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Mathematics Learning through Islamic Environmental Ethics: What is the Form?

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Abstract: A Learning mathematics in elementary schools needs to develop student's environmental literacy. For Islamic elementary schools, this is also to promote that Islam is full of values of sustainable living. By integrating mathematics learning through ISLAMIC ENVIRONMENTAL ETHICS (IEE), it is hoped that it can create fun learning while at the same time depicting Islam as environmentally friendly. This paper begins by designing the Integration-Interconnection matrix for four domains. The matrix explains the integration of Mathematics learning through the realms of philosophy, methodology, strategies and materials. After that, a learning implementation matrix was compiled, which included Basic Competencies and ISLAMIC ENVIRONMENTAL ETHICS #1-ISLAMIC ENVIRONMENTAL ETHICS #5. Based on these matrices, an example of the application of learning through ISLAMIC ENVIRONMENTAL ETHICS is given in the form of a mathematics learning project in a waste bank. Learning begins with an introduction to love for the environment with verses and hadiths related to ISLAMIC ENVIRONMENTAL ETHICS. Then continued learning related to activities in the waste bank. Materials that can be discussed include measuring time and weight, rounding decimal numbers, and simple statistics.

Keywords: Islamic Environmental Ethics, mathematics learning, waste bank

Introduction

The world view of Islam is not entirely positive. (Helbling 2012 ; Bayraklı & Hafez 2015; Iner et al 2019). There are still some people who see that Islam is radical and extreme. This is detrimental, because in fact Islam is full of values of peace, caring and compassion (Hidayat 2017; Ilham, Amiruddin & Arif 2020; Islam 2022). On the other hand, learning mathematics still requires innovation and creativity, so that the quality of learning can be maximally implemented.

Learning in schools and madrasas today is inseparable from the responsibility to promote awareness and protect nature. The concept of concern for the environment, among others, appears in various terminologies in various fields, namely: Environmental Education (Riordan & Klein 2010; Nxumalo & Ross 2019), Sustainable

Development Goal (Sadoff, Borgomeo & Uhlenbrook 2020), ESD (Kohl & Hopkins 2019) , Green Learning (Wang et al 2020), Green Company (SWA, Issue 21, 2020), Green Accounting (Bartelmus & Seifert (Eds.) 2018), Green Architecture (Ragheb, El-Shimy & Ragheb (2016), Green Business (SWA, 13rd Edition, 2012). Even this concept of caring for the environment should be integrated into mathematics learning (Spiropoulou, Roussos & Voutirakis 2005 ; Piqueras and Gallardo 2021)

Mathematics learning needs to be designed so that students enjoy learning, happy and have fun. Fun math learning, will be able to explore the potential of students well. (Setiyadi et al 2017; PRINOTAMA, LARASATI & ROOSYANTI 2019). Learning mathematics through outdoor learning can increase participation, curiosity and creative thinking (Auliandari, Agusta & Bintari 2019; Harris

& Bilton 2019; van Kraalingen 2021). For this reason, mathematics learning can be developed through outdoor learning that is integrated with the values of environmental concern based on Islamic values.

Why is it necessary to explore Islamic values related to the environment? We all understand that the understanding and application of Islamic values influences the view of Islam itself. It is time for adherents of Islam to bring up Islamic values that have inclusive values. That is, Islam which is very concerned about preserving the earth, preserving nature and so on, is an inclusive value that needs to be campaigned for. (Fathil et al 2015; Khalid 2019).

Materials and Methods

The research method of this paper is the early stage development method. Referring to the ADDIE model, the implementation of this paper is in the Define, Design, and Develop stages. (Rayanto 2020; Spatioti, A. G., Kazanidis, I., & Pange 2022) The Implementation and Evaluation stages are not done yet. The define stage contains procedures for analyzing Competencies standard and Basic Competencies in elementary school mathematics. Then compiling grades -Islamic Environmental Ethics values based on various references. As for the design stage, the researcher compiled the integration matrix of learning mathematics through 4 domains, namely the philosophy, methodology, strategy and material domains. And the develop stage the researcher carried out the development of the integration matrix, namely compiling an integration table consisting of Basic Competencies components, IEE values, learning activities and assessments.

Results and Discussion

This section content three results: IEE values, Integration matrix with 4 domains, and matrix of activities and assessment.

Result-1 (Islamic Environmental Ethics)

The term Islamic Environmental Ethics began to be used by Samarrai in 1990 in his article entitled: Islamic Environmental Ethics, Law, and Society Ethics of Environment and Development. (Gottlieb 2004) and by Fazlun Khalid in Richard C. Foltz's (Editor) book entitled Environmentalism in the Muslim World (Khalid 2005). The IEE principles in this paper specifically cover how to treat water, animals, plants, earth and air (Manoiu et al 2016; Mian, Khan, & Rahman 2013)

IEE 1 (Ethics for Water)

Water as a source of life is contained in the Qur'an 21:30, 25:54, 24:45 (Santoso, 2014) Also, Islam has a great attention to the importance water resources and its equipment in the form of rivers and so on. The attention is seen in the many mention of the term water (maa '), rivers and rivers (nahr and anhar), drinking water 63 times, 54 and 39 times each in the Qur'an (Naff 2009; Nisa 2017).

IEE2 (Ethics for Animals)

Islam recommends very good treatment of animals. Procedures for caring for, using as a mount, slaughtering sacrificial animals and other things are regulated in the hadiths and the Qur'an. (Awaludin 2017; Awan & Rahim 2018). Islamic attention in reminding people of the awareness of the creation of animals for the benefit of humans is contained in several verses of the Qur'an as follows. QS. 16 (An Nahl) verse 5: Farm animals for their feathers and food use. QS.16 (An Nahl) verse 7: animals are used to lift weights, Verse 8: horses, mules and donkeys for mounts and jewellery; QS 22 (Al-Hajj): camel for food and *sodaqoh* (Tasgheer & Anwar 2021).

IEE 3 (Ethics for Plant)

Islam has a deep attention to the relationship between humans and plants. It is contained in the Qur'an QS An-Nahl: 141 (Mamat & Mahamood 2017), which explains the importance of using plants without overdoing it. The importance of planting trees, planting trees as sodaqoh (if there are animals and humans use them), it is prohibited to cut trees without specific reasons; commanded by the Prophet in his hadith (Gul & Ali 2018).

IEE 4 (Ethics for Earth)

Islam refers to humans as the khalifah fil-ard (God's representative on earth). The meaning of the representatives of God, God Almighty, Merciful, Preserver, and 99 Asmaul-husna, then, of course, the weight and full of honour of the task of the Caliphate. Mention of humans as the caliph at the earth has shown the concern of Islam for the preservation of life on earth (Mardliyah, Sunardi, & Agung, 2018). In the Koran mentioned khalifah fil-ard, among others, on QS. Al-Baqarah (2): 30, which is having faith and doing good deeds, then God will make them (humans) as rulers of the earth. (Q.S. An-Nur (24): 55). Broadly speaking, these verses show the task of humans is to protect the earth in its entirety. It is also as stated in Q.S. Al-An'am: 165 (Iqbal 2016).

IEE 5 (Ethics for Air)

Islamic Environment Ethics about air has to do with the importance of humans protecting water. Water availability is related to the smooth process of the water cycle (Bellette and G. Lee, 2003). This is stated in the Qur'an QS 56: 68-70. How does God send wind (air) to barren regions to make it rain, also written in the Qur'an, namely: QS 7:57 (Manoiu et al 2016)

Result-2 (Integration Matrix with four Domains)

To implement IEE-based learning, it is necessary to prepare a matrix first. This matrix refers to the

integration-interconnection matrix of Islamic values in learning through 4 domains (Abdullah 2006; Siswanto 2013). In the 4th domain, you can fill in IEE points number 1 to 5. In the matrix in this paper, Domain 1 = D1 = philosophy domain, Domain 2 = D2 = methodology domain, then Domain 3 = D3 = strategy domain and Domain 4 = D4 = material domain.

Result 2 (Integration Matrix with four Domains)

To implement IEE-based learning, it is necessary to prepare a matrix first. This matrix refers to the integration-interconnection matrix of Islamic values in learning through 4 domains (Abdullah, 2006; Siswanto 2013). In the 4th domain, you can fill in IEE points number 1 to 5. In the matrix in this paper, Domain 1 = D1 = philosophy domain, Domain 2 = D2 = methodology domain, then Domain 3 = D3 = strategy domain and Domain 4 = D4 = material domain. Then BC= basic competence, H=hadith, Q= Qur'an verse

Table 1 Matrix of integration of Basic Competencies with 4 domains

NO	BC	D1	D2	D3	D4	NOTE 1	NOTE 2
1	BC1	Q 1			IEE 3	Math tools: leaves and flowers	Use second hand box for keep the math tools
2	BC2				IEE 2	Livestock	
3	BC3	Q 2		Problem Based Learning	IEE 5	Volume of gas	Online reading

4	BC4	H1			IEE4	Math tools: bottle caps, saving the world from plastic	Buy and sell activity in the animal market :online reading sources
5	BC5	H2		Project Based Learning	IEE1	Volume of water, velocity, rasio	

The following is an example of a case in grade 3 mathematics learning, integrating IEE 4.

Table 2. Matrix of integration of Basic Competency#3.7 and #4.7 interconnection with 4 domains.

NO	BC	D1	D2	D3	D4	NOTE 1	NOTE 2
1	BC1:3.7	Q1		Project Based Learning	IEE4	Math activity in the waste bank	Use recycle box for keep the math tools
2	BC2: 4.7	H1			IEE4	Math activity in the waste bank	

Result 3 (*Integration Matrix of Learning Activity and Assessment*)

After compiling the integration matrix of the 4 domains and the selected basic competency matrix, the next step is compiling a more operational matrix containing the learning activities and assessments to be carried out. Planning these learning activities, the intention is that the learning carried out will be effective. (Conole & Fill 2005).

Discussion

Learning with multidisciplinary, transdisciplinary and interdisciplinary dimensions has several advantages, including to bring closer contact between general science and Islamic studies. (Abdullah, 2020). This paper provides an example,

an implementation idea regarding interdisciplinary learning between mathematics learning through integration with Islamic Environmental Ethics (IEE). Mathematics learning that is integrated with environmental concern has been carried out a lot. (Hidayati et al, 2008; Astuti, 2018; Emeraldal & Soesanto, 2022). Integration through Christian religious education and social environmental care. This paper integrates mathematics learning, specific concern with the environment based on its values in Islam. The implementation of this paper uses project based learning which is in line with several previous studies. Implementation with Project based learning can improve mathematics learning outcomes (Farida 2018; Prabowo, Saputra, & Atharina 2020). Project based learning with learning outside the classroom will improve several aspects of students' abilities. This is in accordance with the results of research, namely learning with outdoor learning improves critical thinking (Crismono 2017) and improves problem solving abilities (Taqwan 2019). This paper has only reached the learning design stage, so that research can be developed regarding other aspects and variables. Specifically in this paper, outdoor learning uses the facilities and exploration of the waste bank.

Conclusions

The form of math learning through the Islamic Environmental Ethics is started with making the integration matrices. The first is matrix about the integration math learning in the 4 domains. Then making the matrix/table of the learning activity through IEE. The implementation in the classroom must pay attention of the using hadith and ayah for giving inspiration and the basic of Islamic values for student. Exploring the waste bank is one of the alternative activity as the outdoor learning.

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Prediction of Central Asia Bank's Stock Price using Support Vector Regression Method

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Abstract: The capital market in Indonesia is a developing market that is very vulnerable to global economic conditions and world capital markets. There is a term mostly found in the capital market, namely investment. Investment is a form of delaying consumption from the present to the future where there is a risk of uncertainty. In capital market investment, it is necessary to analyse stock price predictions to find out stock prices in the future by using historical stock prices because stock prices change quickly from time to time, making the shareholder immediately decide when the shares should be sold or retained. This study aims to obtain stock price predictions and model implementation and determine the model's accuracy in predicting a stock's movement to benefit from each stock price that changes from time to time or can be referred to as time series data. Therefore, we need a method that can predict stock prices. In this study, the predicted stocks are BCA stock data using the SVR algorithm with linear and RBF kernels. SVR has advantages in making accurate stock price predictions and can overcome overfitting problems. From several studies conducted, SVR provides optimal results for stock price prediction analysis. Based on the results of the research for BCA shares, it can be concluded that the SVR algorithm has an excellent predictive accuracy value with a linear kernel function with the help of a grid search using a k-fold Cross-validation of 3, which has an R-square value of training data of 93.79% and an R-square data testing is 92.98%, Mean Absolute Percentage Error (MAPE) training data is 0.2340, and MAPE data testing is 0.1021, Root Mean Square Error (RMSE) training data is 0.0597, and RMSE data testing is 0.0499. This algorithm shows that the SVR method is suitable for predicting stock prices.

Keywords: Prediction, Stock, Support Vector Regression, Time Series.

Introduction

The capital market in Indonesia is a developing market that is very vulnerable to global economic conditions and world capital markets (Septiningrum et al. 2015). There is a term that is often found in the capital market, namely investment. Investment is a form of delaying consumption from the present to the future where there is a risk of uncertainty (Dwi and Pengembangan, 2015).

Stock price prediction is an analytical technique to determine future stock prices using past historical stock prices. Stock price predictions are beneficial for investors who are engaged in buying and selling stocks. This technique avoids losses due to the nature of stock prices which move lucratively and tend to be dynamic at any time, so

stock price predictions are needed to maximize profits for investors (Yudhawan, 2020).

Changes in stock prices that are relatively fast from time to time make shareholders immediately decide when shares should be sold or maintained. An accurate predictive model for stock price movements can assist investors in making stock transaction decisions because stock price movements tend to be non-linear, which makes it difficult for investors to make predictions. Therefore, predicting stock price movements is still a hot topic for discussion in buying and selling stocks. Thus, there is research on predictions using several models (Fadilah et al. 2020). Stock data is time series data that moves continuously over time, and this is a characteristic of time series models to produce excellent and optimal predictions. (Rahmadayanti et al. 2018).

The Support Vector Machine (SVM) algorithm is a classification method that can produce a learning process or learning which is then separated by a line called a hyperplane into two groups. The SVM used for the regression approach is the Support Vector Regression (SVR) method. The concept of SVR is to maximize the hyperplane to obtain support vector data (Septiningrum et al. 2015).

Problems in the real world are rarely linear and more non-linear (Jondri and Saepudin, 2015). To solve this non-linear problem, the kernel function is used. The kernel function is a function that maps data to a higher dimensional space in the hope that the data will have a better structure so that it is easier to separate. Four kernel functions are widely used: linear, sigmoid, radial basis function (RBF), and polynomial kernel functions (Neneng and Asep, 2019). Kernels often used in the SVR method for predicting stock prices more often use linear and RBF kernels because these kernels provide better results for predicting stock prices.

Several previous studies have carried out stock prediction analysis using the SVR method. Research conducted by Yudhawan (2020) regarding the implementation of SVR for forecasting the stock prices of mining companies in Indonesia. The results showed that the prediction analysis of ADRO, PTBA, and ITMG stock prices using the SVR algorithm had good predictive accuracy. The accuracy used is the value of R-square and Mean Absolute Percentage Error (MAPE).

Henrique et al. (2018) researched predicting stock prices using SVM on daily and minute data. The results showed that the SVR obtained lower prediction results than the random walk model. Using linear kernels and RBF produces more minor errors than random walk models for almost all daily stock prices.

The author wants to do research on predicting Bank Central Asia stock prices using the SVR method with linear kernels and RBF.

Materials and Methods

Study area1. Support Vector Regression (SVR) Model
SVR is the application of the SVM algorithm in the regression case. The SVR method applies machine learning theory to regression cases that produce real or continuous numbers. The concept of the SVR algorithm can produce good forecasting values because SVR can solve overfitting problems.

- Forecasting using SVR considers the relationship between the values in the \mathbf{y}_t period and the values of the previous time series data elements, using several time lags. The regression function of the SVR method is formulated in the equation:

$$f(\mathbf{x}_i) = \langle \mathbf{w}, \mathbf{x}_i \rangle + \mathbf{b}$$

Where $\langle \cdot, \cdot \rangle$ are the results of the dot product in the input space. The coefficients \mathbf{w} and \mathbf{b} are the weights and biases. The coefficient of the equation above can be estimated by minimizing the following risk function.

$$\min_{\mathbf{w}, \xi_i, \xi_i^*} \frac{1}{2} \|\mathbf{w}\|^2 + C \sum_{i=1}^n (\xi_i + \xi_i^*)$$

with the provision of

$$\begin{aligned} \mathbf{y}_i - \langle \mathbf{w}, \mathbf{x}_i \rangle - \mathbf{b} &\leq \varepsilon + \xi_i \\ \langle \mathbf{w}, \mathbf{x}_i \rangle + \mathbf{b} - \mathbf{y}_i &\leq \varepsilon + \xi_i^* \\ \xi_i, \xi_i^* &\geq 0 \end{aligned}$$

The constant C (cost) > 0 is a penalty governing the trade-off between the tolerable upper bound for errors of more than ε and the "flatness" of the function f . The "flatness" in the previous equation means the minor \mathbf{w} and can be found by regularizing the function, which is the norm of \mathbf{w} .

2. Kernel Function

To solve non-linear problems, kernel functions are used. To solve linear problems in high-dimensional space, all you have to do is replace the inner products (x_i and x_j) with the appropriate kernel functions. The SVR is modified by incorporating kernel methods so that the kernel function must be positive to guarantee a unique optimal solution to the square of the optimization problem. The kernel functions used in this study are shown in the table below.

Table 1. Kernel functions in SVR.

Kernel Function	Definition
Linear	$K(x_i, x) = x_i \cdot x$
Polynomial	$K(x_i, x) = (x_i \cdot x + c)^d$
Radial Basis Function	$K(x_i, x) = \exp\left(-\gamma \ x_i - x\ ^2\right)$ With $\gamma = \frac{1}{2\sigma^2}, \gamma > 0$
Sigmoid	$K(x_i, x) = \tanh(\sigma(x_i \cdot x + c))$

3. Grid Search Algorithm

This algorithm divides the range of parameters to be optimized into grids and traverses all points to get the optimal parameters. The grid search algorithm is usually measured by cross-validation on training data in its application. These parameters must be set before the training process is carried out, commonly called hyperparameters. The hyperparameters that play a role in the SVR method are the types of kernel functions and their parameters, namely γ and d as well as parameters C and ϵ .

4. Coefficient of Determination (R^2)

The coefficient of determination (R^2) measures the proportion of the variation in the dependent variable that the independent variables can explain in the model. R^2 shows the goodness of the model. The bigger the R^2 , the better the model. R^2 value between 0 to 1 or 0% to 100%.

5. Mean Absolute Percentage Error (MAPE)

The selection of the best forecasting method is based on the error rate. The smaller the error rate, the forecasting results are closer to the actual value. The method used to measure errors is MAPE.

$$MAPE = \frac{\sum \left| \frac{y_t - \hat{y}_t}{y_t} \right|}{n} \times 100\%$$

Table 2. Criteria for Accuracy of Forecasting Results with MAPE

Value	Criteria
< 10%	Very Good
10 – 20%	Good
20 – 50%	Enough
> 50%	Bad

6. Root Mean Square Error (RMSE)

Root mean square error (RMSE) is a parameter used to evaluate the result value of a measurement to the actual value or the value considered correct.

The smaller the RMSE value, the closer the data clustering is to accuracy. In general, the equation used to calculate the RMSE value is as follows.

$$RMSE = \sqrt{\frac{(x' - x)^2 + (y' - y)^2}{n}}$$

Procedures

There are several stages and procedures to implement the best model to predict Bank Central Asia's stock price movements using the SVR method. The following are the steps used in this study.

- (1) Collect the data then the data that used in this study is secondary data obtained from yahoo.finance.com. In this dataset, there are as many as 2976 data records.
- (2) Perform data pre-processing with data scaling, data is scaled using a min-max scaler with a range of 0-1 and dividing the data into training and test data with a ratio of 80% and 20%.
- (3) Conduct model training using the SVR method on training data that has been pre-processed data, then proceed with test data. The model is built using the Python application.
- (4) Evaluate the best model obtained using test data based on R^2 and MAPE. Evaluate the comparison of the results obtained from the SVR method using linear and RBF kernels.
- (5) Forecasting the closing price of shares for the next 10 days.
- (6) Implement the results of the best model accuracy.

Data analysis

This study uses stock price data from Bank Central Asia at yahoo.finance.com. The data is closing daily data from 28 September 2010 – 28 September 2022.

Results and Discussion

Identification Model

This study uses secondary data, namely daily data on the closing stock price of BCA from 2010 to 2022. There are 2,976 closing stock price data

divided into two, training data and test data, with 80% training data and 20% test data. Identification of the training data plot for the closing stock price of BCA is presented in Figure 1.

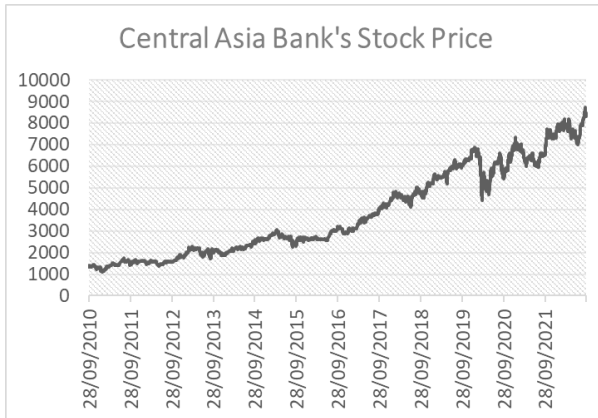


Figure 1. The plot of output indicators

The plot above shows that the plot of the closing stock price data for BCA indicates an upward trend pattern, even though there is a decline at certain times.

Analysis with the SVR method

In the initial step, after dividing the data into training and test data, the data is scaled using the min-max scale. Forecasting using SVR considers the relationship between the value in the period yt and the value of the previous time series data elements, using several time lags. SVR has the concept of determining parameters to form a model so that the support vector enters the hyperplane area to form an optimal regression model.

The parameters used to form the model in this study are linear and radial basis function kernel parameters. The linear kernel has C parameters, while the RBF kernel uses C and γ parameters. Next, the determination of the range of parameters C and γ is carried out, as shown in Table 3.

Table 3. Parameter range

Parameter	Value Range
C	$10^{-4}, 10^{-3}, 10^{-2}, \dots, 10^3$
γ	$10^{-5}, 10^{-4}, 10^{-3}, \dots, 10^1$

The best parameters and kernels are determined by tuning the SVR using a grid search and k-fold cross-validation with $k = 3$ in training on training data. The performance of the model formed is measured using the accuracy values of R-square, MAPE, and RMSE. The closer the R-square value is to 1, the better the model. The best parameter is seen from the minor error value. The results are presented in Table 4.

Table 4. Best parameter

C	Kernel
10^1	Linear

The analysis results in predicting the closing stock price of BCA using the SVR method obtained the best parameters, namely C of 10 and a linear kernel with MAPE, R^2 , and RMSE values on the test data of 0.1021, 97.8%, and 0.0499. Then these results are used to predict the closing share price of BCA. The comparison plot between the training data and the forecast results can be seen in Figure 2. The orange plot shows the value of the training data, while the blue one is the forecast result. It can be seen that the forecast data pattern follows the original data pattern.

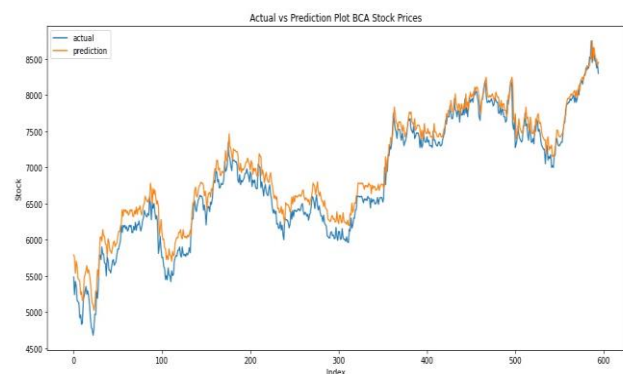


Figure 2. Actual vs prediction BCA stock prices plot

After the model and forecasting results are obtained, an evaluation is needed to measure the accuracy of these results. Evaluation of forecasting results using MAPE, R-square and RMSE values. Table 5. Displays the evaluation value of forecasting results using the SVR method.

Table 5. Evaluation of SVR Method Forecasting Results

Data	MAPE	R-SQUARE	RMSE
Training	0.2340	99.8%	0.0597
Testing	0.1021	97.8%	0.0499

It can be seen in Table 5 above. The table shows that the accuracy of forecasting results on training and test data has excellent results.

Forecasting the next 10 days periods

From the experimental results of the parameters to form the support vector regression model that has been done, the next step is to forecast stock prices using the best model that has been formed before. The model generated from stock data shows good performance. The line graph of actual stock data and stock predictions shows that the forecasting data plot follows the actual data plot, which means that the forecasting data is not much different from the actual data.

The following table will display prediction and actual data on BCA shares using the best model that has been determined.

Table 6. Comparison of Actual and Predictive Data on BCA Shares

Date	Actual	Predictive
4/14/2020	5485	5788
4/15/2020	5240	5761
4/16/2020	5425	5536
4/17/2020	5355	5706
4/20/2020	5160	5642
:	:	:
9/21/2022	8475	8567
9/22/2022	8475	8498
9/23/2022	8375	8498
9/26/2022	8425	8407
9/27/2022	8300	8452

The results of predictions made for the following 10 periods on BCA daily shares with a predetermined model are as follows:

Table 7. Forecasting closing price of the stock for the following 10 periods

Date	Forecast
28-Sep-22	7974
29-Sep-22	8039
30-Sep-22	8099
03-Oct-22	8154
04-Oct-22	8205
05-Oct-22	8251
06-Oct-22	8293
07-Oct-22	8331
10-Oct-22	8367
11-Oct-22	8399

Table 7 shows the stock price forecasting for BCA, which shows that the stock price forecasting results use the SVR model with a linear kernel with parameter C = 10 for the following 10 periods. From the forecasting results, the share price of BCA has increased.

Discussion

This research used the support vector regression method to predict the closing price of shares, which can assist in predicting the movement of Bank Central Asia's stock prices using the SVR method with a linear kernel and RBF. In addition, the model can be applied for forecasting many stock predictions to detect future predictions so that the shareholders of the stocks can minimize the impact of loss.

Conclusions

Based on the results of the research for BCA shares, it can be concluded that the SVR algorithm has an excellent predictive accuracy value with a linear kernel function with the help of a grid search using a k-fold Cross-validation of 3, which has an R-square value of training data of 93.79% and an R-square data testing is 92.98%, Mean Absolute Percentage Error (MAPE) training data is 0.2340, and MAPE data testing is 0.1021, Root Mean Square Error (RMSE) training data is 0.0597, and RMSE data testing is 0.0499. This algorithm shows that the SVR method with linear kernel is suitable for predicting stock prices.

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The Earth Formation Process Analysis According to Science and Quran

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Abstract: The process of the formation of the earth has been explained in the Qur'an which has been interpreted by many scholars. Theories of the formation of the earth have also been expressed by previous scientists such as the big bang theory, nebula theory, planetesimal theory, tidal theory, and dust cloud theory. The formation of the earth can be observed not only based on science. But the process of the formation of the earth has been written in the Qur'an long before the creation of the earth and its contents. This paper aims to find out the process of creating the earth based on the Qur'an and science. The writings were arranged using library Research Method. With data collection techniques, namely reviewing scientific articles, books, or other sources of information in print or electronic form that are in accordance with the topic discussed in this paper. The data is then reviewed and analyzed so that conclusions are obtained. Allah wrote the process of creating the earth in the Koran, which was then explained by the big bang theory. In the big bang theory, the beginning of the creation of the earth stems from a big explosion whose effects are felt to this day. It is hoped that this article can add insight and faith to readers.

Keywords: Formation of Earth, Big Bang, Qur'an.

Introduction

Earth formation occurred around 4.5 billion years ago. Earth was formed from leaking gas and then transformed into a process that can last anywhere from 10 to 20 years. The primary composition of the body is the substance that transforms the body into the only planet on the planet. To become the third planet, as well as the second planet, has resulted in the creation of an optimum living environment. This position allows the body to have a stable temperature among other planets, allowing it to be less dingy and more peaceful.

Awakening bumi is a life-changing experience for humans. However, through developing theories, fisikawan can get insight into the process of developing bodies. The theory of big bang is the most well-known theory of brain development.

The big bang theory reveals that the world formed in space and then grew in size, attracting everything around the lump to the center.

The process of earth formation is also outlined in the Koran, which many experts have read. Previous scientists' theories on the genesis of the earth have likewise become their property. In the Koran, Allah describes the process of creating the cosmos. Some are worldwide, while others are more specific.

Materials and Methods

This paper was written utilizing the process of literature review. Whereas, literature research is the process of gathering data via reading, writing, and analyzing the material received with the problems to be related (zed, 2008). This article

relies on secondary data. Secondary data, according to Sugiyono, is indirect data derived from other individuals or documents (Sugiyono, 2012).

Results and Discussion

The end product is a succinct response to the article's headline.

1st Result:

According to science, the big bang theory explains how the planet formed. That the world was formed by a massive explosion around 4.5 billion years ago. The earth's primary constituents are dust and gas. Several scientists and NASA have confirmed this notion.

Result 2: According to the Quran, the process of earth formation has been written down. Surah Al-Araf verse 54 is one among them. Allah tells us in this Quran that the earth was created in six days. The day mentioned in the text is yet unknown. Are days calculated in human terms or 1000 years calculated in human terms?

Result 3: The scientists' explanation of the big bang hypothesis in terms of size may already be linked with QS al-Araf verse 54, which states that scientists can describe the 6-day procedure of constructing the planet. Although the reason requires further investigation

1. According to Science, Earth's Formation

Modern scientists believe that the big bang hypothesis is the most likely explanation for the earth's genesis. Many investigations, observations, and physics calculations are now indicating that the planet was formed by a huge explosion 15 billion years ago (Andriana, 2009).

With his theory of relativity, Einstein asserts that the cosmos does not come to an end (Mcevoy and Zarate, 2005). Einstein discovered the proper solution to his cosmological constant equations. He did so because astronomers told Einstein that there

was no other way to verify the equations correct at the time. Einstein recognized that his cosmological constant equation was incorrect.

The big bang hypothesis was proposed by George Gamow and his collaborators Ralph Alpher, Hans Bethe, and Robert Herman. According to Gamow, radiation was distributed across space following the great explosion. Once upon a time, the cosmos was unified in a massive ball of neutrons and radiant energy.

The radiation released in the cosmos is classified into different phases. The first is the Gamow radiation period. It is predicted that hydrogen fusion generates helium at a temperature of 10 billion degrees 27 during the Gamow radiation. Furthermore, at the age of quark radiation, the existing particles are not organized and overlap each other. At the time of the quark radiation, elemental hydrogen had a density of 1 billion to/cm³. When the universe was 10⁵-10⁶ years old, its temperature was 3000K. Furthermore, at the age of 100 million years-billion years, a spiral gas forms in space, which spins on its axis at the age of 4.5 billion years. That is when the solar system began to develop (Yahya, 2001).

Menurut fisikawan partikel Alan Guth, kecepatan ekspansi alam semesta terus melambat, dan akhirnya kosmos mengalami peristiwa transformasi serentak, membentuk sebuah bola besar yang terus membesar. Setelah itu, Einstein mengusulkan konstanta kosmologis, yang membatasi gerak ekspansi alam semesta.

However, Hubble challenged the constant 28 by stating that there was a red shift, which was supported by Slipher's measurements of the radial velocity of the balls travelling away from the earth. This corresponds to the spectral line that leads to the red wavelength. These findings support the idea that the cosmos is constantly expanding and decreasing.

NASA's high-sensitivity satellites were able to collect some of the radiation from the massive

explosion at the time. This finding adds to the evidence for a large explosion, as well as scientific proof that the cosmos came from nothing (Andriana, 2009).

2. According to Quran, Earth's Formation

The process of earth formation is described in the Qur'an, which has been interpreted by numerous scholars. Previous scientists have also stated theories on the birth of the Earth, such as the big bang hypothesis, nebular theory, planetesimal theory, tidal theory, and dust cloud theory.

Allah discusses the genesis of the world in general and particular passages in the Quran. According to Allah, the process of creating the heavens and the earth took six days.

إِنَّ رَبَّكُمُ اللَّهُ الَّذِي خَلَقَ السَّمَاوَاتِ وَالْأَرْضَ فِي سِتَّةِ أَيَّامٍ ثُمَّ اسْتَوَىٰ عَلَى الْعَرْشِ

Truly, your Lord, Allah, is the One who created the heavens and the world in six days and then ascended to the Throne. Al-A'raf: 54 (QS).

According to Ibnu Katsir in al-Bidayah wa an-Nihayah, the meaning of the day in the Quran verses may be translated into two meanings: 1) the meaning of the day from dawn to sunset based on what humans know, and 2) the meaning of the day in the Quran for 1000 years based on human calculations.

According to Ibnu Katsir's commentary, the process of creating the world lasted six days, on Sunday, Monday, Tuesday, Wednesday, Thursday, and Friday. Saturday is not the day of creation since it is the day of cease.

The Messenger of Allah held my hand then said: "Allah, the Mighty, Most High, has created the land (earth) on Saturday, created mountains on it on Sunday, created trees on Monday, created things that are not liked on Tuesday, created light on Wednesday, and spread the animals to him on Thursday, and created Adam alaihissalam after

Asr on Friday at the end of creation at the end of the time of Friday."

According to Prof. Thomas, space experienced celestial body development in order for celestial bodies and their contents, including the earth, to be created. According to the Quran, the process of producing the heavens and the earth may be described by the big bang hypothesis.

According to the Quran, the earth was created in six days. This can be explained by the big bang theory.

The big bang started the development of the earth, which then generated stars. This term is conveyed in the Quran as the phrase completing the sky. as shown by QS An-Naziat verse 28

...رَفَعَ سَمَكَهَا فَسَوَّاهَا...

"He exalted and developed his structure."

The second stage, which consists of hydrogen and helium gases and dust, then condenses and expands. Then it causes a nuclear reaction, which causes a star to shine before bursting and generating the elements that make up other celestial bodies. This appears to be described further in Fussilat letter verse 11, when Allah states

ثُمَّ اسْتَوَىٰ إِلَى السَّمَاءِ وَهِيَ دُخَانٌ فَقَالَ لَهَا وَلِلْأَرْضِ ائْتِيَا طَوْعًا أَوْ كَرْهًا قَالَتَا أَتَيْنَا طَائِعِينَ .

"Then He went to the sky, and (the sky) was still smoke, and He said to him and to the ground, "Come both of you according to My directions, obediently or forcefully." "We came obediently," the two said.

According to Thomas, the third and fourth phases are the creation of the heavens, which might occur after or before the creation of the world, because the process continues. According to QS An-Naziat verse 31, the fifth stage involves plant growth and water emerging.

أَخْرَجَ مِنْهَا مَاءَهَا وَمَرْعَاهَا

It emits springs and (grows) flora from it. The last stage is the process of photosynthesis, which arose in plants around 2 billion years ago.

