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# Integration of Local Wisdom in Web-Based Science Teaching Materials: Hots and Cultural Caring Attitudes Analysis

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**Abstract:** The purpose of this study was to analyze the effect of web-based science teaching materials with the context of local wisdom on higher-order thinking skills (HOTS) and cultural care attitudes of students. The non-equivalent post-test-only control group design is the quasi-experimental design used. The study population included 140 grade VII SMPN 16 Mataram students, with a total sample of 35 students in the experimental class and 35 people in the control class. Data were obtained from the HOTS test instrument and a cultural caring attitude questionnaire which were analyzed using one-way MANOVA descriptive statistics. The HOTS test consists of 20 multiple-choice questions and a cultural care attitude questionnaire with 12 statements. The results showed that the average HOTS score of students in the experimental class was 83.75 while in the non-experimental class (the control class) it was 74.29. The average value of students' cultural attitudes in the experimental class was 91.61 while in the control class, it was 88.39. This means that HOTS and students' cultural care attitudes are superior in the experimental class compared to the control class. Based on the Multivariate tests, an F value of 20.32 was obtained with a significance much less than 0.05. This means there were differences in HOTS and cultural awareness between students who used web-based science teaching materials in the context of local wisdom and those who used conventional science teaching materials. Thus, using web-based science teaching materials in the context of local wisdom has an effect on HOTS and the attitude of caring for the culture of students. Web-based science teaching materials with the context of local wisdom can be an alternative contextual learning resource that plays an important role in strengthening character education, especially caring attitudes.

**Keywords:** Cultural care; HOTS; Local wisdom; Teaching materials

## Introduction

The 21st century skills such as higher order thinking skills (HOTS) and caring attitudes need to be trained from an early age (Alshamsi et al., 2022). Competence in the HOTS aspect can be in the form of critical analysis skills, collaborative thinking, creativity, problem solving, algorithmic reasoning, and communication (Junpho et al., 2022). The character traits such as personality and caring attitude are provisions to become exemplary leader figures, in the fields of education, organizations and other fields (Budiarti et al., 2022). Therefore, teachers have an important role in developing student character (I Wayan Suastra, 2018) and HOTS so that they can maintain the integrity and progress of the nation (Sanjayanti et al., 2022; I Wayan Suastra et al., 2021).

Teachers are expected to be able to design learning that can increase HOTS and caring attitudes (I. W. Suastra et al., 2019; I Wayan Suastra & Ristiati, 2019).. The design must also be in accordance with the times and technology so that students are enthusiastic in learning (Zhang, 2023). The use of technology, the internet, in learning has a big role, especially during the health crisis due to the Corona virus outbreak (Al-taai & Kanber, 2023). In the current era of globalization, students easily take advantage of learning resources that

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come from the internet to find information according to learning topics (Balushi et al., 2022).

The current use of mobile-learning platforms by students can be utilized for online learning, including web-based learning. Teaching materials as learning resources can be packaged online, which can be accessed via mobile phones or similar devices, by integrating various surrounding phenomena (Oo et al., 2022). Scientific phenomena around students can be used as problem issues in science learning so that students can practice their thinking skills to provide alternative solutions (Savitri et al., 2021). The use of teaching materials associated with phenomena in the environment around students can increase caring attitudes (Sueb & Damayanti, 2021).

The use of the web can increase HOTS, students can access material or find learning resources anytime and anywhere (Hariadi et al., 2022). In other words, digital teaching materials that contain phenomena around students or teaching materials based on local wisdom can increase students' HOTS, especially creativity (Hastuti et al., 2023). Thus, student interaction on the web that utilizes technology or applications has a positive effect on intelligence (Veide & Strozeva, 2013). The development of student HOTS through local wisdom-based learning such as ethnoscience can be done by utilizing e-learning platforms or the web (Prayogi et al., 2022). The integration of local wisdom in the form of ethnoscience in learning is proven to increase HOTS, including critical thinking skills (Verawati et al., 2022).

