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Nature of Science (NoS) Oriented in Improving Students' Science Process Skills

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Abstrak

Keterampilan proses sains memungkinkan siswa memahami, mengembangkan, dan menemukan hakikat sains dengan menggunakan metode ilmiah. Namun pada kenyataannya proses pembelajaran IPA di Indonesia gagal melatih keterampilan proses sains siswa. Sumber belajar IPA berupa website berorientasi NoS membantu dan membimbing siswa untuk belajar mandiri selama dan setelah pandemi covid 19. Penelitian ini bertujuan untuk menghasilkan produk berupa sumber belajar IPA berorientasi NoS berupa website yang valid, praktis, dan efektif untuk digunakan. Subyek penelitian dipilih dengan menggunakan teknik purposive sampling yang terdiri dari dua ahli materi, satu ahli media, satu ahli bahasa, 15 guru IPA, dan 40 siswa kelas VIII. Penelitian ini dirancang dengan memodifikasi model pengembangan Thiagarajan yang terdiri dari tahap define, design, dan develop. Desain uji coba lapangan dalam penelitian ini menggunakan one group pre-posttest design. Analisis data menggunakan teknik analisis deskriptif kualitatif dan kuantitatif. Hasil penelitian menunjukkan tahapan pembelajaran berorientasi NoS memiliki fokus melatih keterampilan proses sains siswa yang disajikan dalam bentuk website. Produk penelitian ini sangat valid pada aspek materi. Berdasarkan penilaian pengguna, produk penelitian ini sangat praktis. Sumber belajar IPA berorientasi NoS berupa website telah valid, praktis, dan efektif dalam meningkatkan keterampilan proses sains siswa.

Kata kunci: *Sumber Belajar Berorientasi Nos, Website, Keterampilan Proses Sains*

Abstract

Science process skills enable students to understand, develop, and discover the nature of science using the scientific method. But in reality the science learning process in Indonesia fails to train students' science process skills. Science learning resources in the form of a NoS-oriented website helps and guides students to learn independently during and after the covid 19 pandemic. The aim of this study is to produce a product in the form of a NoS-oriented science learning resource in the form of a website that is valid, practical, and effective to use. The research subjects were selected using a purposive sampling technique consisting of two material experts, one media expert, one linguist, 15 science teachers, and 40 classes of VIII grade students. This research was designed by modifying the Thiagarajan development model which consists of define, design, and develop stages. The field trial design in this study used a one group pre-posttest design. Data were analyzed using qualitative and quantitative descriptive analysis techniques. The results show NoS-oriented learning stages has a focus on training students' science process skills which is presented in the form of a website. The product of this research is very valid on the material aspect. Based on user assessment, this research product is very practical. NoS-oriented science learning resources in the form of websites have been valid, practical, and effective in improving students' science process skills.

Keywords: NoS-Oriented Learning Resources, Website, Science Process Skills

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1. INTRODUCTION

The focus of education in the 21st century is being able to produce individuals who have critical thinking skills, communicate, collaborate, and think creatively and are skilled at using technology and media to obtain information (Guo, 2020; Hidayatullah et al., 2021; Prabowo et al., 2016). The role of education in the 21st century is becoming increasingly important in order to prepare a generation that likes to learn, adapt quickly, and

is ready to compete (Thaher, 2020). The closest support that can be given to training 21st century skills is optimizing Natural Science (IPA) education in schools (Afdareza et al., 2020). Convey that the purpose of science education is to produce students who have knowledge, ideas, and concepts about the natural environment that are obtained through experience in pursuing scientific processes (Christensen & Knezek, 2016). The government has sought improvements and renewals in the 2013 curriculum aims to integrate 21st century life skills through the development of attitudes (know why), skills (know how), and knowledge (know what) (Setyorini, 2020).