Conclusions

The formation of the world may be examined not only via science, but also through the study of the Koran based on expert interpretations. Scientific research can be used to explain the Quranic account of the earth's origin, which lasted six days. However, further tests and verification are required to reinforce this theory. It is intended that through writing this, readers would gain knowledge and trust in the creation of the planet.

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Perceptions and Responses of Prospective Biology Teachers on The Use of Virtual Laboratories in Learning Plant Tissue Biology Material

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Abstract: This study aims to examine the perceptions and responses of prospective biology teachers towards the use of virtual laboratories in teaching plant tissue material. This research involved prospective biology teachers, namely biology education students from universities in Indonesia. Students answered 15 questionnaire questions which were distributed online. Questionnaire result data will be analyzed quantitatively and qualitatively. This study shows the results that prospective biology teacher students have positive perceptions and responses to the use of plant tissue virtual laboratories in biology learning. Biology teacher candidate students strongly agree that the plant tissue virtual laboratory is easier to use in terms of accessing and displaying microscopic visual images of plant tissue. Responses from biology teacher candidate students indicate that they agree to use the plant tissue virtual laboratory as a biology learning medium. The use of a plant tissue virtual laboratory also has the potential to increase student motivation and learning outcomes in learning plant tissue biology material.

Keywords: Virtual laboratory, biology Learning, perceptions, prospective biology teachers.

Introduction

In the 21st Century, the world is constantly changing with technological advances. Technology facilitates various sectors of life, including the world of education. Technology in the world of education has become a necessity in every learning activity. In Indonesia itself, the world of education was assisted by technology when massive online learning began to be implemented suddenly in early 2020 due to the COVID-19 pandemic. The COVID-19 pandemic has changed the way of face-to-face learning in class to virtual face-to-face from home. Based on the Circular Letter of the Ministry of Education and Culture of the Republic of Indonesia Number 4 of 2020, teaching and learning activities are carried out from home to prevent the spread of COVID-19.

Learning plant tissue requires careful study, discussion, and laboratory procedures for various

microscopic visualizations of plant tissue. For this reason, learning facilities are needed that support student activities in studying the material. However, there are still constraints on limited laboratory facilities in several educational units. An alternative solution is to develop a virtual laboratory (virlab) application which is expected to overcome the limitations of laboratory facilities and give students the experience of 'working' in the laboratory.

Virlab is an application and web interactive simulation of experiments where all the manipulations are done inside the computer. Virtual laboratory is a software that simulates experiments in real laboratories. Virlab has been popularly used in most science lessons, especially because it is supported by increased computer capabilities in information processing. Various virlab applications related to biological content as well as virtual biology equipment have been developed and used in learning, for example

biotechnology virtual labs, virtual microscope, virtual transgenic, virtual immunology, virtual morphology laboratory and in the fields of microbiology and pharmaceutical toxicology (penjak & Šorgo, 2017). Most of Virlab's software features 3D graphics that enhance the user experience, but the level of detail of the Virlab environment varies. Virlab's software products are available on multiple platforms, including desktop and web-based. Desktop versions generally have better graphics and higher quality content (Raineri, 2001).

Virtual laboratories have several advantages, namely being flexible in setting practicum times and locations, practicum results are immediately available and reliable, practicums can be repeated immediately, no need to buy laboratory equipment and materials frequently, experiments are safe and economical because they allow 'work' with hazardous or expensive materials, and the shorter the duration of the experiment regardless of the availability of actual experimental facilities, minimal work procedure errors and experimental handling errors, and also minimal use of reagents increases work safety in the laboratory and is a more effective way to focus students in understanding difficult concepts. On the other hand, there are limitations or weaknesses in using virlab in learning, namely the loss of acquiring hands-on skills in working in real laboratories, the lack of connections between designs and experimental results, and the level of socialization or collaboration among students becomes lower (Špernjak & Šorgo, 2009); limited possible actions, poor manual responses, and possible lack of proper experience when dealing with real laboratory facilities (Potkonjak, et al., 2016).

Based on existing research, there has been no research on the perceptions and attitudes of prospective Biology Education teachers regarding the potential use of virtual laboratories as learning media in plant tissue material in Biology Learning. Many studies focus on the use of virtual laboratories in teaching biology to students. Therefore, this study aims to explore the potential use of virtual laboratories as a medium in Biology Learning based on the perceptions and attitudes of prospective biology teachers. The findings of this

study contribute to providing basic information for lecturers, students, and teachers regarding the perceptions and attitudes of prospective biology teachers towards virtual laboratories as learning media in plant tissue material. This will be a consideration for policy makers to issue relevant policies and improve educational facilities and services in the field of quality learning media.

Materials and Methods

This research uses mixed-method research by combining quantitative and qualitative research methods. Data collection is done by using a questionnaire. the questionnaire was distributed in the form of a google form contains 15 questions. Questions were answered using a 5-point Likert scale. The questionnaire was filled out by prospective biology teachers who are active students from various semesters.

Results and Discussion

The results of the analysis of data filling out the questionnaire conducted by 67 respondents stated that prospective biology teachers were familiar with virtual laboratories. They have often used Virtual laboratories in Microteaching. The biggest percentage is 70% in using the Virtual laboratory. Thus, technical problems in using virtual laboratories can be reduced because respondents are familiar with using virtual laboratories.

Table 1. Perceptions of Prospective biology teachers on the use of plant tissue virtual laboratories in biology learning

Peceptions	Mean	Result
I am well acquainted with the "virtual laboratory" of Plant tissue	52 %	Agree
I once used a Plant tissue "virtual lab".	52.2 %	Agree
I can understand very well the plant tissue material in the plant tissue "virtual laboratory".	39.1 %	Agree
Virtual plant tissue laboratory is easy to access	47.8 %	Agree
It is very easy to operate the plant tissue Virtual Laboratory	47.8 %	Doubtful

Table 1 shows the responses of prospective biology teachers to perceptions about using the Virtual

Laboratory in biology learning. Prospective biology teachers respond 'agree' on the use of the Virtual Laboratory in class. These results indicate that prospective biology teachers respond positively to the use of the Virtual Laboratory in biology learning. Prospective biology teachers assess that Virtual Laboratory is easy to access as a learning platform. Many teachers also use Virtual Laboratory media as online learning media because of its easy operation. The convenience of Virtual Laboratory features is also a distinct advantage. This is in line with research conducted by Evy Suryanti et al. (2019) on Students regarding perceptions of using Virtual Laboratories in learning Molecular Biology

Table 2. perceptions of prospective biology teachers on the potential of plant tissue virtual laboratories as media in the learning process

Peceptions	Mean	Result
Material features of the Virtual Laboratory of plant tissue can be used in biology learning of plant tissue material	60.9 %	Agree
The use of plant tissue virtual laboratories in biology learning has the potential to increase student motivation	52.2 %	Agree
The use of plant tissue virtual laboratories in biology learning has the potential to increase interaction between students	52.2 %	Agree
The use of plant tissue virtual laboratories in biology learning has the potential to increase student creativity	43.5 %	Agree
The use of plant tissue virtual laboratories in biology learning has the potential to create fun learning for students	65.2 %	Agree

Table 2 shows perceptions of prospective biology teachers on the potential of plant tissue virtual laboratories as media in the learning process From the results it can be seen that prospective biology teachers gave responses ranging between 'agree' . Prospective biology teachers agree with the use of the Virtual Laboratory which can increase student learning motivation. the use of Virtual Laboratory in learning can increase student motivation. Various Virtual Laboratory features can be used to increase student learning motivation. Furthermore, prospective biology teachers responded 'strongly agreed' on the use of Virtual Laboratory to increase interaction, creativity and fun learning for students. In case of interaction, Virtual Laboratories can bring students closer even though they are far apart because social media can 'bring closer' those who are far away so that they can 'easier' the communication process (Sari, 2017). Utilization of the Virtual Laboratory in learning

that contains descriptive text can be fun learning for students

Table 3. Responses of prospective biology teachers to the use of plant tissue virtual laboratories in the learning process

Peceptions	Mean	Result
I agree to tell other biology teacher candidates that it is very effective to use a plant tissue Virtual Laboratory	39.1 %	Agree
I prefer to use Virtual Laboratory media on plant tissue material in biology learning	39.1 %	Agree
Interesting plant tissue virtual laboratory is used for biology learning	56.5 %	Agree
I agree that the Virtual Laboratory of plant tissue can increase students' interest in learning plant tissue material	60.9 %	Agree
Overall I like the use of the Virtual Laboratory in learning plant tissue biology material	56.5 %	Agree

Table 3 shows the attitude responses of prospective biology teachers to the use of the Virtual Laboratory in biology learning. Prospective biology teachers responded with a range of 'agree'. Prospective biology teachers agree that the Virtual Laboratory is inherent in their daily lives. Prospective biology teachers also agree that they are proud to use the Virtual Laboratory. In addition, prospective biology teachers like the use of the Virtual Laboratory application in teaching biology. Even so, prospective biology teachers do not agree if there is a feeling of being left behind when they do not open a Virtual Laboratory in learning plant tissue material. This shows that prospective biology teachers are not dependent on always opening the Virtual Laboratory application. Prospective biology teachers also disagree if they prefer to use the Virtual Laboratory in online teaching rather than face-to-face. Basically, the integration of social media technology is not to replace traditional methods, but only to improve the teaching and learning process. Virtual Laboratory can be an alternative online learning platform and overcome the problem of lack of laboratory facilities in schools.

Conclusions

Based on data analysis and discussion, it can be concluded that evenly most students have a positive perception of the use of virtual laboratory applications in learning plant tissue biology

material, although a small number of students are still unsure. The results of this study can be used as a basis for further developing virtual laboratory applications as an alternative to create more interesting learning, help improve mastery of concepts, and overcome the limitations of laboratory facilities.

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Electronic Atlas Morphological and Anatomical Structure of Little Egret's Cervical Bones as A Biology Learning Media

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Abstract: Electronic Atlas (*E-Atlas*) is a biology learning media product that utilizes technology and information developments to support the biology learning process. The purpose of this research is to find out the quality of *E-atlas* Morphological and Anatomical of Little Egret's Cervica Bones as a biology learning media. This research is Research and Development. To find out the morphological and anatomical structure of little egret's neck, meat on the neck were cleaned. Then each bone segment were cut and sanded on the ventral and lateral part until the structure of little egret's neck is visible. Then, to develop the *e-atlas*, uses the ADDIE method. To make the *e-atlas*, there is 5 steps. Step 1 is design concept, cover, ribbon, and another supporting elements in CorelDRAW 2022 Grapich Suites. Step 2 is finishing the *e-atlas* at Articulate Storyline 3 to fill the content. Step 3 is validation test to material and media expert. Step 4 is field trials to biology teacher and students. Step 5 is evaluate the result of validation test and field trials. Based on the research result, it was found that the *e-atlas* could be used as a proper biology learning media.

Keywords: Electronic Atlas, Morphology, Anatomy, Little Egret, *Egretta garzetta*, Learning Media.

Introduction

Education is a process that has a systems, strategies, and goals, so that teaching and learning activities are events directed. Bound to goals and carried out to achieve the goals of education it self. In an education system, there are activites carried out by the entire educational community namely teachers, students, and other education.

School is an institution where educational activities are carried out formally following the rules and curriculum that's applied. School as places where education is held, aim to prepare students to develope it's knowledge and skills in solving life problems in the present and the future. Therefore school must organize the teaching and learning process properly.

As the results of observations obtained by researches regarding the fundamental problem experienced by students and teachers when carrying out the biology learning process. The current biology learning process tends to be

monotonous. School want an increase in student learning outcomes in learning study ojects. But due to the lack of adequate learning media, this goal has not achieved.

One of the biology content that studied at school is Aves that belongs to the sub phylum of vertebrates. Various types of birds, ranging from small birds to large birds can be distinguished based on several characteristics such as the shape of the beak, the shapes of the legs, the shapes of the wings, and the shape of the neck.

Little Egret (*Egretta garzetta*) is a type of bird that spends half the time in water area. Little egret (*Egretta garzetta*) belongs to the order Ciconiiformes and the Ardeidae family is spread all over the world, including Indonesia, especially in Sumatera, Kalimantan, Bali, and Java.

Out of a total of 24 species in the Ardeidae family, almost half are species protected by the government thought Government Regulation no. 7 of 1999 concerning Preservation of Plant and Animal Species.

In studying Aves, students do not only study it using learning media which tends to make students feel bored and reluctant to read the media. An ideal learning media is needed, so that it can support student's needs and be motivate to learning Aves.

E-Atlas can be used as a biology learning media that discusses Aves. Because uses *E-Atlas*, theachers and students do not have to go to outside the school to observe and learning Aves. The process of learning Aves can be done in the classroom by using *E-Atlas* as a biology learning media which contains pictures and explanations in detail and is easy to use. Thus, the objective of the biology learning process can be achieved.

Materials and Methods

Study Area

The observation of Little Egret has been held at Ketingan Tourism Vilage, then the observation of morfological and anatomical structure of little egret's neck has been held at Gatén, Condongcatur, Depok, Sleman, and the field test has been held at Sewon Senior High School, Bantul, Special Region of Yogyakarta.

Procedures

1. Little Egrets are blanched in boiling water to make it easier to separate it body from it feathers.
2. The little egrets neck are separated from it body, and all cervical bones are cut one by one and put them into a flakon bottle.
3. The C2, C6, and C12 bone segments are taken to measured.
4. The three bones are sanded on the ventral and lateral part using soft sandpaper.

Data Analysis

Observational data were analyzed by observing the three cervical bones. The morphological and anatomical structure of the three vertebrae were observed. In addition, an analysis was also carried out by means of a literature study related to relevant research to get conclusions from exiting problem formulation.

Results and Discussion

Observation of Anatomical and Morphological Structure of Little Egret's Cervical Bones

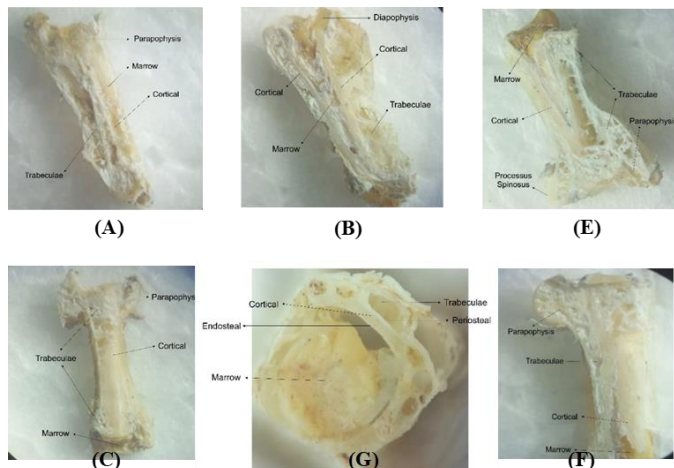


Figure 1. Observation result of three bone segments by lateral, ventral, and crossing section. (A) C2 Lateral, (B) C2 Ventral, (C) C6 Lateral, (D) C6 Ventral, (E) C12 Lateral, (F) C12 Ventral, (G) Crossing Section.

Development of *E-Atlas* Anatomical and Morphological Structure of Little Egret's Cervical Bones

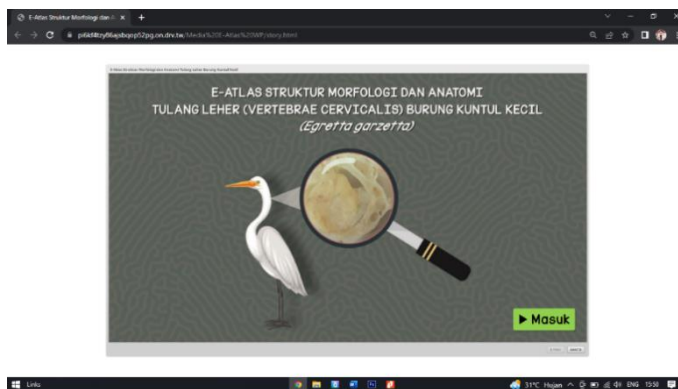


Figure 2. Cover page of *E-Atlas*

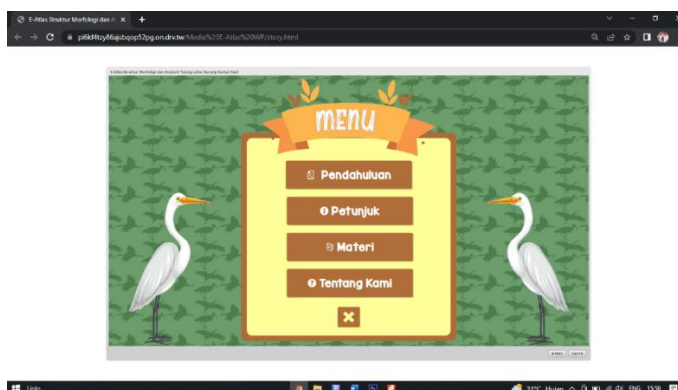


Figure 3. Menu page of *E-Atlas***Figure 5.** Anatomical structure page of *E-Atlas*

Discussion

Based on the observations of the anatomical structure of little egret's cervical bones, there are cortical bone, trabecular bone, bone marrow, parapophysis, diapophysis, periosteum, endosteum, processus spinosus, and foramina transversaria.

Cortical bone has a low priority over trabecular bone, that is equal to 5-10%. This causes the tissue structure of the cortical bone to be dense and tough. This bone has a high elastic modulus. Bone marrow is inside the cortical bone, bone marrow is an organ that plays a role in the formation of blood cells in the body. Trabecular bone or commonly called cancellous bone is porous bone, so it can be called spongy bone. Spongy bone is found near the articular surfaces at the ends of the long bones and the inside of the short bones. The periosteum is a sheath of fibrous connective tissue that surrounds the outer cortical surface of the bone. Periosteum contains osteoblasts, osteoclasts blood vessels, and nerve fibers. Periosteum is also play a role in providing nutrition, protection, assisting the process of bone formation, and be the important role in the repair and growth of broken bones. Endosteum is a membranous structure that lines the inner surface of cortical bone, trabecular bone, and the vascular canal.

Based on the field test of *E-Atlas*, there are getting a percentage of 94% from material expert, it

means if classified into a Linkert Scale, is very feasible, getting a percentage of 78% from media expert, it means if classified into a Linkert Scale, is very feasible, getting a percentage of 86% from biology teacher, it means if classified into a Linkert Scale, is very feasible, getting a percentage of 96% of biology students, it means if classified into a Linkert Scale, is very feasible.

Conclusions

The research result show that the length of the bones is 1,1 until 1,3 cm, the width of the bones is 0,7 until 1 cm, and the height of the bones is 0,5 until 1 cm. The result about the anatomical structure of little egret's servical bones show that servical bones are composed of cortical bone, trabecular bone, marrow, parapophysis, diapophysis, foramina transversaria, processus spinosus, periosteum, and endosteum.

Based on the result of validation test to material and media expert, and field trials to biology teacher and students. it was found that the *E-atlas* could be used as a proper biology learning media.

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The Analyze of Ethnoscience "Sanggring Gumeno" on Islamic and Science Learning Materials

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Abstract: The purpose of this study was to analyze the ethnoscience study "Sanggring Gumeno" on natural science material using a qualitative descriptive method. The study was carried out using observation techniques, interviews, and literature studies. The research subjects were the people of Gumeno Village, Gresik Regency, East Java Province. This research examines the ethnoscience associated with science with Islamic values in the field of Education. The results of the ethnoscience research were obtained from the indigenous knowledge of the community about "Sanggring Gumeno" which is linked to scientific and Islamic knowledge. The tradition of "Sanggring Gumeno" is found in scientific materials on chemical and physical changes, additives and addictive substances, nutrition, separation of mixtures, temperature and heat, and measurements. The Islamic value of the "Sanggring Gumeno" tradition is the culture of the Gumeno people which is carried out on the 23rd night of the month of Ramadan to welcome the night of Lailatul Qadar. The Islamic aspects contained in this tradition are sincerity, piety, obedience, honesty, and the implementation of habluminallah and habluminannas.

Keywords: Ethnoscience, Islamic and Science Material, Sanggring Gumeno.

Introduction

Globalization can be interpreted as a social process by which geographical constraints on social and cultural arrangements recede and in which people become increasingly aware that they are receding (Betul, 2002; Mosedale, 2014; Rifai, 2013). Globalization is something that cannot be avoided in society and has affected all aspects of life, from education, science, technology, social to culture. Human culture was acquired or created by man as a member of a society that contains mostly Language. Whereas cultural processes as designed to embrace the soft networks of society, assumptions, premises, understandings, rules, and intangible values (Magu, 2015). However, the habits and lifestyles of westerners seem to be a modern mirror of the presence of Western culture as if it dominates and has always been the trend-center of society (Irmania, Trisiana, & Salsabila, 2021). All these trends (cutting-edge styles) can bring positive and even negative influences can be seen from the consequences they cause and can

erode local culture and wisdom that is the heritage of the archipelago.

Indonesian culture is the entire local culture that exists in every region in Indonesia. Culture is an asset of the nation that needs to be maintained and preserved so that its authenticity and existence are not eroded by the torrent of globalization. The durability of a culture, including local culture, depends largely on the changes that occur in its society (Maridi, 2015). This includes values and customs; a view of life or a system of life that is still adaptive in its society. The idea of cultural preservation has never subsided and has even become a classic expression. But efforts to preserve the culture seem to have not found an effort that can restore collective memories, so that they can remain part of people's lives. Various preservation strategies can be carried out through efforts to revitalize and diversify cultural works without having to eliminate the noble values of the culture concerned (Jayadi, 2014).

One of the heritage of the archipelago in East Java, precisely in Gresik Regency, is sanggring Gumeno. Sanggring Gumeno is a tradition that is carried out on every night of 23 Ramadan and is eaten together during iftar (Mufarohah, 2014). This culture is inseparable from the great history. It is said that the sanggring gumeno culture is related to the proselytizing event of Sunan Dalem. In the course of proselytizing, Sunan Dalem fell ill and never recovered. On the 22nd night of Ramadan, Sunan Dalem had a dream. In his dream, he gets a clue about the cure for his illness, namely that he must eat a food with the main condition that the rooster is young. Sunan Dalem then sent the men (santri) to prepare the spices of his dishes, namely leeks, Javanese sugar, cumin, and coconut milk. Meanwhile, other students are looking for young roosters (Rizqianah, Aliffiati, & Murniasih, 2021). So for remember this history, the implementation of sanggring gumeno has been preserved until now. However, it turns out that this culture is only limited to being a culture on the 23rd night of Ramadan and has never been applied in learning.

Even though culture can be used as a source of learning knowledge commonly called ethnoscience. Ethnoscience is a strategy to create a learning environment by integrating culture as part of the science learning process (Sarini & Selamat, 2019). Ethnoscience encourages teachers and education practitioners to teach science based on culture, local wisdom and problems that exist in society, so that students can understand and apply the knowledge they learn in the classroom can be used to solve problems they face in everyday life (Fahrozy, Irianto, & Kurniawan, 2022). Besides being able to be integrated with science learning, Sanggring Gumeno also stores Islamic values such as obedience to worship addressed to God Almighty. Therefore, this study aims to analyze Sanggring Gumeno on aspects of science and Islamic learning.

Materials and Methods

Study area

This research was conducted by qualitative methods. With the subject of community research,

science teachers, and ustadz in Gumeno village, Gresik district, East Java. Data collection techniques using interviews, observations, and literature reviews

Procedures

Interviews

Interviews were conducted with the community, science teachers, and ustadz who knew the Gumeno sanggring tradition. This is done so that the research is relevant and gets the appropriate information.

Observation

Observations were carried out at the time of making the Gumeno sanggring. However, at the time of carrying out this traidisi research has not been carried out, so the observation is only through video.

Literature Review

Literature review aims to obtain data with reliable sources through books and articles

Data analysis

The data that has been collected is analyzed by triangulation, namely looking at the similarity of answers between interviews, observations, and literature reviews. Triangulation using multiple sources of data means comparing and cross - checking data collected through observations at different times or in different places, or interview data collected from people with different perspectives or from follow - up interviews with the same people (Meriam, 2009).

Results and Discussion

Result

The process of making sanggring gumeno can be seen in this figure



The data collection results can be seen in table 1

Table 1. result of data collection

items	interview		observatio n	Literature review
	Community	Science teacher		
Materials	Onion, cumin, coconut, brown sugar, powdered broth, chicken	Additives and additive substances Classification of substances Separation of mixtures	Honestly	Gumeno sanggring culture has been discovered in Gresik with its distinctive making and taste
Process	Roast cumin to fragrant Pour coconut milk, let stand to boil Put brown sugar and chicken Add powdered broth and salt Cook until cooked	Physical and chemical changes Measurement Temperature and heat	Honestly	
Sanggring sharing	Sanggring eaten together and distributed to relatives and neighbors at iftar	Nutrients	Sincerity silaturrahmi	

Table 1. Description of Sanggring Gumeno

Item	Scientific Knowledge	Islamic values in indogeneous knowledge
Materials	Additives and additive substances Classification of substances Separation of mixtures	From donations used to buy ingredients to the process of making "sanggring Gumeno" there is a value of honesty and sincerity of the community
Process	Physical and chemical changes Measurement Temperature and heat	يا أيها الذين آمنوا اتقوا الله وكونوا مع الصادقين "O you who believe! Fear Allah, and be with honest people" QS. At Taubah:119
Sanggring sharing	Nutrients	After going through a long cooking process, sanggring is distributed to pilgrims and families on the 23rd night of Ramadan, on this item strengthens silaturrahmi, adds to the flexibility to share and alms to fellow human beings, so as to add to the blessings of gratitude In addition, on the 23rd night of Ramadan, various amaliyahs are also carried out which increase obedience to Allah فذكرين التوكل والتوكلوا الي ولا تفكروا "Therefore, remember Me, I will remember (also) you, and be grateful to Me and do not deny (favor) Me" QS. Al Baqoroh: 152

Discussion

In 2019, Gumeno sanggring was recorded as Indonesia's intangible cultural heritage. Sanggring Gumeno is an intangible cultural heritage that begins with the proselytizing event passed down by Sunan Dalem. Sanggring Gumeno is held every night of the 23rd holy month of Ramadan in the village of Gumeno. Sanggring Gumeno is a unique food because 1) its main ingredient is unique from compotes in general; 2) held once a year; and 3) the "sacred" cooking process where only men cook. In its development, Sanggring Gumeno is not only limited to making food to open together, but has spiritual value and can be used in learning.

Based on the results of interviews with various parties, such as the community, science teachers, and ustadz that in the materials, processes, and traditions of sanggring Gumeno can be associated with science learning and storing high spiritual values. However, so far science learning has not applied the ethnoscience of sanggring Gumeno which is integrated with Islamic values. The ingredients in making Gumeno sanggring include onions, cumin, coconut, brown sugar, powdered broth, chicken.

In these materials, if applied in learning, students can classify types of substances, additives, and mixture separation. The classification of substances at the junior high school level science material is included in class VII material, where the classification of substances is divided into solids, liquids, and gases. This is in accordance with the ingredients in making Sanggring Gumeno, namely onion, cumin, coconut, brown sugar, powdered broth, and native chicken including solid substances. Water mixed with coconut to become coconut milk includes liquid substances, as well as the smell produced from the cooking process is said to be gas. In addition to the main ingredients, there are additional ingredients used in the process of making Sanggring Gumeno, namely brown sugar and powdered broth. These additives are referred to as additives that are deliberately added to the dish so that the dish has a good taste (Emilia et al., 2020). One of the ingredients that makes sanggring taste good is coconut milk. In the process of making coconut milk, there is a process of separating the mixture, namely the separation of coconut granules from coconut milk using a filtrator (Parahita, 2018).

In the process of making sanggring involves material changes in physics and chemistry that were previously associated with measurements and temperatures. The first thing to do is to measure the materials to be used. This aims to produce a delicious sanggring with proportional seasoning. To measure materials of the solid type using a balance sheet, while liquid materials use measuring cups or commonly called liters. The tools for measuring are related to class VII measurement materials. The second step is to heat the furnace over medium heat. This is related to temperature and heat material related to class VII science material. If the fire is not controlled then the Gumeno sanggring will burn easily, and vice versa if the fire is too small then Sanggring Gumeno does not mature quickly.

In addition to the pre-making steps of sanggring, the most important step is when making sanggring. First, roast cumin until fragrant. In the process of roasting cumin, there is a process of chemical change, where there is a change in particles and color so that the substances owned by

cumin cannot return to their original shape. Secondly, pour coconut milk to a boil. In the process of boiling coconut milk, there is a change in physics, where the higher the temperature, the faster the movement of coconut milk particles so that coconut milk boils quickly. In addition to boiling, coconut milk is also subjected to evaporation. Third put brown sugar and chicken; adding powdered broth and salt; waiting for it to ripen. In the third process undergoes a chemical change, namely the chicken turns into mature and cannot return to its original shape.

After the sanggring is cooked, it will be distributed to relatives and neighbors to open together in the mosque. Sanggring has a distinctive and delicious taste, coupled with tender and nutritious chicken. Chicken has a high content of vitamin B6, a source of protein, and is high in fat, especially in the lower part of the skin. Protein is useful for maintaining healthy bones, muscles, as well as tissues in the body, as well as blood clotting processes. While vitamin B6 is useful for the development of the brain, nerves, and skin.

The community carries out the sanggring tradition based on a sense of obedience to a descendant of kamil (saints), namely Sunan Dalem who is the son of Sunan Giri. This obedience can be regarded as worship directed to God Almighty. Sanggring tradition is a tradition that coincides with the month of Ramadan, namely the 22nd of Ramadan or the 23rd night. The month of Ramdhan is a blessed month. On the final dates or above the 20th, it is believed to be the nights of the descent of Lailatul Qadar, a night better than a thousand months.

In addition to religious values, in making sanggring gumeno also applies the values of honesty and sincerity. This is because in making it, the community works together to give alms and share, both energy and materials for making sanggring. If there are people who are generous in donating the ingredients for making sanggring, then the chef must also be honest in spending his mandate. In addition, chefs are also required to be honest in making sanggring according to the dosage without being reduced in the slightest. Of course, if the sanggring is cooked, it will be eaten

together at the time of breaking the fast, of course, it will add to the value of habluminannas.

Conclusions

The conclusions of this studies are One of the cultures of "Sanggring Gumeno" which is carried out on the 23rd of Ramadan can be used as a source of learning science that is associated with Islamic values; science materials that can be found in Sanggring Gumeno are in the form of materials and manufacturing processes as well as sharing sanggring that can be consumed by the community; and the Islamic values contained in this tradition are sincerity, piety, obedience, honesty, and the implementation of habluminallah and habluminannas.

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Mapping Science Learning Materials Integrated Ethnoscience “Jamu Madura” for Middle Schools/MTs

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Abstract: This study aims to map natural science materials in junior high schools against the Madura’s herbal medicine or *jamu Madura* ethnoscience. The mapping consists of mapping indigenous knowledge about the process of making *jamu Madura*, with scientific knowledge in the form of science concepts and materials for SMP/MTs. This research is a qualitative descriptive study with analytical techniques in the form of interviews, observation, and literature review. Interviews and observations were conducted at the production sites of Madura’s herbal medicine which have recipes passed down from generation to generation to find out genuine knowledge about the process of making *jamu Madura*, while a literature review was conducted to examine the linkages between the process of making Madura’s herbal medicine and natural science concepts and materials. The results of this study show that each step in the process of making Madura’s herbal medicine is related to science concepts and materials taught in junior high schools/MTs. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additive (natural preservatives), and measurements. Material substances and their changes can be related to the process of making Madura’s herbal medicine which cuts the jamu material and dries it. The material for the classification of living things and biodiversity can be seen from the process of selecting the raw materials for Madura herbal medicine. Material temperature and heat can be seen in the drying process of the *jamu* material used to reduce the water from the ingredients. While the measurement material is used when weighing the raw materials for Madura’s herbs. So, it can be said that the mapping of Madura herbal medicine ethnoscience can be input as a main theme in SMP/MTs learning science.

Keywords: Ethnoscience, Jamu Madura, Science Learning Material.

Introduction

The 21st century is a century defined in knowledge and technology. The rapid development of science and technology makes all activities in human life easier (Prayogi and Estetika 2019). All areas of life can be facilitated in this 21st century. This convenience can be one way to overcome problems that exist in everyday life. So that this century becomes one of the efforts to create solutions with the development of knowledge and technology (Widodo, Indraswati, and Sobri 2019). The development of knowledge and technology has forced every human being on earth to follow its development. Thus, every activity carried out can implement the results of these developments and can also optimize the creation of solutions to

civilization problems (Fadhilatunnisa, Rosidah, and Fakhri 2020; Fitri et al. 2022; Prayogi and Estetika 2019).

The problems of life so far are expected to be resolved in the 21st century. One formulation of the solution is through education, so there is the term 21st century education. 21st century education consists of Life and career skills, Learning innovation skills, and Information, media, and technology skills (Hidayat, Dyah M, and Ulya 2019; Mardhiyah et al. 2021). Life and career skills contain abilities that must be imparted to students who are the younger generation in order to gain skills for social life and the world of work later. Learning innovation skills relate to students' abilities to be honed in their abilities in

critical thinking, communication, and collaboration (Sudarmin et al. 2019; Sutama et al. 2022). Finally, Information, media, and technology skills, namely preparing students to be able to keep abreast of technological developments and use them to help everyday life.

Education in the 21st century not only prepares students to be smart in the academic field but is also required to hone skills that are useful for their future lives (Mardhiyah et al. 2021). In addition, life and career skills in 21st century education also requires students to carry forward traditions/cultures and values in Indonesia or also known as cultural awareness. 21st century education considers the original culture of society as one of the important things to learn for students (Nugraha 2019).

The world era that has focused on the development of knowledge and technology has made all information from all over the world very easy to access. It also facilitates the mixing of foreign and native cultures, so that knowledge of culture for the younger generation becomes one of the main focuses of 21st century education. Students must be equipped with native Indonesian culture so that the character of this nation is not lost in time (Rahayu, Iskandar, and Abidin 2022).

Science learning has an important role in the implementation of 21st century education. This is because science learning is expected to help create solutions to life's problems (Amelia, Jumini, and Khoiri 2021; Tursinawati and Widodo 2019). The end result of learning science is students who are ready to overcome life's problems around their environment through scientific processes that have been obtained at school. In addition, science learning can be an intermediary in fostering students' cultural awareness (Dwipayana, Redhana, and Juniartina 2020). Integrating culture with science learning is one of the means to obtain two solutions at once.

Ethnoscience is one way/method that can be applied in science learning by integrating it with the culture/traditions of society. Previous research stated that ethnoscience in science learning can improve students' critical thinking, scientific literacy, and cultural love characters (Asri Nugraheni et al. 2022; Darmayasa, Jampel, and

Simamora 2018; Pertiwi and Rusyda Firdausi 2019; Sakti, Defianti, and Nirwana 2020) discussed in 21st century education. Ethnoscience is a way to connect original knowledge of the community into scientific knowledge which in this case is science material in schools. (Amelia et al. 2021; Sumarni et al. 2020; Utari et al. 2020). One culture that can be implemented in learning is the culture of the Madura's community in processing and consuming Madura's herbal medicine.