Cultural integration as part of local wisdom needs to be developed through curriculum reconstruction in the education sector, including culture-based science learning (Isa et al., 2022). The local wisdom in question needs to be preserved because it is an ancestral heritage that has many noble values (Arjaya et al., 2022; Santika et al., 2022). In Indonesia, local wisdom content can be combined with a scientific approach in accordance with the applicable curriculum. This local wisdom is integrated into learning tools including science teaching materials (I Wayan Suastra & Arjana, 2021). Science teaching materials as learning resources that integrate local culture or wisdom can increase student motivation in learning (Syafii et al., 2022). Students' difficulties in understanding abstract concepts in science can be overcome by using interesting videos or images that can be presented through learning resources in the form of web-based teaching materials (Ahmad et al., 2021).

The fact that occurs in the field is that conventional learning using chalk, lectures, and teacher demonstration models has had a negative impact on science learning (Manishimwe, 2022). The low level of teacher pedagogical knowledge has affected student achievement which is still relatively low (Mapulanga et al., 2022). From the student aspect, some of the challenges that students can experience in learning, including in the field of science, are low HOTS, skills, self-confidence, and peer attitudes, as well as learning instructions (Aranda, 2022). Available learning resources in the form of science teaching materials are still unable to optimally equip students with 21st century skills. Therefore, teaching materials should be designed not only to develop learning outcomes in the domain of knowledge, attitudes and 4C skills (Critical thinking, Creativity, Collaboration, Communication), but also characters that can be in the form of a caring attitude. Besides that, current science teaching materials should pay attention to ICT so that it is in accordance with the times (Asrizal et al., 2022).

Learning innovations that utilize technology will help students have better retention abilities as part of HOTS when compared to conventional learning (Jammeh et al., 2022). Science learning innovations for science teaching materials, for example, contain content or components including display design or layout, procedures or instructions for use, material explanations, teaching aids and experimental materials, assessments, and answer keys (Fahmi et al., 2022). In the assessment process, students will be more interested in context-based questions, such as questions containing the context of local wisdom (Yılmaz et al., 2022). Innovative assessment based on constructivism, such as assessment with the context of local wisdom, is a recommended assessment model to improve HOTS (Rapi et al., 2022). Assessment of local culture-based science projects is also proven to influence all domains of student learning outcomes simultaneously (Parmiti et al., 2021).

The process of learning science with teaching materials and online assessment has many advantages including innovative teaching and transparent assessment (Khlifi, 2022). Learning innovations in the form of science teaching materials with the context of local wisdom can increase conceptual knowledge (HOTS) and care for the environment (Hariadi et al., 2022), but there is no research on its effect on cultural caring attitudes. Therefore, the purpose of this study was to analyze the effect of web-based science teaching materials in the context of local wisdom on students' HOTS and cultural caring attitudes.

This research is also a real step in supporting sustainable development programs in Indonesia, and in accordance with calls from international institutions. UNESCO calls for a sustainable development program so that real efforts are needed to improve student competence in aspects of knowledge, attitudes and skills (Funa et al., 2022). The real effort that can be done is by integrating local wisdom in learning so that it will produce quality human resources (I Wayan Suastra et

al., 2017). In addition, the use of web-based science teaching materials is part of an effort to take advantage of educational innovation. The use of ICT in the field of education has become a necessity due to the development of an all-digital era (Galarce-miranda et al., 2022).

## Method

This quantitative research includes a Quasi-Experiment which uses a non-equivalent post-test only control group design (Creswell, 2012). The form of treatment given to the experimental class was the use of web-based science teaching materials with the context of local wisdom, while the non-experimental class (the control class) was not given special treatment (students used conventional teaching materials, namely those used in schools). After being given the treatment, the two classes, both the experimental class and non-experimental class (the control class), were given a post-test with the aim of knowing HOTS and cultural caring attitudes in each class.

