Pegem Journal of Education and Instruction, Vol. 14, No.2, 2024 (pp. 216-229)

RESEARCH ARTICLE WWW.PEGEGOG.NET

Learning in Electronic Local Cultural Environment to Improve Higher Order Thinking Skill of Elementary Pupil with Different Self-Regulated Learning

Dek Ngurah Laba Laksana[1*] , Maria Yuliana Kua[2] , I Gde Wawan Sudatha[3] , Dimas Qondias[4] , Ngurah Mahendra Dinatha[5]

[1,2,4,5]Citra Bakti College of Education, Trans Ende-Bajawa Street, Ngada, Nusa Tenggara Timur, 86461

[3]Universitas Pendidikan Ganesha, Udayana street No.11, Banjar Tegal, Singaraja, Bali, 81116

Abstract

The purpose of this study is to identify the difference between elementary pupils' higher order thinking skill (HOTS) in an environment learning using a variety of resources in a local culture-based learning. HOTS differences between those who use printed and electronic learning resources after controlling self-regulated learning pupil. This is an experimental quasi-research. Four groups of elementary school pupils from Ngada, Nusa Tenggara Timur, Indonesia, are the subject of the study. A three-dimensional self-reliance feature and 20 item of variable indicator descriptions are used to collect data, as is a high-level cognitive ability exam at the level of analysis, assessment, and invention of 10 item. To test the research hypothesis, the data was then examined using covariate analysis. A qualitative and descriptive analysis follows. A descriptive analysis is used to characterize the student's (high-level thinking) and deviation standards, whilst a qualitative analysis is used to explain high levels of thought profiles on elementary school thematic study. The results show a significant difference between students who are participating in incubation studies that draw on printed study resources and electronic study sources in terms of their high level of thinking capacity. Once the free learning variable was taken into account, the outcome indicated substance differences.

Keywords: higher order thinking skill, learning resources, local culture, self-regulated learning.

Introduction

Using a variety of learning resources in a learning environment, learning primarily involves interaction between students and teachers (Nartiningrum & Nugroho, 2020). The ability to more freely explore one's skills and actively add to one's knowledge will be opportunities that a good learning process will give students (Putranta & Supahar, 2019; Awaludin, Wibawa, & Winarsih 2020; Dewi & Ramadan, 2021). The teacher's capacity to establish learning objectives, create learning materials, choose learning strategies, select learning resources, and conduct learning evaluations determines the quality of the learning process at all educational levels (Kua, Suparmi, & Laksana, 2021).

Learning patterns and learning resources have a close relationship (Frank, Quanjiang, Michael, Chun, & Chuang, 2021). In activities for individualized learning, the learner is the main focus, and the teacher serves the same purpose as other learning resources (Rapanta, Botturi, Goodyear, Guàrdia, & Koole, 2020). Because of this, the need for learning resources is critical. In their interactions with students, teachers play the roles of facilitators, learning managers, directors, mentors, and recipients of student learning progress (Liao et al., 2021). The design of the learning process must take into account all factors that facilitate the accomplishment of learning objectives, including deciding on the range of learning strategies, learning resources, and learning environments (Madani, 2019).

Printed and electronic learning resources are both readily available at the present time and are very simple to obtain (Singh, Steele, & Singh, 2021). According to an additional study, the levels of learning comprehension created by print and electronic instructional materials differ. According to an additional study, the levels of learning comprehension created by print and electronic instructional materials differ. Children who learned by electronic means had conceptual knowledge that was more vocally oriented than pupils who learned through print, according to research by Samri, Rewo, & Laksana (2020).

Corresponding Author e-mail: laba.laksana@citrabakti.ac.id

https://orcid.org/0000-0003-4695-5403

How to cite this article: Laksana L N D, Kua Y M, Sudatha I G, Qondias D, Dinatha M N (2024), Learning in Electronic Local Cultural Environment to Improve Higher Order Thinking Skill of Elementary Pupil with Different Self-Regulated Learning , Vol. 14, No. 2, 2024, 216-229

Source of support: Nil

Conflict of interest: None.

DOI: 10.47750/pegegog.14.02.26

Received: 01.02.2023

Accepted: 13.05.2023 **Publication:** 01.04.2024

Both make a variety of lovely objects using the wonderful variant method. So it is advantageous to learn how to use electronic media, whether they are digital or printed.

In the midst of the development of this increasingly complex world, the issues that result from the limited learning resources are undoubtedly no longer appropriate (Hamidaturrohmah & Mulyadi, 2020). Students' enthusiasm and active participation will be encouraged by educator strategies in selecting and utilizing different learning resources based on the needs and setting in which the learning process is conducted (Laksana, Degeng, & Dasna, 2019; Sudatha & Simamora, 2021). From a variety of learning resources, students will have their pick of knowledge and information sources. One of the learning resources that can be utilized in the learning process is teaching materials based on local culture (Simamora, Saragih, & Hasratuddin, 2019). Local culture teaching materials are proven to improve student learning achievement (Sarnely, Amos, & Mahmuddin, 2019). Additionally, using a variety of learning resources can help students improve their critical and constructive thinking abilities (Sari & Prasetyo, 2021).

Effective learning activities undoubtedly consider the various learning environments. Self-regulated learning is one of the things connected to learning conditions. A student who can organize himself on learning is seen as being able to set goals, plan assignments, manage time, and reflect the results that achieve (Russell, Baik, Ryan, & Molloy, 2020). Meanwhile, student self-regulated learning requires teaching, practice assessments, and supporting teaching activities (Butler and Cartier, 2018). The concept of being able to learn independently may be formed through social interaction, the provision of tools, the assignment design, and other components of the learning environment so as to form self-learning self-reliance (Nugent et al., 2018). Depending on their desire to master particular competencies and address issues, learners who have self-regulated learning will be able to complete learning activities on their own or with the assistance of others (Maulyda, Hidayati, Rosyidah, & Nurmawati, 2019). A learner who lacks independence will never be able to develop his own skills and will always be dependent on others (Mujahideen, Ruhendra, & Nasution, 2018). Self-learning abilities unquestionably have the most significant role in the development-based educational process as a way to improve both student competence and credentials. The student's autonomous learning skills in the classroom must be developed in order to ensure that each teaching process is maintained efficiently (Ozdal, Ozden, Atasoy, & Guneyli, 2022).

The necessity for student self-regulated learning is supported by a number of study findings, notably for students taking basic education courses. The research shows that individuals with high levels of self-regulated learning are more likely to learn well, be able to efficiently monitor, evaluate, and organize their learning, complete tasks more quickly, manage their time and learning well, and perform well on science exams. Contrarily, the learning objectives for primary school education as a whole, which develop low-level cognitive abilities at the level of taxonomy C1–C3, namely knowledge, understanding, and application, have proven successful. Students have not, however, gotten extensive instruction in the C4–C6 thinking abilities, which include analyzing, evaluating, and producing, or, as they are more popularly known, According to the research, people with high levels of self-regulated learning are more likely to learn well, be able to effectively monitor, evaluate, and organize their learning, finish tasks faster, manage their time and learning well, and perform well on science exams (Butcher, Davies, & Highton, 2019; Brown, Friesen, Beck, & Roberts, 2020). On the other hand, learning outcomes for elementary school education as a whole, which train low-level thinking skills at the level of taxonomy C1–C3, namely knowledge, understanding, and application, have been operating well. However, students have not received intensive training in the following thinking ability, C4-C6, which consists of analyzing, evaluating, and creating, or what is commonly referred to as high-level thinking skills (Annuuru, Johan, & Ali, 2017).

To build and integrate learning from LOTS to HOTS is unquestionably a challenge for teachers (Fanani, 2018). HOTS is essential for applicability in educational settings nowadays. According Hasan & Pardjono (2019; Pratama & Retnawati, 2018; Suhendro, Sugandi, & Ruhimat, 2021), HOTS is now one of the talents that will be required both now and in the future. Learning that is based on HOTS will equip students to address problems in both the present and future workplaces (Mitani, 2021; Yeung, 2015). According to another researcher (Sukatiman, Akhyar, Siswandari, & Roemintoyo, 2020; Tyas & Niaibaho, 2021) learning that develops students' cognitive capacities will allow students to provide answers to complicated questions and solve the learning problem.