Contrary to this expectation, the results of The Program for International Student Assessment (PISA) 2018 actually show that the ability of students in Indonesia in the science field is still low at level 1 a with a score of 396. The 2015 Trend in International Mathematics and Science Study (TIMSS) survey showed that the average score in the field of science for Indonesian students was 397, ranking 44 out of 49 countries (Hadi & Novaliyosi, 2019). In addition to the results of PISA and TIMSS, education practitioners carried out research on the science learning process in Indonesia which failed to train student's science process skills. Science process skills enable students to understand, develop, and discover the nature of science by using the scientific method (Prasart & Juhji, 2020; Tanti et al., 2021). That is, science process skills are important in building students' scientific knowledge. One of the most important goals of science education is to create learning by acquiring basic and integrated science process skills (Kizilaslan, 2019). Facts in the field show the results of the study of science process skills in class VIII SMP Negeri 12 Makassar as many as 379 students with a score of 15.24 in the medium category (Saleh et al., 2020). A total of 41.4% of the 58 respondents (class VIII students) at SMP Negeri 9 Denpasar obtained science test results below 80. The low science process skills of students were caused by several factors such as lack of practical activities, lack of in-depth discussions, and limited learning resources (Samputri, 2020). Science process skills consist of observation, hypothesizing, predicting, investigating, interpreting findings and drawing conclusions, and communicating (Rubini et al., 2019; M. Wulandari et al., 2020).

Not finished dealing with obstacles in face-to-face learning, the latest fact in March 2020 when *Corona Virus Diseases (Covid-19)* began to plague Indonesia, learning at all levels of education was carried out online. Constraints that occur, especially in science materials that require practicum cannot be implemented, so it is deemed necessary to have learning resources that provide practicum stages that guide students to carry out practicum at home (Jariyah & Tyastirin, 2020). The Ministry of Education and Culture of the Republic of Indonesia provides *a* free online learning *platform* "Rumah Belajar" and students in areas with poor connections can also study through TVRI stations and recommend using *websites*, social media, and *teleconferences* in the learning process (Ichsan et al., 2020). The Ministry of Education and Culture also recommends 23 *websites* that can help students and teachers while studying from home. However, the available *website* is still in the form of a summary of the material, there are no stages of learning, and no one has focused on training students' science process skills. Learning resources can help students to understand, master new abilities and skills, motivate students to study further independently, and help students solve learning problems (Hastuti, 2020). Web-based technology can be used as a learning resource because it is in the form of software or software that is connected to the internet network, provides a place to share content, and is *user-friendly* (Chu, 2020). Not only used in face-to-face learning, the *website is* also effectively used as a means of supporting *e-learning* (Haka et al., 2020).

Nature of Science (NoS) is a knowledge of how science works (Lederman & Lederman, 2019). NoS emphasizes the characteristics of scientific knowledge that comes from the development of that knowledge and is strengthened by *scientific inquiry* which

produces a certain way because of the assumptions that scientists have about how we learn about the world through the process of inquiry (Hottecke & Allchin, 2020). The existence of NoS is also considered important in science learning resources as researched conducted by previous study that emphasizes the element of scientific knowledge consisting of scientific knowledge has an empirical evidence base; empirical evidence collected is interpreted based on a scientific perspective that comes from the subjectivity of scientific values, prior knowledge and experience; scientific knowledge is the product of imagination and creativity; and the direction and product of scientific inquiry is influenced by the society and culture in which it is developed (Irez, 2016). Moreover other previous study also added that NoS-oriented learning was able to improve students' science process skills (A. Wulandari et al., 2019).

NoS-oriented learning resources in science education practice can be applied to the learning process by using the NoS-oriented learning model. The flow of this activity consists of six steps including background readings, case study discussion, inquiry lessons, inquiry lab, historical studies, and multiple assessment. The fact is that in the field there are no science learning resources in the form of a NoS-oriented *website* and there is a desire to contribute in improving students' science process skills, so this research is designed to produce a product in the form of a NoS oriented science learning resource in the form of a websites that are valid, practical, and effective to be applied.

2. METHODS

This research is designed by modifying the Thiagarajan development model which consists of define, design, and develop stages. *Define* stage to collect and analyze information related to product development. This stage consists of preliminary and final analysis, student analysis, task analysis, and concept analysis to determine learning objectives. The research subjects in this stage are science teachers and students. The object of research in this stage is the learning process, student characteristics, concept material, and assignments. The instrument used is a questionnaire. Data collection techniques were carried out by distributing questionnaires to science teachers at SMP Negeri 9 Denpasar *online*, observation, and unstructured interviews. The *design* stage is to plan and design the content framework and outline of a product. This stage consists of preparing a science process skills test, selecting and designing media, and designing material formats. The results of the *design* phase are the first draft of NoS-oriented science learning resources in the form of *websites*, validation sheets, teacher and student response questionnaires, and science process skills tests.