The population in this study consisted of 140 students at SMPN 16 Mataram in grade VII, with 35 people in the experimental class and 35 people in the control class. The total number of samples is 70 students. The research data were obtained from the HOTS test instrument and the cultural caring attitude questionnaire.

The HOTS test is in the form of multiple choice with 4 answer options. The HOTS test consists of C4 (Analyze), C5 (Evaluate), and C6 (Create) which totals 20 questions. The cultural care attitude questionnaire consists of 12 statements using a scale of 4 which consists of strongly agree, agree, disagree, strongly disagree (Likert, 1932). The Cultural Care Attitude indicator includes 3 components namely: 1) Like local culture; 2) Introducing local culture to other people; 3) Preserving local culture.

The validity and reliability of the two instruments, both the HOTS test and the cultural care attitude questionnaire, were tested. The results of the Pearson Product Moment validity analysis show that all HOTS test items and all cultural care attitude questionnaire items are valid criteria, with a significance less than 0.05, and the r count value is greater than the r table value of 0.349 (the number of n respondents is 32). The results of the reliability analysis of the two instruments show that Cronbach's Alpha is greater than 0.6 so that the two instruments are considered reliable criteria, namely the Cronbach's Alpha coefficient for HOTS is 0.882 and for cultural caring attitudes is 0.868.

HOTS data and cultural caring attitudes were analyzed using descriptive statistics and inferential statistics. The research hypothesis was tested with One Way MANOVA. Before carrying out the analysis, the analysis prerequisite test is carried out first, namely: 1) the normality test of the data distribution; 2) variance homogeneity test; 3) multicollinearity test for the dependent variable. The data analysis activity uses the help of the IBM SPSS Statistics Version 25 application.

## Result and Discussion

*Result*

Learning in the context of local wisdom or based on ethnoscience is a good recommendation in an effort to improve students' science learning outcomes (Dewi et al., 2021). Local wisdom can be integrated into web-based science teaching materials so that these teaching materials not only increase HOTS and cultural care attitudes, but also digital literacy. Thus, students can be said to have mastered various 21st century skills as provisions in solving various problems in the future. The local wisdom of the Sasak tribe, Lombok Island, which is integrated into web-based science teaching materials can be seen in Table 1.

**Table 1.** Local Wisdom in web-based science teaching materials

| Local Wisdom | Description | Correlation to science |
|---|---|---|
| Sesata, Sedepa, Sprunjung | Sesata: the distance from the elbow to the tip of the middle finger. | Non-standard unit of base length. The standard unit for length in the International System is the meter, which is abbreviated as m. |
| Sekoboq, Sejai, Sekeraro | Sekoboq is the equivalent word for one kilogram taken using koboq.<br>Sejai is the measure for one plate made of coconut shell.<br>Sekeraro is the equivalent word for a basket. | Non-standard unit of the base quantity Mass. The standard unit for mass in the International System is the kilogram, which is abbreviated as kg. |
| Sebalit, Setaun, Sejelo | Sebalit is the equivalent of one season in Lombok, namely for six months.<br>Setaun is the equivalent of a year, which is 365 days.<br>Sejelo is the equivalent of a day, which is 24 hours. | Non-standard unit of the basic quantity of Time. The standard unit for time in the international system is the second, which is abbreviated as s. |