Learning at the elementary school level attempts to cultivate each student's fundamental skills, and students engage in active learning because they are driven internally to do so (Erwanto, 2020; Febriana, Yusri, & Delyana, 2020). Students aren't used to being encouraged to think critically, to be completely honest. According to Kumala, Setiawan, & Shaleha (2019; Indah, 2020), students are less trained to recognize what they are doing, comprehend when they are doing something incorrectly, and discover solutions to issues. As a result, students are less adept at creating their own concepts of knowledge.

The importance of optimizing students' high levels of thinking ability in elementary school is based on the fact that most students have not been able to link knowledge or what is learned in school with the problems of students' daily lives (Rami & Azrul, 2022; Saepuzaman, Istiyono, & Haryanto, 2022). Learning that occurs and is experienced by students in schools tends to emphasize memorized aspects without a deep understanding that can be actualized in daily life. This suggests that what students learn is not the same as what happens in real life, which makes learning less meaningful. Learning by linking concepts learned and then linking them to real-world problems directly experienced by students is able to make students understand (Kua, Ulfia, Sawu, & Ngole, 2015). The learning process will be more enjoyable in order to foster a learning environment that encourages students to actively engage in independent discovery, analysis, and problem solving (McCormick, Clark, & Raines, 2015; Kua et al., 2021). Thus, learning that pupils receive at school will provide them with opportunities for further HOTS development.

When students use high-level thinking, their cognitive abilities are developed to a higher level. As a result, they are

better able to combine information and concepts when analyzing, assessing to the point of making in the form of giving an evaluation of a fact that is learned or can create from something that has been learned creatively (Andoko, 2020, Ichsan et al, 2019; Saraswati & Agustika, 2020). Students can learn more thoroughly, comprehend ideas clearly, work out problems, and create their own knowledge based on prior knowledge and experience by using high-level thinking processes (Zulfiani, Suwarna, & Sumantri, 2020).

The purpose of this study is to examine students' higher order thinking skills in inquiry learning between groups that employed printed and electronic learning resources, as well as after adjusting for student self-regulated learning.

METHOD

Research Design

This study focuses on the disparity in students' HOTS between groups who participate in inquiry learning while using printed learning resources and electronic learning resources. In addition, after taking into account students' self-regulated learning, this study focused on differences in students' HOTS.

The purpose of this study is to ascertain the impact of using a variety of learning resources in inquiry learning strategies on elementary school students' high-level thinking abilities with varying levels of self-regulated learning. Due to this, a study involving two groups of students—the experimental group and the control group—was carried out.

The learner condition plays a significant role in learning and has an impact on its effectiveness, efficiency, and allure. The self-regulated learning is a key component of the learner's condition. Messages discovered while learning using a variety of resources, depending on the level of independence of the students. Inquiry-based learning strategies are connected to this self-regulated learning. where students build high-level thinking skills and knowledge in the form of behavior. Variables for measuring self-regulated learning using a self-regulated learning questionnaire with a scale of 1 to 5. The higher-order thinking variable in this instance was derived from the students' results on the test of higher-order thinking skill.

The stages of generating research instruments and learning implementation advice are included in the research process. This tool consists of self-regulated learning tools, HOTS test tools, and a manual for guided inquiry learning. The second stage is research implementation, when instruction is given in four schools with one control class and one experimental class. Data gathering in the form of HOTS data and self-regulated learning is the third stage. Data analysis and conclusion-drawing comprise the fourth stage. Analysis of variance is a tool used in data analysis to draw conclusions from put forth hypotheses.

Sample and Data Collection

Students from Ngada District, Nusa Tenggara Timur Province, Indonesia, elementary schools made up the two research groups. Since it is unlikely that the subjects will be randomly assigned because they have naturally clustered into one group, a quasi-research design was selected in which the researcher simply randomly selected the groups with the entire subject intact to be treated. Due to the use of whole groups (intact groups) in this study's pseudo-experimental design, which is based on "two-factor analyzed experiments," there are two student groups (the experimental group and the control group), each made up of four classes—two classes for the experimental group and two classes for the control group.

Both of the study's groups, the experimental group and the control group, received treatment. One dependent variable is affected by one independent variable and one moderator variable. To identify the variations in elementary school students' high-level thinking abilities, a covariant research design was used. In order to determine the status and accreditation of the schools, the study will be carried out in fourth grade at four elementary schools. The elementary schools are both public and private schools that fall under the impact and core elementary school categories. The total number of classes required is 4, with each treatment being administered in two classes—two for the control group and two for the experiments. Dolupore Elementary School, Rutosoro Elementary School, Lekogoko Elementary School, and Mangulewa Elementary School (West Golewa District) are the schools used as research sites (Aimere District).

The self-regulated learning rubric consists of 20 questions that are broken down into categories and descriptions of the self-regulated learning markers. According to Fraile, Panadero, & Pardo (2017), these qualities include being independent of others, being self-assured, acting in a disciplined manner, feeling responsible, acting on one's own initiative, and practicing self-control.

The description exam measures a person's ability to think critically. According to the topic of the material studied, researchers developed the high-level thinking test utilizing operational verbs at the levels of analyze, evaluate, and create using Bloom's revised taxonomy (Laksana, Dhiu, Jau, & Ngonu, 2019). The number of items used to assess conceptual knowledge and high-level thinking skills could reach 10.

Both printed and electronic teaching resources are used in a learning environment that is based on the local culture. These two teaching resources include context and material related to local culture. The printed learning resources employed are those created by Laksana, Seso, & Riwu (2019) in the form of printed textbooks that are rooted in the community. The electronic teaching materials in the form of flipbooks created by Samri, Rewo, & Laksana (2020) are the learning tools that are used online.

Treat the two groups listed in Tables 1 and 2 as the focus of the research. Learning activities were conducted sparingly during the pandemic through study groups of three to four people. Students in the experimental group are those who are being taught using guided inquiry learning 5E model and electronic learning resources (Laksana, Degeng, & Dasna, 2019).

Table 1: Research Procedures for Test Groups

Phases of learning	Learning activities
Engage	By examining students' initial ideas about the subject under discussion and, with the aid of electronic learning resources, building a solid foundation for the following stage of learning, teachers draw on prior learning experiences. The instructor asks the class to come up with theories about the upcoming activities. The instructor stays silent regarding the student's theory.
Explore	Students carry out experiments to test the hypothesis put forth and aided by the instructor's display of electronic learning resources. Teachers support students as they engage in inquiry-based activities.
Explain	Students engage in group discussions about the investigation's findings under the direction of teachers, with the aid of supporting information from electronic learning resources.
Elaborate	Students apply concepts learned in the explain stage to new situations in the form of practice questions, etc., using visualizations from electronic learning resources.
Evaluate	Students draw conclusions from their observations and consider how their learning has changed.

Students in the control group are those who are taught using the guided inquiry learning model 5E with printed learning materials.

Table 2: Treatment for Experimental Groups in Research

Phases of learning	Learning activities
Engage	With the aid of **printed learning resources**, teachers examine students' initial thoughts about the subject being covered. The instructor asks students to propose theories regarding the forthcoming activities. The instructor stays silent regarding the student's theory.
Explore	Students carry out testing exercises against the hypothesis put forth and aided by printed learning resources. Teachers guide students through inquiry-based activities.
Explain	Students participate in group discussions about the investigation's findings under the guidance of teachers, with supporting information shown in printed learning resources.
Elaborate	With the assistance of visualizations displayed in printed learning resources, students apply their concepts in new situations such as problem solving, practice questions, and so on.
Evaluate	Students draw conclusions based on their observations and reflect on the progression of their learning.

Data Analysis

Data analysis revealed a significant correlation between pretest and posttest results for higher-order thinking abilities. Pretest score is therefore controlled in this study by making it a covariate variable. As a result, covariate analysis, or analysis of covariance, was used to analyze the data in this study (ANCOVA). Descriptive analysis and qualitative analysis were also carried out. The research hypothesis was put to the test using ANCOVA factorial analysis. In order to explain the profile of advanced thinking in primary thematic learning, qualitative analysis is used. The standard deviation and student learning achievement (higher order thinking skill/HOTS) were described using descriptive analysis.

