching and Learning is a learning process that aims to see students understand the topic academically by connecting academic subjects with contexts in real life. The syntax in the CTL stage includes (1) modeling, (2) Questioning, (3), Learning Community, (4) Inquiry, (5) Constructivism, (6) Reflection (7) Authentic Assessment. The following is a learning strategy for learning style and motion topics using the syntax of the Contextual Teaching and Learning method (Wiyono & Budhi, 2018)

Table 6. Stages of Contextual Teaching and Learning Syntax

No	Syntax Contextual Teaching and Learning
1	*Modelling* *a. Students open the website link provided by the teacher before learning begins https://gresiksurf.com/learningasik/2021/04/23/e-book-topic-gaya-dan-motion/* *b. Students observe the instructions given by the teacher to open the e-book on force and motion topic* *c. Students listen to animated examples of the notion of force and motion* *d. Students practice activities according to animated pictures*
2	*Questions* *a. Students ask about examples of changes caused by the presence of a force*

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No	Syntax Contextual Teaching and Learning
	b. Students explore types of motion based on their acceleration
3	*Learning Community*
	a. Students actively mention other examples of types of force and motion
	b. Students discuss examples of the types of force and motion
4	*Inquiry*
	a. Students identify what factors can affect the motion of an object
	b. Students discover what factors can affect force and motion
5	*Constructivism*
	a. Students build an understanding of the application of force and motion in everyday life
	b. Students rank the understanding of the application of force and motion in everyday life from easy to difficult
6	*Reflection*
	a. Students conclude the meaning of force and motion
	b. Students conclude the factors that cause objects to move
	c. Students conclude the types of forces in everyday life
	Students make videos of the application of force and motion in everyday life
7	*Authentic Assessment*
	a. Students send answers/respond to assignments via google forms
	b. Students send the link address for the task of making videos of the application of force and motion in everyday life that have been uploaded on their respective YouTube
	Students receive notes from the teacher about the understanding of force and motion learning

Development and Selection of Learning Topics (Develop and select an instructional topic). At the stage of developing and selecting a digital literacy-based style and motion learning topics for deaf teenagers. The researcher observed (student books) given to each deaf student during learning at home. The force and motion topic in the (student book) has not been able to accommodate the learning needs of students as a whole. Due to the different language skills and understanding of deaf adolescent students and the teacher's absence directly in delivering the topic, it is difficult for deaf adolescents to understand the meaning (content) of the topic (Sya'ban, 2014). To meet the learning needs of deaf adolescent students during the pandemic, especially learning style and motion topics. The researcher developed a learning design for style and motion topics in the form of an e-book that deaf teenagers can access through the website link that has been shared. The advantages of the style and motion e-book topic are: (1) it can be accessed wherever they are, provided they have a quota, (2) apart from that, the topic can also be accessed and installed on cellphones so that when offline, it can still be used, (3) each explanation of the topic is accompanied by a short animated video that explains the activities of the previous sentence, and (4) students can work on the problem directly because it is connected to google froms. Educators must understand that in the selection and delivery of a topic, educators must in-depth convey the concept accompanied by further examples of the concept of the topic and its relationship with other concepts (Mufida & Widodo, 2021).

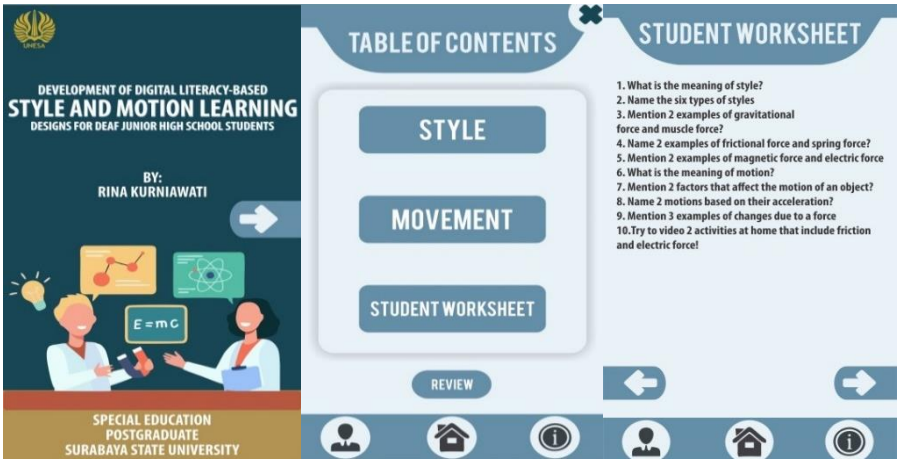

Figure 2. Display Topic Style and Motion
https://gresiksurf.com/learningasik/2021/04/23/e-book-topic-gaya-dan-motion/

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In the formative assessment stage, formative evaluation is carried out by a topic expert test, a design expert test, and an extraordinary education expert test. The Figure 3 show the feasibility assessment by design experts, topic experts and extraordinary education experts—science learning design for style and motion topics based on digital literacy for the deaf.