| Local Wisdom | Description | Correlation to science |
|---|---|---|
| The Bau Nyale Tradition | This tradition is an activity of catching sea worms called Nyale. Nyale is believed by the Sasak people to be the incarnation of Princess Mandalika. | "Nyale" or sea worms have the Latin name Eunice viridis, belong to the phylum Annelida and are classified in the group (kingdom) Animalia or animals. |
| Sasak typical Sesek Sukarara weaving | The Sasak woven fabric is a traditional woven fabric which is in the manufacturing process without the help of sophisticated machines. Sesek yarn is made from spun cotton. The thread coloring process uses natural dyes, namely turmeric, betel leaves, tree sap, mangosteen rind, and pandan leaves. | The dyeing process of the Sukarara sesek woven thread, typical of Sasak, Lombok Island, shows an example of a chemical change. Color changes related to changes in the type of substance; if in a process there is a change in color, then a new substance is formed. |
| Sekarbela traditional gold craftsmen | Goldsmiths can make gold bars by forging them and melting them into necklaces, bracelets, rings, earrings or brooches. Traditional gold craftsmen in Sekarbela, Mataram City, even add pearls to the gold jewelry according to customer requests. | One type of atom that makes up matter is called an element.<br>One example of a malleable element is gold. Gold can be made into various types of jewelry. |
| Bangko-Bangko salt farmers | The salt farmers in Bangko-Bangko, West Lombok Regency, make salt in the traditional way. The process of making coarse salt is carried out by filtering sea water (which is stored in the soil) using conventional equipment. Furthermore, the filtered water is boiled for about 8 hours so that salt crystals form. | Sea water when evaporated will form salt solids. This salt solid is the dissolved substance while water is the solvent so that a substance consisting of two or more constituent substances that join without going through a chemical reaction is called a mixture. |
| Gule Beak | Gule beak is brown sugar which is made traditionally with raw materials from palm sugar. | An example of a change in the state of a substance is when we make " Gule Beak" in which during the process the water from the palm sugar evaporates, then the palm water turns into a solid. |

The results of the descriptive test showed that classes using web-based science teaching materials with the context of local wisdom had an average value of HOTS and cultural care attitudes of 83.71 and 91.61, respectively. The class that uses conventional teaching has an average value of HOTS and a cultural caring attitude of 74.29 and 88.39, respectively. Thus, classes that use web-based science teaching materials with local wisdom contexts are superior to classes that use conventional teaching materials, both for HOTS competencies and cultural care attitudes competencies. The comparison between the experimental class and the non-experimental class (the control class) can be seen in Table 2.

**Table 2.** Descriptive Statistics

| Class | | Mean | Std. Deviation | N |
|---|---|---|---|---|
| HOTS | Experimental Class | 83.71 | 6.341 | 35 |
| | Control Class | 74.29 | 7.683 | 35 |
| | Total | 79.00 | 8.453 | 70 |
| Cultural Attitude | Experimental Class | 91.61 | 4.505 | 35 |
| | Control Class | 88.39 | 5.657 | 35 |
| | Total | 90.00 | 5.328 | 70 |

The results of the analysis show that the F value for Wilks' Lambda is 20.320 with a significant value of 0.000 which is much smaller than 0.05. This means that the F values for Wilks' Lambda is significant. It can be said that there are differences in HOTS and cultural caring attitudes between students who use web-based science teaching materials in the context of local wisdom and students who use conventional teaching materials. The results of this analysis can be seen in Table 3.

**Table 3.** Multivariate Tests

| Effect | | Value | F | Hypothesis df | Error df | Sig. |
|---|---|---|---|---|---|---|
| Class | Pillai's Trace | 0.378 | 20.320[b] | 2.000 | 67.000 | 0.000 |
| | Wilks' Lambda | 0.622 | 20.320[b] | 2.000 | 67.000 | 0.000 |
| | Hotelling's Trace | 0.607 | 20.320[b] | 2.000 | 67.000 | 0.000 |
| | Roy's Largest Root | 0.607 | 20.320[b] | 2.000 | 67.000 | 0.000 |

The different test results for each dependent variable separately show that the difference in HOTS between students who use web-based science teaching materials in the context of local wisdom and students who use conventional teaching materials produces an F value of 31,351 with a significance of 0,000. This shows that there are differences in HOTS due to differences in the teaching materials used. On the other hand, differences in cultural caring attitudes between students who use web-based science teaching materials in the context of local wisdom and students who use conventional teaching materials produce an F value of 6.917 with a significance of 0.011, which is also significant at the 0.05 significance level. That is, the teaching materials used also result in differences in cultural caring attitudes. This can be seen in Table 4.