FINDINGS

Techniques for gathering data include questionnaires with up to 20 items of statements and descriptions of the test with up to 10 questions each to gauge students' high-level thinking abilities and gauge the independence of their learning. This instrument has been acknowledged as reliable and valid.

A decision-making tool assesses the capacity for high-level thought based on the value r_{count} (Corrected Item-Total

Correlation) > r_{table} by 0,304 to df = 42 – 2 = 40, and α = 0,05. The instrument reliability test also uses the SPSS program's Cronbach Alpha formula.

Table 3: Result of the High-Order Thinking Skill Test Instrument's Reliability Testing

		N	%
Cases	Valid	42	100.0
	Excluded[a]	0	0.0
	Total	42	100.0

a. Listwise deletion based on all variables in the procedure.

The results of the validity test indicated that all of the item values of the Corrected Item-Total Correlation > from the value of the r_{table} (0.304) indicate that all of the items of the high-level thinking ability instrument (Y) are valid and practical for use in retrieving research data. Each instrument has a Cronbach Alpha value greater than 0.900 for reliability testing, making all of the instruments reliable. A very high reliability standard is a reliability value of 0.933.

Instruments for decision-making in the form of questionnaires are also used to assess the independence of student learning r_{count} (Corrected Item-Total Correlation) > r_{table} by 0,304 to df = 42 – 2 = 40, andα = 0,05. The instrument reliability test also uses the SPSS program's Cronbach Alpha formula.

Table 4: Result of the Self-regulated learning test Instrumen's Reliabily Testing

		N	%
Cases	Valid	42	100.0
	Excluded[a]	0	0.0
	Total	42	100.0

a. Listwise deletion based on all variables in the procedure.

The results of the validity test indicated that all item values of the Corrected Item-Total Correlation > of the value of R_{table} (0.304) indicate that the entire item questionnaire to assess the independence of student learning (X) is valid and practical for use in retrieving research data. Each instrument has a Cronbach Alpha value greater than 0.900 for reliability testing, making all of the instruments reliable. A very high reliability standard is a reliability value of 0.933.

In the group of students who received instruction using printed learning resources and electronic learning resources, normality and homogeneity testing of all data on the unit of analysis of both student self-regulated learning and high-level thinking skills (Y), as well as the correlation test of dependent variables with Covariant variables, were conducted prior to the hypothesis test. Shapiro-Wilk and Kolmogorov-Smirnov statistics are used for normality testing. The normality test's criteria state that if p > 0.05, H_0 is accepted and H_1 is rejected, indicating that the data came from a population with a normally distributed distribution. On the other hand, if p 0.05, H_1 is accepted and H_0 is rejected, indicating that the data did not come from a population with a normally distributed distribution. Table 5 below lists the findings of the normality test.

Table 5: Result of the Normality Test

	Learning Materials (A)	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Unstandardized Residual	Using electronic resources for learning	0.090	40	0.200*	0.979	40	0.668
	Using printed learning materials when studying	0.132	41	0.071	0.950	41	0.069

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Based on the information in Table 5 above, the results of the data normality test using the Kolmogorov-Smirnov and Shapiro-Wilk statistics show that all data in the unit of analysis for both self-regulated learning (X) and higher-order thinking skills in groups of students who receive learning from sources such as electronic learning and printed learning resources in inquiry learning showed a significance value of more than 0.05 in both the Kolmogorov-Smirnov and Shapiro- It can be said that the distribution of all gathered data is normally distributed in accordance with the test criteria because it has a significance value greater than 0.05.

Using the Levene test to assess the homogeneity of variants If sig. > 0.05, then H_0 is accepted and H_1 is rejected, which denotes that the data come from populations with the same or homogeneous variance, is the criterion for testing the hypothesis for the normality test. The data come from populations with different variances or that are not homogeneous, so if sig. 0.05, H_1 is accepted and H_0 is rejected. The results of the normality test are shown in Table 6 below.

Table 6: Result of the Variance Homogenity Test

		Levene Statistic	df1	df2	Sig.
Higher Order Thinking Skills	Based on Mean	1.129	1	79	0.291
	Based on Median	0.927	1	79	0.338
	Based on Median and with adjusted df	0.927	1	78.638	0.338
	Based on trimmed mean	1.096	1	79	0.298

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.
a. Dependent variable: Higher Order Thinking Skill
b. Design: Intercept + A

The Levene test results show that the statistical significance value of the Levene's Test of Equality of Error for the unit higher-order thinking skill is shown in Table 6's Test of Homogeneity of Variance for that unit. It is possible to conclude that the variance between groups is homogeneous if the variance is greater than 0.05.

The covariant variable self-regulated learning (X) on higher order thinking skills had a value of r 0.753 and sig. 0.000 according to the results of the correlation test between the covariant variables and the dependent variable (Y). The dependent variable and the covariant variables have a linear relationship, according to sig. value 0.05. Higher order thinking skills are impacted by student self-regulated learning by 56.7%, according to the r square value of 0.567. Table 7 below displays the data from the dependent variable's covariant variable correlation test results.

Table 7: Results of the Test for Dependent Variable Correlation with Covariant Variables

		Studen Self Regulated Learning	Higher Order Thinking Skills
Student Self Regulated Learning	Pearson Correlation	1	.753**
	Sig. (2-tailed)		.000
	N	81	81
Higher Order Thinking Skills	Pearson Correlation	.753**	1
	Sig. (2-tailed)	.000	
	N	81	81

**. Correlation is significant at the 0.01 level (2-tailed).

The results of the prerequisite test demonstrate the normal and homogeneous distribution of all data in the unit of analysis, including student self-regulated learning and higher order thinking skills, in groups of students who receive instruction using printed learning resources and electronic learning resources. The results of the correlation test demonstrate a linear relationship between the dependent variable and the covariant variable.

The One-way ANOVA test, shown in Table 8 below, is used to test the first hypothesis, which asks whether there is a significant difference in students' higher order thinking skills between groups of students who receive instruction using electronic learning resources and printed learning resources during inquiry learning.

Table 8: Test results for Anova

Dependent Variable: Higher order thinking skills (Y)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2181.953[a]	1	2181.953	47.136	0.000
Intercept	401780.718	1	401780.718	8679.582	0.000
A	2181.953	1	2181.953	47.136	0.000
Error	3656.936	79	46.290		
Total	406950.000	81			
Corrected Total	5838.889	80			

a. R Squared = 0.374 (Adjusted R Squared = 0.366)

One-way ANOVA calculations reveal that higher-order thinking skills have a $F_{(count)}$ value of 47.136 (sig. 0.000), rejecting H_0 and accepting H_1. As a result, it is claimed that there is a significant difference in students' high-order thinking skills between groups that received inquiry-based learning using printed learning resources and electronic learning resources. It can be seen from the subsequent LSD follow-up test which independent variable has the greatest impact.

Tabel 9: LSD Test of Hypothesis 1

Dependent Variable: Higher order thinking skills

(I) Learning Materials	(J) Learning Materials	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Using printed learning materials when studying	Using electronic resources for learning	10.459*	0.446	0.000	9.571	11.347
Using electronic resources for learning	Using printed learning materials when studying	-10.459*	0.446	0.000	-11.347	-9.571

Based on estimated marginal means

*. The mean difference is significant at the 0.05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

Higher order thinking skills were significantly different in the group of students who received instruction using electronic learning resources and printed learning resources during inquiry learning, as shown by the results of the follow-up test with Pairwise Comparisons in Table 9 above. This is due to sig. 0.000 0.05. In the meantime, electronic learning resources are the most effective ones, with an average score of 75.625 for higher order thinking skills, as shown in Table 10.

Table 10: Putting the Best Learning Resources to The Test Dependent Variable: Higher order thinking skills

Learning Materials	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Using electronic resources for learning	75.625	1.076	73.484	77.766
Using printed learning materials when studying	65.244	1.063	63.129	67.359

Additionally, the ANCOVA test was used with SPSS 26 computational results to test the second hypothesis to see if there is a significant difference in students' higher order thinking skills between groups of students who receive learning using printed learning resources and electronic learning resources in inquiry learning after self-regulated learning variables are controlled. The results are shown in Table 11.