Jamu is one of the cultural heritages from Indonesian ancestors which still exists today. Jamu is a traditional herb that is believed to cure various diseases (Kristianto et al. 2020; Ratanawati, Ali, and Wirata 2019). Madura is one of the areas that until now is known for herbal medicine. Madura's people from ancient times have always made and consumed herbal medicine as an alternative medicine to cure disease. However, currently the younger generation of Madura are very rarely interested in herbal medicine, so they are less familiar with this culture (Hidayat 2018; Kristianto et al. 2020; Salat 2020). Therefore, the integration of culture in learning, especially science learning, really needs to be done to introduce Madura's herbal medicine to students.

The previous statements have sufficiently explained the background of this research. It is necessary to map natural science material related to the culture of processing herbal medicine in Madura which is integrated into science learning at schools. The mapping of natural science material is carried out in SMP/MTs by following the latest curriculum, namely the independent curriculum. Science materials for SMP/MTs are mapped with the big theme of Madura's herbal medicine to find out which materials can be integrated with the herbal medicine culture. Integration is done by looking at the process of making traditional Madura's herbal medicine. The hope is that this mapping can be used by schools, especially in Madura, to be implemented in science learning.

Materials and Methods

Study Area

This research is a qualitative descriptive study. This study uses research subjects, namely Madura's herbal medicine manufacturers who still maintain the traditional herbal medicine manufacturing process from ancient times. Madura herbal medicine producers as research subjects came from Sumenep, Madura. This research was started in November by conducting interviews, observations, and literature studies.

Procedures

Interview

Interviews were conducted to find out the process of making Madura's herbal medicine as the main theme in this mapping of SMP/MTs natural science material. Interviews were conducted with Madura's herbal medicine producers who continue to maintain the tradition of making herbal medicine from generation to generation.

Observation

Observations were also made to find out the process of making Madura's herbal medicine.

Literature Review

A literature study was conducted to link the process of making Madura's herbal medicine with natural science material for SMP/MTs, so that the process of integration through ethnoscience can be carried out. This step is also carried out to find suitable materials to be associated with the theme. In addition, you can find out the SMP/MTs science materials that are in the independent curriculum.

Data Analysis

Data analysis resulted from the three data generated, which came from interviews, observations, and literature reviews. The resulting interviews and observations data are qualitative data which are used as the main data to produce mapping of natural science materials. The initial data generated is referred to as indigenous knowledge, then mapped and studied with literature reviews which is referred to as Scientific Knowledge.

Results and Discussion

Interview and Observation Results

Figure 1 is the result of observations and interviews conducted with Madura herbal medicine producers.



Figure 1. Raw materials and production of Madura herbal medicine (Source: Personal Document).

Table 1 is the stages of making traditional Madura's herbal medicine which are commonly used for products that can be stored, not for Madura's herbal products which must be consumed immediately. Table 1 also shows the ethno-scientific process of making Jamu Madura.

Table 1. The process of making Madura's herbal medicine is related to the ethnoscience method.

No.	Stages of Making <i>Jamu Madura</i> (Indigenous Knowledge)	Scientific Knowledge
1)	Choose the basic ingredients of herbal medicine according to the type and benefits	The selection of the basic ingredients of Madura herbal medicine uses native Madura herbal plants which have benefits because they contain fiber, prebiotics, probiotics, other phytochemicals.
2)	The basic ingredients are cut thinly and dried in the sun	The process of cutting the material and drying it in the sun is useful in the process of preserving herbal ingredients so that they last longer
3)	The dry raw materials are weighed and mixed according to the types and benefits, then crushed with a mortar	This process makes physical changes to the form of herbal raw materials and the process of using measurement tools
4)	Jamu is ready to be consumed by serving it in warm water	Brewing with warm water is one of the mixed methods to make it easier to dissolve something.

Results of SMP/MTs Science Learning Materials Mapping

Previously, we had known the process of making Madura's herbal medicine which was linked to the ethnoscience method, so that mapping of Madura's herbal medicine with natural science material for SMP/MTs could be done easily. Table 2 below describes the results of the mapping carried out based on the process of making Madura's herbal medicine that has been written down.

Table 2. Mapping the process of making Madura herbal medicine with natural science material for SMP/MTs

No.	Stages of Making <i>Jamu Madura</i>	Science Material in SMP/MTs	Sub-Material	Grade level di SMP/MTs
1)	Choose the basic ingredients of herbal medicine according to the type and benefits	1. classification of living things 2. Ecology dan biodiversity	1. classification of living things (plantae kingdom) 2. biodiversity	VII
2)	The basic ingredients are cut thinly and dried in the sun	1. substances and their changes 2. Temperature, Heat, and Expansion 3. Digestive system	1. Physics changes 2. Temperature and Heat 3. additive (natural preservatives)	1. VII 2. VII 3. VIII
3)	The dry raw materials are weighed and mixed according to the types and benefits, then crushed with a mortar	1. substances and their changes 2. The nature of science, measurement, and the Scientific method 3. Elements, compounds, and mixtures	1. Physics changes 2. measurement mixtures	1. VII 2. VII 3. VIII
4)	Jamu is ready to be consumed by serving it in warm water	1. Temperature, Heat, and Expansion 2. Elements, compounds, and mixtures	1. Temperature and Heat 2. mixtures	1. VII 2. VIII

Discussion

Mapping the process of making Madura's herbal medicine into SMP/MTs natural science material using the ethnoscience method can be done. The results of the mapping show that each stage in the process of making Madura's herbal medicine can be linked to scientific knowledge which is then integrated into SMP/MTs natural science material. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additives (natural preservatives), and measurements.

The first process in making Madura herbal medicine is the selection of raw materials. The selection of raw materials is adjusted to the type and benefits of the raw materials, so that herbal medicine with certain properties can be produced. This process can be linked to SMP/MTs natural science material, namely the classification of living things as well as ecology and biodiversity. The classification of living things can be related because the raw materials are selected according to the types and benefits of the raw materials which are plants, so that they are included in the classification of the kingdom *Plantae*. Ecology and biodiversity can be related to Madura herbal medicine because it is related to biodiversity (flora/plants) in Madura.

The process of cutting and drying the raw materials for Madura's herbal medicine can be related to business materials, energy, and simple machines; substances and their changes; temperature, heat, and expansion; as well as the digestive system. Material work, energy, and

simple machines can be related to the use of knives when cutting raw materials which is one of the implementations of using simple machines in life. The material and its changes can be seen when the raw material is cut and dried which is a physical change in the raw material. The material temperature, heat, and expansion are related because there is a process of drying in the sun. The material for the digestive system is connected to the sub-material for additives in the form of natural preservation methods due to the drying process.

The next process is weighing, mixing, and grinding the raw materials. This process can be related to matter, energy, and simple machines; substances and their changes; nature of science, measurement, and scientific method; and elements, compounds, and mixtures. The matter of work, energy and simple machines can be related to the sub-matter of work and energy that occur during these processes. Material substances and their changes can be connected because this process involves physical changes in the raw materials for herbal medicine. The material nature of science, measurement, and the scientific method can be linked because there is a process of weighing raw materials using a balance which is a measurement process. Elemental, compound, and mixed materials can be related because there is a process of mixing the raw materials.

The final process is to consume Madura herbal medicine by brewing the herbal concoction with warm water. This process can be related to matter temperature, heat, and expansion; and elements, compounds, and mixtures. This material can be connected because of the consumption of herbal medicine which is brewed (mixed process) with warm water (hot/heat temperature).

Conclusions

Mapping natural science material for SMP/MTs by being integrated into the culture of making Madura's herbal medicine can be one way to implement the formulation of 21st century education. This mapping can prepare students who think critically, are scientifically literate, and have local cultural characteristics using the ethnoscience

method. Natural science materials that can be related to the process of making Madura herbal medicine are, substances and their changes, classification of living things, temperature and heat, biodiversity, additives (natural preservatives), and measurements. The results of this mapping are expected to be implemented in SMP/MTs, especially in the Madura area.

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Development of *E-Module* Biology Based on Modified Free Inquiry on Invertebrate Materials as Independent Teaching Material

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Abstract: This research aims to develop biology *E-Module* Based Modified Free Inquiry on Invertebrate Main Subject as independent teaching materials and measure *E-Modul* quality. This reaserch is determined as a Research and Development (R&D) method by applying ADDIE procedure which is focused on the level of Analysis, Design, Development and Evaluation phases. It employs questionnaire as a research instrument. Biology *E-Modul* quality is assesed by some respondents involving in this research. They are, one subject expert, one media professional, three peer reviewers, three biology teachers, and fifteen students' responses of *X MIPA MA WI Kebarongan Banyumas*. The data obtained from the research is analized by implementing qualitative and quantitaive decriptive method. Biology *E-Module* product based modified free inquiry is developed using ADDIE model on main subject's sub material about Invertebrate for students in the first year of *X MIPA MA WI Kebarongan Banyumas*. The result of this research shows that e-modul product has a great quality with a percentage of 81,67% (one subject expert), 92,27% (one media professional), 87,36% (*peer reviewers*), 89,92% (three biology teachers) and 93,52 % (fifteen students' responses). Thus, it can be concluded that Biology *E-module* has a great quality to be used as independent teaching materials to the students of *X MIPA MA WI Kebarongan Banyumas*.

Keywords: Teaching Material, *E-Module*, Invertebrate, *Modified Free Inquiry*.

Introduction

The year of 2020 was the tough year as Indonesia was hit by the covid-19 pandemic. The first case was detected on March 2 2020, after two people were confirmed infected from Japanese citizens. The Covid-19 is a new type of corona virus that was discovered in Wuhan, China in 2019 (Ilmiyah, 2020: Hui, et al., 2020). Covid-19 is an infectious disease that leads to a world health crisis caused by acute respiratory syndrome corona virus 2 (Server Acute Respiratory Syndrome Coronavirus 2 or SARSCoV-2). This virus is a family of corona viruses that can attack both animals and humans. On one hand, the Covid-19 pandemic has affected all education systems from pre-primary schools, secondary schools, to tertiary institutions. Based on the ABC News report March 7 2020, schools and

colleges had been shut down due to the Covid-19 pandemic in more than dozens of countries (Purwanto, et al., 2020). As a result of the Covid-19 pandemic situation, the Indonesian government had implemented physical distancing for its citizens.

The applied physical distancing causes the learning process of students in the classroom to change its method from face-to-face learning to learning from home or online-based learning (Herliandry, et al., 2020). Online-based learning is a type of learning that uses an internet network with accessibility, connectivity, flexibility, and the ability to bring up various learning interactions. One of the affected schools was MA WI Kebarongan Banyumas. The online learning process during the pandemic at MA WI

Kebarongan Banyumas was carried out through Zoom Online Meeting application, Whatsapp and Google Classroom. In this case, students were required to use their time at home by studying, discussing, doing assignments independently with online media (Safitri, et al., 2020).

Based on the results of interviews that had been conducted by researchers with the students of class X MIPA MA WI Kebarongan Banyumas regarding online learning that made full use of Google Classroom media, the teacher usually provided materials in the form of PPT (presentation slides) for teaching materials which is uploaded on Google Classroom. However, during the online learning process some students experienced difficulties with the material delivered by the teacher because there was no independent teaching material that facilitated students in the online learning process. In line with these conditions, based on the additional data from interviews with the Biology teachers at MA WI Kebarongan Banyumas, the learning process suffered constraints such as the limited Biology learning hours. This was because online learning has special challenges including internet connection and different living locations of the teachers and students, therefore the implementation of learning was not yet effective and the teacher could not fully supervise learning directly. Furthermore, the teacher had implemented several learning models in class, such as the discovery learning model by utilizing Power Point media and also giving assignments. Based on the results of students' scores on invertebrate material which were still below the KKM (minimum score) of 75, the use of this model did not seem to show maximum outcomes due to the limited teaching materials. Students were only relied on Student Worksheets (LKS) as teaching materials. The limited carrying capacity of teaching materials had an impact on the learning process. Another problem was related to student learning outcomes, in which the teachers had emphasized that during the online learning period students were expected to learn more independently at home, and therefore, there was no direct control and guarantees from the teachers that students really understand the material presented. Moreover, many students had less focus during the online learning process and as a result,

student learning outcomes on a particular Biology topic, invertebrate lesson, were not optimal.

Invertebrate material of the animalia sub-chapter is one of the biology materials taught in class X SMA/MA. This material has a lot of discussion while the time allocation is not sufficient to discuss all the Phyla. Invertebrate material is classified as very broad and uses a lot of scientific language. On the other hand, many species are further classified into other Phylum. Each example of species in the Phylum has many similarities and differences, this makes students think that Invertebrate material is quite difficult. It caused the expected student learning outcomes were not satisfactory. Based on the results of the material difficulty questionnaire that was distributed to students, it showed that 50% of students had difficulty with invertebrate material. Simultaneously, the test for understanding the invertebrate material tested by the researchers showed an average score of 62.52 from the Minimum Completeness Criteria (KKM), which was 75.

This condition showed that the learning process was still lacking and students had not acquired in-depth knowledge. Considering these conditions, practical teaching materials are needed to enable students to study independently outside of school hours. One of them is with electronic modules. Electronic modules (e-modules) are learning materials that are designed systematically based on a certain curriculum and are packaged in the form of the smallest learning units and allow them to be studied independently within a certain time unit. The goal is that students can master the competencies taught in learning activities as well as possible (Purwanto, 2007). E-modules that are arranged in electronic form can save the use of stationery such as papers so that it will indirectly help reducing paper waste. In addition, e-modules are electronic teaching materials in which animation, audio, navigation and video can be added to help visualize the process, making it more interactive and interesting.

Based on students' needs for independent teaching materials that were not yet optimal, the researchers innovated to develop teaching materials in the form of modified free inquiry-based Biology e-modules to support the use of e-

modules so that students are able to improve the quality of learning. The characteristic of the developed E-module is it can be run offline and online. For the offline type, it is a Windows application that has an executable format (exe) and can be opened via laptop or PC with a capacity of ± 20 MB. As for the HTML format, it can be performed directly via online with a link and is already connected to the internet.

Materials and Methods

The type of research was structured based on Research and Development (R&D) method. It is a method used to produce certain products, and test the effectiveness of these products (Sugiyono, 2015: 297). This study used the ADDIE model which was limited to the Analysis, Design, Development and Evaluation (ADDE) stages only. However, this research was conducted without an implementation stage. The research site was MA WI Kebarongan Banyumas. The test subjects for this study were class X MIPA MA WI Kebarongan Banyumas. Data collection techniques were carried out by distributing student needs questionnaires and teacher interviews, assessments by the material experts, media experts, peer reviewers, Biology teachers and limited testing to 15 students.

Results and Discussion

This development research produced a product in the form of a modified free inquiry-based Biology e-module with Invertebrates material for class X SMA/MA students. The e-module had been tested for validity, both content validity and validity construction so that it is declared feasible by material experts, media experts and peer reviewers, and had gone through a limited response test from students and biology teachers who had used it. The development of e-modules in this study has its own characteristics. The e-module developed in electronic form contains the Modified Free Inquiry (MFI) learning model on Invertebrate material. Product preparation referred

to Core Competencies (KI) and Basic Competencies (KD) in the 2013 curriculum.

The quality of the product in the form of e-Module based on Modified Free Inquiry (MFI) on invertebrate material was tested using data analysis obtained from 1 material expert, 1 media expert, 3 peer reviewers and 3 Biology teachers and a limited test of 15 students of MA WI Kebarongan Banyumas. The assessment criteria were summarized in a questionnaire submitted to the reviewer. The performed stages of data analysis was changing the qualitative data obtained from the reviewers into quantitative data, then calculated using the relative frequency distribution formula, and hence the results obtained were qualitative data based on ideal assessment categories. The following table shows the results of the overall e-module assessment by the reviewers:

Table 1.1 Overall e-modul assessment result data by reviewers

No	Reviewer	Score		Average	Ideal Percentage	Quality
		Max	Min			
1	Material expert	120	24	99	81,67%	Very good
	Media Expert	75	15	70	92,27%	Very good
3	Peer Reviewers	135	27	121	87,36%	Very good
4	Biology Teachers	135	27	113	81,875%	Very good
	Total	465	93	403	85,79%	Very good

Based on table 1.1. the average score obtained from the material expert's assessment was 99 and then converted to the ideal percentage obtained by a value of 81.67% which according to the quality percentage scale is included in the very good criteria. The average score obtained from the media expert's assessment was 70 and then converted to the ideal percentage, a value of 92.27% was obtained, which according to the quality percentage scale, was included in the very good criteria. Furthermore, the average score obtained from the peer reviewer's assessment was 121 and then converted to an ideal percentage, a value of 87.36% was obtained which according to the quality percentage scale was included in the very good criteria. As for the latter, the average score obtained from the Biology teachers' assessment was 113, and then converted to an ideal percentage obtained by 81.875% which according to the quality percentage scale was included in the very

good criteria. Overall, the average percentage of ideality obtained was 85.79%. The number showed that the quality of e-module Biology product is in the very good category.

The following is a more detailed description of the assessment of each reviewer:

Table 1.2. Data from e-module assessment results by the material expert

No	Assessment Aspects	Max. Score	Min. Score	Average	Ideal Percentage	Quality
1	Content/Material Feasibility	60	12	51	85%	Very good
2	Presentation	40	8	32	80%	Good
3	Language	20	4	16	80%	Good
	Total	120	24	99	81,67%	Very good

Based on table 1.2. the assessment given by the material expert above showed that the e-module has very good quality with an ideal percentage of 81.67%. The result of the highest assessment was in the feasibility aspect of the content/material with an ideal percentage of 85% and the lowest score was in the presentation and language aspects with an ideal percentage of 80%.

Table 1.3. Data from e-module assessment results by the media expert

No	Aspect	Max. Score	Min. Score	Average	Ideal Percentage	Quality
1	Presentation	55	11	52	94,54%	Very good
2	Language	20	4	18	90%	Very good
	Total	75	15	70	92,27%	Very good

Based on table 1.3. the assessment given by the media expert above demonstrated that the e-module has very good quality with an ideal percentage of 92.27%. The highest rating result was in the presentation aspect with an ideal percentage of 94.54% and the lowest score was in the language aspect with an ideal percentage of 90%.

Table 1.4. Data from e-module assessment results by the peer reviewers

No	Aspect	Max. Score	Min. Score	Average	Ideal Percentage	Quality
1	Content/Material Feasibility	60	12	55,3	92,2%	Very good
2	Modified free inquiry	15	3	11,7	78%	Good
3	Presentation	40	8	36,3	90,75%	Very good
4	Language	20	4	17,7	88,5%	Very good
	Total	135	27	121	87,36%	Very good

Based on the rating of table 1.4. given by peer reviewers above, it illustrated that the e-module has very good quality with an ideal percentage of 87.36%. The highest rating results were found in the feasibility aspect of the content/material with

an ideal percentage of 92.2% and the lowest score was in the modified free inquiry (MFI) aspect with an ideal percentage of 78%.

Table1.5. Data from e-module assessment results by the Biology teachers

No	Aspect	Max. Score	Min. Score	Average	Ideal Percentage	Quality
1	Content/Material Feasibility	60	12	52,5	87,5%	Very good
2	Modified free inquiry	15	3	13,5	90%	Very good
3	Presentation	40	8	34	85%	Very good
4	Language	20	4	13	65%	Good
	Total	135	27	113	81,875%	Very good

Based on table 1.5. about the assessment given by the biology teacher above, it showed that the e-module has very good quality with an ideal percentage of 81.875%. The highest rating result was obtained in the modified free inquiry (MFI) aspect with an ideal percentage of 90% and the lowest score was in the language aspect with an ideal percentage of 65%.

Table 1.6. Data from students' responses results towards the product

No	Aspek	Skor max	Skor min	Rata-rata	Presentase keidealan	kualitas
1	Material Coverage	15	3	13	86,66%	Very good
2	Interest	10	2	8,3	83%	Very good
3	Interface	5	1	4,4	88%	Very good
4	Language	5	1	4,5	90%	Very good
5	Images, videos/animations	30	6	26	86,66%	Very good
6	Learning independence	20	4	17,3	86,5%	Very good
7	Presentation	35	7	30,3	85,71%	Very good
8	Appearance	5	1	4,5	90%	Very good
	Total	125	25	116,9	93,52%	Very good

Data on table 1.6 were collected from 15 class X MA WI Kebarongan Banyumas students who responded to the product of Biology e-module. Students stated that the quality of the products produced in this study was very good, with the ideal percentage of each aspect ranging from 83% to 90% in which the highest ideal percentage was in the language and appearance aspects with an ideal percentage of 90% and the lowest score was in the interest aspect with an ideal percentage of 83%. As for the overall students' responses to the quality of the e-module, an average percentage of 93.52% was obtained with a very good category. This denoted that the quality of the e-module was very good so that the e-module is feasible if it is used to support the learning process.

Based on the overall results of the assessment given by reviewers (material expert, media expert,

peer reviewers, and biology teachers), an ideal percentage of 85.79% was obtained or was included in the *Very Good* category. Meanwhile, the results of the readability test for 15 students at MA WI Kebarongan Banyumas obtained an ideal percentage of 93.52% or was included in the *Very Good* category. Therefore, it can be summarized that the product in the form of a modified free inquiry-based (mfi) Biology e-module with invertebrate material is suitable to use as teaching material on invertebrate material for students of class X at MA WI Kebarongan Banyumas. The result in this research is in accordance with Sawitri's research, et al (2014: 412) which stated that quality and appropriate learning e-modules are e-modules that have met the validity standards assessed by experts.

The advantage of this biology e-module product is that there is Interactive Publishing which appears not only in the text form but it can also be images, videos, music/voice, hyperlinks and others. This e-module is in the form of a flipbook that can be opened in the form of sheets like a real book, therefore students can be more interested in and understand the material they are studying. It also allows the e-module to be interactive with users. With this e-module, students can have a variety of learning experiences and it can reduce student boredom because the media used is more varied. Additionally, this e-module is very recommended to use in order to increase students' understanding in the learning process.

The product output is in the form of a *Flip PDF builder* with extensions including HTML 5, EXE, ZIP and APP. The e-module was packaged in Android form so that users are more practical to use it anywhere and anytime. However, the e-module developed using the Flip PDF Builder application has several drawbacks. The e-module that was processed in the software can only be input from PDF format. If there are changes to the main file, the users have to create a new project. Then, the file size is quite large because the content is full of videos and images. It will have an impact when opening this e-module product on a smartphone, which requires a large enough memory space to open it. This is likely to be one of

the reviewers' considerations in assessing the quality of the Biology e-module.

Conclusions

Based on the conducted research, the following conclusions have been obtained: Invertebrate e-module product based on modified free inquiry for class X MA WI Kebarongan had been successfully developed using the Corel Draw X7 application and Flip PDF builder. The quality of the e-module received the *Very Good* category (SB) from the material expert with an ideal percentage of 81.67%, the assessment from media expert obtained the *Very Good* category (SB) with an ideal percentage of 92.27%, the assessment from peer reviewers obtained the *Very Good* category with an ideal percentage of 87.36%, and the assessment from the Biology teachers obtained a *Very Good* category (SB) with an ideal percentage of 87.92%. Furthermore, students' responses to the developed e-module obtained a *Very Good* (SB) category with an ideal percentage of 93.52%. Therefore, the e-module based on modified free inquiry is considered suitable as teaching material for class X SMA/MA with invertebrate material.

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Development of Science Literacy-Based Physics Magazine on Vibration and Wave Material for Class VIII SMP/Mts

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Abstract: This study aims to: (1) Determine the feasibility of scientific literacy-based physics magazines based on the opinion of the validator (2) Know students' responses to the attractiveness of scientific literacy-based physics magazines. This research is an R&D research that adopts the development from Borg & Gall with stages namely potentials and problems, data collection, product design, design validation, product revision, and product testing. The research subjects involved consisted of experts (material experts and media experts), teachers, and students of class VIII SMP/MTs. The types of data generated are quantitative and qualitative data which are analyzed with the guidelines of the assessment category criteria to determine product quality. The results obtained are: (1) The feasibility of the final product of physics magazine based on scientific literacy based on expert judgment is very feasible, with an average percentage of material expert validation of 90.7%, an average percentage of media experts is 91%, an average percentage -the average percentage of religious experts is 93%, and the average percentage of magazine experts is 93% (2) The response of students to the attractiveness of physics magazines based on scientific literacy as a learning medium obtained in the small group test is good with an average score of 76%. The field test obtained good criteria with an average score of 79%. Science literacy-based physics magazines were declared feasible and received a positive response to be used as learning media.

Keywords: Development, physics magazine, scientific literacy, vibrations, waves.

Introduction

With the rapid development of science and technology in the 21st century, the world of education is faced with ever-greater challenges to improve human resources. Information and communication technologies are developing rapidly. (Kennedy & Sundberg, 2020) One of the areas that were significantly affected was the education sector. (Zobrist et al., 2009) To keep up with rapid technological developments, education must have a great interest in keeping up with technological developments. Therefore, it is necessary to improve the quality of education so that it can support the development of an increasingly advanced era, and all aspects of education, both educators and students, must be able to have good relationships and interrelationships. (Pasmore et al., 2019) Based on this, education has an important role in improving

the quality of human resources. (Chipukuma et al., 2020)

According to the verse above, education and human life are inextricably linked because, through education, people should be able to master knowledge that will aid them in understanding the natural world around them. (Steffe & Ulrich, 2020) To improve educational quality, education and learning are both connected to how students' personalities and behaviors are formed. (Rissanen et al., 2019) Many factors can affect classroom learning, and these factors can come from students and educators. Improving the quality of education does not only refer to increasing the potential development of students; educators are required to make learning more innovative to encourage students to learn optimally in class or independently. (Jiang et al., 2021) One of the subjects that need to be improved is physics. Physics is a part of science that has an important

role in life.(Akben, 2020) One of the abilities that students are expected to master after studying science is scientific literacy. Scientific literacy is defined as the ability to use scientific knowledge, identify questions, and draw conclusions based on facts to understand the universe and its changes as a result of human activities.(Oliver et al., 2021) Scientific literacy skills are very important for students to have.(Afandi et al., 2019) Students who have scientific literacy skills will have strong scientific thoughts and attitudes to be able to effectively communicate knowledge and research results to the general public.(Sharon & Baram-Tsabari, 2020) Participants who have scientific literacy are people who can use scientific concepts and have the scientific process skills to assess them in making everyday decisions in dealing with other people, society, and the environment, including social and economic development.(Valladares, 2021) So, when students have scientific literacy skills, they can use scientific concepts, solve problems and not easily believe in issues circulating in society without empirical evidence.(Lederman, 2019)

The results of the assessment using PISA questions on the scientific literacy of students in Bandar Lampung obtained very low results. According to the report's findings, an average score of 27.27 ± 2.28 . (R et al., 2019) The scientific literacy competence of public school students is higher than that of private school students, and the scientific literacy of female students is higher than that of male students, but the difference between the two is not significant.(Chen et al., 2021) Questionnaire analysis shows that the external factors that influence scientific literacy are the learning methods used by science teachers, the educational backgrounds of students' parents, and the professionalism of science teachers, while the internal factors that influence the education majors students are interested in.(You et al., 2021) Therefore, there should be teaching materials or learning resources that can increase students' scientific literacy and help them learn independently.(Lai et al., 2019)

The use of media in learning can generate new desires and interests, increase motivation, and stimulate learning activities. and even affect

students psychologically.(Li & Chu, 2021) Magazines can be one solution.(Nasar et al., 2019) A magazine is a print medium that resembles a book, but in its presentation, it is much more interesting and lighter.(Rogelberg et al., 2022) because the portion of the picture is larger than the book and the explanation and language used are shorter, denser, and clearer. This is because sight leaves a longer impression and is easier to understand and remember.(Marshall et al., 2019)

Magazines are widely known among teenagers, but it is still rare to find magazines with educational backgrounds.(Maree, 2021) even though magazines can be an alternative source of learning because the forms presented are interesting and provide complete information.(Granić & Marangunić, 2019) Magazines in this context are physics magazines that are used as learning resources to understand physics subject matter while at the same time giving pleasure to students studying physics.(Nückles et al., 2020) As a learning resource, physics magazines can support students' understanding of the material presented by educators and provide an interesting learning experience.(Margot & Kettler, 2019)

Based on pre-research conducted at SMP Negeri 28 Bandar Lampung, SMP Al-Huda Jati Agung, and SMP Negeri 9 Metro, information was obtained that the learning process was still monotonous and only centered on the teacher. This makes students less active in the learning process. While the learning resources used in class still use books, prints, and LKS, Not many learning resources use magazines as material for independent teaching; when the learning process takes place, some students do not pay attention to the material presented by the teacher and prefer to chat with a friend. The library itself has no such independent learning resources as a physics magazine. The limitations of students in learning in class are still depending on the teacher and learning resources used to be one cause of students' scientific literacy skills are still low.

Through scientific literacy-based physics magazines, it is expected that students can gain knowledge about technological developments by knowing the benefits and impacts on the

environment and society. In addition, students can relate the lessons learned to everyday life and apply them. Therefore, researchers conducted research and development under the title "Development of Science Literacy-Based Physics Magazine on Vibration Material and Waves for Class VIII SMPs and MTs." This is expected to provide benefits for educators and students as a learning resource to create learning effectiveness and increase students' scientific literacy.

This research was conducted at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. After conducting preliminary research at SMP N 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, during the observation, namely by distributing questionnaires to class VIII students and conducting interviews with science subject educators, information was obtained that students only used LKS books and printed books in the learning process, so students need updates in the form of learning media. This study uses a qualitative approach and is supported by quantitative data in the form of product feasibility data, which contains suggestions and responses from validators and students' responses. Then it is changed to quantitative data in the form of numbers from the product feasibility score by processing the formulation of the numbers for the development stage. This research uses research and development research methods or development research. The development research approach and methods are guided by Borg and Gall. The result is a physics magazine based on scientific knowledge of vibration and wave material. Development procedures are the steps used to create a product. The research procedure used is the research model developed by Borg and Gall. However, due to limited time, cost, and manpower, this research will be carried out until the 7th stage, namely product revision. The following are the research steps carried out by the researcher: preliminary research, needs analysis, media design, validation, evaluation, media revision, and media implementation. Data for this study is gathered through questionnaires, interviews, observation, and documentation. 8 The instrument used in collecting this data is a validation sheet in the form

of a questionnaire using a Likert scale, which is used to find out whether the instrument that has been designed is valid or not. The validation sheet in the study consisted of 5 types; namely, in this technique, the researcher gave a questionnaire to media experts, and material experts gave a response questionnaire to physics teachers and VIII-level students. In this study, data collection instruments included questionnaires, interviews, and documentation. Before distributing the instrument sheet to the field, the supervising lecturer is consulted. After being declared good by the supervising lecturer, validation is carried out first by the validator. If the validity of the instrument is determined by the validator, it can be used in the field. The data analysis technique in this study was qualitative analysis, which involved describing and interpreting qualitative data such as comments and suggestions from educator validators, as well as students. Quantitative data in the form of numbers obtained from questionnaires were first analyzed, which would later be analyzed qualitatively. Data in the form of responses to the product test from the questionnaire assessment were analyzed statistically with the assessment provisions and five scoring rules.

Materials and Methods

Study area

Materials The research and development method (research and development) is a research method used to produce certain products and test the effectiveness of these products. To be able to produce certain products, research is used to analyze the needs and to test the effectiveness of the product so that it can function in the wider community, research is needed to test the effectiveness of the product.

In this study, researchers used the Borg and Gall development model. Borg and Gall suggest that 10 steps of research and development must be carried out, but in this research, the researcher limits the steps to only seven due to the limited time, energy, and costs required. as shown in the following chart:



Figure 1: Steps for using the Research and Development (R&D) Method

Based on several research and development methods mentioned above, this research uses the Borg and Gall model, which has been modified by Sugiyono. In development research, ten development steps are needed to produce a final product that is ready to be expected in educational institutions. However, due to limited time, cost, and energy, this research will be carried out until the 7th stage (seven), namely product revision..

Physics learning in junior high school aims to enable students to master physics concepts and their interrelationships and be able to use scientific methods based on science literacy skills to solve problems or issues faced by society in terms of economic, social, health, environmental, and other issues so that they do not easily believe in issues circulating in society without empirical evidence. Based on this assumption, the researcher attempted to create a physics magazine based on science literacy, in the form of a semi-scientific magazine (a semi-popular magazine), because later this magazine contains physics knowledge with a more interesting presentation and uses light language. In its visualization, this magazine will be designed in full color and equipped with examples of images or events in everyday life that support the explanation of the material and make it easier to understand. This magazine has a specialty in the evaluation system, the evaluation is made like a game, such as matching two statements, and experiments are conducted in everyday life. Science literacy-based physics magazines on vibration and wave materials can improve students' science literacy skills because they are compiled based on competencies that are part of science literacy, namely aspects of content, context, and science processes in everyday life. Science literacy-based physics magazines developed aim to

attract students' attention so that learning is interesting and not monotonous and so that students' science literacy skills can increase..

Data analysis

The data analysis technique in this research is qualitative analysis, which involves describing and interpreting qualitative data such as comments and suggestions from educator validators as well as students. First, quantitative data in the form of numbers obtained from questionnaires are analyzed, followed by a qualitative analysis. Data from the questionnaire assessment in the form of product test responses were analyzed statistically under the provisions of the assessment with five scoring rules, as shown in Table 2.

Table 1. Scoring rules

Kategori	Skor
Sangat Setuju (SS)	5
Setuju (S)	4
Kurang Setuju (KS)	3
Tidak Setuju (TS)	2
Sangat Tidak Setuju (STS)	1

- 1.) Calculate the percentage of the feasibility of each aspect with the following formula:

Likert scale formula

$$P = \frac{\Sigma x}{X} \times 100\%$$

Description:

P: Percentage

Σx : Number of respondents' answers in one item

Σx_i : The number of ideal values in the item

- 2.) Calculate the average presentation of all respondents with the formula :

$$P = \frac{\Sigma x}{X} \times 100\%$$

Description:

f = the frequency for which the percentage will be sought

N = number of frequencies

P = percentage number

- 3.) Converting the average score obtained into a qualitative value by the assessment criteria in the table.

Table 2. Criteria Scale

Persentase	Keterangan
0% - 20%	Sangat Kurang Baik
20% - 40%	Kurang Baik
40% - 60%	Cukup Baik
60% - 80%	Baik
80% - 100%	Sangat Baik

Based on these criteria, the product is said to be good if the percentage is $\geq 60\%$ seen from all aspects so that science literacy-based physics magazines can be used in the learning process.

Results and Discussion

The result of the research conducted by the researcher is to develop a product in the form of a science literacy-based physics magazine on vibration and wave material for class VIII SMP and MTs that is valid according to the assessment of validators and interesting according to the responses of students. The steps in the development of physics magazines can be explained by researchers through the following steps:

1. Potential and Problems

The potential of this research and development is to develop a science literacy-based physics magazine on vibration and wave material for class VIII SMP / MTs. The potential for product development is useful for minimizing problems in the classroom. The following are some of the results of the needs analysis, among others:

- In learning, teachers still use a lot of printed media and LKS, so teachers need quite a lot of time which results in teachers not maximizing time in delivering material.
- Limited independent learning resources for students
- Lack of development of innovative and interesting learning media
- There is no renewal of physics magazines based on science literacy that helps students in improving their science literacy.