**Table 4.** Tests of Between-Subjects Effects

| Source | | Type III Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| Corrected Model | HOTS | 1555.714[a] | 1 | 1555.714 | 31.351 | 0.000 |
| | Cultural Attitude | 180.868[b] | 1 | 180.868 | 6.917 | 0.011 |
| Intercept | HOTS | 436870.000 | 1 | 436870.000 | 8803.985 | 0.000 |
| | Cultural Attitude | 567000.000 | 1 | 567000.000 | 21685.455 | 0.000 |
| Class | HOTS | 1555.714 | 1 | 1555.714 | 31.351 | 0.000 |
| | Cultural Attitude | 180.868 | 1 | 180.868 | 6.917 | 0.011 |

Based on a comparison of the average HOTS scores in the experimental class and the non-experimental class (the control class) for each question level, namely C4 (Analyze), C5 (Evaluate), and C6 (Create), it shows that the HOTS scores of students who use web-based science teaching materials in the context of wisdom local learning is higher than students who use conventional teaching materials. Comparison of student scores in the experimental class and the control class according to the HOTS level for each question can be seen in Figure 1.

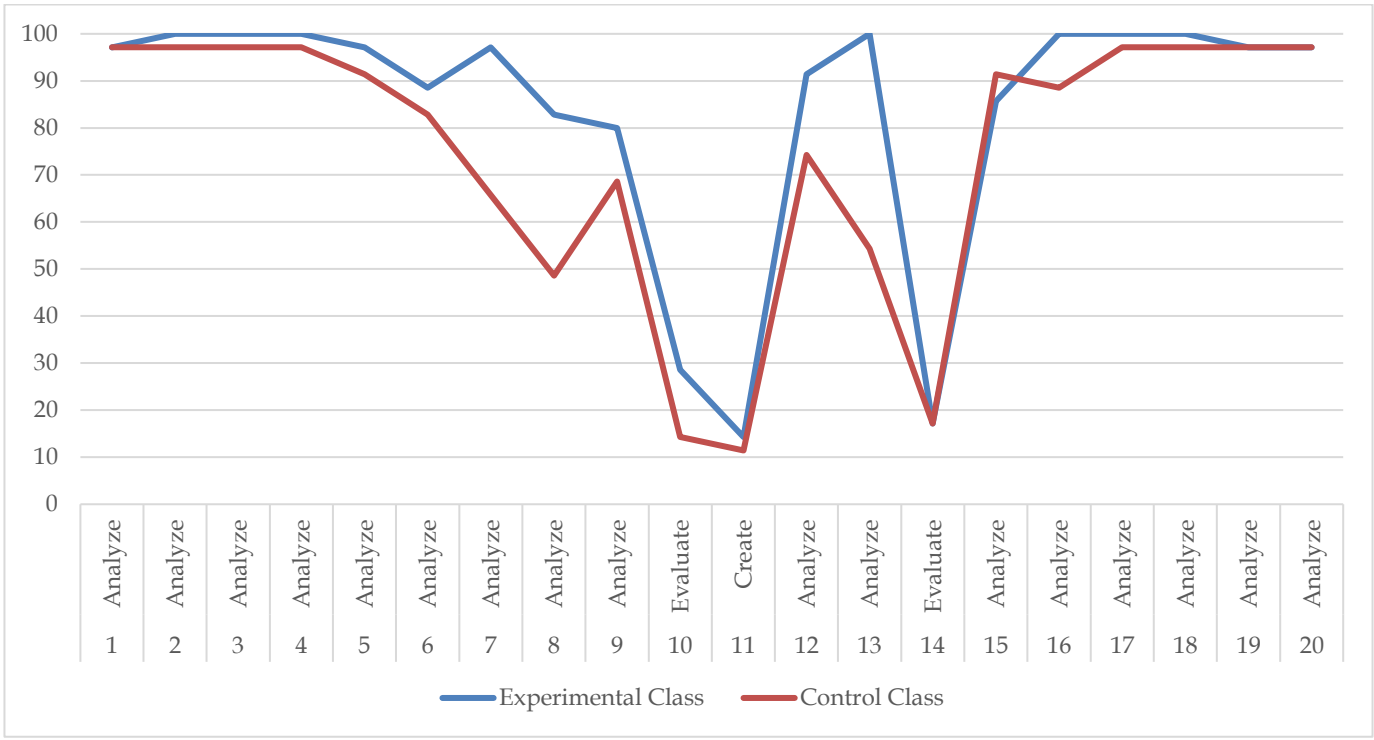


**Figure 1.** Comparison of HOTS Scores for Each Question

Based on a comparison of the mean values of cultural caring attitudes in the experimental class and the non-experimental (the class control class) for each statement shows that the value of cultural caring attitudes of students who use web-based science teaching materials with the context of wisdom local learning is higher than students who use conventional teaching materials. Comparison of student scores in the experimental class and the control class according to the statement of cultural care for each statement can be seen in Figure 2.