Table 11: Tests of Between-Subjects Effects

Dependent Variable: Higher order thinking skills

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	5524.615[a]	2	2762.308	685.581	0.000
Intercept	976.804	1	976.804	242.435	0.000
X	3342.663	1	3342.663	829.621	0.000
A	2214.796	1	2214.796	549.693	0.000
Error	314.273	78	4.029		
Total	406950.000	81			
Corrected Total	5838.889	80			

a. R Squared = 0.946 (Adjusted R Squared = 0.945)

The ANCOVA analysis's findings indicate that H_0 is rejected and H_1 is accepted because the FA (count) value for higher order thinking skills is 549.953 (sig. 0.000). Thus, after controlling for self-regulated learning variables, it is stated that there is a significant difference in students' higher order thinking skills between groups of students who receive instruction using electronic learning resources and printed learning resources. It can be seen from the subsequent LSD follow-up test which independent variable has the greatest impact.

Table 12: Results of the LSD test Hypothesis 2

Dependent Variable: Higher order thinking skills						
(I) Learning Materials (A)	(J) Learning Materials (A)	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Using electronic resources for learning	Using printed learning materials when studying	10.459*	.446	0.000	9.571	11.347
Using printed learning materials when studying	Using electronic resources for learning	-10.459*	.446	0.000	-11.347	-9.571
Based on estimated marginal means						

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

After student self-regulated learning variables are controlled, the results of additional tests using Pairwise Comparisons in Table 12 indicate that students' higher order thinking skills differ significantly depending on whether they learn using electronic learning resources or printed learning resources. In the meantime, electronic learning resources, with an average value of higher-order thinking skills of 75.664 as shown in Table 13, are the best learning resources used in inquiry learning to improve higher-order thinking skills.

Table 13: Putting the Best Learning Resources to The Test

Dependent Variable: Higher order thinking skills				
Learning Materials	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Using electronic resources for learning	75.664[a]	0.317	75.033	76.296
Using printed learning materials when studying	65.205[a]	0.313	64.581	65.829

a. Covariates appearing in the model are evaluated at the following values: Self Regulated Learning = 77.6173.

Discussion

The results of this study demonstrate that there are differences between elementary school students who learn through inquiry using printed teaching materials and those who learn through electronic teaching materials. Students who study with electronic teaching materials have higher order thinking skills than students who learn with printed teaching materials. This study also discovered a significant difference between inquiry learning with printed teaching materials and electronic teaching materials, with or without adjusting for students' independent acquisition of higher order thinking skills.

Learning in an inquiry-based environment demonstrates how learning is accomplished by showcasing each student's unique skills. Students engage in small-group inquiry learning, where individual aptitudes are valued highly.

Higher order thinking abilities, problem solving abilities, conceptual understanding, and critical thinking abilities are all aspects of inquiry learning that are developed (Liana, Muzzazinah, & Indrowati, 2022; Pursitasari, Suhardi, Putra, & Rachman, 2020). Project-based learning, collaborative learning, learning through various media, and game learning all make use of relevant inquiry learning (Chu, Reynolds, Tavares, & Lee, 2017).

Because the inquiry learning model maximizes all students' abilities to look for and investigate existing events or phenomena methodically, critically, and logically so that students can formulate their own findings, it can help students become more adept at critical thinking. In addition, students' understanding is deeper because they are actively involved in locating solutions to problems that already exist and applying those solutions right away (Distrik, Ertikanto, & Sesunan, 2022). Inquiry-based learning is intended to help students develop their scientific thinking skills as well as encourage them to actively participate in the learning process by using their minds and bodies to solve problems and make decisions (Abdurrahman, Ariyani, Maulina, & Nurulsari, 2019)

Learning materials that are relevant to students' daily lives and are culturally charged can also help students develop higher-order thinking skills. The electronic teaching materials incorporate various facets of nearby Ngada culture that are relevant to students' daily lives, influencing how critically students think. Learning about local cultures is doable to implement and has the potential to enhance students' multiple intelligences and higher-order thinking skills (Agusta, Suriansyah, Hayati, Nurkhalis, & Mahmudy, 2021; Redhana, Redhana, Sudiatmika, & Selamat, 2018; Simamora, Saragih, & Hasratuddin, 2019). A strategy for designing learning experiences and learning environments that incorporate culture as a part of the learning process is known as "culture-based learning" (Saripudin, Abdulkarim, & Komalasari, 2018). Culture-based learning is predicated on the understanding that culture plays a fundamental role in education as a means of expressing ideas and expanding knowledge (Wihartanti & Wibawa, 2017). In culture-based learning, students use culture as a medium to translate their observations into original forms and naturalistic principles (Siregar, Sinaga, & Syahputra, 2021). Thus, through culture-based learning using these electronic teaching resources, students are not only copying or receiving information, but also engaging in a process of

creating meaning from the knowledge they have acquired. The goal of the culture-based learning process is to help students create meaning and push the boundaries of their imagination and creativity in order to have a thorough understanding of the subjects they are studying. It goes beyond simply transferring or conveying culture or having students embody it (Atmojo, Lukitoaji, & Noormiyanto, 2021)

Higher order thinking skills are increased more effectively when electronic teaching materials are used, according to research. This result is consistent with research by Liana, et al. (2022), which demonstrated that e-modules can improve students' critical thinking abilities.

Additionally, Maharani, Susanti, Indarti, & Syamsi (2022) research's indicated that using electronic teaching materials had a significant impact on students' higher-order thinking skills. Students can better comprehend the material and avoid boredom during the learning process with the help of electronic teaching materials (Rahayu, Ladamay, Kumala, Susanti, & Purwono, 2022). Higher-order thinking skills can be improved more effectively by using electronic teaching materials (Astra, Raihanati, & Mujayanah, 2020; Widyawati & Sujatmika, 2020). Electronic teaching materials come with multimedia features like audio, video, and images to make them more appealing and interactive (Fuady & Mutalib, 2019). Students can customize the media in electronic teaching materials so that it meets their needs. Additionally, this electronic teaching material can be accessed on a variety of gadgets, including cellphones, laptops, and desktop computers. But to develop a digital learning source, attention needs to be paid to basic skills, competence, and character qualities (Syafril, Rahmi, & Azrul, 2022).

This study also discovered a significant difference between inquiry learning with printed teaching materials and electronic teaching materials, with or without adjusting for students' independent acquisition of higher order thinking skills. After adjusting for independent learning variables, electronic learning resources are the most effective teaching tools used in inquiry learning to enhance higher order thinking abilities. This means that without extensive guidance and assistance, students can use electronic teaching materials independently. This result is in line with the findings of Mamun, Lawrie, & Wright, (2020), who found that electronic teaching materials like online modules can be given to students without any help from instructors or their peers during the learning process. Other studies' findings demonstrate that e-modules can help students develop their higher-order thinking abilities and are appropriate for use as stand-alone teaching resources (Astra et al., 2020). The state of perfection and completion of the two components (mind and reason) in a personal unity is known as independence (personal maturity) (Hasibuan, Saragih, & Amry, 2019). As evidenced by the existence of learning initiatives and a desire to expand one's experience, student learning independence is a reflection of a creative attitude, freedom of action, and responsibility. If students are confident in themselves, they can implement learning independence. If students are confident in themselves, they can implement learning independence. Learning that is followed by independence will motivate students to complete their academic tasks with complete responsibility, a strong will, and strict discipline so that learning goals can be met to the fullest extent possible (Ucu, Sri, Erdawati, & Yuli, 2019).

The results support those of Liana et al. (2022), who found that e-modules help students develop their critical thinking abilities. Through module packaging with the design of issue formulation features developed with common contextual problems and supplied with critical thinking questions, the pattern of improving critical thinking can be carried out (Maniotes & Kuhlthau, 2014; Wulandari, Prayitno, & Maridi, 2022). Sutiani, Situmorang, & Silalahi (2021) claim that an Ethno-Constructivism-based inquiry learning methodology encourages students to enhance their problem-solving and discovery skills while also fostering internalized cultural values.