The results of the needs analysis show that educators have not created effective and creative learning that supports students' science literacy, therefore researchers try to develop science literacy-based physics magazines that can improve students' science literacy skills.

2. Data Collection

Reference sources used for data collection of science literacy-based physics magazine products come from journals, books, and the internet. The reference is useful to know what is needed in making physics magazines such as how to use CorelDraw X7, the content in each magazine, and the source of images in the magazine.

Whereas the physics magazine uses vibration and wave material. The results of the information obtained will later be used as a basis for developing science literacy-based physics magazine products on vibration and wave material class VIII SMP / MTs.

3. Product Design

After the information-gathering stage, the next step is to plan media development. The product to be developed is a science literacy-based physics magazine that can help teachers and students in the learning process. At the initial development stage of science literacy-based physics magazine using CorelDraw X7 software. This program serves to help create a physics magazine design before being printed.

The development of physics magazines based on science literacy is emphasized in magazine design, material and practice questions, and images that support learning. The design on each page of this physics magazine varies to give an interesting impression to be used in learning material. which is associated with everyday life so

that it can improve the science literacy of students. The format of the developed science literacy-based physics magazine development is, namely, the outer front cover, inner front cover, editor, editorial, content, initial provision, main presentation, scientist, physics info, physics around us, simple experiments, islamcopedia, physics notes, short stories, practice question games, aphorisms, author biography, and back cover.

4. Design Validation

After the product has been developed, the next step is to test the feasibility of science literacy-based physics magazine products by validating the product. Validation is a stage used to determine the feasibility of the product to be used. Validation is carried out by validators according to their fields. This product is validated by material experts and media experts. The validators are physics lecturers whose job is to assess the products and instruments that will be used by researchers. The validated instrument is a product feasibility instrument. The material expert validators were carried out by 3 lecturers namely Mrs. Sri Latifah, M.Sc, Mr. Antomi Seregar, M.Pd, M.Si, and Mr. Ajo Dian Yusandika, M.Sc. Media expert validators were carried out by 2 lecturers, namely Dr. Yuberti, M.Pd, and Mr. Irwandhani, M.Pd.

Material validation with assessment indicators includes content quality, language, implementation, and visualization display. Media experts aim to see the feasibility of materials developed in science literacy-based physics magazines. It is known that in the 1st assessment aspect about the quality aspects of the content of science literacy-based physics magazines get a percentage of the feasibility of initial assessment before revision sebesar 86%. In the 2nd assessment aspect language gets a feasibility percentage of 88%. The 3rd assessment aspect about the implementation gets a feasibility percentage of 73% and the 4th assessment aspect about the appearance of visualization gets a feasibility percentage of 70%. The average assessment of the material expert validator on the feasibility percentage before revision is 80% with feasible criteria. Furthermore, the validation assessment by the material expert after revision is in the 1st assessment aspect on the quality aspect of the

physics magazine content obtained a percentage of 92%. In the 2nd assessment aspect of the language aspect in physics, the magazine obtained a percentage of 91%. In the 3rd assessment aspect about the implementation of physics, magazines get a percentage of 86%, and in aspect, k3 4 about the appearance of visualization get a percentage of 93%. Thus, the average assessment of the material expert validator at the post-revision stage is 91% of the eligibility percentage.

Based on the results of the material expert assessment, it is known that the feasibility percentage score is in the very feasible category, so the product can already be used in junior high school / MTs class VIII, especially physics subjects on vibration and wave material.



Graph 1. Material Validation Results Before Revision



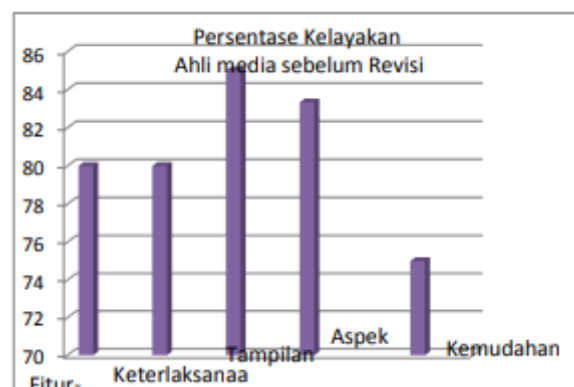
Graph 2. Material Validation Results After Revision

Graph 1. and Graph 2. explain that the assessment of all material by expert validators per an aspect of assessment has increased between before and after the revision. In the aspect of content quality assessment, the initial percentage was 86% to 92% with very feasible criteria; in the aspect of language, it was 89% to 91% with very

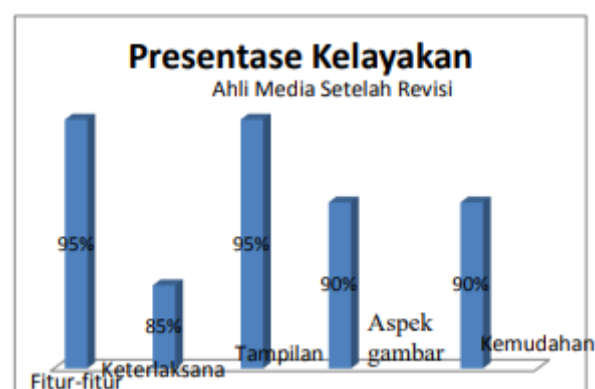
feasible criteria, in the aspect of implementation, it was 73% to 86% with very feasible criteria, and in the aspect of visualization, we got an initial percentage of 70% to 93% with very feasible criteria. The average percentage of all aspects before revision was 80% and after the revision was 91% with very feasible criteria.

In the assessment by media expert validation above, it can be seen that a percentage of 80% is assigned to the feasibility of the initial assessment before revision in the first assessment aspect about the features of science literacy-based physics magazines. The second assessment aspect is about implementation and obtaining an 80% feasibility percentage. The third assessment aspect, the magazine's appearance, receives an 85% feasibility percentage. In the 4th aspect assessment about the image aspect, it gets a percentage of 83%, and in the 5th aspect assessment about ease of use, it gets a feasibility percentage of 75%. The average assessment of media expert validators on the feasibility percentage before revision is 81% with very good criteria. Furthermore, the assessment of validation by material experts after revision obtained a percentage of 95% in the first assessment aspect of the physics magazine's features, a percentage of 85% in the second assessment aspect of the physics magazine's implementation aspect, a percentage of 95% in the third assessment aspect of the physics magazine's appearance, a percentage of 90% in the fourth assessment aspect of the image aspect, and a percentage of 90% in the fifth assessment aspect of the image aspect. Thus, the average assessment of media expert validators at the post-revision stage is 91% of the feasibility percentage.

Based on the results of the material expert assessment, it is known that the feasibility percentage score is in the "very good" category. Then the product can already be used in junior high school and MTs Class VIII, especially in physics subjects on vibration and wave material.



Graph 3. Media Validation Results Before Revision



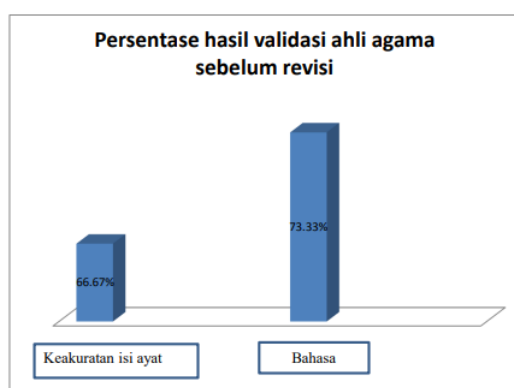
Graph 4. Media Validation Results After Revision

In Graph 3. and Graph 4. it is explained that the assessment of all media expert validators per an aspect of assessment has increased between before and after the revision. In evaluating the magazine's features, initial percentages ranged from 80% to 95% with very realistic standards, from 80% to 85% with very realistic standards for implementation, from 85% to 95% with very realistic standards for the magazine's appearance, from 83% to 90% with very realistic standards for images, and from 75% to 90% with very realistic standards for convenience. The average percentage of all aspects before revision was 81%, and after revision it was 91%, with very feasible criteria.

Based on the assessment by the religious expert validation above, it can be seen that in the first assessment aspect about the accuracy of the magazine content, the percentage of the feasibility of the initial assessment before revision is 66%. In the second assessment aspect about language, it gets a feasibility percentage of 73%. The average assessment of religious expert validators on the percentage of feasibility before revision is 70% with decent criteria. Furthermore, the validation

assessment by religious experts after revision, namely in the first assessment aspect of the accuracy of the magazine content, obtained a percentage of 93%. In the second assessment aspect, the linguistic aspect of the physics magazine received a percentage of 93%. As a result, the average assessment of religious expert validators at the post-revision stage is 93% eligibility.

Based on the results of the religious expert assessment, it is known that the feasibility percentage score is in the very feasible category. Then the product can already be used in junior high school / MTs class VIII, especially physics subjects vibration and wave material.



Graph 5. Religious Validation Results Before Revision



Graph 6. Results of Religion Validation After Revision

In Graph 5. and Graph 6. is explained that the assessment of all religious expert validators per an aspect of assessment has increased between before and after the revision. In the aspect of assessing the accuracy of the content of the verse, initially, the percentage was 66%–93% with very feasible criteria. The average percentage of all aspects

before the revision was 70%, and after the revision, it became 93% with very feasible criteria.

In the assessment by the magazine expert validation above, it can be seen that in the first assessment aspect about the completeness of the material, the percentage of the feasibility of the initial assessment before revision is 73%. In the second assessment aspect, the activities supporting the magazine get a feasibility percentage of 73%. The third assessment aspect, about the material's omnipresence, receives a 100% for feasibility. In the 4th assessment aspect about the use of notation, symbols and units get a percentage of 60%. In the fifth assessment area, the presentation's usefulness and meaning were taken into consideration, and a feasibility percentage of 75% was given. In the sixth assessment area, students were encouraged to participate, and a feasibility percentage of 80% was given. In the seventh assessment area, the general appearance was given a feasibility percentage of 65%. In the eighth assessment area, the anatomy of the physics magazine was given a feasibility percentage of 75%. In the ninth assessment area, language was given a feasibility percentage of 75%. A percentage of 70% was obtained in the 11th assessment aspect about the completeness and suitability of the rubric; a percentage of 73% was obtained in the 12th assessment aspect about the magazine's appearance; a percentage of 80% was obtained in the 13th assessment aspect about the magazine cover; a percentage of 80% was obtained in the 14th assessment aspect about the layout; and a percentage of 70% was obtained in the 15th assessment aspect about readability. The average assessment of magazine expert validators on the feasibility percentage before revision is 73% with decent criteria.

In addition, the validation assessment performed by magazine experts after revision, particularly in the first assessment component regarding the completeness of the material, reveals a feasibility percentage of 93% of the initial assessment's feasibility prior to revision. The second assessment aspect of the magazine's activities received an 86% feasibility percentage. The third assessment aspect, about the material's omnipresence, receives a 100% for feasibility. In the 4th assessment aspect about the use of notation,

symbols and units get a percentage of 100%. In the 5th assessment aspect of the presentation, considering meaningfulness and usefulness, we got a feasibility percentage of 86%, in the 6th assessment aspect involving students actively, we got a percentage of 100%, in the 7th assessment aspect about the general appearance, we got a percentage of 100%, in the 8th assessment aspect about the anatomy of the physics magazine, we got a percentage of 95%, in the 9th assessment aspect about language, we got a percentage of 88%, in the 10th assessment aspect about the appearance of the picture, we got a percentage of 100%, In the 11th assessment aspect about the completeness and suitability of the rubric, a percentage of 90% was obtained, in the 12th assessment aspect about the appearance of the magazine, a percentage of 86% was obtained, in the 13th assessment aspect about the magazine cover, a percentage of 93% was obtained, in the 14th assessment aspect about the layout, a percentage of 100% was obtained, in the 15th assessment aspect about readability, a percentage of 90% was obtained, and in the 16th assessment as The average assessment of magazine expert validators on the percentage of feasibility before revision is 93% with "very feasible" criteria.

Based on the results of the magazine's expert assessment, it is known that the feasibility percentage score is in the "very feasible" category. Then the product can already be used in junior high school and MTs Class VIII, especially in physics subjects involving vibration and wave material.

5. Design Revision

Physics magazines that have been validated by material experts and material experts then the next stage is to improve the design of physics magazines by the criticisms and suggestions given by the experts. The results of validation by the validator provide information to researchers related to weaknesses in science literacy-based physics magazine products.

Based on the criticisms and suggestions given by the material experts, the researchers made improvements to the content and material to perfect the physics magazine product so that it could be feasible to use before the field trial. The physics magazine was assessed by 3 lecturers who

have expertise in the field of physics, namely validator 1 Mr. Ajo Dian Yusandika, M.Sc, validator 2 Mrs. Sri Latifah, M.Sc, and validator 3 Mr. Antomi Saregar, M.Pd, M.Si. The improvements made are to add more examples of various kinds of waves and more varied images. Improvements are made to clarify the content of the material and improve the material that is not by the theory contained in the science literacy-based physics magazine. Material improvements are made to match the material with the image and clarify the material in the physics magazine so that it can be easily learned. Islamclopedia's improvement is to add verses of the Qur'an associated with vibration and wave material and multiply the verse to increase the reference source of the verse in the physics magazine.

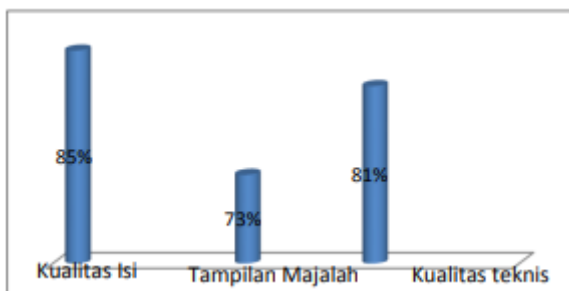
Based on the criticisms and suggestions given by the media experts, the researchers made improvements according to the suggestions given so that the physics magazine can be better and more feasible to use before being tested. The improvement of the front cover is to remove the himafi symbol and remove the name of the author and his supervisor. This was done to make it look tidier and simpler. The inside front cover was improved by adding the name of the second supervisor, Prof.Dr.H.Syaiful Anwar, M.Pd., and removing the himafi symbol. The editor's improvement is to add the names of the supervisors, material experts, and media experts to the physics magazine. Improvements were made by adjusting the picture with the content of the short story, namely about the ocean. Improvements are made by including image reference sources in physics magazines taken from the internet or other sources.

6. Product trial

After the product is validated and then revised and declared fit for use by both experts, the product in the form of a physics magazine is tested in three schools, namely at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The trial was conducted to determine the response of students and educators to the level of attractiveness of the physics magazine product. The trial was conducted during the learning process, then students were asked to fill out a

response questionnaire after students were given a science literacy-based physics magazine product on vibration and wave material.

The questionnaire was distributed to find out the response of educators to the assessment of physics magazine products. The assessment was carried out by 3 (three) educators in the field of science studies at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. recapitulation of the results of the response of educators conducted on three science subject teachers in grade VIII in three schools. The results obtained are in the assessment of the 1st aspect of the quality of the content getting a percentage of 85%. In the 2nd assessment aspect of the appearance of the magazine got a percentage of 73%, and in the assessment of the 3rd aspect of technical quality got a percentage of 81%. The average assessment of the expert review test by the 8th-grade science subject teacher is with a percentage of 80% with very good criteria.



Graph 7. Recap of Teacher Response Assessment

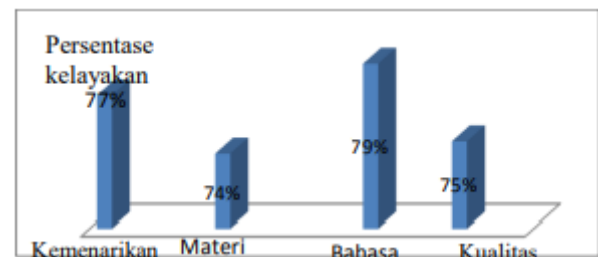
Graph 7. explains the results of the recapitulation of the responses of science subject teachers in three schools with details of the aspect assessment, namely the aspect of content quality at 85%, the appearance of the magazine at 73%, and the aspect of technical quality at 81%, for an average of 80% very good criteria. This means that physics magazines are suitable for use in learning after validation by teachers, so the product is ready to be tested.

The next stage is the product trial of science literacy-based physics magazines. The small group trial used 10 respondents from VIII grade students in three schools, namely, SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, to see the students' responses to the product that the researchers developed. The small group trial was used to determine student

evaluations of a limited number of physics magazines developed.

The results of the small group trial, the magazine product reached an average percentage of 76% with good criteria, which means that the physics magazine developed by the researcher has a high degree of feasibility to be used as a tool in learning in the odd semester of class VIII SMP and MTs.

The results of the small group trial showed that the aspect of interest received a percentage of 77%, the material aspect received a percentage of 74%, the assessment of the language aspect received a percentage of 78%, and the aspect received a percentage of 74% for the assessment of the technical assessment. The overall number of aspects met good criteria, so that the physics magazine is, in the opinion of students, very interesting as teaching material. Broadly speaking, the results of the small group trial can be seen in the following graph:



Graph 8. Graph of Small Group Trial Results

A total of 92 students participated in the field test, including 32 students from SMP Al-Huda Jati Agung school, 29 students from SMP Negeri 9 Metro school, and 31 students from SMP Negeri 28 Bandar Lampung school. The trial process was the same as the small group trial, namely, filling out the learner response assessment questionnaire. The results of the assessment of the content quality aspect of the feasibility percentage of 78%, the material aspect of 78%, the language aspect of 80%, and the technical quality aspect of 78%. Thus, the average percentage of field tests at SMP Negeri 28 Bandar Lampung with attractive criteria is 79%.

The results obtained from the field test through the questionnaire of students of SMP Negeri 9 Metro in the aspect of content quality obtained a percentage of 86%, the material aspect reached a percentage of 84%, the language aspect reached a percentage of 82%, and the aspect of technical

quality reached a percentage of 87%. The average percentage value is 85%, which is a very interesting criterion.

In a field test conducted through student questionnaires at Al-Huda Jati Agung Junior High School, the content quality aspect reached a percentage of 72%, the material aspect reached a percentage of 72%, the language aspect reached a percentage of 76%, and the technical quality aspect got a percentage of 75%. The average percentage value is 74%, which meets interesting criteria.

The physics magazines' interpretations have shown interest, so the product does not need to be revised. In general, students consider science literacy-based physics magazines to be something new, the material displayed becomes new knowledge for students, and the content in the magazine is easy to understand. This is because the writing in a simple magazine is not excessive in letters, the language used is communicative, and the varied images make students interested in reading it.

1. Product revision

Based on the results of the field trial, the science literacy-based physics magazine is feasible and gets a positive response to make it a learning resource.

Based on the results of research conducted in the three schools SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung, it is known that the learning process is limited in place and time, learning resources are less varied, there are no adequate alternative learning resources to improve science literacy.

The success of the teaching and learning process is characterized by good student achievement. The factors that influence learning include the performance of educators, facilities and infrastructure that support learning facilities, school management, curriculum, students, syllabus and teaching materials, learning aids or media, and the role of parents, communities, stakeholders, and others.⁴⁵

Schools that utilize alternative learning resources are still very few, especially for physics learning, and many schools do not have physics magazines that can be used as independent learning resources.

At the junior high school level, for example, students have difficulty understanding the material, therefore it is hoped that the existence of this science literacy-based physics magazine can help students understand the material, especially vibration and wave material in class VIII junior high school / MTs.

The initial steps taken in the preparation of the physics magazine include determining the idea, analyzing the material used, preparing the CorelDRAW X7 application, and adjusting the material with science literacy based. Physics magazine content consists of cover, editor, editorial, content, initial provision, main presentation, scientist, physics info, physics around us, simple experiments, islamicopedia, physics notes, short stories of wave physics, physics quiz, and aphorisms and biography of the author.

Based on the data obtained by the validators that the physics magazine based on science literacy is said to be feasible for use at the level of junior high school / MTs class VIII. Validators consist of 3 material experts and 2 media experts who are experts in their fields.

To produce a product in the form of a science literacy-based physics magazine, the researchers used the research and development procedures of the Borg and Gall model which were only limited to the seventh stage, namely potential and problems, data collection, product design, design validation, design revision, product trials, and product revision. The reason for using only seven stages is that in the seventh the product has reached a state that is suitable for use. The success of the development of physics magazines can be seen by using a Likert scale measurement of 1-5 which is then adjusted to the range of feasibility and attractiveness values.

After going through the validator stage, the physics magazine was then tested on the educator's response consisting of three teachers of SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The educator's response covers aspects of media quality, media display, and technical quality. Furthermore, after obtaining data and analyzing the results it was stated that the physics magazine was very

interesting to use with an average percentage of 80%.

Product trials for students, consisting of small group trials and field trials of science literacy-based physics magazines were tested in three schools SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The trial began with demonstrating and explaining the physics magazine and then students were asked to fill out a response questionnaire to the physics magazine obtained.

The small group trial was given to 10 students from each school of SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung. The test covered 4 aspects, namely interest, material, language, and technical quality. Based on the recapitulation of the small group trial on class VIII students get a percentage assessment of 76% attractiveness and it can be concluded that the science literacy-based physics magazine is interesting to use in the learning process.

Improving the quality of education requires learning innovation, starting from formal and non-formal education levels. In addition to being more efficient, the learning process is also expected to be more enjoyable and educate students to cover all attitudes, namely both intellectual, spiritual, and others.

As a result, the product, which takes the form of a science literacy-based physics magazine, is expected to make learning easier for students and to improve students' science literacy.

Some advantages and disadvantages of science literacy-based physics magazines are obtained based on the existing results. This development product has the following advantages:

- 1) Science literacy-based physics magazine can be an interesting and educational additional learning resource reference and can increase students' reading motivation.
- 2) Learning media in the form of physics magazines can minimize the limitations of facilities and infrastructure in the learning process.
- 3) The product can maximize learners based on a fun learning style.
- 4) Science literacy-based physics magazines can be used independently or in groups because the magazine presents the material very concisely.

The products of this development have shortcomings, namely the material developed in science literacy-based physics magazines only material vibrations and waves odd semester class VIII.

From the advantages and disadvantages of this science literacy-based physics magazine, it is expected not to reduce or affect the performance of this product itself. Where physics magazine products as a tool used by educators to convey material well to make it easier for students to understand it.

Conclusions

Based on the results of research and development of science literacy-based physics magazines on vibration and wave material for class VIII SMP and MTs, several conclusions were obtained, including 1) The development of science literacy-based physics magazines is very feasible to use in learning. The feasibility of the product is based on the assessment of material experts and media experts, with a percentage assessment of 90.7% in the category of "very feasible" and 90% in the category of "very feasible." 2) The attractiveness of the production response of physics subject teachers in SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung is very interesting, obtaining an average percentage of 80%. The results identify that this science literacy-based physics magazine is very interesting and has been feasible to be applied to students at the junior high school level (MTs Class VIII Even Semester), and product attractiveness in small group trials and large group trials conducted at SMP Negeri 28 Bandar Lampung, SMP Negeri 9 Metro, and SMP Al-Huda Jati Agung is very interesting and effective against the science literacy-based physics magazine developed. In each trial, the percentage of attractiveness performed by the three schools was 76% for small-group trials and 79% for large-group trials. These results identify that this science literacy-based physics magazine is very interesting.

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Islamic and Science Study of Jombang “Kenduren” Culture in Learning Materials

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Abstract: The purpose of this study was to analyze the integration of science material and Islamic religious education in the Jombang "Kenduren" tradition. Kenduren is a community tradition that is held once a year to commemorate gratitude for garden produce. At the "kenduren" event, the community distributes the number of durians in accordance with the year of implementation. This research method is a qualitative research in Wonosalam Village, Jombang Regency, East Java Province. Data collection was carried out through observational studies and literature studies. The results of the analysis state that in the "Kenduren" tradition there is integration between Islamic religious education and science. Islamic studies contained in this tradition are a form of gratitude and sharing activities among the people of Wonosalam village. This shows the implementation of *habluminallah* and *habluminannas* in people's lives. While the study of science in the "Kenduren" tradition can be linked to the concepts of physics, chemistry, and biology. The preparation of kenduren applies the concepts of physics to the theory of balance, parabolic motion, and energy; chemical concepts in the theory of biomolecules; as well as biological concepts in the theory of biodiversity and natural ecosystems.

Keywords: Islamic and Science, Kenduren, Learning Materials.

Introduction

Science and technological developments have changed the world as the fourth industrial revolution. Education is an important basic aspect to be developed for sustainable development (Alenezi, 2020). One of the important elements to increase economic growth and national competitiveness in this era is preparing a more innovative learning system and increasing competency graduates who have learning and innovation skills in the 21st century. 4C competencies can be implemented in the teaching and learning activities (Supena, Darmuki, & Hariyadi, 2021). 4C competence can be implemented in the process of teaching and learning activities. Subjects that apply 4C competencies can make students think coherently. One of the subjects studied by students is Natural Sciences.

Natural science education is a science with the topic of discussing natural phenomena which are arranged systematically based on the results of experiments and observations (Hamza, Wojcik, Arvanitis, Haglund, Lundegård, & Schenk, 2022). Science learning includes knowledge in the form of facts, concepts and principles obtained from experience, as well as the result of a series of processes through investigation, preparation, and presentation of ideas (Jannah & Atmojo, 2022; Nurmala, Triwoelandari, & Fahri, 2021; Pratiwi, Gunawan, & Ermiana, 2022). Science learning is closely related to the natural potential that is in the environment around students. In addition to studying natural forms theoretically, students also learn the blessings of gratitude for the creation of the almighty. The link between science learning and religion can be implemented in Islamic religious education learning.

Islamic religious education is a process of guidance that originates from the Al-Qur'an and As-Sunnah which is given to a person (student) on physical and spiritual development in order to lead to the formation of a main personality, morals, and Muslim personality by using methods and approaches that are Islamic style. Students are important to instill their religious souls from an early age. Brushing good and structured life makes students uphold the level of courtesy in civilized both in the school environment and in the community. Islamic religious learning can be related to the local culture of the area that is usually followed by students, one of them is the culture of "Kenduren".

Kenduren is a community tradition that is held once a year to commemorate gratitude for garden produce. At the "Kenduren" event, the community distributes the number of durians in accordance with the year of implementation. There are three forms of gratitude, namely verbal, heart and deed gratitude (Rachmadi, Safitri, & Aini, 2019). Facts on the ground show that teachers still haven't implemented the potential of local culture with the concept of science and Islamic religious education (Ibrahim & Nugroho, 2019). Students feel passive when learning in class (Kurnia, Sukarmin, & Sunarno, 2021). The culture of "Kenduren" when studied broadly will produce a very detailed analysis of natural science materials and Islamic religious education.

Kenduren culture can be integrated into Islamic religious education and science material. This topic is new invention so that it can be implemented in formal learning. Learning becomes meaningful because it is able to associate with the local culture of the area.

Materials and Methods

Study area

This study uses a qualitative descriptive research method. The data was obtained based on the results of interviews with the village head of Wonosalam, Jombang, East Java. Researchers mapped the results of interviews with science learning materials and Islamic religious education.

Research instruments in the form of interviews, observations, and literature reviews.

Procedures

Based on this research, produce research procedures namely:

1. Interviews

The first stage is the interview. The interviews conducted by the researchers were with the head of the village of Wonosalam, Jombang, East Java. The interview guide indicators related to the "Kenduren" activity schedule, the meaningful messages of the program, and the origins of the "Kenduren" activities carried out. The results of the interviews show a detailed explanation of the characteristics of the "Kenduren" activities, then these results can be analyzed by researchers who are related to science material and Islamic religious education.

2. Observations

The second stage is the observation of "Kenduren" activities. Field observations were carried out by researchers when the "Kenduren" activity took place. The researcher observed directly when the activity took place. At the observation stage, researchers mapped related science concepts and could be used as teaching materials for students. In addition, there are some very strong values of the Islamic Religion concept which can then become a place of learning for students. The community was very enthusiastic in participating in the "Kenduren" activity.

3. Literature review

The third stage is the literature review. Based on the results of interview and observation data, it is strengthened by using several relevant literature sources. Researchers use indexed journals and books related to research topics. At this literature review stage, researchers can broadly add insight based on the author's point of view in both journals and books.

Data analysis

Data analysis techniques include data reduction, data display, and drawing conclusions on verification. Processed data obtained from interviews, observations, and literature reviews. The results of data processing produce mapping

data for "Kenduren" activities with natural science and Islamic religious education material.

Results and Discussion

Result

Based on the research conducted, it produces data on the results of a qualitative descriptive analysis. Figure 1 shows the "Kenduren" activities which were attended by local residents and outside the region. The author maps out the "Kenduren" activities associated with science material and Islamic religious education in Figure 2. The results of a detailed description of the material can be seen in Table 1.



Figure 1. "Kenduren" culture in Jombang, East Java.

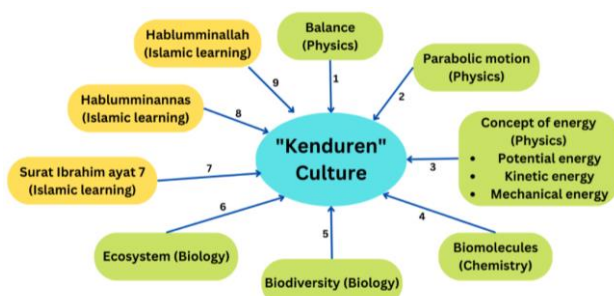


Figure 2. Mapping results of natural science and Islamic religious education materials in the "Kenduren" culture.

Based on Figure 2 the analysis results were obtained in Table 1

Table 1. The results of the description of the material mapping of Science and Islamic Religious Education in the "Kenduren" culture.

No	Description
1	Durian drafting design
2	The process of falling durian when distributed
3	The position of the Durian when it is in a still and moving position
4	Content of organic compounds in durian fruit
5	Crops in Wonosalam village
6	Garden and ricefield ecosystem
7	وَادِّ تَأَذَّتْ رَبِّكُمْ لِيْنَ سَكَرْتُمْ لَأَزِيدَنَّكُمْ وَلِيْنَ كَفَرْتُمْ إِنَّ عَذَابِي لَشَدِيدٌ
8	Mutual cooperation, sharing sustenance, and silaturrahim
9	Increase piety and gratitude

Discussion

The "Kenduren" culture is a durian feast held by the Wonosalam people once a year. The number of durians is adjusted to the number of years of implementation. In language, "Kenduren" comes from the Javanese term, which is a community thanksgiving for the delivery that has been achieved. The term "Kenduren" is also combined with the word "Duren" which means durian fruit in Javanese. The "Kenduren" activity started with the good intentions of the village head as a form of gratitude for sharing garden produce with the surrounding community. As the people's economy develops, the majority of Wonosalam residents work as farmers who grow durian fruit. Durian plants in Wonosalam are very dominant compared to other plant products. Thus, durian is used as an icon of Wonosalam village. In several years the village head gathers residents who own durian to jointly perform a form of gratitude to the creator. The durian garden owners donate their garden products sincerely with the intention as a form of gratitude to the creator. Increasingly, the durian garden owners took the initiative to hold a durian party which is held once a year. Based on the interview results, the head of the Wonosalam village stated that the "Kenduren" activity was carried out once a year as a form of gratitude for the residents to the creator and local and foreign communities could feel the results of the Wonosalam village gardens.

The "Kenduren" culture was attended by several village leaders and village communities. Students were also very enthusiastic in participating in these activities. Therefore, the "Kenduren" activity is embedded in the minds of students when

attending the event. So if it is associated with learning it will be more meaningful. "Kenduren" activities can be associated with the concept of science. Science learning is one of the abstract materials, so students have difficulty digesting the material. However, with the connection with culture, students will be interested in learning science material. The link between science material and "Kenduren" activities is found in the concepts of physics, biology, and chemistry. The mapping results are in Figure 2.

In physics material there are concepts of balance, parabolic motion, and concept of energy. Balance theory is related to the preparation of durian fruit which is used as a form of cone as in Figure 1. It takes maximum balance so that in the preparation of durian there is no fall and damage. The Parabolic Motion concept is associated with the sequence of events held, which is throwing durian fruit from top to the bottom. At that time, the occurrence of parabolic motion carried out, this was with the physics formula about the parabolic motion. In the concept of energy there is a combination of potential energy, kinetic energy, and mechanical energy. Potential energy is the linkage of the preparation of durian cone so that it is balanced and is related to the relationship of the gravitational force of the earth. Kinetic energy implementation is the fall of durian fruit distributed to the public from top to the bottom. In mechanical energy is a combination of potential energy and kinetic energy. Based on the results of the mapping can be used as a learning resource and can be used as material for physics related to local culture, namely "Kenduren".

In chemistry, there are biomolecules. The biomolecules contained in durian fruit are methanol and ethyl acetate extracts. Durian contains secondary metabolites consisting of alkaloids, terpenoids and steroids (Lubis, 2020). Durian is rich in macronutrients (sugar and fat), micronutrients (potassium), dietary fiber and volatile compounds (Aziz & Jalil, 2019). The content of chemical compounds found in durian fruit can be used as a source of learning for students.

Based on biological material, there are biodiversity and ecosystem. Students can find out

the potential of any plants found around their area. In terms of biodiversity, it can be identified by the presence of durian fruit, rambutan fruit, salak fruit, chocolate, and so on. Fruits and vegetables are also served in the "Kenduren" program. Students will learn meaningfully. Students can also study garden ecosystems, because the plants produced certainly have a life cycle in the form of an ecosystem.

The "Kenduren" activities also uphold Islamic values. If it is associated with Islamic religious education material, there are several materials that are found in the Qur'an in the letter of Ibrahim verse 7, Habmumminallah, and Hablumminannas. The translation of Surah Ibrahim verse 7 is "And (also remember), when your Lord announces; "Indeed, if you are grateful, surely We will increase (favours) to you, and if you deny (My favours), then indeed My punishment is very painful." Learning from this verse, humans should be grateful for God's blessings by giving alms according to the ability of the sustenance that has been obtained. This makes learning for students that when they have wealth, it would be better to set it aside to give alms to fellow human beings. The next concept is "Hablumminallah" which means relationship with God. Connection with the "Kenduren" culture is a form of gratitude to God for all the gifts that have been bestowed in the form of garden crops that greatly support the community's economy. The village community donated their garden produce sincerely. Based on this, it can be related to Islamic religious education material about the importance of being sincere and grateful. Next is the concept of "hablumminannas" which means relations with fellow human beings. As a social community, we should help each other. In the "Kenduren" culture, it fosters a spirit of peace in the community about the importance of collaboration between citizens, harmony, reducing envy and envy, and so on. With the application of religious concepts in learning that are associated with local culture, it is hoped that students can understand them seriously, so that learning will become more meaningful.