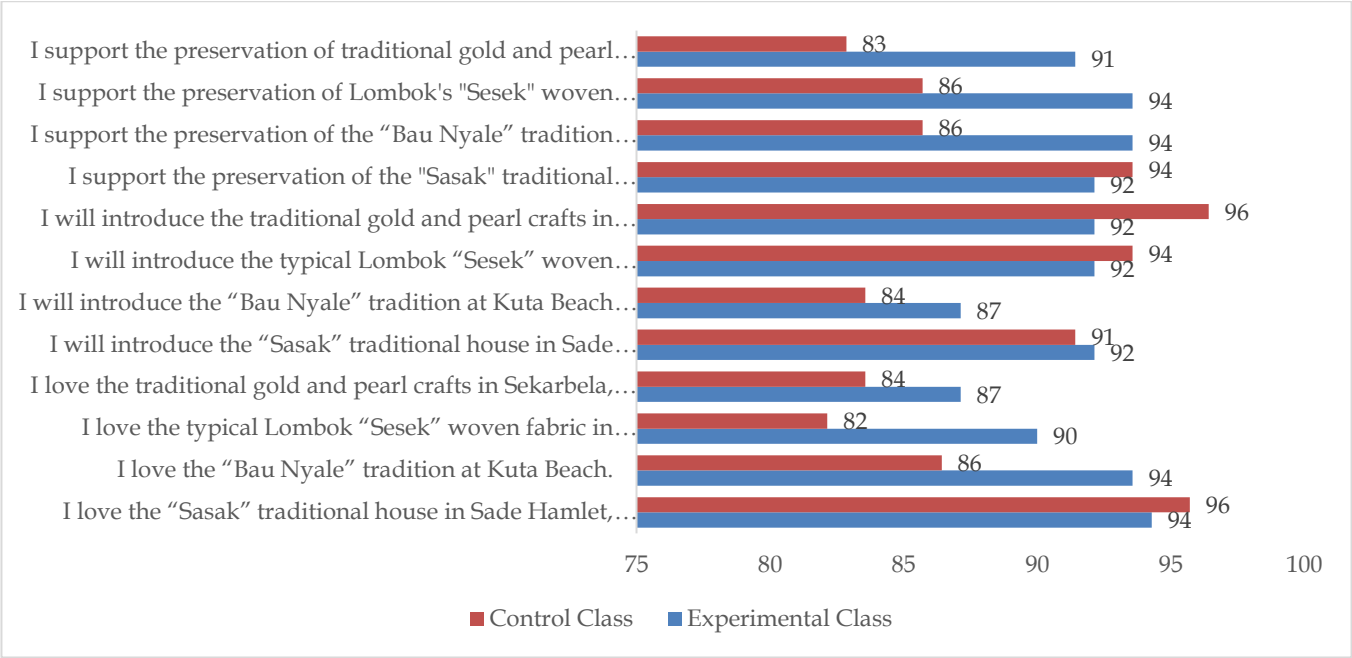


**Figure 2.** Comparison of Cultural Caring Attitudes for Each Statement

*Discussion*

Academic achievement (HOTS) and character education (cultural caring attitude) are two things that are the main focus of education in Indonesia (Irwandi et al., 2022). Web-based student character assessment obtained differences in perceptions of gender and character, that is, there were significant differences between male and female students (Asrial et al., 2022). Students' attitudes and perceptions of science will influence success in learning and mastery of various 21st century skills including HOTS and cultural care attitudes (Oral & Erkilic, 2022). However, cultural caring attitudes cannot predict student academic achievement (Tian et al., 2022). The 21st century learning process in science learning can increase HOTS which is higher in male students than female students (Sepriyanti et al., 2022).

Science learning based on Revised Bloom Taxonomy is learning based on student activity so that it can increase HOTS, namely at levels C4, C5, and C6 (Pujawan et al., 2022). Learning science by integrating Pancasila values or local wisdom values should be preserved so that students do not only have HOTS competencies, but also care about culture and good citizenship (Ruyadi & Dahliyana, 2022). Various traditional games also contain character values and noble character that are appropriate to be integrated into science learning (Hafina et al., 2022). Other local wisdom can also be integrated into science learning, namely local socio-scientific issues (Saija et al., 2022). Teachers can use scaffolding sets to help students find solutions related to socio-scientific issues (Erman et al., 2022). Application of teaching materials with local contexts can even reduce the risk of natural disasters (Wahyono et al., 2022).

Teaching material innovations that are in accordance with the times and technology can be done by making teaching materials in the form of digital books or web (Moundy et al., 2022). Research-based designed science teaching materials have even been proven to be used as learning resources that increase knowledge and awareness of the surrounding environment (Suryani et al., 2021). Learning science based on local culture or local wisdom has a positive effect on problem solving skills as part of HOTS (Sudarsono et al., 2022). Local potential that is owned needs special attention to help students in increasing awareness or concern for the surrounding environment so that local wisdom can be maintained properly (Nurhidayati et al., 2022). Tolerance and caring have a positive influence on maintaining local wisdom (Amin et al., 2022). The attitude of care that can be increased through the integration of local wisdom is not only an attitude of care for the environment, but also an attitude of care for culture, as the results obtained from this research.