The learning activities in electronic learning at the elicit stage, specifically bringing up prior learning experiences by extracting ideas so that students have greater conceptual capital, have a significant impact on the study's findings. Additionally, at the extented stage, critical thinking abilities can be developed by testing the concepts learned through real-world problem-solving questions. This is in line with a study by Hapern & Dana (2021), which shows that using a variety of different approaches to real-world problems, a person can develop their critical thinking abilities. Through a level of needs analysis and development that takes into account cognitive, affective, and psychomotor needs, the electronic module developed must be oriented in accordance with the components of student learning needs (Maksum & Purwanto, 2022). According to Toker & Saturay's (2022), creating digital content that is tailored to real life has an indirect impact on students' positive attitudes in addition to developing critical thinking skills. This impact may be brought on by habituation of analysis and interpretation to find solutions to problems with a phenomenon that is presented graphically (Qondias, Lasmawan, Dantes, & Arnyana, 2022; Lapuz & Fulgencio, 2020).

The use of electronic learning resources is thought to accelerate learning because it increases the likelihood that students will comprehend the material in any setting and at any time. Both teachers and students believe that a learning tool with high mobility is a useful tool for improving and developing skills through adaptable transfer of learning (Calamlam, 2020; Encarnacion, Galang, & Hallar, 2021). Electronic learning patterns that are more student-centered must promise appealing, interactive, innovative designs and through the integration of local local wisdom, according to Sofyan, Anggereini, & Saadiah (2019); Charlina (2022).

The findings of this discovery are consistent with research by Kua et al. (2021), which demonstrates that the electronic media presentation of learning materials based on actual, day-to-day experiences in a local cultural context will encourage students to integrate newly acquired knowledge into their own knowledge. According to additional research, learning materials presented via electronic media that are based on the local culture will aid in enhancing students' fundamental reading and critical thinking skills (Laksana et al, 2019). The instructor can make the most of all of the students' senses in receiving the material delivered by using electronic media in the classroom. The lesson will be more engaging, which will increase the student's desire to learn. In their research, Ngurah & Kua (2019) also highlight how using electronic learning

resources might improve a user's capacity for high-level thinking because they show information in greater depth than print resources.

According to the findings of the second hypothesis, which holds that electronic learning resources can enhance critical thinking after controlling independent learning, this finding pattern perspective suggests that the design of electronic learning resources has a learning concept design that can be carried out independently at anytime and anywhere. Students' independent learning motivation, which has a significant impact on their critical thinking abilities, is demonstrated by their awareness of their learning needs by Turan and Koc (2018). (Bishara, 2021). The primary motivations for this situation, according to Zhu, Bonk, & Berri (2022), are internal and make sense of curiosity and fulfillment of the need for additional knowledge, while external motivations are very beneficial in various simple learning preparations. Working in teams or groups to find answers outside of regular business hours can have repercussions for self-reliance learning (Budiman, Nugraheni, Sabaria, Julia, & Purnomo 2022).

With constructivists who believe that education should cultivate independent, reflective, and self-directed learners as its main objective (Butler & Cartier, 2018). Piaget (in Calamlam, 2020), who firmly believes that knowledge is a long-term process of acquisition in which students construct their own personal knowledge and stimulate brain development through independent learning, the tendency of these results is very dynamic. A student's ability to learn independently can be promoted, in accordance with Adinda & Mohib (2022); Karatas, Şentürk, & Teke (2021), through the use of electronic learning resources that target thinking abilities consistent with the growth of 21st century life skills and a propensity for lifelong learning. Curran, 2019; Garava and Pole, 2021; Morris 2020, all concur in this declaration of achievement that independent learning cannot be separated from the use of resources, teaching methods, and learning styles that can help students become proficient at exploring ideas and using ideas to further their academic objectives.

Conclusion

For groups of students who receive inquiry-based learning using printed learning resources versus electronic learning resources, there is a sizable difference in their higher order thinking abilities. These findings suggest that electronic learning resources are the most effective ones. The study's findings revealed that there were significant differences in students' higher-order thinking abilities between groups of students who received learning using electronic learning resources and printed learning resources during inquiry learning after controlling for student self-regulated learning variables. After adjusting for student self-regulated learning variables, electronic learning resources are the most effective teaching tools used in inquiry learning to enhance higher order thinking skill. This study demonstrates the value of using electronic learning resources for inquiry-based learning to enhance higher order thinking skill.

Recommendation

(1) It is imperative to use electronic learning resources when learning because the study's findings show that using electronic teaching materials is more successful than using printed teaching materials. (2) This study employs a small number of people and extremely particular information; therefore, additional research with a bigger subject and more generic information is required in order to make conclusions with a wider scope. (3) Through this instruction, it can help to protect regional culture. Because this is the foundation for the development of national culture, a priceless asset to the Indonesian nation. As a result, it is essential to conserve culture by incorporating materials based on local culture into digital learning resources.

Limitation

The study is confined to looking at how using different learning tools, like printed and electronic teaching materials, affects learning. Only learning materials for grade 4th can use media. The only subject matter for grade 4th elementary school that requires high-level thinking is thematic content.

References

Abdurrahman, Ariyani, F., Maulina, H., & Nurulsari, N. (2019). Design and validation of inquiry-based stem learning strategy as a powerful alternative solution to facilitate gifted students facing 21st century challenging. Journal for the Education of Gifted Young Scientists, 7(1), 33-56. https://doi.org/10.17478/jegys.513308

Adinda, D., & Mohib, N. (2020). teaching and instructional design approaches to enhance students' self-directed learning in blended learning environments. The Electronic Journal of e Learning, 18(2), 162-174. DOI: 10.34190/EJEL.20.18.2.005

Agusta, A.R, Suriansyah, A., Hayati, R.P., Nurkhalis, M., Mahmudy. (2021). Learning model gawi sabumi based on local wisdom to improve student's high order thinking skills and multiple intelligence on elementary school. International Journal of Social Science And Human Research. 4(11), 3269-3283. http://www.ijsshr.in/v4i11/29.php

Anandari, Q. S., Kurniawati, E. F., Piyana, S. O., Melinda, L. G., Meidiawati, R., & Fajar, M. R. (2019). Development of electronic module: Student learning motivation using the application of ethnoconstructivism-based flipbook kvisoft. Jurnal Pedagogik, 6(2), 416–436. doi: https://doi.org/10.33650/pjp.v6i2.584

Andoko. (2020). Peningkatan HOTS dan prestasi belajar melalui metode inkuiri kelas 7C SMPN 1 Wonosobo tahun pelajaran 2018/2019. Spektra: Jurnal Kajian Pendidikan Sains, 6(1). https://doi.org/10.32699/spektra.v6i1.134

Annuuru, T.A., Johan, R.C., & Ali, M. (2017). Peningkatan kemampuan berpikir tingkat tinggi dalam pelajaran ilmu pengetahuan alam siswa sekolah dasar melalui model pembelajaran treffinger. Edutcehnologia, 3(3), 136-146

Aripin, M.A., Hamzah, R., Setya, P., Hisham, M.H.M., & Ishar, M.M.I. (2020). Unveiling a new taxonomy in education field. International Journal of Evaluation and Research in Education (IJERE), 9(3), 524-530.

https://doi.org/10.11591/ijere.v9i3.20458

Astra, I.M, Raihanati, R., Mujayanah, N. (2020). Development of electronic module using creative problem-solving model equipped with hots problemson the kinetic theory of gases material. Jurnal Penelitian danPengembangan Pendidikan Fisika. 6 (2). 181 - 194. https://doi.org/10.21009/1.06205

Atmojo, S.E., Lukitoaji, B.D., Noormiyanto, F. (2021). Thematic learning based on local culture in implementing national character values in inclusive referral elementary school. Jurnal Kependidikan. 7 (4). 845-856. https://doi.org/10.33394/jk.v7i4.4256

Awaludin, Wibawa, & Winarsih. (2020). Integral calculus learning using problem based learning model assisted by hypermedia-based e-book. Jurnal Pendidikan Indonesia, 9(2). https://doi.org/10.23887/jpi-undiksha.v9i2.23106.