Based on this explanation, the culture of "Kenduren" can be associated with the concept of science and Islamic religious education. The link between the material shows that the "Kenduren"

event contains a lot of learning that is studied more. Meaningful learning can make students become more enthusiastic in learning. The resulting teaching material can make the handle for students in understanding the material link between local culture "Kenduren" which is integrated with science material and Islamic religious education.

Conclusions

"Kenduren" culture can be associated with the concept of science material and Islamic religious education. This shows the implementation of *habluminallah* and *habluminannas* in people's lives. While the study of science in the "Kenduren" tradition can be linked to the concepts of physics, chemistry, and biology. The preparation of kenduren applies the concepts of physics to the theory of balance, parabolic motion, and energy; chemical concepts in the theory of biomolecules; as well as biological concepts in the theory of biodiversity and natural ecosystems. Based on the results of study indicate that very detailed and structured mapping can be used as teaching materials for local culture based learning related to natural science material and Islamic religious education.

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Making Chemical Practicum Kit For Polimedia Students

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Abstract: The purpose of this study was to obtain a chemistry practicum kit according to standards for graphic engineering study program students in applied chemistry courses. The population in this study were students of the Polymedia PSDKU Medan graphic engineering study program, which consisted of 2 classes. The sample in this study was obtained by simple random sampling technique for one class. This research is descriptive and experimental in nature (development and research). The research steps include: a) Design and manufacture of a chemistry practicum KIT for applied chemicals; c) Implementation of KIT practicum in learning to find out student learning outcomes. The results of the research show that the practicum KIT has been developed for students of the graphic engineering study program. The implementation of the chemistry practicum KIT that has been developed shows that student learning outcomes are higher than the KKM score of 83.72 and the average student psychomotor score is 91.1. This shows that the practicum KIT that has been developed is suitable for use in chemistry learning at Polimedia PSDKU Medan.

Keywords: Practicum KIT, Applied Chemistry, Student Learning Outcomes.

Introduction

Chemistry is a science that needs proof experiments that have two things that are very related and cannot separated, namely chemistry as a product (chemical knowledge in the form of facts concepts, theories, and principles) and processes (scientific work). Both of these things can achieved by students, one of which is through practicum activities (Zidny, et al.,2017).

According to Rustaman as quoted by Trisnawati (2011:110), practicum instructions or practicum diktat are some of the tools needed so that activities in the laboratory run smoothly, so that the objectives learning can be achieved, minimizing the risk of possible accidents happen and others. The benefits of practical instructions / practical instructions between others: (1) can help achieve student learning mastery, (2) cultivate scientific work habits, (3) to provide feedback on teacher in preparing a more varied learning design and meaning. Practical instructions have a very very important role in carrying out laboratory activities. With practical instructions expected to have a positive impact on success in the laboratory.

However not all schools have practicum instructions / dictates. Educators tend to more emphasis on the material without linking between the science being studied environment, technology, and society as one unit (integrated). The school has adequate facilities. Equipment and The materials available in the laboratory are sufficient practicum is carried out.

The absence of tools and chemicals is one of the factors that often becomes the obstacle is not doing practicum, because of the practicum guidebook still use a lot of tools and materials that are hard to come by. Therefore Chemistry teachers really need creativity in developing practicum kits by looking for alternative materials and other tools that are easily found in everyday life. Thus the practical implementation will remain carried out and does not depend on laboratory facilities in schools. One alternative solution to support experimental learning then it is deemed necessary to use KIT learning media (Box Integrated Instrument) simple chemistry practicum without compromising objectives the practicum itself (Zidny, et al., 2017). The practicum KIT is a set practicum tools

packaged in such a way in a box containing the tools practice. Implementation of chemistry learning practicum with practicum KIT become easier, simpler, not scary, safer for health, and can reduce the risk of laboratory accidents (Epinur, et al., 2015).

Based on the problems described above, the purpose of this study is to develop an alternative chemistry practicum kit that is relatively cheaper and easy to overcome the problem of limited facilities and infrastructure laboratory as a support for chemistry learning in high school according to the curriculum 2013.

Identification of problems

1. Difficulties in providing practicum tools and materials available on campus thus hindering the teaching and learning process with experiments.
2. There is no adequate practicum included in the textbook
3. The difficulty in providing practicum tools and materials in the available guides hinders the teaching and learning process with experiments.
4. Implementation of chemical practicum which is rarely carried out on campus
5. Chemistry learning outcomes of students who still have not reached grades

Scope of problem

1. The material being analyzed is a solution material.
2. The learning model used is a practicum learning model.
3. The media used is KIT (integrated instrument box).
4. The research was conducted in Semester II Graphic Engineering class

Formulation of the problem

1. Does the chemistry practicum kit designed for the Graphic Engineering class meet the eligibility standards of a KIT?
2. Are student learning outcomes using the developed chemistry practicum KIT higher than the KKM price?

Research purposes :

1. To find out whether the chemistry practicum kit designed for the Graphic Engineering class on solution material meets the eligibility standards of a KIT.
2. To find out whether student learning outcomes use the chemistry practicum KIT that has been developed to be higher than the KKM price.
3. To find out the results of the validation of the Lecturer and Teacher chemistry practicum KIT that was developed to have a high value

Benefits of Research Research

Theoretical benefits are:

1. understanding how to analyze chemistry practicum KIT;
2. understand how to develop practicum guides;
3. understand how to design a chemistry practicum KIT. Meanwhile, the practical benefits are: (a) a chemistry practicum kit and guide is obtained that is easy to obtain, feasible and interesting, and easy to implement; (b) practicum KIT products can be applied by chemistry teachers in the learning process; and (c) contributing ideas for teachers, lecturers, students, and all groups in developing chemistry practicum KIT and guides.

Materials and Methods

A. Types of research

The type of research used in this research is development and research. Development research is research that is used to produce certain products and test the effectiveness of these products (Sugiyono, 2014).

B. Research Instruments

1. Chemistry Practicum KIT Validation Questionnaire

The aspects contained in the validation questionnaire included aspects contained in the

practicum KIT validation questionnaire including the feasibility and practicality assessment which had been modified from research by Zidny et al. (2017).

The rating scale used is a Likert scale where the score used is 1 to 4 where:

- a. The number 4 means very good / very interesting / very easy / very clear / very precise.
- b. Number 3 means good / valid / interesting / easy / clear / precise.
- c. The number 2 means not good / not interesting / not easy / not clear / not quite right.
- d. Number 1 means very unfavorable / very unattractive / very not easy / very unclear / very inaccurate.

2. Learning Outcome Instrument

a) Cognitive Instruments

The cognitive instrument used in this research is an objective test in the form of multiple choice questions totaling 20 questions with each item consisting of five answers (a, b, c, d, and e) and there is only one correct answer.

b) Psychomotor Instruments (Activities)

The instrument in this study used performance sheets (activities) consisting of 2 aspects of assessment, namely practicum (before practicum) and practicum implementation (including student work results). The pre-employment aspect consists of 3 aspects, namely the aspect of clothing, the aspect of practicum readiness and the systematic aspect of work, while the implementation aspect consists of 6 aspects, namely the aspect of skills, the aspect of using materials, the aspect of waste management, the aspect of cleanliness and the aspect of observational data. This rubric is used to assess students' (psychomotor) performance during practicum activities using observation sheets guided by the psychomotor rubric.

C. Research design

In this study, the One Group Pretest-Posttest Design was used in the implementation of the guide and practicum KIT. This design was used because there was only one group (class) to be sampled and there was no control class as a comparison.

Table 1. Guide Implementation Research Design and Practicum KIT

Group	Pre-test	treatment	Post-test
Experiment	T1	X	T2

Information :

X = Learning using the developed chemistry lab guide and KIT

T1 = Administration of the initial test (pretest)

T2 = Provision of the final test (posttest)

At the beginning of the study, an initial test (pretest) was given, followed by treatment over a certain period of time and ended with a final test (posttest).

D. Research procedure

The research procedure are the steps used as a tool for collecting data and answering questions in the study. The procedures for implementing this research include the following stages:

1. Observation and Data Collection Stage

In this observation, the first part is research and data collection. The research and data collection section aims to collect supporting data that can provide information regarding field situations and conditions and as a reference or comparison in developing products. In the research and data collection section consists of two steps, namely library research and field studies.

a. Literature and Curriculum Studies

Literature and curriculum studies are studies to study concepts or theories relating to the product or model to be developed. Next, collect data regarding the steps that need to be taken to make a good and feasible tool by following the criteria for tool development, for example from tool materials that are easy to obtain, tools are easy to operate, easy to carry and store, tools that are not dangerous when used and most importantly The tool has sufficient accuracy and is easy to assemble. Furthermore, the results of this study are used as a reference in making products.

b. Field Study

The field study section was carried out at Polimedia Medan. Observations were made regarding the circumstances and conditions of the campus related to practicum activities. In addition to observations, interviews were also conducted

with PLP Polimedia Medan. The purpose of this interview was to obtain data regarding the practicum including the tools and materials that have been used so far that an analysis of the deficiencies and weaknesses in the practicum activities can be carried out.

2. Planning Stage

After obtaining the data needed in the design of making the KIT, the next part is to determine the material or shape of the practicum tool in the form of a KIT which will be developed based on the results of the analysis that has been carried out. In addition, the planning section also determines what aspects are used by the validator in assessing the feasibility of the practicum tool in the form of a KIT that is made.

3. Initial Development Stage (Design)

a. Tool Design

In the draft development section, the first thing to do is to design the reaction rate material KIT which will be made by considering aspects related to teaching materials, the efficiency of making tools, the ease of use of tools, safety for students and the durability of tools.

b. Design Discussion

After designing the tool, the results of the design are discussed with fellow lecturers. This stage aims to assess the feasibility of the tool to be made with reference to the aspects to be achieved.

c. Tool Design Revision

If there are still deficiencies, then a revision is made to the KIT design which is designed according to the inputs given by fellow lecturers.

4. Advanced Development Stage (Tool Making)

The next part is the manufacture and development of practicum tools in the form of a KIT which is made based on the results of the revised tool designs at a later stage.

a. Tool Making

After completing the revision of the KIT design, the KIT is made. Tools and materials are provided according to what has been arranged in the KIT instructions. Tools that are tailored to the needs of applied chemistry practicum.

b. Tool Validation

After the tool has been assembled, the product in the form of a KIT is brought to the validator for product validation. Tool validation aims to obtain

recognition or validation of conformity with needs so that the tool is feasible and suitable for use in learning. This validation consists of various aspects of feasibility that have been determined. The validator is an expert in related fields of chemistry where the validator can be a lecturer in chemistry expert and also PLP Chemistry on campus. Before implementing the practicum KIT, it is tested first with the exact same tools and materials and work procedures so that the effectiveness can be tested first before testing.

5. Practical KIT Implementation Stage

The trial phase of using the practicum KIT is carried out to find out whether the practicum KIT that has been made can be understood and is suitable for use by students seen from the results of student learning after getting learning using the practicum KIT. This trial uses one class as the experimental class. Prior to practicum, a pretest was first carried out, then followed by practicum using the practicum KIT along with the instructions. After that, at the end of the treatment, a posttest was carried out.

6. Evaluation of the practicum kit

At this stage an assessment and analysis of student learning outcomes is carried out to find out how the influence of the use of practicum kit in improving chemical learning outcomes.

E. Data Collection Technique

The data obtained from this study are (1) in the form of responses and suggestions for improvement from lecturers and PLPs to guidance and practicum kit obtained from the answers to the Validation of Guidance and Modified Kit Validation. Assessment (responses) obtained are collected and tabulated and calculated the average assessment, and (2) learning outcomes during the practicum guide test that has been developed. This data is in the form of data pretest and student posttest data.

1) Analysis, validation, and assessment of practicum kit.

Data obtained based on the questionnaire will be processed by descriptive statistics. Descriptive statistics are statistics used to analyze data by describing or describing the data that has been

collected as it is without intending to make generally accepted conclusions or generalizations (Ridwan, 2007). The equation used to calculate the results of the questionnaire filling is by calculating the average put forward by Arikunto (2013), namely:

$$\text{Average score for each item question} = \frac{\text{Total scoring score}}{\text{Number of validators}}$$

The average score of the feasibility of teaching materials = $\frac{\text{Total average score of each question item}}{\text{Number of question items}}$

To strengthen the validation result data, a range of validity criteria qualifications was developed. Determination of the range can be known by means of the highest score minus the lowest score divided by the highest score. The rating scale to be used is 1 to 4, where 1 is the lowest score and 4 is the highest score. Thus the validity criterion qualification range is obtained by $(4-1): 4 = 0.75$. The average analysis validation criteria used can be seen in Table 2.

Table 2. Prakticum KIT Validation Criteria

Average	Variable criteria
3.26 - 4.00	Valid and does not need revision
2.51 - 3.25	Valid enough and does not need revision
1.76 - 2.50	Invalid, some of the contents need to be revised
1.00 - 1.75	Invalid and needs to be totally revised

1) Psychomotor Results Data

Performance assessment (psychomotor) is carried out when students are doing practicum activities. Assessment of performance (psychomotor) is carried out on each aspect and the value of the performance results (psychomotor) of each student. The calculation of the value obtained from each aspect is:

$$\text{The average value of each aspect} = \frac{\text{The number of student grades for each aspect}}{\text{The Number of students}}$$

Determination of the range can be known through the range of high scores minus the lowest score divided by the highest score. Based on the determination of the range, a range of 0.6 is obtained. The criteria for the

average value of each aspect used can be seen in the following table:

Table 3. Criteria for the Average Value of Each Aspect

Average	Variable criteria
2.4 - 3.0	Tall
1.7 - 2.3	Currently
1 - 1.6	Low

In addition to the average score for each aspect, the performance (psychomotor) score of each student is also produced, whose assessment is based on these nine aspects with a maximum score of 27. The calculation of the value obtained for each student is:

$$\text{Score} = \frac{\text{Total acquisition score}}{\text{Maximum score}} \times 100$$

The value obtained from each student is then calculated on average to find the final value. Clarification of the average value obtained can be determined in the following criteria table:

Table 4 Value Conversion

Score	Information
91-100	Very Good
76-90	Well
61-75	Enough
51-60	Currently
< 50	Not Enough

Results and Discussion

The data described in this study include: KIT analysis of applied chemistry practicum based on feasibility and practicality assessment; and the acquisition of student scores and psychomotor skills in applied chemistry material using the practicum KIT that was tested.

A. Making Practicum KIT

After making observations and analyzing them as well as designing the initial KIT design, the next step in this research is making a chemistry practicum KIT. In this manufacturing stage, KIT instructions were compiled and developed based on the results of descriptive analysis data from field observations and practical adjustments to the needs of the syllabus. The deficiencies obtained from the results of the previous analysis are used as a reference in designing the KIT and the instructions so that the products created are suitable for use.

The tools and materials contained in the practicum KIT that have been made are in the form of simple tools and materials, namely tools and materials that are easy to obtain in everyday life such as plastic cups, glass cups, water, and so on. The tools used are durable and not easily damaged.

The first in making the KIT is to provide the tools and materials needed, the tools provided are: glass cups, flashlights, plastic cups, plastic spoons. While the materials provided are: Salt, Milk, Wheat Flour, Coffee and Water. Materials are put into containers according to needs. All tools and materials fall into the easy-to-find category, such as glass cups, plastic cups, flashlights, plastic spoons, salt, milk, flour and coffee obtained from chemical supply stores. Tools and materials are arranged in such a way in a box with partitions separating each type of tool and material so that the tools and materials are not damaged or contaminated. All tools and materials used in the experiment regarding the Tyndall Effect and Distinguishing solutions, suspensions and colloids, namely in detail in the Tyndall Effect using tools and materials in the form of salt, water, milk, a flashlight as well as glass cups and plastic spoons. In the experiment of differentiating solutions, suspensions and colloids using tools and materials in the form of salt, milk, coffee and wheat flour.

To test the effectiveness of tools and materials, testing is carried out by carrying out experiments according to work procedures that have been prepared and carried out with tools and materials that are exactly the same as the tools and materials arranged in the box.

B. Validation Of The Practicum Kit That Has Been Made

The practicum KIT validation that was developed was carried out by providing an assessment in the form of a score, the practicum KIT assessment was based on an assessment of feasibility and practicality. Where the scores range, among others: a score of 4 (very good), 3 (good), 2 (poor), and 1 (very bad).

From the results of the research, the assessment made by 1 chemistry lecturer at Polimedia on the KIT practicum obtained an average of 4.62 and 4.87. This means that the lecturer gives a positive opinion on the practicum KIT as a result of development and the chemistry practicum KIT that has been made by researchers, meaning that it is valid and does not need revision.

The overall research results are presented based on all existing assessment items in accordance with the material suitability standards. The average value of each assessment item was calculated from the two assessment teams. At the end of the study, the average of all items was calculated so that the final value of the KIT practicum was known. The average practicum KIT assessment can be seen in detail.

Table 4. The average KIT practicum assessment according to Lecturers and PLP

Components assessed	Assessment of practicum KIT		
	D	G	Average
Linkage with learning materials	4,00	4,00	4,00
Educational value	3,95	4,00	3,95
Tool Resistance	4,00	3,95	4,00
Tool Accuracy	4,00	4,00	3,85
Tool Efficiency	4,00		4,00
Security For Students	4,00	4,00	4,00
Aesthetics	4,00	4,00	3,95
Equipment Mobility Endurance	4,00	3,95	4,00
Total Average	4,00	3,95	3,95

The practicum KIT that has been validated is then improved. Improvements to the practicum KIT were carried out based on suggestions and input that had been given by lecturers and PLP.

C. Implementation Of The Practicum Kit That Has Been Developed

1. Student learning outcomes

The last stage in this research is the trial phase. The trial conducted was a limited trial. A limited trial was conducted to determine the level of students' understanding of the chemistry practicum that had been developed using the instruments provided at the end of the practicum and to find out how much the use of the practicum KIT could have a positive impact seen from the student's learning outcomes during the practicum process. The instrument used is a question that is standard and valid to use.

This limited trial was carried out at Polimedia Medan in 1 class (experimental class). During the practical KIT trial implementation to students, practicum guides were distributed to students in the form of LKM (Student Worksheets), after which students were divided into 6 groups, where each group consisted of 2-3 students. In student groups it will be easier to carry out practicum activities.

To see the level of students' understanding of the practicum KIT that has been developed, a treatment is made by giving a limited test to students. The initial stage is to give an applied chemistry pretest, then use the practicum KIT that has been developed as a guide in practicum activities and finally give a posttest to see the level of student understanding after using the practicum KIT that has been developed.

Based on the results of the analysis of the level of student understanding in the pretest and posttest, the results are as listed in Table 5

Table 5. Students' Pretest and Posttest scores on students' understanding of the practicum KIT.

Data Type	Pre-test	Post-test
The number of students	12	12
The highest score	68	98
Lowest value	26	62
Total value	1012	1242
Average value	53,68	85,23
ΣStudent complete	3	9
ΣStudents do not complete	10	2
%completeness	7,45%	94,56%

Based on table 5. it can be seen that learning using the chemistry practicum KIT shows a high level of understanding. The high level of

understanding of the practicum KIT turns out to be proportional to the value of the learning outcomes obtained. Student grades have increased after receiving learning using the chemistry practicum KIT.

Mulyasa (2006) said that learning is considered successful, if the completeness of student learning outcomes reaches 85%. The chemistry KKM score is 75. In general, one class has been completed but individually there are still 7.12% of students who have not completed it. This is due to the low interest in studying practical instructions before learning and the ability of each individual to absorb the material presented varies. The student's incompleteness can be followed up with remediation, so that all students can complete individually. Overall, an increase in the level of student understanding indicates that the practicum KIT that has been developed is good and suitable for use in chemistry practicum activities.

Conclusions

Based on the results of the research that has been done it can be concluded that:

1. The chemical practicum KIT on solution material that has been developed is suitable for use and has met the eligibility and practical criteria.
2. The learning outcomes using the Chemistry practicum KIT on solution materials that have been developed are higher than the KKM score.
3. From the results of the research, the assessment carried out by 1 lecturer at Polimedia, for KIT practicum obtained an average of 4,00 and 3.95. This means that the lecturer gives a positive opinion on the practicum KIT resulting from the development and the solution chemistry practicum KIT that the researcher has made, meaning that it is valid and does not need revision. Using the same questionnaire criteria, the assessment results were also obtained from each chemistry lecturer who taught at the research site, namely at the Polimedia

Campus in Medan, with a total of 1 assessor as a fellow lecturer.

4. %completeness students' pretest and posttest scores on students' understanding of the practicum KIT 7,45% and 94,56%.

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Development of Learning Tools Based on a Realistic Mathematics Approach with the Karo Cultural Context to Improve Student's Mathematical Connection Ability in Class XII

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Abstract: The purposes of the research were to 1) Produce valid, practical and effective quality learning tools, which were developed based on a realistic mathematical approach with the Karo Cultural Context (RME-KCC) for class XII of SMA Masehi Berastagi; 2) Analyzing the increase in students' mathematical connection abilities using learning tools based (RME-KCC). This research is a development research using the EDDIE development model. Learning tools produced from this study are Learning Implementation Plans, Student Books, Student Worksheets, Student's Mathematical Connection Ability Tests. Based on the research results obtained 1) Learning tools based on RME-KCC have met the valid, practical, and effective criteria in terms of each criterion; 2) There is an increase in students' mathematical connection abilities by using learning tools based on RME-KCC seen from the N-gain value in trial I of 0.32 (criterion "moderate") increased to 0.56 (criteria "moderate") in the trial II.

Keywords: Realistic Mathematic Approach, Karo Cultural, Connection Ability.

Introduction

Mathematics is a science that has a number of characteristics, namely that it is structured, hierarchical, and systematic, which means that the concepts and principles contained in it are related to one another. In learning a new concept, a student needs previous experience and knowledge related to the concept to be discussed. According to NCTM 2000, "making connections" is an important activity for teachers and students if learning mathematics is carried out with the aim of building mathematical understanding. If students are able to make connections between mathematical ideas, then their understanding of mathematics will be deeper and more durable. Students who have good connection skills will be more consistent in understanding a mathematical topic.

According to Sumarmo (Minarni, dkk 2020:101), when a student has good mathematical connection

skills, the student will be able to see a broad interaction between mathematical topics, so that students learn mathematics more meaningfully. The explanation above shows that the ability to connect mathematics is a very important aspect of students' cognitive development.

The mathematics problems that exist in schools, such as low mathematical connection abilities, lead to low mathematics learning outcomes, requiring educators to apply various efforts to improve such conditions. Educators can improve learning tools and strategies. One of the mathematical strategies based on the mathematicalization of experience and the application of mathematics in everyday life is the Realistic Mathematics Learning (RML) approach. Freudental (Ningsih: 2014) states that mathematics is a human activity and must be related to reality. That is, mathematics must be familiar to students and relevant to everyday life. In the Realistic Mathematical Approach (RMA),

mathematics is a science that students must construct themselves, not a ready-made result. The Realistic Mathematics Approach (RMA) positions reality and the learner's environment as a reference for learning. Learning does not begin with definitions, theorems, or characteristics that are accompanied by various examples, but it is hoped that the definitions, theorems, and characteristics of these characteristics will be sought by students independently. So it is clear that realistic mathematics learning encourages or challenges students to play an active role and is even expected to allow them to construct their own knowledge to be acquired. Realistic mathematics education has three main principles, including guided reinvention through progressive mathematizing, didactic phenomena (dialectical phenomenology), and the development of independent models (self-developed). In addition, Treffers (1897) identified five characteristics: 1) use of context; 2) use of the approach to progressive mathematization; 3) use of students' construct results; 4) interactive activities; and 5) continuity. Realistic mathematics learning is a learning method originating in the Netherlands. The term "realistic" or "real world" is the real world. According to Zulkardi and Ilma (2010), realistic mathematics learning is a learning method based on various elements that are "real" for students, emphasizing the "process of doing mathematics" skills, working together and discussing, and communicating between classmates so that students create their own (student invention, which is the opposite of "teacher telling"). So it ends with mathematics being used to solve problems for individuals and groups. The main idea of realistic mathematics is to provide opportunities for students to reinvent various mathematical ideas with guidance from educators (guided reinvention). With informal knowledge, the teacher directs students to obtain various mathematical theories for their formal knowledge. With contextual problems that students understand using informal knowledge, it is used to find various mathematical materials. The procedure can support students' learning interactively. The existence of contextual problems in realistic mathematics is very important in

building students' mathematical concepts from informal to formal. The contextual problems that are presented should be close to the daily lives and environments in which students live, such as linking learning with the culture in which students live. According to Efendi and Syarifuddin (2021:26), combining mathematics and culture will increase the Indonesian people's appreciation of local geniuses. According to Montago and Dawson (in Daryanto, 2015: 34), culture is a way of life, especially a way of life that radiates the identity of a nation. Meanwhile, student culture-based contextual learning, according to Hosnan (2014:64), can help students feel that Arikunto (2010:62) suggests that "to improve the quality of mathematics education, it must be accompanied by research, especially development research, namely the development of learning tools." Learning devices are devices used to carry out learning activities in the classroom. Teaching materials include student guidebooks, teaching materials, evaluation instruments or learning achievement tests, worksheets, and lesson plans. There is a need for teaching materials in learning activities, and educators are required to develop them. Research by Apulina, Saragih, and Siagian (2019:17) states, "When compared to students who are taught without teaching materials, students who are taught with teaching materials have very good achievement scores." Learning devices are the most important aspect that must be used when conducting learning in class (Trianto, 2009:201). According to research by Purnama, Khairani, and Surya (2021: 53), the importance of learning tools is to support the implementation of effective and efficient learning in order to create an environment or atmosphere that allows students to learn, improve student learning outcomes, arouse student interest in learning, provide opportunities for students to practice, and help solve problems faced by students.

Therefore, this study aims to develop a learning tool that is able to improve students' mathematical connection skills. The title of this research is "Development of Learning Tools Based on a Realistic Mathematics Approach with the Karo Cultural Context to Improve Students' Mathematical Connection Ability in Class XII."

Materials and Methods

This type of research is developmental research using the ADDIE model. The goal of this study is to create mathematics learning tools based on a realistic mathematical approach in the context of Karo culture. The research was carried out in the even semester of the 2021–2022 school year at Berastagi Christian High School for Class XII students. The subjects of this study were Berastagi Christian High School class XII students for the academic year 2021-2022, as well as the object of this research, which was a learning device based on a realistic mathematical approach with the Karo cultural context.

There are two stages to this research. The first stage is the development of learning tools based on a realistic mathematical approach. The development of learning devices includes the design of learning devices. The development of learning tools includes i) the validity of lesson plans; ii) the validity of student activity sheets (LKPD); iii) the validity of student books; and iv) the validity of problem-solving ability test instruments. The second stage is the implementation of learning tools as well as research measuring tools that are considered appropriate based on the test results. The scheme of the development model in this study is shown in Figure 1.

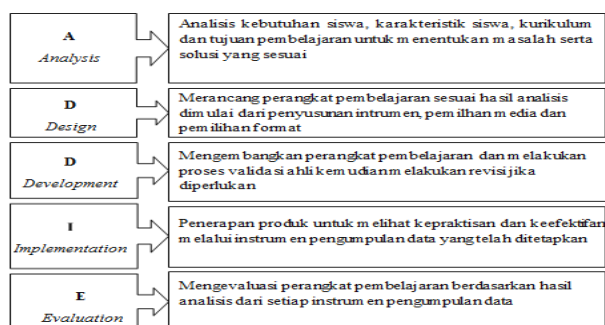


Figure 1. Schematic of the ADDIE Model

The learning tools developed must meet the criteria of being valid, practical and effective. Learning tools are said to meet valid indicators if the RME-KCC learning tools developed are at least in the assessment category ($4 \leq Va \leq 5$). Learning tools are said to meet practical indicators based on the results of observations of the implementation of

learning tools in the classroom including in the category of “Well implemented” ($3 \leq Ok < 4$). The learning tools developed are said to be effective if: (1) the minimum test score for students' connection abilities is 75 (category "medium") and classically at least 80% of students meet the learning mastery; (2) the average student response is in the range of $3 \leq Rs < 4$ (category "positive response");

The normalized N-Gain data, according to Hake (1999), can be used to determine the improvement in students' capacity for connection mathematical problems as follows:

$$N - gain = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}} \dots \dots \dots (1)$$

Utilizing the normalized gain index criterion (g) presented in

Table 1. Normalized N-Gain Score Criteria

Gain Score	Criteria
$g \leq 0,3$	Low
$0,3 < g \leq 0,7$	Medium
$g > 0,7$	High

Results and Discussion

The results of this development research are learning tools based on a realistic mathematical approach in the Karo cultural context. This development research aims to (1) analyze the effectiveness, practicality, and effectiveness of the developed learning tools and (2) improve students' mathematical connection abilities. In order to achieve this goal, the ADDIE model was used to initiate the development research. The results of the development of learning tools based on a realistic mathematical approach with the Karo cultural context, namely lesson plans, student books, the LKPD, and measuring tools for testing students' mathematical connection abilities

Table 2. Validated Instruments

No.	Validated Instruments	Scor	Category
1	Lesson Plan	4,41	Valid
2	Student book	4,34	Valid
3	Student worksheet	4,29	Valid
4	Mathematic problem solving ability test	valid and Reliable	

Student Learning Completeness in Classical Trial 1

The results of the classical mastery assessment of students' mathematical connection abilities in the pretest and posttest for trial 1 are contained in the following table:

Table 3: Levels of Mastery of the Pre- and Post-Test of Students' Mathematical Connection Ability in Trial 1

Category	Pre-test	Classical Student Learning Mastery	Post-test	Classical Student Learning Mastery
	The Total Number Of Students		The Total Number Of Students	
Complete	6	18,75 %	19	59,37 %
Not Complete	26	81,25 %	13	40,62 %
Total	32	100 %	32	100 %
Average	43,22		75,25	

Student Response Trial 1

The results of the response questionnaire from 32 students after attending lessons with a realistic mathematical approach in the Karo cultural context are shown in the following table:

Table 4: Student Response Questionnaire Recapitulation Results

No	Statement	Score
1	Students who express pleasure in learning media components	92.24 %
2	Students stated that learning components and activities were still new.	89.38 %
3	Students who express interest in participating in mathematics learning on other materials such as the learning that is carried out	96.50 %
4	Students who state the language in the student book, LKPD and tests are clear and understandable	90.63 %
5	Students who expressed interest in the appearance of student books and LKPD	92.31 %
Overall Average		92.21 %

Based on the effectiveness of student response categories, the percentage of student responses is positive if it gets more than or equal to 80% of students who give positive responses to the elements of the learning tools developed.

Improvement of Mathematical Connection Ability Trial 1

The increase in mathematical connection ability for trial 1 can be seen in the N-Gain from the pretest and posttest results of the mathematical connection ability for test 1. The summary results of the n-gain mathematical connection capability of test 1 are contained in the following table:

Table 5: Connection Capability Test Results in Trial I

N-Gain Score	Interpretasi	The Number Of Students
$n > 0,7$	Hight	3
$0,3 < n \leq 0,7$	Medium	22
$n \leq 0,3$	Low	7

The average N-Gain value is 0.32, so the total increase in mathematical connection ability obtained for trial I is included in the "medium" level, or 32% with the Gain percentage.

Student Learning Completeness in Classical Trial 2

The results of the classical mastery assessment of students' mathematical connection abilities in the pretest and posttest for trial 2 are contained in the following table:

Table 6: Levels of Mastery of the Pre- and Post-Test of Students' Mathematical Connection Ability in Trial 1

Category	Pre-test	Classical student learning mastery	Post-test	Classical student learning Mastery
	The Total Number Of Students		The Total Number Of Students	
Complete	5	15,62 %	28	87,5 %
Not Complete	27	84,37 %	4	12,5 %
Total	32	100 %	32	100 %
Average	45,25		81,25	

Student Response Trial 2

The results of the response questionnaire from 32 students after attending lessons with a realistic mathematical approach in the Karo cultural context are shown in the following table:

Table 7: Student Response Questionnaire Recapitulation Results

No	Statement	Score
1	Students who express pleasure in learning media components	91.24 %
2	Students stated that learning components and activities were still new.	90.35 %
3	Students who express interest in participating in mathematics learning on other materials such as the learning that is carried out	97.50 %
4	Students who state the language in the student book, LKPD and tests are clear and understandable	93.65 %
5	Students who expressed interest in the appearance of student books and LKPD	94.33 %
Overall Average		93.41 %

Based on the effectiveness of student response categories, the percentage of student responses is positive if it gets more than or equal to 80% of students who give positive responses to the elements of the learning tools developed.

Improvement of Mathematical Connection Ability Trial 3

The increase in mathematical connection ability for trial 2 can be seen in the N-Gain from the pretest and posttest results of the mathematical connection ability for test 1. The summary results of the n-gain mathematical connection capability of trial 1 are contained in the following table:

Table 7: Connection Capability Test Results in Trial 2

N-Gain Score	Interpretasi	The Number Of Students
$n > 0,7$	Hight	3
$0,3 < n \leq 0,7$	Medium	22
$n \leq 0,3$	Low	7

Discussion

Learning tools created with a realistic approach in the context of Karo culture produce valid, practical, and effective results, as well as positive value. The learning model used in the RME-based learning process encourages students to participate actively in the learning process, increasing student learning completion (Amalia et al., 2017). According to Vygotsky, social interaction between teachers and students or between students and other students can help students develop intellectually (Arends, 2008). Students can actively construct their knowledge using the RME-CTL approach that was developed. Through a series of activities organized in learning tools, students can relate existing concepts. The concept is built not only on one path, but on many different paths based on the reasoning abilities of the students. According to Jean Piaget (Harahap, 2012: 55), "theory of knowledge" is the beginning of thinking in order to respond to real-world situations, such as living things that adapt to their surroundings. This is consistent with the concept of a contextual approach, which begins activities with problems that students are already familiar with from their surroundings.

Conclusions

Based on the results of the study, we obtained learning tools that are valid, practical, and effective. As a result, it is possible to conclude that

the learning tools developed using a realistic learning approach with the Karo cultural context are beneficial. Learning tools that have been developed can be used to improve students' mathematical connection abilities.

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Portrait of a Chemistry Teacher's Efforts in Creating an Inclusive Classroom

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Abstract: High school chemistry teachers in the Special Region of Yogyakarta can use this research as a source of information and a reference for developing curriculum implementation, learning strategies, and inclusive classroom assessments. and as input for the development and improvement of inclusive education programs for Yogyakarta equivalent high schools, especially in other districts that want to realize inclusive classes in general. This research study uses a qualitative descriptive method to describe the experience of teaching the object under study. that the percentage of learning strategies for teaching students with disabilities in the application of inclusive chemistry classes that were agreed upon with an average of 79% had the highest percentage, disagreed with 13%, and doubted 8%. For the percentage of learning strategies for teaching students with disabilities in the application of inclusive chemistry classes, agreement with an average of 85% has the highest percentage, disagreement is 7%, and doubt is 7%. And the percentage of learning development monitoring and assessment techniques for persons with disabilities in the application of the inclusion chemistry class agreed, with an average of 86% having the highest percentage, 11% disagreeing, and 4% unsure.