Active involvement of students in learning, including using science teaching materials in the context of web-based local wisdom, will not only increase HOTS but will also increase students' motivation in learning science (Kamarrudin et al., 2022). Student motivation increased after the application of application-assisted teaching technology, including science teaching materials with the context of web-based local wisdom (Wang, 2022). Student creativity through online learning such as the web during a pandemic does not have to be

limited but must be developed through constructivist-based learning (Yustina et al., 2022).

Therefore, a school curriculum that is based on nature or the context of local wisdom can be a place to give students freedom in learning science. The learning process with the context of local wisdom can be designed to be fun and in accordance with the characteristics and level of cognitive development of students (Supriyoko et al., 2022). Learning with science teaching materials containing the context of local wisdom supports the success of science learning and improves student learning outcomes (Heliawati et al., 2022). Science teaching materials with the context of local wisdom, especially in Indonesia, need to be continuously developed to preserve knowledge about ancestral culture or customs (Zulfa et al., 2022). The nation's noble values, such as caring attitude, can not only be developed through learning science, but also through learning economics or other subjects (Nor et al., 2022).

Apart from ethnoscience, ethnoecology is also part of local wisdom which can be integrated into science learning. There are four categories of land, namely leleah, bangket, kebon, and gawah which can be used to describe the diversity of plants by the Sasak people on the island of Lombok (Rahayu et al., 2021). Disaster mitigation material can also be taught through a contextual approach, such as the island of Lombok which is included in two earthquake generators, namely from the south it comes from the subduction zone of the Indonesia-Australia plate, while from the north there is a geological structure of the Flores up fault. Local wisdom in the form of earthquake events that have been experienced in the area of residence can be integrated into science learning as an effort to improve critical thinking (HOTS) and a caring attitude (Astawa et al., 2022).