The *develop* stage is a review activity by a supervisor, *expert appraisal* (expert assessment), and *development testing* (development test). At this stage the researcher proposes the product development to the supervisor for input and revision I is carried out which results in the second draft. Furthermore, the researcher submitted the validation sheet and product development to the validator to be tested for validity and given input for improvement. At the same time, the science process skills test was also tested for validity. This study involved two material experts with a minimum educational qualification of a doctorate in science, one media expert with a minimum educational qualification of a doctorate in science who is a technology expert, and one linguist with a minimum educational qualification of a doctorate in language. After the validity test, analysis and revision II were carried out which resulted in draft III. Draft III continued to the field trial phase to determine the practicality and effectiveness of the product. Practicality is obtained through the analysis of the response of science teachers (15 people) and student responses (40 students of class VIII) to the product development. The results of the practicality test were then analyzed and the researchers revised III which resulted in a draft IV or finished product, namely a NoS-

oriented science learning resource in the form of a *website*. In the field test, using a *one group pretest* and *posttest* test *design*.

The data collected in this study were the results of product validation by experts, the results of the validation of science process skills test, the results of practitioners responses, and the results of the science process skills tests of class VIII I students. The results of product validation were obtained by giving validation sheets to material experts, media experts, and linguists. Experts judge by marking the grass in one of the columns with each category, less (score 1), quite good (score 2), good (score 3), and very good (score 4). The experts also can give their comments and suggestions for improvement in the column provided.

Aspects assessed by material experts are appearance, material, and presentation. The material expert also validated aspects of clarity, content accuracy in the science process skills test used. Aspects assessed by media experts are website page structure, visuals, and functionality. Aspects assessed by linguists are readability, writing techniques, and suitability to the level of development of students. The results of the practitioners' response, namely teachers and students to the product, can be obtained through the provision of teacher and student response questionnaires consisting of three aspect of assessment, namely appearance, material, and usefulness. The results of the science process skills test of class VIII I students were obtained by giving a science process skills test before and after the product was applied.

Data analysis techniques used in this study are qualitative descriptive analysis techniques and quantitative descriptive analysis techniques. Quantitative descriptive analysis techniques were used to analyse the assessments on the material expert validation sheets and science process skills test validations, then compare them with the validation coefficient category (Gregory, 2015), which is presented in Table 1. Assessments by media and language experts were analysed by looking for the level of achievement of scores and compare it with the conversion level of validity presented in Table 2.

Table 1. Gregory Validation Coefficient Category

Gregory Validation Coefficient	Qualification
0.81 – 1.00	Very high validity (very good)
0.61 – 0.80	High validation
0.31 – 0.60	Medium validation
0.21 – 0.30	Low validation
0.00 – 0.20	Very low validation (unusable

Source: (Gregory, 2015)

Table 2. Conversion Validity Level

Achievement Rate (%)	Qualification	Information
85.1 – 100	Very valid	Usable, without revision
70.1 – 85	Quite valid	Usable, with minor revisions
50.1 – 70	Not valid	It is recommended not to use because it needs a major revision
0.1 – 50	Invalid	Cannot be used

Quantitative descriptive analysis techniques were also used to analyse scores on teacher and student response questionnaires, then compare them with the practicality criteria for product development presented in Table 3.

Table 3. Practical Criteria

Score	Criteria
$87{,}5 \leq Sr \leq 100$	Very practical
$62{,}5 \leq Sr < 87{,}5$	Practical
$37{,}5 \leq Sr < 62{,}5$	Not practical
$25 \leq Sr < 37{,}5$	Very impractical

The pretest and posttest scores were also analysed using quantitative descriptive analysis techniques using the *gain score* formula and then comparing them with the normalized *gain score* category presented in Table 4.

Table 4. Normalized *Gain Score* Category

Interval	Category
$(g) > 0{,}7$	High gain
$0{,}7 \geq (g) \geq 0{,}3$	Medium gain
$(g) < 0{,}3$	Low gain

Source: (Haka et al., 2020)

The criteria and qualifications for the value of science process skills according to Permendikbud No. 81 A Year 2013 in percentage is presented in Table 5**.**

Table 5. Criteria and Qualifications of Value Science Process Skills

Interval	Qualification
$83{,}25 < Nilai \leq 100$	Very good
$58{,}25 < Nilai \leq 83{,}25$	Well
$33{,}25 < Nilai \leq 58{,}25$	Enough
$Nilai \leq 33.25$	Not enough

The classical completeness criteria for the *posttest* values of students' science process skills are presented in Table 6.