Bishara, S. (2021). The cultivation of self-directed learning in teaching mathematics. World Journal On Educational Technology: Current Issues. 13(1), 82-95. https://doi.org/10.18844/wjet.v13i1.5401

Brown B, Friesen S, Beck J, Roberts V. (2020). Supporting New Teachers as Designers of Learning. Education Sciences, 10(8), 207-221. https://doi.org/10.3390/educsci10080207

Budiman, A., Nugraheni, T., Sabaria, R., Julia, J., & Purnomo, P. (2022). Raising independent-learning awareness: An action research in dance practice course in Indonesia. Pegem Journal of Education and Instruction, 12(2), 133-142. https://doi.org/10.47750/pegegog.12.02.13

Butcher, C., Davies, C., & Highton, M. (2019). Designing learning - from module outline to effective teaching (2nd Edition). London: Routledge.

Butler, D.L., & Cartier, S.C. (2018). Advancing research and practice about self-regulated learning: The promise of in-depth case study methodologies. In: Schunk, D.H. and Greene, J.A. (eds) Educational Psychology Handbook Series. Handbook of Self-Regulation of Learning and Performance (2nd Edition). New York: Routledge, Taylor & Francis Group, pp.352–369

Calamlam, J. M. M. (2020). The development of 21st-century e-learning module assessment tool. Journal of Educational Technology Systems, 49(3), 289–309. Doi:10.1177/0047239520953792

Charlina, C., Septyanti, E., Mustika, T.P., Rahmi, A. (2022). Electronic module as learning needs to write exposition texts for junior high school students. Journal of Education and Learning (EduLearn), 16(2), 219-225. DOI: 10.11591/edulearn.v16i2.20402

Chu, S.W.C., Reynolds, R.B., Tavares, N.J., & Lee, C.W.Y. (2017). 21st Century Skills Development Through Inquiry-Based Learning : From Theory to Practice. Singpore. Springer. http://dx.doi.org/10.1007/978-981-10-2481-8

Curran, V., Gustafson, D. L., Simmons, K., Lannon, H., Wang, C., Garmsiri, M., Wetsch, L. (2019). Adult learners' perceptions of self-directed learning and digital technology usage in continuing professional education: an update for the digital age. Journal of Adult and Continuing Education, 147797141982731. doi:10.1177/1477971419827318

Diane, F. H. & Dunn, D.S. (2021). Critical thinking: A model of intelligence for solving real-world problems. Journal of Intelligence, 9(2), 22. https://doi.org/10.3390/jintelligence9020022

Dinatha, N. M., & Kua, M. Y. (2019). Pengembangan modul praktikum digital berbasis nature of science (NOS) untuk meningkatkan higher order thinking skill (Digital Practice Module Based on Nature of Science (NOS) to Improve Higher Order Thinking Skill). Journal of Education Technology, 3(4), 293. https://doi.org/10.23887/jet.v3i4.22500

Distrik, I.W., Ertikanto, C., & Sesunan, F. (2022). The practicality and effectiveness of the e-worksheet with creative inquiry based and HOTS oriented "3D pageflip" for online learning. Jurnal Pembelajaran Fisika. 10 (1). 1-10. http://dx.doi.org/10.23960/jpf.v10.n1.202201

Encarnacion, R. E., Galang, A. D., & Hallar, B. A. (2021). The impact and effectiveness of e-learning on teaching and learning. International Journal of Computing Sciences Research, 5(1), 383-397. doi: 10.25147/ijcsr.2017.001.1.47

Erwanto. (2020). Profil kemampuan berpikir kritis siswa pada konsep keanekaragaman hayati melalui problem based learning (Profile students' critical thinking abilities on the concept of biodiversity through problem-based learning). Jurnal Kependidikan: Jurnal Hasil Penelitian dan Kajian Kepustakaan Di Bidang Pendidikan, Pengajaran dan Pembelajaran, 6(3), 578–587. https://doi.org/10.33394/jk.v6i3.2916

Fanani, A. & Kusmaharti, D. (2018). Pengembangan pembelajaran berbasis HOTS (higher order thinking skill) di sekolah dasar kelas V (The development of higher order thinking skills through project-based learning in grades V elementary school). Jurnal Pendidikan Dasar, 9 (1), 1 – 11.

Febriana, R., Yusri, R., & Delyana, H. (2020). Modul geometri ruang berbasis problem based learning terhadap kreativitas pemecahan masalah (Problem-based, spatial learning module for creativity in problem-solving). Aksioma: Jurnal Program Studi Pendidikan Matematika, 9(1), 93. https://doi.org/10.24127/ajpm.v9i1.2591

Fraile, J., Panadero, E., & Pardo, R. (2017). Co-creating rubrics: The effects on self-regulated learning, self-efficacy and performance of establishing assessment criteria with students. Studies In Educational Evaluation, 53, 69-76. https://doi.org/10.1016/j.stueduc.2017.03.003

Frank, G.Y., Quanjiang, G., Michael, L., Chun, L., & Chuang, W. (2021). Developing literacy or focusing on interaction: New Zealand students' strategic efforts related to Chinese language learning during study abroad in China. System. 98. 102462. https://doi.org/10.1016/j.system.2021.102462

Fuady, R., & Mutalib, A.A. (2019). Audio-visual media in learning. Journal of K6, Education, and Management, 1(2), 1-6. https://doi.org/10.11594/jk6em.01.02.01

Grava, J. & Pole, V., (2021). The promotion of self-directed learning in pre-school: reflection on teachers' professional practice. Cypriot Journal of Educational Science. 16(5), 2336-2352. https://doi.org/10.18844/cjes.v16i5.6351

Hasan, A., & Pardjono, P. (2019). The correlation of higher order thinking skills and work readiness of vocational high school students. Jurnal Pendidikan Teknologi Dan Kejuruan, 25(1), 52–61. https://doi.org/10.21831/jptk.v25i1.19118

Hasibuan, A.M., Saragih, S., Amry, Z. (2019). Development of learning materials based on realistic mathematics education to improve problem solving ability and student learning

independence. International Electronic Journal of Mathematics Education. 14 (1). 243-252. https://doi.org/10.29333/iejme/4000

Ichsan, I. Z., Sigit, D. V., Miarsyah, M., Ali, A., Arif, W. P., & Prayitno, T. A. (2019). HOTS-AEP: Higher order thinking skills from elementary to master students in environmental learning. European Journal of Educational Research, 8(4), 935–942. https://doi.org/10.12973/eu-jer.8.4.935.

Indah, P. (2020). Development of HOTS (high order thinking skill) oriented learning through discovery learning model to increase the critical thinking skill of high school students. International Journal of Chemistry Education Research, 3(3). https://doi.org/10.20885/ijcer.vol4.iss1.art4.

Kamelia, K. (2019). Using Video as Media of Teaching in English Language Classroom: Expressing Congratulation and Hopes. Utamax : Journal of Ultimate Research and Trends in Education, 1(1), 34– 38. https://doi.org/10.31849/utamax.v1i1.2742.

Karataş, K., Şentürk, C., & Teke, A. (2021). The Mediating Role of Self-Directed Learning Readiness in the Relationship Between Teaching-Learning Conceptions and Lifelong Learning Tendencies. Australian Journal of Teacher Education, 46(6). 54-77 http://dx.doi.org/10.14221/ajte.2021v46n6.4

Kua, M.Y, Ulfia, L., Sawu, A.M., & Ngole, M. (2015). Analysis of the speed of a moving object through the application of videopad to teach mechanical concepts based on a real-world problem. Harmonization of Science, Technology, and society (STS) in science Learning to Prepare 21st Century Generation: Yogyakarta.

Kua, M.Y., Suparmi, N.W., & Laksana, D.N.L. (2021). Virtual physics laboratory with real world problem based on ngada local wisdom in basic physics practicum. Journal of Education Technology, 5 (4), 520-530. doi: http://dx.doi.org/10.23887/jet.v5i4.40533

Kumala, F. N., Setiawan, D. A., & Shaleha, P. R. (2020). Contextual-based animal encyclopedia: hots on elementary school's students. 2nd International Conference on Education and Social Science Research (ICESRE 2019) Contextual-Based, 417(Icesre 2019), 132–137. https://doi.org/10.2991/assehr.k.200318.025.