Keywords: inclusion class, curriculum flexibility, learning strategies, and learning evaluation.

Introduction

Education is the right of all countries, and every citizen has the right to education. This is a bridge for every citizen to receive a proper education, including students with disabilities (Sistem Pendidikan Nasional, 2020). Students with disabilities, who are called students with disabilities, are children who are different from the average child in terms of physical, mental, social, and intellectual limitations, and sometimes even experience extraordinary experiences that are different from the average child (Köb and Janz, 2021). In the field of education, students with disabilities have the same rights as other students. Although educational services for students with disabilities are different from those for ordinary children because they have their own uniqueness and characteristics, This situation requires the provision of educational services that meet their needs (Damianidou, 2021).

In Indonesia, there are many schools that provide special services for students with disabilities, including segregation, integration, and inclusion education (Latifah, 2020). The segregation education system is an education system that separates students with disabilities from the general education system (Calderón-Almendros, Moreno-Parra and Vila-Merino, 2022). The implementation of the segregation education system is carried out separately from the special implementation of general children's education, such as SLB/A (for blind children), SLB/B (for deaf children), SLB/C (for mentally retarded children), SLB/D (for children with physical impairments), SLB/E (for disabled children), and others (Nisa, 2020). Integration Education is an education service system that provides opportunities for students of special schools (SLB) to study in regular schools at certain times, depending on the class of the special schools, such as only in arts or physical education classes. So SLB students are in the same class as regular students (Aqielhaiqal, 2021).

There are various types of integrated education. First, regular schools have special classes for students who receive the same special education, for example only for blind students. Second type Second, regular schools have special rooms for regular students (students with disabilities) who experience learning difficulties due to their physical condition (Insani, Dewi and Furnamasari, 2021). Meanwhile, inclusive education is an education system that provides opportunities for all students with disabilities and intellectual and/or special talents to participate in education or learn in an educational environment with average students (Simón, Palomo and Echeita, 2021). The goal of inclusive education is to ensure that all children have access to education that is affordable, effective, relevant, and appropriate in the areas where they live (Brydges and Mkandawire, 2020).

Meanwhile, inclusive chemistry education is an approach to teaching chemistry that accommodates the needs and abilities of each student, including students with disabilities (Suprihatiningrum, 2016). Inclusive education emphasizes that all students can learn together in the same class, regardless of their background or abilities. This includes providing accessible and meaningful learning experiences for all students, including those with disabilities or special needs (Higgins, Phillips and Cowan, 2013). This also means ensuring that course material is presented in a way that all students can understand it and providing additional support to students who need it to ensure that they are able to participate effectively in class (Gasong, 2018).

Research conducted by (Oktavia, 2022), states that, in an effort to improve inclusive education services, it is expected that teachers can use interesting learning media and optimize student work more, and chemistry teachers should have the knowledge and ability to understand students with disabilities. Research discussing the same topic (inclusive) by (Angreni and Sari, 2022), stated that schools and teachers had not provided services (implementation of learning, media, learning strategies, class curriculum, and service models) that were in accordance with the needs of students with disabilities. And teachers are advised to collaborate with teachers in other schools to

develop learning tools, classes, and service models with the help of special accompanying teachers. Research conducted by (Sari, Fernandes and Febriani, 2022), stated that the teacher had not been able to optimize the inclusive learning strategy with the ability to manage the class, as the teacher's assessment of children with special needs was also different from other children.

Chemistry learning can be carried out inclusively. However, there are obstacles and challenges for schools, especially for teachers who want to create an inclusive class. As for the obstacles found in the research mentioned above, there are educators who lack knowledge of curriculum implementation, learning and assessment strategies, accessibility barriers, and limited learning resources. From there, it becomes a challenge for chemistry teachers to create an inclusive class.

These three components (curriculum, learning strategies, and assessment) are the principles for becoming professional educators, as explained in the national curriculum system, namely that the learning design takes into account the stages of development and the current level of achievement of students and reflects the characteristics and development of students that vary according to learning needs, making learning meaningful and interesting. Lessons are designed and implemented to develop the ability to become lifelong learners (Purba *et al.*, 2021). The learning process supports the development of all abilities and characters in students. Relevant learning, defined as learning tailored to students' backgrounds, environments, and cultures, with parents and the community as partners, and long-term learning (Triwiyanto, 2015).

Based on the indications of the problems above in the application of inclusive education and learning practices as the basis for implementing inclusive classes for chemistry subjects, researchers want to examine the portrait of chemistry teachers' efforts in realizing inclusive classes in senior high schools of the same level in the Special Region of Yogyakarta. This research was raised based on problems in the application of inclusive chemistry in the Special Region of Yogyakarta, namely research conducted by (Hanum, 2019) that there

are obstacles in implementing inclusive chemistry classes, namely the application of learning for deaf students when the class is noisy and deaf students who are less active. Whereas for blind students, the teacher has difficulty managing time. In another study conducted by (Ristiyanti, 2020), It was mentioned that chemistry teachers frequently use this word when explaining material to blind students, whereas the teacher explains material to deaf students with unclear and too fast lip movements. Because of that, the constraints of both ensure that students have difficulty understanding the material presented. There hasn't been a lot of research done on the efforts of chemistry teachers to create inclusive classes.

The findings obtained from this study can be used by high school chemistry teachers in the Special Region of Yogyakarta as a source of information and a reference for developing curriculum implementation, learning strategies, and inclusive classroom assessment. and as a contribution to the development and improvement of inclusive education programs at equivalent high schools in the Special Region of Yogyakarta in particular, as well as in other regions that wish to implement inclusive classes.

Materials and Methods

Study area

This research study was conducted using a qualitative descriptive method that guides researchers to explore or photograph social events that will be studied thoroughly, extensively, and deeply (Ramdhan, 2021). According to Bogdan and Taylor, a qualitative approach is a research procedure that produces descriptive data in the form of written or spoken words from people and observed behavior. Qualitative research focuses on social phenomena, giving voice to the feelings and perceptions of the participants under study (Solihin, 2021).

Procedures

Respondents to this study consisted of 4 chemistry teachers from senior high schools in Yogyakarta, including 2 public schools and 2 private schools. The research object refers to the teacher's

experience in realizing an inclusive class. Respondents were selected and recruited purposefully using an official letter containing a brief description of the research, accompanied by a letter of interest and a consent form to become a respondent.

Data analysis

The research data collection technique was carried out by written interviews, which were carried out by giving a set of written questions to respondents in the form of a questionnaire to answer, which contained 50 statement items. The questionnaire was developed using a Likert scale of 3 (S: agree, RR: undecided, and TS: disagree). The questionnaire used in this study was a closed questionnaire, i.e., one with answers already provided, so that respondents only had to choose and answer directly (Sugiyono, 2008). The results of the questionnaire were analyzed using descriptive statistical techniques. Descriptive statistics are statistics that are used to analyze data by describing it or describing it as it has been collected without intending to make generally accepted conclusions or generalizations (Sugiyono, 2014).

Results and Discussion

Description of Respondents

Respondents in this study consisted of four chemistry teachers (all male) from four senior high schools in the Province of D.I. Yogyakarta. The first respondent (a) has 28 years of teaching experience. While teaching, he has handled students with disabilities of the blind and quadriplegic types. The second respondent (b) has 25 years of teaching experience and, while teaching, has worked with students with disabilities, including blind, mentally retarded, quadriplegic, and deaf. The third respondent (c) has 16 years of teaching experience. While teaching, he has handled students with disabilities of the deaf, low vision, blind, and autistic types. The fourth respondent (d) has 22 years of teaching experience; while teaching, he has worked with students with deafness and mild physical disabilities.

Chemistry Curriculum for Students with Disabilities

The curriculum used by the four respondents who were students with disabilities used the K13 curriculum. Where is the respondent (a)? The curriculum used is the regular curriculum, which has been modified to meet the needs of the child. This curriculum is dynamic and constructive, so it can be adapted according to differences in age, ability, physical, social, economic, ethnic, and religious conditions of students. Passing standards have also been modified to suit the objectives, content, materials, processes, and assessments that have been determined. Teachers do not follow the curriculum rigidly but can adjust it according to the needs of students. Learning programs that are designed and implemented are believed to be able to meet the needs of students, and learning objectives can be negotiated for students.

For respondent (b), the curriculum used is the regular curriculum, which is not modified according to the needs of the child. This curriculum is not dynamic and not constructive, so it cannot be adapted according to differences in age, abilities, physical, social, and economic conditions, ethnicity, and religion of students. This curriculum is not modified based on predetermined goals, content, materials, processes, or assessments. Teachers follow the curriculum rigidly without making any adjustments according to the needs of students. Learning programs that are designed and implemented are believed to be able to meet student needs, but learning objectives cannot be negotiated.

As for respondent (c), the curriculum used is the regular curriculum, which has been modified to meet the needs of the child. This curriculum is dynamic and constructive, so it can be adapted according to differences in age, ability, physical, social, economic, ethnic, and religious conditions of students. Passing standards have also been modified to suit the objectives, content, materials, processes, and assessments that have been determined. Teachers do not follow the curriculum rigidly but can adjust it according to the needs of students. Learning programs that are designed and implemented are believed to be able to meet the

needs of students, and learning objectives can be negotiated for students.

And respondent (d) says: "The curriculum used is the regular curriculum, which has been modified to meet the needs of the child." This curriculum is dynamic but not constructive, so it cannot be adapted according to differences in age, abilities, physical, social, and economic conditions, ethnicity, and religion of students. The graduation standards are not modified, and the curriculum is not modified based on predetermined objectives, content, materials, processes, and assessments. Teachers do not follow the curriculum rigidly but can adjust it according to the needs of students. Learning programs that are designed and implemented are believed to be able to meet the needs of students, and learning objectives can be negotiated to ensure the quality of life in the community. The statistical data obtained can be seen in the following table:

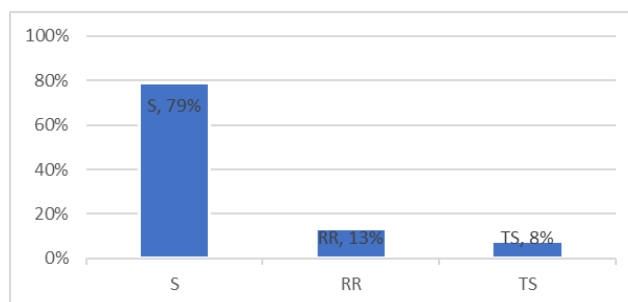


Table 1. (Chemistry Curriculum for Students with Disabilities)

Based on interview data with the four respondents above, the percentage of the curriculum for students with disabilities in the implementation of the inclusive chemistry class agreed, with an average of 79% having the highest percentage, 13% disagreeing, and 8% unsure, as listed in table 1.

Therefore, based on the results above, the Chemistry Curriculum for Students with Disabilities is a modified version of the regular curriculum that has been adapted to meet the special needs of students with disabilities. This curriculum is dynamic and constructive, which means that it can be changed according to differences in students' ages, abilities, physical, social, economic, ethnic, and religious conditions.

Thus, the chemistry curriculum for students with disabilities must pay attention to the special needs of these students, such as the need for

repetition and more detailed explanations, the use of visual or audio materials to help understand material, or the use of assistive technology to assist students in doing assignments or accessing subject matter as expected (Mutia and Cahyani, 2021). This curriculum must also pay attention to students' abilities to understand and apply chemistry concepts and provide challenges according to those abilities (Lailiah *et al.*, 2021).

In addition, the chemistry curriculum for students with disabilities must also pay attention to the need for adaptation to a learning environment that suits the needs of students. This can include adjustments to the equipment or devices used, as well as adjustments to the teaching methods or strategies used (Okech, Yuwono and Abdu, 2021). By taking into account the special needs of students with disabilities, this modified chemistry curriculum can help these students learn more effectively and gain a better understanding of chemistry subject matter (Oktavia, 2022).

For graduation, standards have also been modified to suit the objectives, content, materials, processes, and assessments that have been determined. This allows teachers to not follow the curriculum rigidly but to adapt it according to the needs of students. Learning programs that are designed and implemented are believed to be able to meet the needs of students, and learning objectives can be negotiated for students. This modified passing standard system is an effort to pay attention to the uniqueness of each student and allows teachers to provide appropriate support according to the needs of these students (Toharudin and Yusuf, 2020). Thus, students with disabilities are no longer limited by a rigid curriculum but can participate in learning programs that are tailored to their needs, and learning objectives can be negotiated with teachers. This is an important step to ensure that students with disabilities get fair and equal access to quality education (Wang, 2019).

Meanwhile, the Chemistry Curriculum for Students with Disabilities is a curriculum specifically designed to meet the needs of students with disabilities who study chemistry. This curriculum can be changed according to the needs of students, and graduation standards have also

been modified to suit the goals, content, materials, processes, and assessments that have been determined. Learning programs that are designed and implemented are believed to be able to meet the needs of students, and learning objectives can be negotiated for students.

This specially designed curriculum is an attempt to pay attention to the uniqueness of each student and allows the teacher to provide appropriate support according to the needs of that student (Bachtiar, 2020). Thus, students with disabilities are no longer limited by a rigid curriculum but can participate in learning programs that are tailored to their needs, and learning objectives can be negotiated with teachers. This is an important step to ensure that students with disabilities get fair and equal access to quality education (Suprihatiningrum, 2016).

Learning Strategies for Teaching Students with Disabilities

Learning strategies applied by respondents to students with disabilities, respondent (a) Teachers have the necessary knowledge and skills to select and adapt subject matter and teaching according to the special needs of each student. Various classroom management strategies, such as team teaching, cross-grade grouping, peer tutoring, and teacher assistance teams, are used to create a cooperative learning environment and promote socialization for all students. Learning activities provide opportunities for students to practice, experiment, or find something through observation, research, and others.

All students are given the opportunity to develop their skills and talents. The teacher explains the objectives of learning or study groups to students, and learning activities are designed based on the individual differences, needs, and interests of students. Classroom environments, exhibits, and other resources aid student independence in learning. Learning activities are also designed based on the age difference between students. Teachers use a variety of learning methods to increase student activity and cooperation in learning. Schools also have adaptive teaching aids and media to help students understand the subject matter.

For respondent (b), teachers use various classroom management strategies such as team teaching, cross-grade grouping, peer tutoring, and teacher assistance teams to create a cooperative learning environment. However, teachers do not create learning environments that promote socialization for all students. Learning activities are designed based on individual differences and student needs.

The teacher explains the purpose of learning or study groups to students. However, learning activities are not designed based on differences in the ages of students, and teachers do not use a variety of learning methods. Graduate Competency Standards (SKL), Basic Competency (KD), learning indicators, and learning objectives are not modified in the Learning Implementation Plan (RPP). However, the learning strategy used is able to increase student activity and cooperation in learning. Schools also have adaptive teaching aids and media to help students understand the subject matter. Special companion teachers (GPK) also conduct face-to-face learning for a minimum of 6 hours per week to support the success of student learning.

Respondents (c) and (d) apply the same strategy to students with disabilities, namely, that teachers have the necessary knowledge and skills to select and adapt subject matter and teaching according to the special needs of each student. Various classroom management strategies, such as team teaching, cross-grade grouping, peer tutoring, and teacher assistance teams, are used to create a cooperative learning environment and promote socialization for all students. Learning activities provide opportunities for students to practice, experiment, or find something through observation, research, and others.

All students are given the opportunity to develop their skills and talents. The teacher explains the objectives of learning or study groups to students, and learning activities are designed based on the individual differences, needs, and interests of students. Classroom environments, exhibits, and other resources aid student independence in learning. Learning activities are also designed based on the age difference between students. Teachers use a variety of learning

methods to increase student activity and cooperation in learning. Graduate Competency Standards (SKL), Basic Competency (KD), learning indicators, and learning objectives can be modified as needed in the Learning Implementation Plan (RPP). Schools have adaptive teaching aids and media to help students understand the subject matter. Special companion teachers (GPK) also conduct face-to-face learning for a minimum of 6 hours per week to support the success of student learning. The statistical data obtained can be seen in the following table:

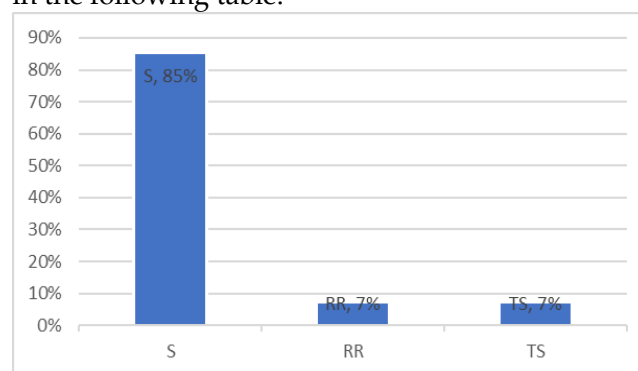


Table 2 Learning Strategies for Teaching Students with Disabilities

Based on interview data with the four respondents above, the percentage of learning strategies for teaching students with disabilities in the application of inclusive chemistry classes agreed, with an average of 85% having the highest percentage, disagreeing 7%, and doubting 7%, as listed in table 2.

Therefore, based on the above results for teaching students with disabilities in chemistry subjects, it is important for teachers to understand the needs and characteristics of these students with disabilities. This helps teachers create an inclusive and enjoyable learning environment for all students, including those with disabilities (Roesminingsih *et al.*, 2022). It also helps teachers develop learning strategies that suit the special needs of students with disabilities, so that these students can learn effectively and reach their full potential (Hudzaifah *et al.*, 2021). As well as understanding the needs and characteristics of students with disabilities, it also helps teachers identify and manage problems that may occur during the teaching and learning process, such as difficulty concentrating or communication

problems (Amka, 2020). By understanding the special needs of students with disabilities, teachers can provide the right support and help these students overcome these problems so that they can continue to study successfully (RAGIL, 2022).

Chemistry teachers select and adapt course material according to the specific needs of each student and use a variety of classroom management strategies to create a cooperative learning environment and promote socialization for all students (Purba *et al.*, 2022).

As a chemistry teacher, it is important to select and adapt course material according to the specific needs of each student. This can be done by understanding the abilities and learning needs of each student, as well as paying attention to their level of understanding of the material that has been taught (Hamdayama, 2022). Chemistry teachers can also use a variety of classroom management strategies to create a cooperative learning environment and promote socialization for all students (Purba *et al.*, 2022). For example, by using learning methods that focus on group discussions or by facilitating fun and interactive learning activities (Kii and Dewa, 2020). Thus, chemistry teachers can help students understand the material better and strengthen their understanding of the necessary chemistry concepts.

Chemistry lessons must be designed based on the individual differences, needs, and interests of students, and teachers must use a variety of learning methods to increase student activity and cooperation. This is important so that students can understand the material better and achieve optimal learning results. Teachers must pay attention to the abilities and learning needs of each student and understand their level of understanding of the material that has been taught. Thus, teachers can adjust the learning methods used according to the needs of students and help them understand chemistry concepts better (Puspitasari, 2019).

The classroom environment, exhibitions, and other resources can help students with disabilities learn independently. Where to ensure classes are friendly to students with disabilities, actions that can be taken are to ensure easy access for students who use wheelchairs or have visual impairments or lack muscle coordination, provide learning

support equipment such as assistive technology, braille devices, or magnifying devices for students who are visually impaired, ensure that classes are equipped with good audio systems for students with hearing impairments, and provide sufficient time and necessary support for students to learn independently (Juwantara, 2020).

Adaptive visual aids and learning media can also help students understand the subject matter. Therefore, teaching aids and adaptive learning media are very important for students with disabilities to understand the subject matter (Ristiyanti, 2020). Visual aids can help students visualize the concepts explained in the subject matter, while adaptive learning media can provide information in a form that suits students' needs, for example, in the form of text that can be read with a magnifying device or in audio form for students who have visual impairments (Abi Hamid *et al.*, 2020). By providing teaching aids and adaptive learning media, students with disabilities will more easily understand the subject matter and can learn better independently.

Meanwhile, special accompanying teachers (GPK) can conduct face-to-face learning for a minimum of 6 hours per week to support student learning success. Special companion teachers (GPK) have an important role in supporting the success of student learning. GPK is usually assigned to help students who have special needs, such as those who have disabilities or who experience learning difficulties. In conducting face-to-face learning, the GPK will meet students directly and provide the assistance students need to understand the subject matter. The GPK is also responsible for developing learning strategies that suit student needs and monitoring student progress in learning. Therefore, GPK must have good communication skills and the ability to arrange and present subject matter in a way that is easily understood by students (Sumarni and others, 2019).

In addition, it is important to modify the Graduate Competency Standards (SKL), Basic Competency Standards (KD), learning indicators, and learning objectives according to the needs of the Learning Implementation Plan (RPP). This will help students with disabilities understand the

subject matter better and achieve the learning goals that have been set (Prestianta *et al.*, 2021).

Learning Development Monitoring and Assessment Techniques for Persons with Disabilities

Learning Development Monitoring Techniques and Assessment for Persons with Disabilities carried out by respondents (a) The assessment carried out consisted of cognitive, affective, and psychomotor assessments. Students with disabilities have special report cards that are prepared according to their needs. The school uses authentic assessments in evaluating student achievement, and this assessment is carried out continuously throughout the semester.

For respondent (b), the assessment consisted of cognitive and affective assessments but did not include psychomotor or portfolio assessments. Students with disabilities have the same report cards as other students, without a special report card for them. Our school uses authentic assessments in evaluating student achievement, and this assessment is carried out continuously throughout the semester.

And as for Respondents (c) and (d), the assessment carried out consisted of cognitive, affective, psychomotor, and portfolio assessments. Students with disabilities have special report cards that are prepared according to their needs. Our school uses authentic assessments in evaluating student achievement, and this assessment is carried out continuously throughout the semester. The statistical data obtained can be seen in the following table:

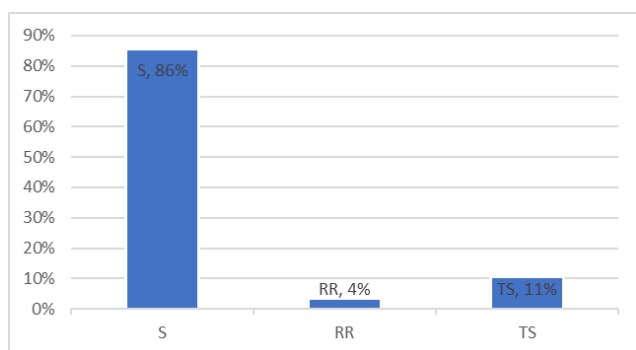


Table 3 Learning Development Monitoring and Assessment Techniques for Persons with Disabilities

Based on data from interviews with the four respondents listed above, the percentage of

learning development monitoring and assessment techniques for persons with disabilities in the application of the inclusive chemistry class agreed with an average of 86%, disagreed with 11%, and doubted 4%, as shown in Table 2.

Therefore, based on the results above, learning development monitoring and assessment techniques for persons with disabilities are a method for measuring the learning progress of students with disabilities in learning chemistry. This assessment consists of four components: cognitive, affective, psychomotor, and portfolio assessment. Cognitive assessment is an assessment that measures students' ability to understand and process the information they have learned (Putri *et al.*, 2022). Affective assessment is an assessment that measures students' attitudes and feelings towards the material being studied (Sani, 2022). Psychomotor assessment is an assessment that measures students' ability to apply the knowledge and skills learned practically (Sani, 2022). A portfolio is a collection of documents that show the overall progress of student learning (Nuraeni and others, 2019).

Teachers in this study prepared special report cards for students with disabilities, which were arranged according to their needs. In addition, teachers also apply authentic assessments in evaluating student achievement, namely assessments that are carried out in a way that is appropriate to the student's learning context and use assignments that are relevant to everyday life (Salamah, Sumarti and Rokhyanto, 2022). This assessment is carried out continuously throughout the semester to obtain a more accurate picture of student learning progress. Continuous assessment during the semester aims to help students identify strengths and weaknesses in learning, understand the material better, help teachers and parents understand student learning progress, help teachers manage learning more effectively, and help schools evaluate the success of learning programs that are applied (Priowuntato, 2020).

Conclusions

Based on the research findings, it can be concluded that the percentage of the curriculum for students

with disabilities in the application of inclusive chemistry classes agrees, with an average of 79% having the highest percentage, 13% disagreeing, and 8% in doubt. For the percentage of learning strategies for teaching students with disabilities in the application of inclusive chemistry classes, agreement with an average of 85% has the highest percentage, disagreement is 7%, and doubt is 7%. And the percentage of learning development monitoring and assessment techniques for persons with disabilities in the application of the inclusion chemistry class agreed, with an average of 86% having the highest percentage, 11% disagreeing, and 4% unsure.

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The Effectiveness of Mathematics Learning in Limited Face-to-Face at SMP Negeri 1 Palopo

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Abstract: This study aims to determine the effectiveness of learning mathematics in limited face-to-face at SMP Negeri 1 Palopo. This type of research is descriptive with a quantitative approach. The population is all students of SMP Negeri 1 Palopo starting from grades VII-IX for the 2021/2022 academic year, totaling 916 students. Sampling was carried out using the Proportionate Stratified Random Sampling technique. The sample was used by 90 students. Data is obtained through questionnaires that are shared directly with students. Furthermore, the research data was analyzed descriptively. The results of this study showed that the effectiveness of mathematics learning in limited face-to-face at SMP Negeri 1 Palopo is quite effective. This can be inferred from the overall number of indicators assessed, namely the quality of learning of 80.38% is considered effective, the suitability of the learning level of 79.28% is classified as effective, the incentive of 85.39% is classified as very effective and the time of 80.22% is classified as effective. Overall, the fourth percentage of indicators is 81.22% which is quite effective.

Keywords: Keywords Effectiveness, Limited Face-to-Face, Proportionate Stratified Random Sampling.

Introduction

Since the Covid-19 pandemic occurred in early March of this year 2020, the learning process which was initially face-to-face was then transferred to the online system (in the network). This is done by the minister of education and culture of Nadiem Makarim as a response to the World Health Organization (WHO) statement which recommended a temporary stop activities that may cause crowds.

According to Tya Ayu Pransiska and Arief Sadjarto, online learning is learning that is carried out remotely, not online directly (face to face) using the help of technology and networks Internet. In its application, online learning has various kinds obstacles, ranging from inadequate facilities to impact negative for child development. According to the results of research conducted by Kusuma and Sutapa, online learning has a negative impact to children's social emotional behavior, such as lack of cooperative attitude students, lack of tolerance,

lack of socialization and rising children's emotions down. The application of online learning which turns out to have various kinds constraints, made the government issue a new policy, namely opening all schools to carry out **limited face-to-face learning** in July 2021.

Limited face-to-face learning according to Handy Ferdiansyah is learning that combines online learning and face-to-face or conventional learning. This means learning carried out at school and at home, while adhering to health protocols which exists. **Limited face-to-face learning** is learning face to face which is not as usual because of the meeting time between teachers with limited students.

Based on the results of an interview with one of the mathematics teachers in SMP Negeri 1 Palopo is known that, one of the biggest obstacles in learning **limited face-to-face mathematics**, namely time such a short lesson. This makes the teacher feel dissatisfied because they have to summarize or

condense math subject matter to suit the time allotted.

According to research conducted by Lusia Sri Rejeki, mathematics lessons more effective when delivered in person or face to face. Mathematics lessons, which are mostly procedural in nature, make these lessons difficult to understand, especially if they are not delivered directly (online). However, face-to-face learning is limited in its application Meeting time is so limited that it is difficult to study mathematics explained so difficult for students to understand. Based on background Therefore, the purpose of this study is to determine effectiveness learning mathematics in **limited face-to-face** at SMP Negeri 1 Palopo.

Materials and Methods

METHODS

Procedures

This type of research uses descriptive quantitative research methods. This study aims to obtain information about effectiveness learning mathematics in limited face-to-face at SMP Negeri 1 Palopo for the 2021/2022 school year. Data collection techniques using a questionnaire instrument. Questionnaire is a list of questions or statements that have been prepared to be given to the research sample. The questionnaire instrument is used to find out the effectiveness of learning mathematics.

Data analysis

The data analysis technique used is descriptive statistical analysis. Calculation of descriptive statistics in this study using Microsoft Office Excel. The data is then analyzed using the deep calculation formula the percentage form is as follows:

$$P = \frac{F}{N} \times 100\%$$

Furthermore, the percentage calculation results obtained will be classified according to the following categories:

Table 1. Score Percentage Interpretation Criteria.

Percentage	Category
81% – 100%	Very Effective
61% – 80%	Effective
41% – 60%	Effective Enough
21% – 40%	Not Effective
0% – 20%	Less Effective

Results and Discussion

Research on the effectiveness of learning mathematics in face-to-face is limited at SMP Negeri 1 Palopo was measured using 90 respondents and 20 statements. Based on the results of the acquisition of learning effectiveness questionnaire data mathematics in limited face-to-face which consists of 4 indicators, data obtained can be seen in the following table:

Table 2. Results of Obtaining Data on the Effectiveness of Learning Mathematics in Limited Face to Face

No	Indicators	Percentage (%)	Category
1	Quality of Learning	80,38	Effective
2	Appropriate Levels of Learning	79,28	Effective
3	Incentive	85,39	Very Effective
4	Time	80,22	Effective
Rata-rata		81,12	Very Effective

Quality Of Learning

This indicator is measured by 3 sub-indicators, namely the teacher's skills in managing learning with a percentage of 88.78%, student activity with a percentage of 78.59%, and learning completeness students with a percentage of 74.67%. The results of the questionnaire analysis on this indicator are included in the effective category, as stated in the sub-indicators of teacher skills in managing learning, knowledge and student skills after getting student learning and activities when the teacher explains the material is good enough. however, there are still few students who answer their assignment scores or test scores always or often goes down during limited face-to-face learning and there are some students rarely never even ask if there is material they don't understand yet to the teacher.

Appropriate Levels of Learning

The indicator of level suitability indicator learning is measured by 1 sub-indicator, namely the readiness of students to receive lessons through face-to-face learning limited advance which obtained a percentage of 79.28%. On this indicator, there are still some students who feel that they are

not ready to accept subject matter. This indicator get a value the lowest percentage compared to other indicators but still in the effective category.

Incentive

This indicator is measured by 2 sub-indicators, namely the provision of motivation with a percentage of 85.34% and reward with a percentage of 85.56%. On this indicator, there are still some students who get low scores in the questionnaire, but with a small frequency compared to the statement on the other indicators. Each of the statement items on this indicator is in the category of very effective which means that all four points of the statement are already very good implementation both from providing motivation, encouragement following the lesson and working on assignments, interest in materials and rewarding to students. Therefore, the incentive indicator has the most percentage value high among other indicators.

Time

The indicator of time is measured through sub-indicators completion of tasks according to the time allocation which obtained a percentage of 80.22%. On this indicator, there were still some students who answered that it was rare never even able to complete the task in accordance with the time given.

Discussion

Incentive indicators are measured through the motivational sub-indicator learning and giving rewards get the highest percentage compared with other indicators. Each item statement on this indicator are in the category of very effective which means in general the provision of motivation learning and giving rewards to students has been very well implemented. This is in accordance with Slavin's theory which states that incentive indicators said to be effective if the teacher's efforts in providing motivation to students it's enough. While the suitability indicator of the level of learning that is measured through the sub-indicators of student readiness to receive lessons in limited face to face learning to become indicator with the lowest percentage compared to other indicators. Appropriate learning level refers to the degree to which teachers ensure readiness students

in receiving new material in learning. According to Slameto, readiness is a person's condition that makes him ready to give answer or response to the conditions encountered. In this study, still There are some students who feel they are not ready to accept the subject matter. Of course, this will affect the process of material absorption by students. Therefore, the teacher must really ensure the readiness of each student in receive learning.

Conclusions

The research results show that the effectiveness of learning limited face-to-face mathematics at at SMP Negeri 1 Palopo is very effective. This is obtained from the results an average of 81.12% of all indicators assessed, namely: (1) Quality of learning 80.38%, (2) Appropriate Levels of Learning 79.28%, (3) Incentive 85.39%, and (4) Time 80.22%

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Algebraic Reasoning Student's of Islamic Junior High School Sabilurrosyad Malang in Solving Mathematical Problem's Based on Mathematical Ability

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Abstract: Algebraic reasoning forms the basis of all mathematical reasoning because in algebra, mathematical structures can be explored. This algebraic reasoning involves forming generalizations from previous experiences and skills related to numbers and calculations, formalizing these ideas with a symbol system and exploring the concept of a pattern and function. The aims of this study were (1) to determine the levels of algebraic reasoning students Islamic Junior High School Sabilurrosyad Malang in terms of high and low mathematical ability; and (2) to describe the characteristics of each level of algebraic reasoning students Islamic Junior High School Sabilurrosyad Malang in terms of high and low mathematical ability. This type of research is a case study qualitative research. The research subjects were selected from students Islamic Junior High School Sabilurrosyad Malang in the odd semester of the 2022/2023 academic year. The subject selection procedure used purposive sampling. The research data is in the form of algebraic reasoning characteristics, with data sources of the subject's occupation, interviews, and field notes. The research instrument was the researcher as the main instrument, written tests and interview guides as auxiliary instruments. Data collection techniques were carried out by task-based interviews. Testing the credibility of the data is done by giving assignments at different times (time triangulation). Data analysis uses a fixed comparison technique which generally consists of data reduction, data categorization, synthesis, and ends with developing a substantive theory. The results of this study are that there are four levels of algebraic students Islamic Junior High School Sabilurrosyad Malang, namely level 0, level 1 for students with low mathematical abilities and two students with high abilities who are at level above level 2 but have not yet reached level 3. Characteristics of algebraic reasoning in each level is at level 0: less able to understand the problem, uses natural language, which means students do not use variables or do not understand the meaning of variables, determine results depending on specific objects, cannot make generalizations so do not perform operations on variables in general forms. Characteristics of students with level 1 algebraic reasoning: can understand problems, can generalize using natural language, students cannot make general forms, so they do not perform operations on variables in general forms. While students with high mathematical abilities have the characteristics of students with level 2 algebraic reasoning but have not fully entered at level 3: able to understand problems, able to generalize and use symbolic language, general forms made are the result of generalizations using variables, able to make general forms is a function and performs operations on the variable after it is given a boost.

Keywords: Reasoning, Algebraic Reasoning, Levels of Algebraic Reasoning, Mathematical Ability

Introduction

Algebra is a branch of mathematics. Algebra is a study of (1) the manipulation and transformation of symbolic statements, (2) the generalization of the rules about numbers and patterns, (3) the study of the structure and abstraction of systems from

computations and relations, (4) the rules for transforming and solving equations, (5) learning about variables, functions, and expressing changes and relationships, (6) modeling mathematical structures. due to abstract mathematical objects, algebraic reasoning is needed (Watson, 2007: 8). Algebraic reasoning is a process that involves

forming formulations or generalizations from experiences related to numbers and calculations, formalizing a mathematical idea using a system of symbols, and exploring concepts of patterns and functions. Thus, algebraic reasoning is important for students to have because it can help students understand mathematics beyond the results of specific calculations and procedural use of formulas (De Walle et al., Ontario Ministry of Education, 2013).