Table 6. Classical Completeness Criteria Value of Science Process Skills

Percentage of Completeness (%)	Criteria
81 – 100	Very effective
61 – 80	Effective
41 – 60	Effective enough
21 – 40	Less effective

Qualitative descriptive analysis technique was used to analyse suggestions for improvement given by supervisors, experts, teacher opinions, and student opinions.

3. RESULTS AND DISCUSSION

Result

Science learning resources in the form of websites have been found by many researchers. Science learning resources in the form of websites that focus on training students' science process skills using the NoS learning stages are not yet available in the field. The advantage of this product is that it presents NoS oriented learning stages, so that in its application it cans guide students to learn science independently by using nature and the surrounding environment as science learning materials. Students are also invited to get closer to technology through the use of the website as a medium. The website can help teachers and students in carrying out the NoS-oriented science learning process. The website is also integrated with several platforms such as Wanapustaka's YouTube, Google Slides, Google Classroom, and Google Forms.

Characteristics of students who were analysed based on the learning outcomes of class VIII I students on science subjects in the odd Semester Final Assessment (PAS) for the 2020/2021 school year. The highest score is 100 and the lowest score is 30. As many as 40% of students scored below 75 as the KKM score and were required to take remedial. During the learning process, only 10% said they dared to ask questions directly in class, the rest were reluctant to ask questions and give their arguments. The reasons are varied, some are because they do not have questions, do not dare because they are afraid of being wrong, and are ashamed to ask. Students rarely carry out practical activities while studying at school or at home. Regarding science process skills, students have observed, concluded, and communicated, but have not learned about making hypotheses, predictions, and determining variables in investigations. In this product contains NoS oriented learning stages, each stage of which trains at least one science process skill. Therefore, to meet student needs, NoS oriented science learning resources in the form of a website can be applied to class VIII I students.

The tasks given by the teacher to the majority of students do written assignments in the form of practice questions made directly by the teacher or the questions contained in the LKS. Several times students were given videos that were not made directly by the teacher, then the teacher gave questions that were not in accordance with the content of the video. In the application of this research product, the tasks that can be done by students in this research are make observations independently; make questions; carry out practical activities; make reports on the results of practicum; and present the results of discussions and practicums. Kizilaslan (Kizilaslan, 2019) also added that the learning resources used by students should be in accordance with the demands of the 2013 curriculum, which is to provide space so that students become the most active parties in the learning process (student center) and build learning experiences.

The media website was chosen to make it easier for students to access information, attract students' attention, learn not to be limited by space and time, and train students to use technology. Web design elements are divided into two, namely visual and functional elements (Sklar, 2015). The scope of the material in this research product is cognitive material consisting of facts, concepts, principles, and procedures. The science subject matter used as the object of development is the material contained in the even semester of class VIII which includes the pressure of substances and their application in daily life; the human respiratory system; the human excretory system; vibrations, waves, and sounds in the human body, daily life; and light and optical instruments. However, the material applied in this research is for a maximum time allocation of 6 meetings which is adjusted to the distribution of the curriculum that applies at the junior high school education unit level. Therefore, the chosen material for vibration, waves, and sound in everyday life consists of two learning activities. Organizing the material pays attention to three things, namely the breadth and

depth of the material; the order in which the material is presented; and efforts to show facts, concepts, principles, and procedures to students. The results of the formulation of science learning objectives in this study are presented in Table 7.

Table 7. Objectives of Science Learning Materials of Vibration, Waves, and Sounds in Daily Life