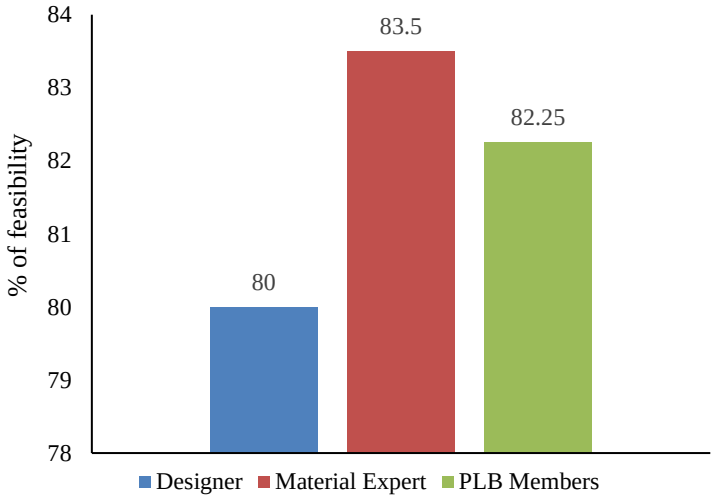

Figure 3. Eligibility Assessment by Members

Based on the assessment by a design expert validator, what needs to be improved include (1) cover display, (2) video display needs to be slowed down in duration, (3) need to add direction signs and similar colour changes, and (4) video display needs to be repeated, so that makes it easier for deaf students to remember the topic. Improving the science learning design product for digital literacy-based style and motion topics for the deaf is carried out based on suggestions and comments from experts. Based on the design feasibility test results, a percentage of 80% was obtained, which means that the product of science learning design for digital literacy-based style and motion topics for deaf students is feasible to use.

An assessment by a validator of science topic experts that it is advisable to add learning objectives to the e-book and display more relevant contexts from context to content to implementation. The collection of suggestions and comments from the validators of digital literacy-based style and motion topics includes (1) on the data displayed before the topic is presented, the learning objectives are displayed, (2) the presentation of the topic from context, content to application has been added at the end of the topic, (3) learning resources have been added, namely the K13 curriculum student book, the arrangement of the indicator column, after KD then there is the learning topic column, (4) the preliminary phase stages are sorted by conditioning students, appreciating, motivating, relating to the topic, and its value for life, and (5) a learning development model has been added, namely Contextual Teaching and Learning (CTL). Improving the style and motion topic based on digital literacy includes preparing lesson plans and syllabus, so that the topic presented follows the learning report. The feasibility test results for force and motion topics obtained a percentage of 83.5%, which means that digital literacy-based force and motion topics are feasible to use.

An assessment by a Special Education expert validator recommended during the design development process is adjusted to the title and development of the deaf characteristics. Suggestions and comments that need improvement include the need for signs (to show directions), and videos need to be repeated so that they are not only played once to facilitate student understanding. This suggestion is used as a reference to improve the product of science learning design for style and motion topics based on digital literacy for the deaf. The feasibility test results by special education experts obtained a percentage of 82.25%, which means that the design product is suitable for the deaf.

The process of assessing the practicality of science learning design products for digital literacy-based style and motion topics was obtained from teachers' and deaf students' responses from their point of view in using the product. The teacher's response assessment consisted of 10 questions, five questions received very practical responses, and five received practical responses. The average number of teacher

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responses is 82% after using the product. The response was that it took time for teachers to get to know the features/menus of the application because of increasingly sophisticated technological developments and not all teachers were able to access technology properly, due to the age factor.

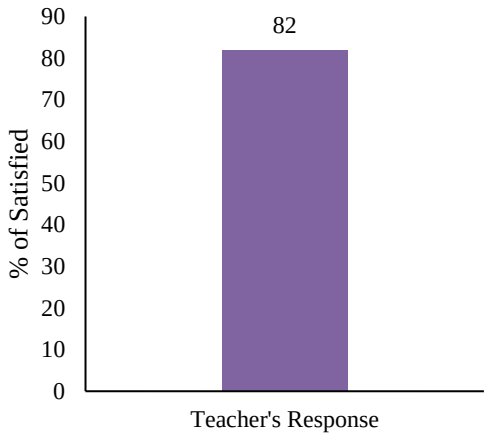

Figure 4. Practical Assessment by Teacher

The process of assessing the response to learning outcomes of deaf adolescent students in the design of science learning topics for force and motion is very practical to use. The responses given by deaf students in answering questions and topics showed good development. The average number of responses to the learning outcomes of deaf students is 80%. This is obtained from the average student learning assessment results in Figure 5.

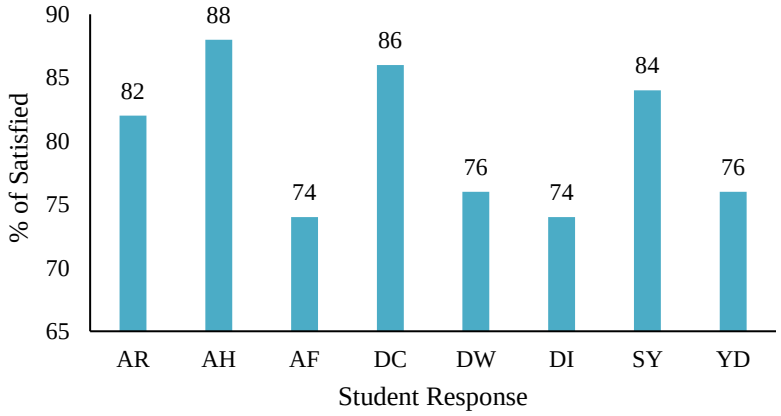

Figure 5. Response Assessment of Deaf Students' Learning Outcomes

CONCLUSION

The design of science learning topics for style and motion based on digital literacy for deaf teenagers that have been developed in this study is appropriate to be used as a learning resource during the Covid-19 pandemic and can later be useful for deaf students during face-to-face learning. The feasibility of the learning design for force and motion topics has met the validation test criteria for special design, topics and education experts. The learning design that has been developed has received a good response from the validator and is indicated by the response from teachers and deaf students. Based on the research results, during the pandemic, it can be understood that in preparing digital literacy-based learning with style and motion topics, educators do not only have to master the topic to transfer knowledge. However, educators are also faced with technology, so educators are also required to develop digital literacy skills. In developing digital literacy-based learning, educators must be based on an assessment of the ability to use technology and information assessment so that all forms of problems can be minimised properly and prevent learning loss.

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