The context of local wisdom such as "Wayang" can also be a vehicle to facilitate students' critical thinking skills (Nugraheni et al., 2022). Contextual-based science teaching materials not only develop problem-solving skills but also generic science skills (Pujani et al., 2022). Teaching materials with the context of local wisdom train students' abilities to analyze information that is contrary to scientific truth (Rofieq & Fauzi, 2022). Therefore, students need the ability to think critically and rationally as part of HOTS which depends on the level of cognitive ability. The cognitive level of these students will later affect conceptual changes (Ezema et al., 2022).

Science learning is inseparable from investigative activities. The activity of making observations in an experiment is an integral part of learning science. This is because science in essence does not only consist of products but is a process and attitude (Borrull & Valls, 2021). In this case, students' creativity as part of HOTS and their scientific attitudes tend to increase when technology-based learning is applied. This is also because today's students cannot be separated from the use of IT-based devices (Koç & Büyük, 2021).

Technology-based learning such as the internet has the advantage that students can communicate with people and obtain new information. However, the drawback is that information technology can interfere with students' concentration in class and can take up a lot of time (Shatri, 2020). To overcome some of the weaknesses in online learning, face-to-face learning is needed in the classroom directly. In other words, blended learning can be used for various reasons, including in science learning (Şengel & Aktaş, 2022). Utilization of ICT in blended learning (a mixture of online and offline) can be applied in science learning to develop factual and conceptual knowledge (Suyanto et al., 2022).

In online learning, teachers need the right approach so students don't feel alienated from the teacher or other students (Hasim et al., 2022). Meanwhile, students need discipline and computer skills in order to complete various activities or assignments in online learning (Alsalhi et al., 2023). Online learning which is designed to facilitate group activities and integrate everyday phenomena not only has an impact on cognitive aspects (HOTS) but also psychomotor aspects and student attitudes (Yusof et al., 2022). In this case, students' understanding of science concepts was not influenced by gender or school location, although in some cases there were variations in abilities between male and female students (Bugingo, 2022). Therefore, prospective science teachers need to be prepared to have competence in HOTS aspects and a caring attitude so that later they can pass them on to students (Rokhimawan et al., 2022).

## Conclusion

The application of web-based science teaching materials in the context of local wisdom has a significant effect on HOTS and cultural awareness of students. This is because students are given the freedom to study independently through the web which is designed with various constructivism-based activities. Students gain meaningful learning experiences because learning resources present material that is close to students' daily lives. In addition, the integration of local wisdom into teaching materials has optimized character values in the form of students' cultural concern for local wisdom in their area. The local wisdom in question is the use of non-standard units for the measurement concepts of length (sesata, sedepa, sprunjung), mass (sekoboq, sejai, sekeraro), and time (sebalit, setaun, sejelo). Other local wisdom is the Bau Nyale (sea worm) tradition; the

process of making the color of the thread for the Sasak typical Sukarara sesek woven fabric; the process of making various jewelery by traditional Sekarbela gold craftsmen; the way Bangko-Bangko salt farmers produce coarse salt; and the traditional process of making Gule Beak. The use of web-based science teaching materials in the context of local wisdom has contributed to science learning innovations thereby improving the quality of learning processes and outcomes in senior high school education units. Web-based science teaching materials with the context of local wisdom need to be supplemented with Learning Implementation Plans so that learning processes and outcomes can be more optimal. This research also has not taken into account student learning styles and gender.

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**Author Contributions**
Conceptualization, H. and I.W.S; methodology, K.S. and A.A.I.A.R.S.; software, H.; validation, H. I.W.S. and R.; formal analysis, H.; investigation, H. and R.; resources, H. and K.S.; data curation, H.; writing—original draft preparation, H.; writing—review and editing, H.; visualization, A.A.I.A.R.S.; supervision, I.W.S.; project administration, K.S.; funding acquisition, H. All authors have read and agreed to the published version of the manuscript.

**Conflicts of Interest**
No conflict of interest.

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