The main problem in students' algebraic reasoning is algebraic generalization (Radford, 2003). This algebraic generalization includes factual, contextual and symbolic generalizations. Generalization is an important aspect of algebraic reasoning which can then be used to develop profiles of students' algebraic reasoning levels. This research related to algebraic reasoning was carried out on junior high school students. This is because students of class VII junior high school start studying algebra, because at the elementary school level students have studied arithmetic (Kamol, 2010). According to Piaget's stages of cognitive development (Desmita, 2006), VII graders of junior high school (11 or 12 years old) are at the end of the concrete operational stage and at the beginning of the formal operational stage. The concrete operational stage is being able to draw logical conclusions based on the information provided to them even though the students' cognitive development is not perfect. The formal thinking stage is being able to think about abstract symbolic relationships, being able to imagine problems in his mind, and developing hypotheses logically.

In line with this research, it was found that during the transition from arithmetic to algebra, subject P (the best student in the study) showed various difficulties. Subject P can perform operations on zero, and regard it as a number. However, not knowing there were negative numbers, subject P thought the operation could not be performed when faced with subtracting a

number with a smaller value from a number with a larger value. Research by Gallardo and Hernandez (2005) on the process of transition from arithmetic thinking to algebraic thinking in 16 students (age 12 to 13 years) in Mexico. This study investigates how students distinguish between the use of the equals sign (as an operator or expressing an equation), the minus sign (as an operator or as a negative sign), and the existence of zero.

Ake et al. (2013) proposed four primary levels of algebraic reasoning in their proceedings "Proto-Algebraic Levels of Mathematical Thinking". That is, level 0 algebraic students have not shown generalization and are still using arithmetic operations, level 1 algebraic students have tried to generalize but still use arithmetic language, level 2 algebraic students have been able to state equations with variables but have not been able to perform operations on variables, level 3 algebra is shown with the use of variables, can perform operations on these variables, and can be stated in the form of a function. The results of this research conducted on elementary school students showed that the highest level of the 52 selected student samples was level 2 algebra.

Based on the results of the pre-survey conducted to find out in general whether the problem exists or not. The pre-survey research was carried out by giving a written test regarding algebraic problems in the matter of number patterns. The test was given to FN as a student who was considered to represent the abilities of class VII students of Sabilurrosyad Islamic Middle School Malang. Analysis of answers and interviews with students shows that the characteristics of algebraic reasoning of FN students are that they can generalize, use symbolic language, that is, they can understand and use variables.

Based on the previous description and considering the diverse abilities of students, the researcher conducted research on the levels of algebraic reasoning in class VII students of SMP

Islam Sabilurrosyad Malang and the characteristics for each level of algebraic reasoning in class VII students of SMP Islam Sabilurrosyad Malang in solving mathematical problems. The diversity of student abilities is because each individual has a way and unit capacity in constructing mathematical knowledge. In this study used a review of mathematical abilities. The mathematical abilities are divided into high and low categories. The choice of upper and lower ability levels, because students with high and low ability levels have special characteristics, usually students with high abilities have special ways or tricks in solving mathematical problems. While students with low abilities, generally students with this ability need more time to understand the problems given. The aims of this study were 1) to determine the algebraic reasoning levels of students with high and low abilities in class VII Islamic Middle School Sabilurrosyad Malang in solving mathematical problems; 2) to find out the characteristics of each level of algebraic reasoning for class VII students of SMP Islam Sabilurrosyad Malang who have high and low mathematical ability in problem solving.

Materials and Methods

This research was conducted at Sabilurrosyad Islamic Middle School Malang. This madrasah is located within the Sabilurrosyad Gasek Malang Foundation. This school was chosen because the school has students with various intelligences, thus enabling researchers to obtain the data and information needed for research purposes. In addition, this school has never conducted research related to students' algebraic reasoning. This research is a qualitative research with a case study type. This is because, the purpose of this study is to determine the levels of algebraic reasoning and the characteristics of each level of algebraic reasoning of Sabilurrosyad Islamic Middle School students in Malang in solving mathematical problems in terms of mathematical abilities (high and low), based on the facts found as existence in the form of written,

spoken, or observable actions. The subjects of this study were students of class VII Islamic Middle School Sabilurrosyad Gasek Malang in the odd semester of the 2022/2023 academic year. Subject selection was based on the following considerations, 1) class VII students have the ability to solve algebraic problems on number patterns; 2) students with various levels of mathematical ability, namely high and low, were selected with the aim of data diversity. As for the technique of selecting research subjects by purposive sampling.

The research data is in the form of students' algebraic reasoning characteristics based on high and low abilities which are obtained from the subject's work in solving problems about number patterns. Then the oral data interviews with research subjects after solving the problem. Sources of data in this study were obtained from the results of the subject's work, interviews with the subject, and field notes. The instruments in this study included the main research instruments, namely the researchers themselves as interviewers who were assisted by auxiliary instruments in the form of problem-solving test questions and interview guidelines. The instrument of problem solving test questions was validated before being used by professionals consisting of two lecturers and one teacher.

The data collection technique in this study was task-based interviews. In addition to collecting written data and interview results, students' behavior in solving problems was also observed. A tool is used in the form of a video recorder to facilitate data collection. After the data was collected, it was coded according to the algebraic reasoning level indicator proposed by Ake et al. (2013), then summarized the characteristics that appear. The subject's algebraic reasoning characteristics were then compared with the algebraic reasoning characteristics proposed by Ake et al. (2013), so that the subject's position in the level of algebraic reasoning can be known. The data obtained is used to answer what characteristics of algebraic reasoning can be observed from the symptoms that arise when the subject solves math problems. The credibility test in this study was carried out by time triangulation

and increasing persistence. The data analysis technique was carried out using the Constant Comparative Method, which is to constantly compare categories with other categories (Glaser and Strauss in Moleong, 2013). In general, the data analysis process includes: data reduction, data categorization, synthesis, and ends with developing a working hypothesis which is a substantive theory.

Results and Discussion

Subject selection was carried out by purposive sampling, namely taking each of the 2 research subjects according to the teacher's directions from each ability level, namely 2 students with high mathematical abilities and 2 students with low mathematical abilities. Data collection techniques were carried out using task-based interviews, namely giving assignments in the form of mathematical problems and then confirming answers through interviews. Research data must be reliable or credible, for this reason researchers triangulate time. The researcher conducted task-based interviews twice at different times, but if the data obtained was invalid, another task-based interview was conducted at different times. The validity of the data on time triangulation is that the data obtained at different times does not show a significant difference.

The research data collected is the characteristics of algebraic reasoning obtained from interviews based on number pattern problem solving tasks. The assignment in the form of a written test was first given to predetermined subjects, then analyzed so that the algebraic reasoning characteristics of each subject were known. On a different day the researcher gave the subject a second written test assignment, the data was analyzed and checked to find out whether there was a difference with the first data. When there is a difference in algebraic reasoning characteristic data between the first and second tasks, the researcher gives the third task. Only subjects whose data showed inconsistencies were given the third task. Then the data for each subject obtained based on the first, second, and even third task-based

interviews were compared. Subject data is said to be valid if there are no more differences between the data in the first, second, and third tasks.

Subject data that has been declared valid is then analyzed further and then compared with the level of algebraic reasoning Ake et al. (2013). Ake et al. (2013) proposed four levels of algebraic reasoning using the following three criteria 1) there is a general form resulting from the generalization process; 2) Steps in generalizing; 3) Operations and transformations on variables in the general form resulting from the generalization process. Based on these criteria, Ake et al. proposed four levels of algebraic reasoning. Characteristics of each algebraic level according to Ake et al. (2013) is described in the following table.

Table 1 Algebraic Reasoning Levels Ake et al.

Level	Characteristics
Level 0	<ul style="list-style-type: none"> - extensive object - expressed in language as it is, numeric, iconic, and with certain gestures - there is a symbol (still an image) to represent a value - the results obtained are from operations on special objects
Level 1	<ul style="list-style-type: none"> - intensive object (intensive object) - generalizations can be clearly recognized by language as it is, numeric, iconic, and with specific gestures - there are symbols that refer to intensive objects, but do not perform operations on these objects
Level 2	<ul style="list-style-type: none"> - involve variables declared in a symbolic language that refer to intensive objects, but are still temporary - the general form is the equation $Ax \pm B = C$ - do not perform operations with variables to create a general shape
Level 3	<ul style="list-style-type: none"> - Intensive objects are expressed by the language of symbols - perform transformations without changing the equation (equivalent) - there are operations on variables to create general forms

(source: Ake et al., 2013)

By using the task-based interview method, the following results are obtained. Students with the initials RA are students with low mathematical abilities. The answers from these students are as follows.

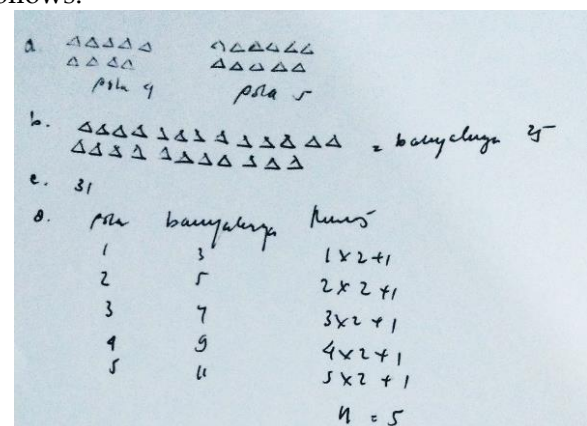


Figure 1. Answers subject with low math ability

Based on the student's answers, then analyzed using indicators of algebraic reasoning Ake et al.

(2013), namely 1) understanding the problem. At this stage the subject reads the problem given, the subject observes changes in the arrangement of tiles, then counts the number of tiles and begins to think about the next pattern arrangement. The subject determines the number of tiles in the pattern sequence asked by using pictures, sorting the patterns one by one from the known patterns. Thus, it can be understood that the subject uses the information contained in the problem to determine how the problem can be resolved. So it is concluded that the subject understands the given mathematical problem; 2) Create a settlement plan. At this stage, the subject raises variable n , but the subject does not understand the meaning of variable n , meaning that the subject still uses natural language. When the subject does not understand the meaning of the written variable, it means that the subject does not use symbols. Furthermore, the subject observed the shape and number of arrangements in each pattern, then to determine the number of tiles in a pattern in a certain order, the subject still manually counted the number of tiles from the previous pattern, meaning that the subject still depended on a particular pattern. The subject counts the number of tiles using the picture first and then counts the number of tiles in a certain order. The subject can determine the calculation but the subject does not understand n as a variable. This means that the subject does not generalize; 3) complete the problems. In this stage, the subject makes a general form but does not understand its meaning and cannot make generalizations. In addition, the subject also does not perform variable operations using this general form, meaning that the subject cannot create a general form and does not perform variable operations on the general form; 4) solve the problem. At this stage, the subject uses the image to determine the number of tiles but when determining the number of tiles in a pattern with high order it cannot be done with images. That is, the subject cannot determine the number of tiles in the 200th pattern. This shows that the subject did not solve the problem and because the subject also did not understand the formula he made, the subject did not solve the problem with the general form.

a. $\triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle$ $\triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle \triangle$
 Pola 4 Pola 5
 b. $n \times 2 + 1 = 12 \times 2 + 1 = 25$
 c. 41
 d. $n \times 2 + 1 = 2n + 1$ seharusnya $U_n = 2n + 1$
 e. $100 \times 2 + 1 = 201$
 $15 = 5 \times 2 + 1 = 11$

Figure 2. Answers subject with high math ability

While the research results for NS subjects (age 12 years), the following results were obtained 1) NS subjects read the problem given, then counted the number of tiles in each known pattern. By knowing the number of tiles that make up the pattern, the subject then conducts a trial and error to determine the right calculation to find out the number of tiles in each pattern. Thus, the subject uses the information in the problem to determine the steps to be taken to solve the problem. So that it can be seen that the subject understands the problem; 2) Make generalizations. At this stage the subject uses the letter n as a variable. This shows that the subject no longer uses natural/as-is language; the subject states the formula for determining the number of tiles in question. This indicates that the subject does not depend on a specific object/pattern to determine the number of tiles in question; The subject knows the meaning of the variable shown when the subject replaces n with 10 when determining the number of tiles in the 10th pattern. This shows that the subject knows that n represents a sequence of patterns. Based on this explanation, it shows that the subject has used symbolic language; subject uses a formula to determine the number of tiles in the tenth pattern. The formula is obtained by the subject by paying attention to the regularity of the pattern. This means that the subject has generalized; 3) Create a general shape. At this stage, the subject generalizes, by writing $U_n = 2n + 1$ as the general formula/form stated by the subject to answer further questions. The subject understands the meaning of the variables in the general form that is made, meaning that the subject makes the general form; the subject can perform operations on variables in the general form after getting encouragement when the researcher asks. This means that the subject has the ability to operate on variables, but is not yet skilled at using that ability; 4) Solve the problem. At this stage, the

subject can determine the number of tiles in the hundredth pattern. So that it can be seen that the subject can solve the problem, the subject determines the number of tiles in the hundredth pattern with the formula stated by the subject to answer the next question. The subject replaces the n variable with 100, so the subject knows how many tiles are needed to make the hundredth pattern. This shows that the subject understands the general form that is made, which is shown by using the general form to solve the problem. Thus, NS, who is a student with high mathematical ability, has algebraic reasoning level 2 but has not yet reached level 3.

Discussion

Based on the results of this study, it can be seen that students with early low math skills have level 0 algebraic reasoning. With the following characteristics, 1) with level 0 algebraic reasoning determines results depending on certain patterns (special objects), using natural language/as it is, does not understand the use of variables, cannot create general forms, and cannot perform operations on variables. This shows that students are still in the concrete operational stage and use factual generalizations. The characteristics of students with low ability algebraic reasoning are as follows 1) Understanding problems with characteristics, namely; a) using the information in the problem to determine the steps to solving the problem, this shows that students understand the problem. At the generalization stage, the subject uses natural language/as it is, determines the quantity of patterns by drawing and hanging with special objects, does not use symbolic language (not categorized), does not generalize (is not characterized); 3) Create a general form with variables. At this stage, the subject cannot make general forms using variables (uncategorized, and does not perform variable operations. There are differences in the algebraic reasoning characteristics of class VII students of SMP Islam Sabilulrosyad Malang with the theory of Ake et al. (2013) at level 3, so that the algebraic reasoning level of class VII students of SMP Islam Sabilulrosyad Malang cannot be said to be at level 3. The difference with theory is that students have

the ability to perform operations on variables, but need encouragement to do so. Based on an analysis of the characteristics of their reasoning, class VII students of Sabilulrosyad Islamic Middle School Malang (11 to 13 years old) with algebraic reasoning levels that are above level 2 but have not yet reached level 3 can control variables, test hypotheses, and are able to draw conclusions in the form of general made. This is in accordance with the theory of cognitive development that students aged 11 to 12 years to adulthood are in the formal operational stage. Based on the type of generalization, students use symbolic generalization.

The levels proposed by Ake, et al (2013) use the following three criteria: 1) there is a general form resulting from the generalization process; 2) Steps in generalizing; 3) Operations and transformations on variables in the general form resulting from the generalization process. Generalization is part of algebraic reasoning that develops through continuous experience. This was revealed in Radford's (2003) research on solving number pattern problems. Students are not necessarily able to generalize about number pattern problems, generalizations develop from calculations with concrete numbers to the use of symbols. Radford (2003) identifies the development of generalization in three types, namely factual generalization, contextual generalization, and symbolic generalization. The factual generalization type is a generalization of mathematical objects that use a numerical scheme that is limited to the level of concrete numbers. Contextual generalization is the next type of generalization that has left calculations with concrete numbers, the determination of values is done by paying attention to the before and after patterns without involving specific patterns. Generalizations that have used letters as symbols in determining values, and determining the simplest form of the formula are called symbolic generalizations.

Conclusions

Based on an analysis of the characteristics of algebraic reasoning for class VII students of SMP

Islam Sabilurrosyad Malang, there are two levels of algebraic reasoning, namely level 0 and the level between level 2 and level 3. The data was obtained from an analysis of four subjects, namely two subjects with low mathematical ability in algebraic reasoning level 0, two subjects with high mathematical abilities at level algebraic reasoning between level 2 and level 3. The characteristics of level 0 algebraic reasoning are that students can understand the problem given. Students use natural language / as it is, students get quantity in certain patterns depending on the previous pattern, namely continuing the image from the previous pattern. Students cannot create common shapes using variables. Students do not perform variable operations on general forms, students cannot solve problems. Students cannot make general forms, so the subject does not use general forms to solve problems. While the characteristics of level algebraic reasoning between level 2 and level 3 (not yet reached level 3) are as follows. Students can understand the problems given. Students use variables and know their meaning, so that it can be said that students use symbolic language. Students pay attention to the arrangement of images and the quantity of each sequence in a known pattern, then students can determine the calculation to determine the quantity in the pattern in question. This shows students can make generalizations. Students can create common forms using variables and know their meaning. Students can perform variable operations on general forms after getting encouragement (not yet fully categorized). Students can solve problems.

Students understand the general forms that are made, which is shown by using these general forms to solve problems.

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The Effect of Using Sway Media on Interest and Learning Outcomes Learners in the Learning of History Of Islam at MTs Arifah Gowa

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Abstract: This type of research is an ex post facto approach methodology namely quantitative and scientific approach in the form of psychology, Meanwhile Respondents in this study amounted to 103 people using the method Non-Probability Sampling. The research instruments used were questionnaires and Documentation format analyzed using descriptive and inferential statistics by doing the F test. Based on the results of descriptive statistical analysis, the results of Media research were obtained Sway is in the medium category, namely 70% with an average value of 46.85, which caused by the Media Sway indicator factor. The results of the descriptive statistical analysis of interest the learning of students at MTs Arifah Gowa is located in the medium category, namely 68% with an average value of 43.39 which is caused by indicator factor of interest in learning. And the results of descriptive statistical analysis of learning outcomes students at MTs Arifah Gowa are in medium category, namely 67% with an average value of 82.17 which is caused by factors learning outcome indicators. Based on the processing results of inferential statistical analysis of media variables Sway (X) to the learning outcomes (Y2) of students at MTs Arifah Gowa obtained the results of the analysis of $t_{count} = 2.202$ while the value of $t_{table} = 1.66$ means that the t_{count} value is greater than the t_{table} value ($t_{count} > t_{table} = 2,202 > 1.66$). Then obtained $F_{count} = 1.445$ and F_{table} value 3.09 and $p\text{-value}/Sig. = 0.000 < 0.05$ or H_0 is rejected and H_a is accepted or the significance is smaller than the error level determined. Thus, there is an influence of Media Sway on learning outcomes students at MTs Arifah Gowa.

Keywords: Sway Media, Interest in Learning, Learning Outcomes

Introduction

The world of education is now moving very fast through The development of science and information technology is very decisive. In the 21st century, the world of education must face great challenges in the era of the industrial revolution 4.0. education that is influenced by industry 4.0 is called education 4.0 which is characterized by the use of digital technology in the learning process known as cyber systems and is able to make the learning process more effective. learning process is known as a cyber system and is able to make the learning process take place continuously without the need for a computer. learning process takes

place continuously without space limits and without time limits. time. Seeing the challenges of education that must be faced, the development of technology in the field of education is also developing with the existence of E-Learning which can be utilized to be a solution in the midst of can be utilized as a solution in the midst of the significant development of education.

With the development of technology & information and the internet, learning can be done online. learning can be done online. Thus, many terms such as e-learning have emerged, namely learning that uses electronic devices. Learning that is conducted using the internet or the world wide

web is called online learning or online education. web is called online learning or online education. Online education connects learners with subject matter through the internet. Some call online education as cyber education or cyberspace classroom. Now there are those who utilize smart phones as a learning tool, it is called m-learning or mobile learning. called m-learning or mobile learning because teachers and learners can move wherever they are. learners can move wherever they are.(Yensy 2020).

Technology in Education becomes an entity that involves in preparing and facilitating the learning process of learners with developed learning, conditioning, and using a learning scheme in the process and technology with the overall change of habituation. Educational Technology has many innovations that can develop learners. (Prawiradilaga n.d.) A media and also technology that is formatted and has been modified periodically is able to create and contribute to a good teaching and learning process by involving learners who will be fostered to obtain a good learning experience. learners who will be fostered to obtain a better work and innovation for them.(Rusydiyah 2019)

The use of the Sway application in learning activities at school is one of the initial breakthroughs to provide an overview and preparation for students in using information technology in the era of education 4.0. students in using information technology in the education 4.0 era. As it is known that the government has committed to continue to encourage the use of E-Learning. So the use of the application application can be used as a process of familiarizing learners in using information and communication technology that is increasingly sophisticated. Sway is a Microsoft Office application that helps collect data, format data, share data, format data, share ideas, share stories, and can be used as a web-based presentation medium. web-based presentation

media. In this media can be added text, images, documents, videos, graphics, or other animated content. Sway as a learning media learning media can be used by students equipped with various animation features.(Harefa et al. 2019).

Based on the assumptions above and the reality that occurs at MTs Arifah Gowa, researchers are interested in linking Sway Learning Media with the hope of increasing student interest and learning outcomes.

Materials and Methods

Sway Media

The Sway app is a presentation tool that is created and played online on the Sway.com website. online on the Sway.com page. Presentation results can be shared with recipients using the shared link. On the Sway.com page, there are already available various presentation design templates that can be selected by the creator. To use the various features on Sway.com, users need to create an account and must use an email with outlook.com. first and must use an email with outlook.com.(Huda 2017)

Microsoft Sway is a presentation program that can be used by people who have a Microsoft account. people who have a Microsoft account by combining text and media to create a presentable website. Sway is an internet-based presentation tool with various features so that when the presentation is run it can combine text, images, video, and sound. Sway is also a form of multimodal text that combines images and certain shapes. Sway is categorized as software so that it can be used to create a product. product. Sway is responsive, which means that its display adjusts to the size of the user's screen. the size of the accessing screen. If accessed on a smartphone, the design will also follow the smartphone. With the design of the Sway object display that is very attractive, it can generate students' interest in

learning. The features presented in Sway can stimulate the brain of learners. (Kulsum 2020).

Learning Interest

In the teaching and learning process, the interest factor is very important for every learner. very important for every learner, so that learners always have enthusiasm, motivation and passion in following and accepting the subject matter that will be presented by the teacher. (Daradjat 2016) Interest is a permanent mental tendency towards something that is valuable to people. Something that is valuable to a person is in accordance with his needs. Interest is one of the psychological factors that helps and encourages individuals in stimulating an activity carried out for individuals in stimulating an activity that is carried out to achieve the goals to be achieved. achieve the goal to be achieved. In terms of language, interest is "high inclination towards something; passion; desire". Based on the description above, it can be understood together that interest is a tendency that resides in the heart that is expected something so that it can give rise to passion or desire for something.

Learning Outcomes

Learning outcomes can also be explained by understanding the two words that make up them, namely results and learning. The definition of results refers to an acquisition as a result of an activity or process that results in a functional change in input. (Purwanto 2011) Meanwhile, learning is a process of effort while learning is a process of effort made by a person to obtain a new change in behavior as a whole, as a result of his experience. overall, as a result of his own experience in interaction with his environment. (Daryanto n.d.)

Another explanation from Dimiyati and Mujiono explains that learning outcomes are "the effect of a learning action interaction". is "the effect of an

interaction of learning and teaching actions, from the teacher's side, teaching action ends with a learning evaluation process. From the side of students, learning outcomes are the end of the penggal and the peak of the learning process. The results learning outcomes are, in part, due to the teacher's actions, an achievement of teaching objectives. teaching objectives. In another part, it is an increase in the mental abilities of mental abilities of learners. (Dimiyati 2006) These learning outcomes can be divided into teaching impact and impact. The teaching impact is a measurable result, as stated in the report card numbers and the accompanying impact is the application of knowledge and abilities in other fields, a transfer of learning." Furthermore, according to Benjamin S. Bloom as quoted by M. Rosyid "Learning outcomes are measured if students are able to master three domains, namely cognitive, affective, psychomotor. (Rosyid 2006)

Referring to the explanation that has been explained, it can be concluded that basically learning outcomes are the results achieved by a learner after participating in learning or tests carried out by the learner. After participating in learning or tests conducted by the teacher in class. In connection with this research, the learning outcomes in question are the scores obtained by students after implementing the learning strategy. obtained by students after implementing the learning strategy referred to in this study.

Methods

The research was conducted at MTs Arifah Gowa. The consideration of the selection of this research location is based on the opportunity, cost, time, tools and energy that the researcher has as the party conducting the research. In addition, the selection of a more basic research location is that it can cooperate with the school, especially the Islamic Religious Education teacher at MTs Arifah Gowa. The research approach is an approach used

to explain the perspective in discussing the object of research, so the research approach used in this research is a quantitative approach. It is said so, because the facts studied are facts that can be observed, can be counted, and can be measured. countable, and measurable. While the psychological approach is a psychological approach is an approach used to study statements that appear in relation to the body, or mental symptoms that appear in relation to the body. statements that appear in relation to the body, or mental symptoms that appear as gestures. as gestures. This research observes the growth of the human spirit, especially those related to the behaviors of students in schools that are shown in their daily activities.

Results and Discussion

The use of Sway Media at MTs Arifah Gowa based on the assessment results of 103 respondents, is in the medium category with a percentage of 70% with an average value of 46.85. This indicates that the use of Sway Media at MTs Arifah Gowa is in the medium category, which means it is not low and not high either, so it still needs to be improved. not high either, so it still needs to be improved. Students' interest in learning at MTs Arifah Gowa based on the results of an assessment of 103 respondents is in the medium category, namely 68% with an average value of 46.85. moderate category, namely 68% with an average score of 43.39.

Tabel 4.23.

Kategorisasi Penggunaan media Sway

No.	Kategori	Interval	Frekuensi	Persentase (%)
1.	Rendah	$X < 41,14$	16	15,5%
2.	Sedang	$41,14 \leq X < 52,58$	71	70%
3.	Tinggi	$X \geq 52,58$	16	15,5%
Jumlah			103	100 %

Sumber Data: Analisis Angket Penggunaan Media Sway

This indicates that the learning interest of students at MTs Arifah Gowa is in the medium category, which means it is not low and not high either, so it still needs to be improved. The learning outcomes of students at MTs Arifah Gowa based on the assessment results of 103 respondents are in the medium category, namely 67% with an average value of 82.17. This indicates that the learning outcomes of students at MTs Arifah Gowa are in the medium category, which means not low and not high, so it still needs to be improved. too, so it still needs to be improved.

M A H S A R Tabel 4.24.

Kategorisasi Minat Belajar Peserta Didik

No.	Kategori	Interval	Frekuensi	Persentase (%)
1.	Rendah	$X < 38,12$	32	31.1%
2.	Sedang	$38,12 \leq X < 48,66$	70	68%
3.	Tinggi	$X \geq 48,66$	1	0,9%
Jumlah			103	100 %

Tabel 4.25.

Kategorisasi Hasil Belajar Peserta Didik di Kelas VIII

No.	Kategori	Interval	Frekuensi	Persentase (%)
1.	Rendah	$X < 76,65$	16	15,5%
2.	Sedang	$76,65 \leq X < 87,69$	69	67%
3.	Tinggi	$X \geq 87,69$	18	17,5%
Jumlah			103	100 %

There is an influence of the use of Sway Media (X) on the motivation (Y1) of students at MTs Arifah Gowa because the value obtained from the calculation of $t_{count} = 12.985$ while the t_{table} value = 1.66 means that the t_{count} value is greater than the t_{table} value ($t_{count} > t_{table} = 12.985 > 1.66$). Thus there is enough reason to reject H_0 . So the sway media variable has a significant effect on the learning interest variable of students at MTs Arifah Gowa.

There is an influence of the use of Sway Media (X) on the interest in learning (Y2) of students at MTs Arifah Gowa because the value obtained from

the calculation of $t_{count} = 2.202$ while the t_{table} value = 1.66 means that the t_{count} value is greater than the t_{table} value ($t_{count} > t_{table} = 2.202 > 1.66$). Thus there is enough reason to reject H_0 . This means that the sway media variable has a significant effect on the variable learning outcomes of students at MTs Arifah Gowa.

Discussion

When associated with the definition of sway media itself, it has been explained that Microsoft Sway is a presentation program that can be used by people who have a Microsoft account by combining text and media to create a presentation. who have a Microsoft account by combining text and media to create a presentable website. create a website that is worth displaying. Sway is an internet-based presentation tool with various features so that when the presentation is run it can combine text, images, video, and sound. Sway is also a form of multimodal text that combines images and certain shapes. Sway is categorized as software so that it can be used to create a product. product. Sway is responsive, which means that its display adjusts to the size of the user's screen. the size of the accessing screen. If accessed on a smartphone, the design will also follow the smartphone. With the design of the Sway object display that is very attractive, it can generate students' interest in learning. The features presented in Sway can stimulate the brain of learners.

In connection with the understanding of sway media above, the things in sway media are able to influence learning interest, learning interest itself has the meaning of a condition in which a person has attention to a desire to know, learn, and prove further. This is in line with the theory which states that interest is a great tendency towards something, for example students interested in mathematics will focus their attention more on learning harder than other students. and learning interest has indicators that become a measuring

tool for changes in an activity, slameto explains that several indicators of learning interest are:4 feelings of pleasure learning interest are: feelings of pleasure, interest, attention, and involvement learners. The following is an explanation of the indicators of students' interest in learning.

This is in line with Ateng Suherman's research, with the title The Effect of Student Teams Achievement DIVISION (STAD) Cooperative Learning Model Assisted by Microsoft Office SWAY Application to Improve Mathematics Learning Outcomes of Junior High School Students. By using quantitative methods and Ateng Suherman's research explains that sway media plays an important role in the math learning outcomes of students at Nurul Hikmah Junior High School.

When associated with the definition of sway media, sway is an internet-based presentation tool with a variety of features that are more complete than other presentation models, where with Sway presenters in presentations can combine text, images, video and sound. Sway is also a form of multimodal text that can be combined with certain images and shapes. Sway is categorized as software so that it can be used to create a product. Sway is an application from Microsoft Office that can be used to collect, format, share ideas, stories, and presentations on a web-based interactive canvas In connection with the understanding of sway media above, the things in sway media can affect learning outcomes, learning outcomes themselves have the meaning of "the effect of an interaction of learning actions and teaching actions, from the teacher's side, teaching actions end with a learning evaluation process. From the side of the participants

From the side of students, learning outcomes are the end of the penggal and the peak of the learning process. Learning outcomes are, in part, due to the teacher's actions, an achievement of teaching objectives. In other parts, it is an increase

in the mental abilities of learners. These learning outcomes can be divided into teaching impact and impact. The teaching impact is a measurable result, as stated in the report card numbers and the accompanying impact is the application of knowledge and abilities in other fields, a transfer of learning".

The results of this study prove that the sway media provides roles that can affect the learning outcomes of students, resulting in analysis results that show a significant effect of sway media on student learning outcomes at MTs Arifah Gowa.

Conclusions

Based on the results of the research that has been stated above and as alimitations that the author has in this study, then the author will some implications in this study as a hope to be achieved as well as completeness in the preparation of this thesis as follows: achieved as well as completeness in the preparation of this thesis as follows: The use of Sway Media is very important to develop. The importance of The importance of media utilization skills by Islamic Religious Education teachers, because this the importance of media utilization skills by Islamic Religious Education teachers, because this greatly contributes to increasing students' interest in learning and learning outcomes according to the research results that have been obtained. Given the importance of learning interest and learning outcomes in the learning process. Learning process, students should be able to increase their interest in learning well, so that participation in the learning process is even more effective. Then with the existence of rapidly developing teaching media as it is today which is more interesting and innovative, it is

hoped that the participation of students will be able to improve their learning outcomes in the learning process. students are able to improve their learning outcomes in the learning process.

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The Effectiveness of Using Conceptual Instruction (ICI) Approach Toward The Concept Mastery Based on Classroom Activity and Learning Style

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Abstract: This research aims to analyze (1) the effect of learning media on concept mastery, (2) the effect of learning activities on concept mastery, and (3) the effect of learning style on concept mastery. This quasi-experiment used a 2x2x2 factorial design. The sample consisted of 236 fourth-grade students of public elementary schools in Laweyan District, Surakarta, Indonesia, who were selected using the stratified cluster random sampling technique. The instruments used included an open essay test, an observation sheet of learning activities, and a learning style questionnaire. The prerequisite tests include normality, homogeneity, and balance tests. The hypotheses were tested using three-way Anova. The results showed that (1) video media is more effective in increasing mastery of concepts, (2) high and low learning activities do not influence the mastery of concepts, and (3) visual and auditorial learning style do not influence the mastery of concepts.

Keywords: Interactive conceptual instructions, concept mastery, instructional media, learning style, and learning activity.

Introduction

Learning by understanding concepts is an activity of students to make changes to concepts by accommodating new ideas (Aslan & Demircioğlu, 2014). A student who has the goal of mastery is usually interested in learning with that goal alone e.g. "one of my goals in class for learning is to understand as much as I can" (Sedrakyen et al., 2018). The level of concept mastery of the students depends on the time needed to learn concepts or skills in ideal instructional conditions. If the instruction has a high quality, students will easily understand and may need a little time to learn; conversely, if the quality of instruction is low, students will find it difficult to understand and need a long time to learn (Guskey, 2015).

Mastery of concepts is a measure of the time needed for children to learn concepts or skills in ideal instructional conditions (Guskey, 2015). Mastery of concepts also means an underlying

mechanism for meaningful learning or deep learning (Farrokhnia et al., 2019). Some students often find difficulties understanding several concepts (Buber & Unal, 2017). Aspects of student's concept mastery follow their cognitive levels, remembering, understanding, applying, analyzing, evaluating, and creating (Anderson & Krathwohl, 2010).

Based on the pre-observations in several elementary schools, it was found that most students wasted their time with endless repetition and did not produce anything for their learning process with ineffective results. They were less encouraged to develop their thinking skills, which made them only able to remember what they had learned and not know how to apply the knowledge. According to Disessa, (2014), many students failed to integrate several related concepts because they experience misunderstanding about the same principle consistently and repeatedly. Wrong concepts allow the students to see a direct

relationship between the final concept and the lack of knowledge that extends to several aspects (Sands, 2014). This is in line with the opinion of Sawyer, (2018) stating that misconceptions occur due to a lack of basic knowledge.

Thus, it is not surprising that the results of the Trend in International Mathematics and Science Study (TIMSS) and Program for International Student Assessment (PISA) in 2007-2012 show that the mastery of science concepts of Indonesian students is still low. Some research has been conducted to overcome student's low concept mastery (Erol & Adile, 2017) by applying the learning approach and using instructional media.

Various attempts were made by implementing specific strategies to improve learning abilities and success (Tsai, 2018) The most effective learning approach is by involving students in developing their projects rather than receiving knowledge that is only explained by the teacher (Erol & Adile, 2017). In addition to the learning approach, we need an instructional media that is attractive and can arouse students' curiosity in the learning material that affects their learning activities. Therefore, the application of an interactive conceptual learning approach with instructional media is necessary.