Laksana, D. N. L., Seso, M. A., & Riwu, I. U. (2019). Content and flores cultural context based thematic electronic learning materials: Teachers and students' perception. European Journal of Education Studies, 5(9), 145–155. http://dx.doi.org/10.46827/ejes.v0i0.2211

Laksana, D.N.L., Degeng, I.N.S., & Dasna, I.W. (2019). The effects of inquiry- based learning and learning styles on primary school students' conceptual understanding in multimedia learning environment. Journal of Baltic Science Education, 18(1), 51-62. doi: https://doi.org/10.33225/jbse/19.18.51

Laksana, D.N.L., Dhiu, K.D., Jau, M.Y. & Ngonu, M.R. (2019). Developing early childhood cognitive aspects based on Anderson And Krathwohl's Taxonomy. Jurnal Pendidikan Indonesia, 8 (2), 219-227. https://doi.org/10.23887/jpi-undiksha.v8i2.19481

Lapuz, A.M.E and Fulgencio, M.N. (2020). Improving the critical thinking skills of secondary school students using problem-based learning. International Journal of Academic Multidisciplinary Research (IJAMR), 4(1), 1-7. www.ijeais.org/ijamr

Liana, D.E., Muzzazinah, M., & Indrowati, M. (2022). Development of guided inquiry-based science e-modules to improve students' critical thinking ability. Jurnal Penelitian Pendidikan IPA, 8(3), 1368–1375. https://doi.org/10.29303/jppipa.v8i3.1668.

Liao, Y.C., Leftwich, A.O., Zhu, M., Jantaraweragul, K., Christie, L., Krothe, K., & Sparks, K. (2021). How can we support online learning for elementary students? perceptions and experiences of award-winning k-6 teachers. TechTrends. 65. 939-951. https://doi.org/10.1007/s11528-021-00663-z

Madani, R. A. (2019). Analysis of educational quality, a goal of education for all policy. Higher Education Studies. 9 (1). 100-109. https://doi.org/10.5539/hes.v9n1p100

Maharani, S.D., Susanti, R., Indarti, L.H., & Syamsi, A. (2022). Integrating HOTS-based student electronic worksheet: Teaching styles in elementary school during the covid-19 pandemic. Journal of Social Studies Education Research. 13 (3), 98-119. https://www.bulenttarman.com/index.php/jsser/article/view/4016

Maksum, H. & Purwanto, W. (2022). The development of electronic teaching module for implementation of project-based learning during the pandemic. International Journal of Education in Mathematics, Science, and Technology (IJEMST), 10(2), 293-307. https://doi.org/10.46328/ijemst.2247

Mamun, M.A.A, Lawrie, G., & Wright, T. (2020). Instructional design of scaffolded online learning modules for self-directed and inquiry-based learning environments. Computers & Education. 144. https://doi.org/10.1016/j.compedu.2019.103695

Maniotes, L. K., & Kuhlthau, C. C. (2014). Making the shift: From traditional research to guiding inquiry learning. Knowledge Quest, 43(2), 8–17. http://files.eric.ed.gov/fulltext/EJ1045936.pdf

Maulyda, M. A., Hidayati, V. R., Rosyidah, A. N. K., & Nurmawati, I. (2019). Problem-solving ability of primary school teachers based on Polya's method in Mataram City. Pythagoras: Jurnal Pendidikan Matematika, 14(2), 139-149. http://dx.doi.org/10.21831/pg.v14i2.28686

McCormick, N. J., Clark, L. M., & Raines, J. M. (2015). Engaging students in critical thinking and problem solving: A brief review of the literature. Journal of Studies in Education, 5(2), 100–113. https://doi.org/10.5296/jse.v5i4.8249

Meng, Q., Jia, J., & Zhang, Z. (2020). A framework of smart pedagogy based on the facilitating of high order thinking skills. Interactive Technology and Smart Education, 17(3), 251–266. https://doi.org/10.1108/itse-11-2019-0076

Miedijensky, S., Sasson, I., & Yehuda, I. (2021). Teachers' learning communities for developing high order thinking skills—a case study of a school pedagogical change. Interchange, 52, 577–598. https://doi.org/10.1007/s10780-021-09423-7

Mitani, H. (2021). Test score gaps in higher order thinking skills: Exploring instructional practices to improve the skills and narrow the gaps. AERA Open, 7, 1-23. https://doi.org/10.1177/23328584211016470

Morris, T. H. (2020). Creativity through self-directed learning: Three distinct dimensions of teacher support. International Journal of Lifelong Education, 1–11.

doi:10.1080/02601370.2020.1727577

Nartiningrum, N., & Nugroho, A. (2020). Online learning amidst global pandemic: efl students, challenges, suggestions, and needed materials. English Franca: Academic Journal of English Language and Education. 4 (2). 115-140. http://dx.doi.org/10.29240/ef.v4i2.1494

Nugent, A., Lodge, Jason, Carroll, Annemaree, Bagraith, Rupert, MacMahon, Stephanie, Matthews, Kelly E., & Sah, P. (2018). Higher education learning framework: an evidence informed model for university learning. Brisbane, Australia: The University of Queensland.https://doi.org/10.14264/348c85f

Ozdal, H., Ozden, C., Atasoy, R., & Guneyli, A. (2022) Effectiveness of self-regulated learning skills on web-based instruction attitudes in online environments. Pegem Journal of Education and Instruction, 12(1), 182-192. https://doi.org/10.47750/pegegog.12.01.18

Pratama, G. S., & Retnawati, H. (2018). Urgency of higher order thinking skills (HOTS) content analysis in mathematics textbook. Journal of Physics: Conference Series, 1097(1), 1-8. https://doi.org/10.1088/1742-6596/1097/1/012147

Pursitasari, I.D., Suhardi, E. Putra, A.P., & Rachman, I. (2020). Enhancement of student's critical thinking skill through science context-based inquiry learning. Jurnal Pendidikan IPA Indonesia, 9(1), 97-105. https://doi.org/10.15294/jpii.v9i1.21884

Putranta, H., & Supahar. (2019). Synthesis of the cognitive aspects' science literacy and higher order thinking skills (HOTS) in chapter momentum and impulse. Journal of Physics: Conference Series, 1397(1). https://doi.org/10.1088/1742-6596/1397/1/012014.

Qondias, D., Lasmawan, I W.,; Dantes, N; Arnyana, IBP (2022). Effectiveness of multicultural problem-based learning models in improving social attitudes and critical thinking skills of elementary school students in thematic instruction. Journal of Education and e-Learning Research, 9(2): 62-70. DOI: 10.20448/jeelr.v9i2.3812

Rahayu, S., Ladamay, I., Kumala, F.N, Susanti, R.H., Purwono, B.S.A. (2022). Development of fun high order thinking skill (HOTS) based thematic learning electronic LKPD to increase the intensity of independent learning of elementary school students. Journal of Positive School Psychology. 6 (4).10731-10739.