Sub Material	Learning objectives
Vibration and waves	1. Through reading activities and gathering information, students can make a background, problem formulation, and the purpose of studying vibration and wave material. 2. Through discussion activities students can identify the types of waves based on their energy, direction of propagation, and direction of vibration. 3. Through discussion activities students can describe the properties of waves. 4. Through discussion activities students can analyze the frequency and period of a vibration. 5. Through discussion activities students can analyze the relationship between wavelength, frequency, speed of propagation, and wave period. 6. Through practical activities on vibrations and waves, students can create and explain how the *gummy bear wave machine* works . 7. Through presentations and discussions, students can convey the results of discussions and practicums related to the material that has been studied.
Sound waves and their application	1. Through reading activities and gathering information, students can make a background, problem formulation, and the purpose of studying sound wave material and its application. 2. Through discussion students can mem Invert Selection type of sound based on great frequency. 3. Through discussion activities students can identify the audible sound requirements and sound characteristics. 4. Through discussion activities students can analyze the law of sound reflection. 5. Through discussion activities students can identify the parts and functions of the human ear. 6. Through discussion activities students can describe the process of hearing in humans. 7. Through discussion activities students can identify the auditory system in some animals. 8. Through discussion activities students can identify the application of vibrations and waves in technology. 9. Through practical activities on sound waves and their application, students can observe and analyze the laws of sound reflection. 10. Through presentations and discussions, students can convey the results of discussions and practicums related to the material that has been studied.

The benchmark reference test results are in the form of a science process skills test that is made by taking into account the characteristics of science process skills and learning

objectives. The results of the selection of media in the form of a NoS-oriented website. The website was chosen so that information can be accessed easily and quickly, used in online and offline learning, serves as a learning resource, and trains students in using technology. NoS-oriented science learning resource format in the form of a website in five static formats. First, the website template format available in Figure 1 contains the website logo, main navigation, and content search facilities in the header section. Website content is loaded in the content section. Footer widget contains photo galleries of social media, about wanapustaka, wanacast, and content categories, copyright and footer navigation, hyperlinks in the form of library donations, contact persons, privacy policy, competency mapping, about wanapustaka in the footer section. Second, the homepage content format includes photo slider, novelties and wanapustaka tag line, learning activity thumbnail containing title and brief description. Third, the detailed content format for learning activities contains the title of the learning activity, breadcome navigation, navigation to a collection of all learning activities, link share, the name of the NoS learning stage, the contents of the learning activity, page number, about article writing, three related articles, and the comment column. Fourth, the category content format contains the category title, category navigation breadcome, a collection of learning activities related to the selected category accompanied by a thumbnail image. The fifth contains the number of search results, learning activities related to search results, category widgets, and poll widgets.

The stages of NoS learning in science learning resources lie in the detailed content format of learning activities, precisely on the page number. Page number 1 is the background reading stage which contains subject matter, interesting information related to the subject matter, and search, write, and explain activities. Page number 2 is a case study discussion that contains tables for grouping questions, discussions, and examining problems. Page number 3 is an inquiry lesson containing how to focus questions through the included slides, answer questions, and a place to view the discussion. Page number 4 is an inquiry lab containing a complete description of practicum activity instructions, practicum titles, practicum objectives, phenomena that students will observe, problem formulations to be solved, hypotheses, tools and materials to be prepared, practicum steps, practicum guide videos, data analysis techniques, conclusions on the practicum that has been carried out, and also questions that may arise during the practicum process. Page number 5 is historical studies which contains presentation activities, material summaries, information on figures related to learning materials that have been studied in the previous learning stages, and references related to literature used as sources of information. Page number 6 is a multiple assessment containing quizzes and answer keys. Quiz is carried out directly on the google form that has been provided. The answer key can only be accessed after completing all the questions in the quiz. Page number 7 is an advanced multiple assessment that shows how to evaluate learning processes and products as well as how to evaluate one's own abilities. Each of these spaces is dynamic and can change according to the characteristics of the material in it. Wanapustaka Website interface is show in Figure 1.

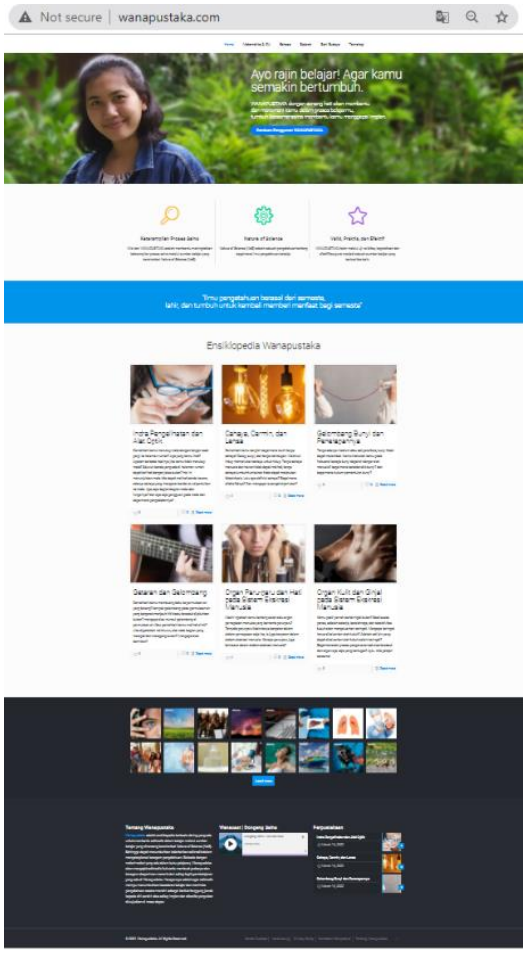

Figure 1. Wanapustaka Website Template Interface

The Gregory validation coefficient based on the assessment of learning material experts on the science process skills test is 0.916 with a very high validation category, so it does not need to be revised. It was assessed on the aspects of clarity, content accuracy, relevance, content validity, no bias, and language accuracy. This means that 18 questions on the science process skills test in the form of descriptions are used at the trial stage. After going through the results of the trial involving 100 test students who successfully met the requirements, a total of 12 questions have passed the test by meeting the standards for the degree of internal consistency of items, item difficulty index, and discriminatory power index. The internal consistency test in this study has a Cronbach alpha coefficient of 0.87 with a reliable category. It mean the questions were used as pretest and posttest questions.

The quality of development products should meet the requirements of validity, practicality, and effectiveness. 'Based on the research results, the NoS-oriented science learning resource in the form of a website has very valid validity in terms of material, media, and language, so it can be used without revision (Istri Aryani & Rahayuni, 2016; Werdiningsih et al., 2019). The results of material expert validation of learning resources in the form of a NoS-oriented website for science material for the even semester of class VIII obtained a gregory validation coefficient of 0.91 with a very high validation category. The results of media expert validation of learning resources in the form of a NoS-oriented website have a value of 0.91 which is in a very valid qualification, so it can be used without revision. The results of the validation of learning resources in the form of a NoS-oriented website on the linguistic aspect obtained the same value for all aspects of the assessment, namely 1 with a very valid category, so there was no need for revision.

This means that NoS-oriented science learning resources in the form of a website have been developed based on KI, KD, the subject matter applicable to the 2013 Curriculum; the material is presented in an attractive manner, the learning stages are clear, and are equipped with instructions for using the website; the material presented is useful in improving science process skills. In general, the material in this product includes facts, concepts, principles, and procedures; product development is feasible in terms of learning media and can be used without revision; learning resources in the form of a NoS-oriented website have good structure of website pages consisting of containers, logos, navigation, content, footers, and whitespace; the research product has good visual and functional elements; learning resources in the form of a NoS-oriented website are good in terms of readability; the writing technique in this research product has complied with the rules in the General Guidelines for Indonesian Spelling (PUEBI) (Haka et al., 2020); and the language used is in accordance with the level of development of students. The researcher decided to revise based on expert advice to perfect the research product (Abdullah, 2012).

The results of the teacher's response to learning resources in the form of a NoS-oriented website have an average score of 93.55 with very practical qualifications. The results of student responses gave an average score of 91 with very practical qualifications for product development. The responses of teachers and students stated that the product was very practical to use. This means display of learning resources in the form of a NoS-oriented website in terms of layout, type of writing, images, color selection and other display aspects; the material presented is in accordance with KI, KD, and learning objectives and lesson time; research products are useful because they contain information that is easy to understand, can train students' science process skills, and involve students actively in learning.

The results of the analysis of students' science process skills obtained a gain score of 0.57 in the medium category. The results of the gains score per indicator of science process skills are presented in Table 8.

Table 8. Gains Score Results per Science Process Skills Indicator

Indicator	S_{pre}	S_{post}	S_{MI}	(g)	Category
Observation	1.25	2.64	4	0.5	Currently
Hypothesize	1.99	2.78	4	0.39	Currently
Prediction	1.9	2.9	4	0.46	Currently
Investigation	1.61	3	4	0.58	Currently
Interpret findings and draw conclusions	2.03	3.3	4	0.65	Currently
Communicate	2.35	3.83	4	0.89	Tall

The average value of science process skills in this study is 76.7, which has exceeded the applicable KKM, which is 75. The classical mastery value for the value is 0.7 or 70% with effective criteria. Therefore, students' science process skills are declared classically complete and research products in the form of NoS-oriented science learning resources in the form of websites are declared to be effectively applied in science learning.