Rahmi, U. & Azrul. (2022). Optimizing the discussion methods in blended learning to improve student's high order thinking skills. Pagem Journal of Education and Instruction, 12 (3), 190-196. https://doi.org/10.47750/pegegog.12.03.20

Rapanta, C., Botturi, L., Goodyear, P., Guàrdia, L., & Koole, M. (2020). Online university teaching during and after the covid-19 crisis: Refocusing teacher presence and learning activity. Postdigital Science and Education. 2. 923-945. https://doi.org/10.1007/s42438-020-00155-y

Russell, J. M., Baik, C., Ryan, A. T., & Molloy, E. (2020). Fostering self-regulated learning in higher education: Making self-regulation visible. Active Learning in Higher Education. doi:10.1177/1469787420982378

Saepuzaman, D., Istiyono, E., & Haryanto. (2022). Characteristics of fundamental physics higher-order thinking skills test using item response theory analysis. Pegem Journal of Education and Instruction, 12 (4), 269-279. https://doi.org/10.47750/pegegog.12.04.28

Samri, F., Rewo, J.M., & Laksana, D.N.L. (2020). Electronic thematic teaching multimedia with local culture based materials and its effect on conceptual mastery of primary school students. European Journal of Education Studies, 7 (12), 625-641. doi: http://dx.doi.org/10.46827/ejes.v7i12.3474

Saraswati, P. M. S., & Agustika, G. N. S. (2020). Kemampuan berpikir tingkat tinggi dalam menyelesaikan soal HOTS mata pelajaran matematika (Higher order thinking skill to answer HOTS questions in math class). Jurnal Ilmiah Sekolah Dasar Undiksha, 4(2). http://dx.doi.org/10.23887/jisd.v4i2.25336

Sari, D. M. M., & Prasetyo, Y. (2021). Project-based-learning on critical reading course to enhance critical thinking skills. Studies in English Language and Education. 8 (2). 442-456. https://doi.org/10.24815/siele.v8i2.18407

Saripudin, D., Abdulkarim , A., Komalasari, K. (2018). Culture-based social studies learning model in developing student multiculturalism. The Central European Journalof Social Sciences and Humanities. 51. 173-183. https://doi.org/10.15804/tner.2018.51.1.14

Sarnely, U., Amos, N., & Mahmuddin, Y. (2019). Development of social studies learning model based on local wisdom in improving students' knowledge and social attitude. International Journal of Instruction. 12 (3). 375-388. https://doi.org/10.29333/iji.2019.12323a

Seels, B.B. & Richey, R.C. (1994). Instructional technology: The definition and domains of the field. Washington, DC: AECT

Simamora, R. E., Saragih, S., & Hasratuddin. (2019). Improving students' mathematical problem solving ability and self-efficacy through guided discovery learning in local culture context. International Electronic Journal of Mathematics Education. 14 (1). https://doi.org/10.12973/iejme/3966

Simamora, R.E., Saragih, S., Hasratuddin. (2019). Improving students' mathematical problem solving ability and self-efficacy through guided discovery learning in local culture context. International Electronic Journal of Mathematics Education. 14(1). 61-72. https://doi.org/10.12973/iejme/3966

Singh, J., Steele, K. & Singh, L. (2021). Combining the best of online and face-to-face learning: Hybrid and blended learning approach for covid-19, post vaccine, and post-pandemic world. Journal of Educational Technology Systems, 50(2), 140-171. https://doi.org/10.1177/00472395211047865

Siregar, A., Sinaga, B., Syahputra, H. (2021). Development of mandailing culture-based learning devices with an open-ended approach to improve students 'mathematic connection and self-efficiency abilities SMPN 2 Batangtoru. Budapest International Research and Critics in Linguistics and Education (BirLE) Journal. 4 (1). 226-238. https://doi.org/10.33258/birle.v4i1.15802

Sofyan, H., Anggereini, E., & Saadiah, J. (2019). Development of e-modules based on local wisdomi in central learning model at kindergartens in Jambi City. European Journal of Educational Research, 8(4), 1137-1143. http://doi.org/10.12973/eu-jer.8.4.1137

Suardana, I.N., Redhana, I.W., A. A. Sudiatmika, A.A.I.A.R., & Selamat, I.N. (2018). Students' critical thinking skills in chemistry learning using local culture-based 7e learning cycle model. International Journal of Instruction. 11(2). 399-412.https://eric.ed.gov/?id=EJ1174908

Sudatha, G.W.I., Degeng, N.S.I., & Kamdi, W. (2018). The effect

of visualization type and student spatial abilities on learning achievement. Journal of Baltic Science Education, 17(4), 551-563. doi: https://doi.org/10.33225/jbse/18.17.551

Sudatha, I.G.W., & Simamora, A.H. (2021). The effectiveness of using dynamic visualization in natural science learning to improve students' understanding in junior high schools. Journal of Educational Science and Technology, 7 (1), 32-39. doi: https://doi.org/10.26858/est.v7i1.17681

Suhendro, Sugandi, D., & Ruhimat, M. (2021). The urgency of HOTS-oriented learning and assessment towards quality of education in facing indonesia sustainable development goals (SDGs) 2030. Proceedings of the 5th Asian Education Symposium 2020 (AES 2020), 566, 237–250. https://doi.org/10.2991/assehr.k.210715.052

Sukatiman, S., Akhyar, M., Siswandari, & Roemintoyo. (2020). Enhancing higher-order thinking skills in vocational education through scaffolding-problem based learning. Open Engineering, 10(1), 612–619. https://doi.org/10.1515/eng-2020-0070

Sutiani, A., Situmorang, M., & Silalahi, A. (2021). Implementation of an Inquiry Learning Model with Science Literacy to Improve Student Critical Thinking Skills. International Journal of Instruction, 14(2), 117-138. https://doi.org/10.29333/iji.2021.1428a

Syafril, Rahmi, U., & Azrul. (2022). The development of case study teaching materials for prospective teachers in LPTK. Pegem Journal of Education and Instruction, 12 (2), 193-199. https://doi.org/10.47750/pegegog.12.02.19

Toker, S., & Baturay, M. H. (2022). Developing disposition to critical thinking and problem-solving perception in ınstructional design projects for producing digital materials. International Journal of Technology and Design Education, 32(2), 1267-1292. https://doi.org/10.1007/s10798-020-09646-2

Triwahyuningtyas, D., Ningtyas, A.S., & Rahayu, S. (2020). The problem-based learning e-module of planes using kvisoft flipbook maker for elementary school students. Jurnal Prima Edukasia, 8(2), 199-208. doi: http://dx.doi.org/10.21831/jpe.v8i2.34446

Turan, M.B., Koc, K. (2018). The impact of self-directed learning readiness on critical thinking and self-efficacy among the students of the school of physical education and sport. International Journal of Higher Education. 7(6), 98-105. doi:10.5430/ijhe.v7n6p9

Tyas, E. H., & Naibaho, L. (2021). HOTS learning model improves the quality of education. International Journal of Research-GRANTHAALAYAH, 9(1), 176–182. https://doi.org/10.29121/granthaalayah.v9.i1.2021.3100

Ucu, C., Sri, S., Erdawati, & Yuli, R. (2019). The influence of web-based learning and learning independence toward student's scientific literacy in chemistry course. International Journal of Instruction. 12 (4). 655-668. https://eric.ed.gov/?id=EJ1230055

Widyawati, A., & Sujatmika, S. (2020). Electronic student worksheet based on ethnoscience increasing HOTS: Literature Review. International Conference on Technology, Education and Sciences.

Wihartanti, L.V., & Wibawa, R. P. (2017). Development of e-learning microsoft sway as innovation of local culture-based learning media. Dinamika Pendidikan. 12 (1). 53-60. https://doi.org/10.15294/dp.v12i1.10582

Wulandari, D.S., Prayitno, B. A., & Maridi, M. (2022). Developing the guided inquiry-based module on the circulatory system to improve student's critical thinking skills. JPBI (Jurnal Pendidikan Biologi Indonesia), 8(1), 77-85. https://doi.org/10.22219/jpbi.v8i1.16512

Yeung, S.S. (2015). The conception of teaching higher-order thinking: perspectives of Chinese teachers in Hong Kong. Curriculum Journal, 26(4), 553–578. https://doi.org/10.1080/09585176.2015.1053818

Zhao, L., He, W., Liu, X., Tai, K.H., & Hong, J.C. (2021). Exploring the effects on fifth graders' concept achievement and scientific epistemological beliefs: applying the prediction-observation-explanation inquiry-based learning model in science education. Journal of Baltic Science Education, 20(4), 664-676. doi: https://doi.org/10.33225/jbse/21.20.664

Zhu, M., Bonk, C. J., Berri, S. (2022). Fostering self-directed learning in MOOCS: motivation, learning strategies, and instruction. Online Learning, 26(1), 153-173. https://doi.org/10.24059/olj.v26i1.2629

Zulfiani, Suwarna, I. P., & Sumantri, M. F. (2020). Science adaptive assessment tool: Kolb's learning style profile and student's higher order thinking skill level. Jurnal Pendidikan IPA Indonesia, 9(2), 194–207. https://doi.org/10.15294/jpii.v9i2.23840.