Discussion

The application of NoS to the product is expected to improve student's science process skills. NoS as a must in various science learning resources because it contains scientific knowledge, contains skills to overcome challenges and interpret scientific claims in today's era (Hottecke & Allchin, 2020). This is reinforced by the opinion of other researcher that stating that the existence of NoS in learning resources is considered important because it confirms the element of scientific knowledge that has an empirical evidence base obtained

through scientific perspectives, values, knowledge, and previous experience of scientists (Irez, 2016). The integration of NoS aspect in learning resources and learning processes is actually to strengthen the scientific process, namely science process skills.

The media website was chosen to make it easier for students to access information, attract students' attention, learn not to be limited by space and time, and train students to use technology. This is supported previous research that learning using website media can motivate students to explore more of the material presented through the features contained on the website (Camel et al., 2020). In addition, the performance of web 3.0 used gives the impression of being fast in finding, sharing, and combining information (Choudhury, 2014). The selected media are materials that exist in the surrounding environment and the website. This is supported by previous research that which states that learning by utilizing the environment and nature provides as many opportunities as possible for students to use more than one sense (Alenezi, 2020). The format of the NoS-oriented science learning resource in the form of this website is adjusted by paying attention to the structure of web pages and web design elements (Sudirman et al., 2021).

The website was chosen so that information can be accessed easily and quickly, used in online and offline learning, serves as a learning resource, and trains students in using technology. This is supported by previous researcher that learning using website media can motivate students to explore more of the material presented through features contained on the website (Camel et al., 2020). In addition, the performance of the web 3.0 used gives the impression of being fast in finding, sharing, and combining information (Choudhury, 2014). Materials that are in the immediate environment of students can be used as science learning media in accordance with the nature of NoS. Previous researcher also states that learning by utilizing the environment and natural surroundings provides as many opportunities as possible for students to use more than one sense (Alenezi, 2020). This means that in the learning process it is important to have teacher and student interactions with learning resources and the surrounding environment.

The limitations of the development contained in the research assumptions include the material in the developed product contains material for even semester VIII grades; in field trials, the materials applied are vibrations, waves, and sounds in everyday life; the indicators of the science process skills test that are trained include the skills of observation, hypothesizing, predicting, investigating, interpreting findings and drawing conclusions, and communicating; and product development is carried out until the develop stage due to limited research time. The product developed is expected to solve the problems encountered in SMP Negeri 9 Denpasar. In addition, this research product also supports the implementation of the 2013 curriculum, so that other schools that have established the 2013 curriculum can use this research product.

Suggestions that can be submitted based on the results of research and discussion are given to teachers and further researchers. Suggestions for teachers, before applying this product, they should pay attention to several things, namely fully mastering NoS-oriented science learning resources in the form of websites both in terms of materials and media used, when applying the product, try to follow the stages of the NoS-oriented learning model, willing to facilitate students to ask questions if there are any difficulties, and preparing student progress notes as material for process evaluation and product evaluation during learning. Suggestions for further researchers, the results of this study can be used as a benchmark, the results of this study can be continued to the experimental research stage involving the control group, and it is necessary to conduct similar research on other subject matter.

4. CONCLUSION

Product characteristics of this study was to load the NoS-oriented learning stages in grain, served on a media website, has a focus on training students' science process skills, and help learners achieve learning goals correspond to 2013. Source learn science curriculum Nos oriented in the form of a website is stated very valid on the aspects of material, media, and language. The NoS-oriented science learning resource in the form of this website has been declared very practical for use in Grade VIII Junior High Schools based on teacher and student responses. The NoS-oriented science learning resource in the form of this website has been declared effective in improving students' science process skills because it has a gain score that is in the medium category. In addition, it is strengthened by the analysis of the average value of the science process skills of students after the application of research products, they managed to obtain good qualifications. As many as 70% of students can exceed the applicable KKM, indicating that students' science process skills, especially on vibration, waves, and sounds in everyday life have been classically completed.

5. REFERENCES

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