The Interactive Conceptual Instructional (ICI) approach has four characteristics: (1) conceptual focus, (2) class interaction, (3) research-based materials, and (4) use of texts (Savinainen & Scott, 2002b). The research results of (Patriot et al., 2017) related to the implementation of the ICI approach show that the use of this learning approach significantly improves students' concept mastery.

In this approach, in exploring the concept, the teacher with the students do demonstrations related to the material to be studied. The use of instructional media in the form of videos and images in the use of text stage can clarify the presentation of ideas in concluding a learning concept. Demonstration activities form an arena where students can experience the importance and meaning of inquiry (Graham et al., 2016). Students must be equipped with sufficient thinking skills to answer questions (Taylor & Rahmawati, 2019). Experience and learning in scientific activities can open the way to explore a concept.

The instructional media in the form of videos and images is used as a means to sharpen the explanation of the demonstration activities and replace the role of teaching aids, especially those that are not possible to demonstrate in front of the class either due to the tools that are difficult to construct or they are very expensive and rare. One of the advantages of video media is that students can hear as well as see (Barani et al., 2010). The video media gives more time for students to respond and ponder what they read or observe and also provides a narrower view of classroom interactions and the inquiry more focused on the students' thinking (Castro et al., 2018). The picture media makes it easier not only to recognize and process but also to remember and understand than words (Baker & Adams, 2015) The advantages of picture media are helping to maintain the concept permanently, providing a complete example for conceptual thinking, creating an attractive environment, and giving direct experience to students (Shabiralyani et al., 2015; X. Wang et al., 2017).

The success of the learning process is seen from the ability of the concepts achieved by students. Meanwhile, the success of the teaching and learning process is inseparable from the learning styles of students. A teacher must consider the characteristics of each student in learning to be able to determine the right method in achieving optimal learning. Someone who is forced to learn something by methods that are not his learning style may feel depressed and frustrated. When someone understands learning styles, he will integrate into the learning process to achieve better understanding and easier to get success (Gilakjani, 2012).

Marzo et al., (2016) state that the diversity of learning styles, when well understood by students and educators, can be converted into appropriate teaching and learning methods. According to (Khalid et al., 2013), it is essential to know and be used as a reference to be more sensitive to students' basic needs. Educators need to know students' learning styles to adapt teaching instructions to students (Norris & Yeghiazarian, 2015; Sunggingwati & Haviluddin, 2019). For students, knowing learning styles can be useful if they

consider how and when they learn, as part of a reflective, metacognitive process, with actions to follow.

Identifying learning styles helps explore learners' weaknesses and strengths about their learning experiences and makes students inclined to learn easily and permanently (Santo et al., 2015). When learning styles are identified and considered in planning, it facilitates learning, opens up learning processes, and teaching becomes more effectively and efficiently (Chimmalgi, 2018). Each student is characterized by their learning styles, their preferred way to see, process, and understand information. Learning styles can be changed during the learning process (Aissaoui et al., 2019). Learning styles are an individual's tendency to adopt strategies in receiving, collecting, organizing, and processing information in the learning process (Mohaffyza et al., 2014). Knowing their own learning styles can assist individual to develop their engagement with various teaching and learning activities in the curriculum, and can support the individual's professional lifelong learning (Yorganci, 2018).

According to B and Hernacki, (2011), there are three types of learning styles i.e. visual, auditory, and kinesthetic. These three types are distinguished based on the students' tendency to understand and capture information more easily using their vision, hearing, or by doing it themselves. At first, humans are mostly visual learners and tend to have one learning style. This is as mentioned by (B & Hernacki, 2011) that, in reality, we have all three learning styles, but only one is dominant. All students with all learning styles have the same opportunity to obtain good learning outcomes.

Active learning forces students to reflect on and respond to a problem by involving them in research practices based on activities. Students not only listen to presentations but, at the same time, also improve their skills through practice, analyze, and evaluate the knowledge they have acquired (Vidermanova & Vallo, 2015). Learning will not occur if there is no activity; without activity, the learning process might not take place perfectly. Activities play an important role in learning

because learning is a change of behavior that is relatively constant and is done intentionally.

This research is relevant to that conducted by Aslan & Demircioğlu, (2014) showing that video with conceptual changes is an effective way to improve mastery of concepts. This is in line with the research conducted by van Es et al., (2014) showing that the use of video-based mobile facilities can improve students' mastery of concepts. The previous research still focused only on science and mathematics while the material to be examined in this study is integrated thematic. The field of study studied includes all integrated material. Learning is focused on not only one subject but a mapping of four subjects into one unit of theme (Fauziah et al., 2020). This research is still new because some previous research has never combined both learning media with the same approach, Interactive Conceptual Instruction. Application of the ICI approach which is still rarely done because many previous researchers only measured the mastery of concepts without using learning approaches and media. The combination of the ICI learning approach with video and picture media will produce new information about students' mastery of concepts.

Based on the explanation above, this research is entitled The Effectiveness of the Interactive Conceptual Instruction (ICI) approach on elementary mastery of concepts. The problems of the research are formulated as follows: (1) which learning media (video or picture) is more effective for students' mastery of concepts; (2) which learning activity (high or low activities) better influences students' mastery of concept; (3) which learning style (visual or auditory) better influences students' mastery of concept; and (4) which interaction between learning media, learning activities, and learning styles better influences students' mastery of concepts.

Materials and Methods

This research employed a quasi-experiment with a 2x2x2 factorial design with unequal cells assisted by SPSS software version 21. This research was conducted in 8 public elementary schools in Surakarta City, Indonesia in the odd semester of

the 2019/2020 academic year. A total of 4 classes were made the experimental class I which applied ICI learning with video media while the other 4 classes were made the experimental class II which applied ICI learning with picture media. The ICI approach was applied in 8 out of 18 learnings in one theme.

The dependent variable in this research is concept mastery, the independent variable is the use of video and picture media in the ICI approach, and the moderating variables are learning activities and learning styles. Student learning activities are divided into high and low, the student learning styles are divided into visual and auditory learning styles, and the use of instructional media is divided into picture media and video in the ICI approach.

The media used in this research are videos and pictures about the energy source material, changes in form of energy, and alternative energy sources. The video displayed has a high-quality picture and sound when deepening the material, and the pictures are shared with each group. Researchers only use the movie maker application to edit videos with video duration of 30 minutes.

The image media used contains images of the energy source material, changes in form of energy, and alternative energy sources. Each group gets a picture of 3-4 sheets printed on A3 paper size with a high image quality so that it is clear and can be understood by the students. Video and image media used in each learning adapted to the material of each learning. This study uses the Theme 2 "Always Save Energy" which contains 3 sub-themes (energy sources, energy benefits, and alternative energy). The ICI approach was applied in 8 out of 18 learnings in one theme.

The concept mastery was measured before and after the treatment. Student learning activities were obtained from an observation sheet consisting of several indicators including visual, oral, listening, written, mental, and emotional aspects as measured by an assessment scale. Student learning styles were determined from the results of the questionnaires after the treatment. This research used a three-way ANOVA with a 2x2x2 factorial design presented in Table 1.

Table 1. Design factorial 2x2x2

				Instructional Media	
				Picture (A ₁)	Video (A ₂)
High Learning Activity (B ₁)	Visual Learning Style (C ₁)	A ₁ B ₁ C ₁	₁ C ₁	A ₂ B	
		A ₁ B ₁ C ₂	₁ C ₂	A ₂ B	
Low Learning Activity (B ₂)	Visual Learning Style (C ₁)	A ₁ B ₂ C ₁	₂ C ₁	A ₂ B	
		A ₁ B ₂ C ₂	₂ C ₂	A ₂ B	

The population in this research was 700 fourth-grade students of public elementary schools in Laweyan District, Surakarta, Indonesia in the 2019/2020 academic year, who were selected using stratified cluster random sampling or random class sampling. The sampling steps included (1) creating population strata (high, medium, and low) based on national examination ranking and (2) categorizing the schools into high, medium, and low and selecting three schools from each category. 4 elementary schools were made the experimental class I and 4 as the experimental class II which already represented each category. The samples used in this research were taken from the high, medium, and low school categories based on the school rankings in the 2018 National Examination.

Representative sampling was done using tables to determine the number of samples with the formula of Isaac & Michael (Sugiyono, 2014) "with a significance level of 1%, 5%, and 10%" as shown in Table 2.

Table 2. List of Sampling Tables by Isaac and Michael

N	I		
	1%	5%	10%
700	341	233	195

This research uses a significance level of 5%. Based on Table 2, the minimum sample is 233 students, and 236 samples of the fourth-gradestudents of elementary school were grouped into the experimental groups I and II. In this study consisted of 2 experimental groups which were distinguished. The experimental group I consisted of 4 elementary schools applying the ICI approach with video media while the experimental group II

consisted of 4 elementary schools applying the ICI approach with video media. The use of video and image media is applied in the ICI stage, namely "use of text".

The data collection techniques included test and non-test techniques. The test instrument for measuring concept mastery was an essay test with only four of the six cognitive domains classified by Bloom (Anderson, 2010), including aspects of remembering (C1), understanding (C2), analyzing (C4), and creating (C6). The non-test technique included learning activity and learning style questionnaires.

The types of non-test techniques used are observation sheets and questionnaires. The instruments used to collect the data on learning activities and learning styles are observation sheets of learning activities and questionnaire sheets containing several written questions used to obtain information from the subjects related to some characteristics of their learning styles.

Results and Discussion

The statistic used in this research is the three-way Analysis of Variance (ANOVA) with unequal cells. The ANOVA test was carried out to compare the average scores of each treatment (William R. Shadish et al., 2002). The ANOVA test is one of the parametric tests which assumes data normality, homogeneity, and independence. Therefore, as the prerequisite, the group normality test was performed on the posttest data using Kolmogorov-Smirnov statistics. Besides, a homogeneity variance group test was also performed using Levene statistics (Peck, 2012). After the ANOVA test has been performed, if there is an effect, a post hoc test is carried out using the Scheffe test.

Table 3. Results of Normality Test on the Data of Concept Mastery, Learning Styles, and Learning Activities

Score	Media	Sig.
Posttest (Concept Mastery)	Video	0.106
	Picture	0.354
Learning Style	Visual	0.213
	Auditory	0.136

Learning Activity	High	0.192
	Low	0.539

Based on Table 3, a summary of the results of the normality test of concept mastery on all variables, according to Kolmogorov-Smirnov, the sig. value of P is ≥ 0.05 so that the entire data are declared to be normally distributed. This means that students' mastery of concepts for instructional media, learning style, and learning activity factors come from populations that are normally distributed.

Table 4. Results of Homogeneity Test on the Data of Concept Mastery, Learning Styles, and Learning Activities

Score	Sig.
Posttest (Concept Mastery)	0.585
Learning Style	0.131
Learning Activity	0.871

Based on Table 4, the homogeneity test results in a sig. value ≥ 0.05 for all variables, which means all data are homogeneous. It can be concluded that the concept mastery, learning styles, and learning activities come from a homogeneous population. The Sig. value The Levene's Test for Equality of Variance in the same variant is assumed in Table 5 which is $0.964 > 0.05$, which means that the data variance between video and picture media classes is the same. The Sig. value (2-Tailed) is $0.194 > 0.05$, then H_0 is accepted. Thus, it can be concluded that the classes with video and picture media have the same concept mastery ability.

Table 5. Result of Balance Test

	Levene Test for Equality of Variances		Independent Samples Test							
	F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
								Lower	Upper	
Posttest	Equal variances assumed	.02	.964	1.301	234	.194	2.332	1.792	-1.199	5.866
	Equal variances not assumed			1.301	233.985	.194	2.332	1.792	-1.199	5.866

The factorial design used in this research was the $2 \times 2 \times 2$ formula. This analysis is aimed at examining the effect of the independent variable on

the dependent variable. Hypothesis testing was carried out with the following steps: (1) determining the research hypotheses, (2) determining the test statistical method, (3) determining the level of significance, (4) determining test decisions, and (5) comparing the mean of hypotheses. If $p\text{-value} > 0.05$, then H_0 is accepted and vice versa.

Pretest and Posttest Data on Concept Mastery

The concept mastery data were obtained from the pretest and posttest. Details of the pretest and posttest data on the concept mastery can be seen in Table 6.

Table 6. Description of Pretest and Posttest Data on Concept Mastery

Data	Experimental Class	N	Max	Min	Mean	Std. Deviation
Pretest	Video	119	97	48	67.92	13.827
	Picture	117	97	31	70.25	13.704
Posttest	Video	119	95	70	80.19	5.124
	Picture	117	94	60	76.87	5.684

Based on Table 6, after learning with video and picture media, it was found that the average concept mastery of students with video media is higher than image media. The student learning activity data were obtained from the questionnaire sheets with assessment descriptors with certain criteria. The high and low learning activity data were obtained from the average score obtained from all samples. The description of the learning activity data can be seen in Table 7.

Table 7. Description of Learning Activity Data

Data	Video Media				Picture Media			
	N	%	Mean	Std. Deviation	N	%	Mean	Std. Deviation
High	63	52.94	80.78	5.244	64	54.7	77	5.609
Low	56	47.06	79.54	4.951	53	45.3	76.72	5.822

Based on the description above, it was found that in the video media class, the frequency of students with high learning activities is more than that of students with low learning activities. The student learning style data were obtained before the treatment during the learning process through the visual, auditory, and kinesthetic learning style questionnaires. The data used in this research included visual and auditory data. The description of the student learning style data can be seen in Table 8.

Table 8. Description of Learning Style Data

Data	Video Media				Picture Media			
	N	%	Mean	Std. Deviation	N	%	Mean	Std. Deviation
Visual	59	49.58	79.73	5.071	59	50.43	78.31	5.096
Auditory	60	50.42	80.65	5.178	58	49.57	75.41	5.918

The description above informs that 95 students from the picture media class have a visual learning style and 60 students have an auditory learning style, while in the multimedia class, there are 59 students with a visual learning style and 58 students with an auditory learning style.

Based on the normality, homogeneity, and balance tests, we can see that the analysis prerequisites have been fulfilled. The data obtained were analyzed using SPSS 21 with computation calculated with Tests of Between-Subjects Effects. Based on the test results above, if the $p\text{-value} > 0.05$, the null hypothesis is accepted; meanwhile, if the $p\text{-value} < 0.05$, the null hypothesis is rejected. The Summary of Anova Results of Concept Mastery, Learning Style, and Learning Activity The results of the three-way ANOVA hypothesis test in detail can be seen in the following Table 9.

Table 9. ANOVA Test Decision

Tests of Between-Subjects Effects							
Dependent Variable: Concept Mastery							
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Decision	
Media	625,645	1	625,645	22,268	.000	H ₀ is rejected	
Activity	32,747	1	32,747	1,166	.281	H ₀ is accepted	
Force	61,241	1	61,241	2,180	.141	H ₀ is accepted	
Media*Activity	16,456	1	16,456	.586	.445	H ₀ is accepted	
Media*Style	242,088	1	242,088	8,617	.004	H ₀ is rejected	
Activity*Style	10,582	1	10,582	.377	.540	H ₀ is accepted	
Media*Activity*Style	111,397	1	111,397	3,965	.048	H ₀ is rejected	

Discussion

The Effect of the Use of Instructional Media on Concept Mastery

Based on Table 9, the results of the SPSS 21 analysis with computation calculated by Tests of Between-Subjects Effects show a significance level of 0.000, smaller than 0.05, which means that H_0 is rejected or H_1 is accepted. This shows that learning media influences concept mastery. Based on the results of the analysis of the average concept mastery in Table 6, the average score for the concept mastery through the ICI approach with video media is 80.19 while the picture media is 76.87. There is a very significant difference in the average scores of students.

Instructional media can increase the attention of students towards learning. The use of video media in learning is very influential on the understanding and ease of absorption of learning materials because one of the advantages of video media is that students not only listen but also see (Barani et al., 2010). Meyer et al., (2019) concluded that motion videos are more focused on deepening the analysis so that learning is more challenging to think from time to time.

In the first stage of conceptual focus, students observed the demonstration done by the teacher or students as discussion material for other students. The teacher provided guidance and plans for learning so that the achievement of the material could be conveyed to the maximum. Without guidance and investigation activities, students become shallow so that the teacher facilitates learning by exploring basic principles (Çaliskan, 2011) or developing a deep understanding of coherent understanding (M. M. Wang et al., 2016). Bustillo and Garaizar, (2016) emphasize that it is necessary to provide students with opportunities for creation because it converts abstract concepts into concrete and concepts that are well understood. It was stated that the skills requiring spatial thinking such as using materials of different shapes, building various structures with blocks, and reaching to the whole by combining different parts form an important basis in school readiness (Toran et al., 2015; Verdine et al., 2014).

In the second stage of class interaction, students were given the opportunity to discuss solving problems given by the teacher through inquiry. Discussion activities can increase practitioners' success, teach orientation, and learn how to plan inquiry-based lessons (Yukselturk & Altiok, 2016). Discussion can also increase conceptual understanding at a higher level (Marcelino et al., 2018; Tsai, 2018).

In the third stage, the use of research-based teaching materials served to improve students' mastery of concepts and overcome student difficulties in learning concepts. At this stage, the teacher gave questions and feedback verbally to ensure the level of understanding and mastery of the concepts the students had. The purpose of

feedback is to design information systems and improve awareness processes during the learning process (Sedrakyan et al., 2018). The feedback can be built based on the learning profile of the regulatory process phase, including planning, monitoring, and activities so that it is possible to detect inefficient processes of learning to adapt.

In the fourth stage of the use of text, students conducted material deepening activities by paying attention again to the summary of learning material that had been implemented in the learning video and picture media. The use of mobile facilities supports teachers to make connections with broader learning principles and an emphasis on cognitive knowledge (Tekkumru-kisa & Stein, 2017). The media used in this research are videos and pictures with the energy source material, changes in the form of energy, and alternative energy sources. The video displayed has a high-quality picture and sound when deepening the material, and the pictures are shared with each group. Each group gets a picture of 3-4 sheets printed on A3 paper size with a high image quality so that it is clear and can be understood by the students.

Learning with video media has a higher visualization value than with picture media. Instructional video media can prepare students to access their own knowledge, manage their interpersonal interactions, and increase the potential to build their knowledge (DeLozier & Rhodes, 2016). Video media also provides information that represents a real situation, and the students can select the information that they experience directly. The research conducted by (van Es et al., 2014) shows that the use of video-based motion facilities can enhance discussions that affect the students' concept mastery.

This result is in line with the hypothesis proposed by the researcher that the video media gives more time for students to respond and ponder what they read or observe, as well as provides a narrower view of classroom interactions and the inquiry more focused on the students' thinking (Castro et al., 2018). One of the advantages of video media is that students can hear as well as see (Barani et al., 2010). This is also supported by Castro et al., (2018) mentioning that

video media can stimulate students to respond to what they read or observe, make investigations more focused, and create an interaction between students and the teacher in class.

Interactive conceptual learning with video and picture media influences student's concept mastery. The student's level of concept mastery depends on the time needed to learn concepts or skills in ideal instructional conditions. If the instruction has a high quality, students will easily understand and may need a little time to learn; conversely, if it is low, they will find it difficult to understand and need a long time to learn (Guskey, 2015).

The difference between the concept mastery using ICI with video and picture media is because, with the video media, the learning material can be presented more interestingly, the learning atmosphere becomes more relaxed, and the students become more curious with the material, which leads to more meaningful and real-life learning. Real-life learning can stimulate the student's imagination better to understand the learning material delivered.

van Es et al., (2014) argue that the use of motion facilities provides an opportunity for teachers to critically analyze and discuss what they notice from the video. This is indeed very influential on the student's concept mastery; in other words, this is what makes video media have more influence on the student's concept mastery compared to the picture media that only displays still images without audio-visuals, which make students less interested and their imagination to interpret the material received not optimal.

This is in line with the research by Chittaro, (2017) stating that the use of video media has a better effect than picture media in the learning process of story-writing skills. Video media can describe a process precisely and can be watched repeatedly if needed. This is in line with the research conducted by (Zhang et al., 2020) also state that video media is effective in improving student's conceptual understanding, learning motivation, and learning outcomes. The ICI approach with video media produces a higher average score than with image media because video media stimulates multiple senses and

explains abstract concepts using a combination of visuals, texts, sounds, and music. It also improves the student's cognitive processes and learning performance (Lei et al., 2015).

The Effect of Learning Activity on Concept Mastery

The result of the analysis calculated by Tests of Between-Subjects Effects shows a significance level of 0.281, smaller than 0.05, which means that H0 is rejected or H1 is accepted. This shows that there is no influence between concept mastery and the high or low learning activities of the students. The average score of concept mastery with high learning activities is 78.87 and low learning activities is 78.16.

Some factors that influence student learning activities on concept mastery are differences in IQ or the level of intellectual intelligence of each student, facilities, and infrastructure, learning methods, and media. Students with high learning activities can listen well, write every new concept, solve problems, and dare to express their answers while those with low activities have a good concept mastery ability even though some activity indicators are less visible in learning. Therefore, during the test, the students with high learning activities obtain a similar score. The results of this research are relevant to those of Maduretno et al., (2016) stating that neither high nor low learning activities of students influence their learning achievements, in both knowledge and skill aspects.

Student learning activities were measured according to teacher observations in learning using Diedrich indicators which include visual, oral, listening, writing, mental, and emotional aspects. The teacher plays the role of systematically designing the learning system, thereby stimulating student activity in the learning process. Active participation of students is very influential in the process of development of thinking, emotions, and social. This is in line with the opinion of Nagayoshi & Nakamura, (2019) stating that ways to improve student involvement include allocating more time for teaching and learning activities and providing clear and precise teaching in accordance with the teaching objectives to be achieved.

The implementation of the assessment of student learning activities in the research is following the assessment indicators prepared, but the lack of a learning management system in recording and assessing the learning activities of each student increases the teacher burden. This is possible for only a few students who actively answer the questions during learning are recorded so that the effect indicators of learning activities on concept mastery are less visible. This is what causes differences in the results of research conducted by (Gil-Jaurena & Kucina Softic, 2016) showing that learning activities are an important predictor in the academic determination of children. This is in line with the research conducted by (Guerrero-Roldán & Noguera, 2018) that active learning activities are designed by focusing on students, for example, by grabbing their hands to participate in learning science and interacting with their friends to obtain meaningful knowledge.

The Effect of Learning Style on Concept Mastery

The result of the analysis calculated by Tests of Between-Subjects Effects shows a significance level of 0.141, smaller than 0.05, which means that H₀ is accepted or H₁ is rejected. This indicates that learning style influences concept mastery. From the comparison between the average scores of each learning style, the scores are similar. The average score of the concept mastery of the visual students is 79.01 and of the auditory students is 78.07.

A person's tendency to learn is very diverse and influenced by several things. The way a person absorbs, processes, and manifests information in a tangible form of their behaviors is called learning style/type. Everyone has a different learning style and typology; some can easily receive new information by listening directly from the source while others need to write or make a memo and need a demonstration. Teachers must distinguish study groups to meet the needs of each student (Guskey, 2015). The learning style trends in this research are visual and auditory.

This research uses picture media and multimedia as a treatment in learning and both are the instructional media that can facilitate students with a visual learning style. Each learning style has

its own characteristics. The sense of sight (eyes) plays an important role in the visual learning style. Students who tend to have a visual learning style feel more comfortable in learning when the teacher brings teaching aids/media or directly brings them to visit the objects related to the concept being studied. The visual students are very concerned about their teacher's body language and facial expressions.

The auditory learning style relies on learning success through the sense of hearing (ears). Students with a dominant auditory learning style feel comfortable when learning with verbal discussion and listening to what the teacher says. Their learning outcomes are strongly influenced by the tone, pitch (high and low), and clarity of speech.

Turki, (2014) states that learning styles have implications for teaching practice although not only determined by students' learning styles. The use of instructional media that can accommodate students' learning styles is very necessary for learning. ICI learning with video and picture media involves visual and auditory learning styles even though each presentation is different. The use of video media in the ICI approach tends to activate the auditory learning style and the use of picture media tends to activate the visual learning style.

Humans are mostly visual learners and tend to have one learning style. This is following the opinion of (B & Hernacki, 2011) DePorter (2011) stating that, in reality, we have all three learning styles, but only one that is dominant. Students with all learning styles have the same opportunity to obtain good learning outcomes. This is why the results of this study indicate that there is no effect of learning styles on the concept mastery results of the students.

The results of this research are relevant to those of Mite et al., (2016) that there is no relationship between learning styles and student's learning outcomes at St. Mary's Catholic Senior High School Malang based on corrected scores in biology learning through group-investigation learning in Malang. This is contrary to the findings of (Bozkurt, 2013; Fan & Xiao, 2015), in their research, concluded that there was an interaction between

learning media and learning styles on student learning outcomes. Besides, Kolb and Kolb, (2013) states that learning style can influence performance on various types of assessment methods and improve team performance. Therefore, learning style does not influence concept mastery.

Conclusions

Based on the results of the hypothesis, it is significant: (1) video media is more effective in increasing mastery of concepts; (2) high and low learning activities do not influence the mastery of concepts; (3) visual and auditorial learning style do not influence the mastery of concepts; (4) the interaction of video media with high learning activities and auditory learning style has more influence on the mastery of concepts than other media, activities, and learning styles.

Based on the conclusions above, the researcher formulated several recommendations for teachers, schools, and future researchers. Teachers must improve their students' concept mastery by designing effective and innovative learning that is integrated with instructional media. The application of ICI approach with video media can improve students' mastery of concepts. In addition, teachers must pay attention to the level of student learning activities and learning styles of each student to determine the appropriate approach and learning media to accommodate the unique diversity of each student. The use of video media in the ICI approach activate the auditory learning style and the use of picture media activate the visual learning style. Schools must provide supporting learning facilities needed by teachers to develop their potentials, such as infrastructure and other facilities. Future researchers are expected to develop research with other variables such as learning motivation, creative-thinking skills, problem-solving skills, or other variables. They can also learn more up-to-date learning approaches and media, for example applying E-Learning-based interactive learning media programs (Moodle), websites (Zenius Education), Android applications (Quipper), etc.

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University Students' Coping Strategies in Blended Learning after The Pandemic COVID 19

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Abstract: After the COVID 19 pandemic, in some universities, learning methods returned to offline methods gradually. Starting with the use of blended learning methods. But this situation makes students need to adapt again. One of the factors that support the success of this adaptation is the pattern of coping strategies developed by students. This article aims to describe the patterns of the universities students' coping strategies during this blended learning. Therefore interviews were conducted with six students who took part in this mixed lecture. From the exploration results obtained an overview of the three patterns of coping strategies that were formed in these students. The first pattern is students who have negative perceptions of the learning process but fail to do coping because they fail to do Accepting responsibility; while the second are those who have succeeded in overcoming emotional-oriented stress by carrying out Accepting responsibility and Positive reappraisal as well as problem-oriented coping by carrying out Planful problem solving and; third are students who have positive perceptions but also face problems in the middle of the lecture process, they are able to do emotion-oriented stress coping by doing Accepting responsibility and Positive reappraisal.

Keywords: Blended Learning, Coping Strategies, Post Pandemic COVID-19, Universities Student.

Introduction

Indonesia began to establish the new normal for the COVID-19 pandemic at the end of 2021. And since then, teaching and learning activities which have been carried out online for two years have gradually returned to using offline teaching and learning methods. However, this is not done directly. Offline lectures are carried out in stages by starting lectures with the blended method, which combines online teaching and learning methods with offline methods. This method has been introduced a long time ago. Several researchers have published in several studies regarding the application of this method.

The blended learning method basically offers alternative learning methods that can effectively reduce the time and place limitations of study

participants (Abdullah 2018). This is because when the online method is used it can be done even though the instructor and students/students are not in the same place. While the online method can still be done when it requires direct interaction or in a practicum learning process. However, this method is not yet familiar in the world of Indonesian education.

At the beginning of the COVID 19 Pandemic, when all lines of education were "forced" to carry out activities online, it turned out that this caused many problems and obstacles. At that time, online lectures were considered difficult because in terms of infrastructure and human resources, there were still many limitations. Some of these obstacles include limited infrastructure and human resources that are not optimal in supporting the changes in the education system that are occurring

(Basar 2021). This obstacle also causes the teaching and learning process to cause psychological disturbances such as increasing levels of psychological disorders such as stress, anxiety, and mood disorders among students (Hasanah et al. 2020; Hazim, Fihayati, and Rezania 2021; Pawicara and Conilie 2020; Rahmajati 2021; Sari 2020).

Recovery, which eventually began to slowly return to the offline method with the application of the blended method, was not without other constraints either. Every change that occurs in an individual will cause tension and be considered a "threat" that activates the stress response (Lazarus and Folkman 1984). Stress is a natural mechanism that will happen to someone who is experiencing change. One theory that explains the mechanism of this stress response is the General Adaptation Syndrome (GAS) (Folkman 2013; Holahan, Ragan, and Moos 2017; Rice 2012). This stress response mechanism has three main stages, namely the alarm stage, the resistance stage, and the exhaustion stage. At the alarm stage a person shows a spontaneous response according to the intensity of the stressor and the individual's perception of the stressor. At this stage, generally a person will experience a decrease in psychological power and increased vigilance like facing a danger. Then in the second stage a person begins to use all the power he has both physically and psychologically to return the condition to a stable condition or homeostatic condition. It is in this second phase that a person will carry out a coping mechanism. When he succeeds in coping, he will return to a balanced state, however, when he fails to cope, he will enter the third phase, namely stage exhaustion. In this exhaustion phase a person experiences exhaustion both physically and psychologically. It is in this final phase that a person has the potential to experience stress or even distress.

From the GAS mechanism we know that coping mechanism is very important so that the stress he faces does not increase during the distress phase. Likewise with the adaptation period in blended lectures after the COVID 19 Pandemic. When a student succeeds in coping, he will succeed in adapting to changes in existing learning methods. Coping strategies are behavioral and cognitive tactics used to manage crises, conditions, and demands that are appraised as distressing (Carr and Pudrovska 2007). The coping process approach argues that coping is responsive to both environmental demands and personal factors such as values and beliefs. As such, coping strategies are flexible and unfold over time, either in response to changing appraisals or as a function of developmental processes (Aldwin and Yancura 2004; Lazarus and Folkman 1984). There are many different conceptualizations of coping strategies, but the five general types of coping strategies are problem-focused coping, emotion-focused coping, social support, religious coping, and meaning making (Aldwin and Yancura 2004; Lazarus and Folkman 1984; Dubow and Rubinlicht 2011). but, in this research, we use the two types of coping strategies are problem-focused coping, emotion-focused coping.

Problem-focused coping, also called instrumental action, encompasses behaviors and cognitions aimed at solving the problem, such as seeking information, taking direct action, or breaking the problem down into more manageable pieces, a strategy referred to as "chunking." Sometimes, delaying or suppressing action can be a useful problem-focused strategy. For example, purposefully delaying a direct confrontation with someone may lead to a more rapid solution to a problem than acting in anger (Aldwin and Yancura 2004; Dubow and Rubinlicht 2011; Lazarus and Folkman 1984). Emotion-focused coping includes a wide range of strategies that are directed toward managing one's emotional

response to the problem. Some examples are avoidance, withdrawal, expressing emotion, and the use of substances such as alcohol or food. As might be expected, avoidance strategies are often associated with poor outcomes, but other emotion-focused strategies, such as expressing emotion through journals or writing, may be associated with positive outcomes (Aldwin and Yancura 2004; Folkman 2013; Lazarus and Folkman 1984).

After the COVID 19 pandemic, in some universities, learning methods returned to offline methods gradually. Starting with the use of blended learning methods. The transition phase was the most stressful as it created insecurity condition and was handled with insufficient information, consultation, and support (Smollan 2015). But this situation also makes students need to adapt again. One of the factors that support the success of this adaptation is the pattern of coping strategies developed by students. This article aims to describe the patterns of the university students' coping strategies during this blended learning.

Materials and Methods

Study area

This research involved 6 students who had previously been selected from 50 students from three universities in Kudus Regency. From these 50 people, an initial survey was carried out which aimed to get an overview of students' initial perceptions regarding the application of the blended learning method in their lectures in early 2022. The initial survey produced an overview of three types of responses in the form of statements regarding the problems they encountered during the teaching and learning period. The three types of responses are: "encountered obstacles during blended learning", "sometimes encounters obstacles", and "doesn't feel encountered obstacles at all". Based on these three responses, two

informants were selected for each response category.

Procedures

After screening to get 6 students as the main informants, interviews were then conducted using the in-depth structure interview method. The aspects that were interviewed were initial responses regarding the blended learning method, the obstacles encountered and how to overcome the obstacles encountered.

Data analysis

The method of analysis used was coding and followed by categorization based on three interview aspects and conclusions drawn from each group of respondents.

Results and Discussion

Based on the results of interviews with 6 students according to their perception of the learning system using the blended method, three groups of responses and dynamics of coping strategies were obtained from each of these student categories.

Students who stated that they "encountered obstacles during blended learning".



Figure 1. The dynamics of coping mechanisms in students that they experienced problems during learning with the Blended learning method.

The first pattern is the students who stated that they "encountered obstacles during blended learning" and they have negative perceptions of the learning process but fail to do coping because they fail to do Accepting responsibility. There are similarities between the two respondents, where they feel they are experiencing problems in the lecture process. They feel that they often feel bored

and tired when attending lectures due to activities that coincide with lectures, especially when lectures are in offline sessions. Their habit in the past, where they could take lectures online together with other jobs, made them overwhelmed by this blended system. This is what gives rise to negative perceptions of this blended learning system, resulting in increasing negative feelings such as feelings of boredom, laziness, or disappointment. So that the tendency of coping that they do is emotional oriented coping, such as looking for diversions and other activities so that this can restore their mood. However, the method they did was not fully successful because when they returned to class and carried out the teaching and learning process, these negative feelings reappeared.

Students who stated that "sometimes encounters obstacles" during blended learning.

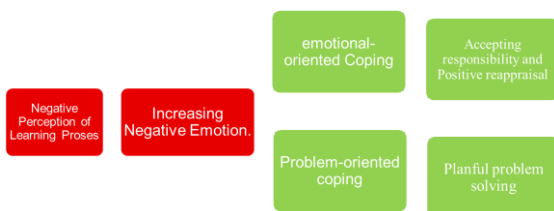


Figure 2. The dynamics of coping mechanisms in Students who stated that "sometimes encounters obstacles" during blended learning

The second are those students who stated that "sometimes encounters obstacles" during blended learning and they have negative perceptions of the learning process, but they succeeded in overcoming emotional-oriented stress by carrying out Accepting responsibility and Positive reappraisal as well as problem-oriented coping by carrying out Planful problem solving. The two respondents felt that they only occasionally encountered problems in the lecture process. However, at the beginning of the lecture period, they felt that the most disturbing thing was when there was a change in method from offline to

online, this made their mood tend to change, especially because it disrupted the rhythm of activities they could normally do together with online lectures. They immediately overcome these negative feelings or moods by improving their mood with two things. The first way is to reduce emotions by calming down and accepting that the changes that have occurred have become a part of their choice to go to college. While the second way is to rearrange their schedule of activities, adjusting to the lecture method that was used at that time.

Students who stated that they "doesn't feel encountered obstacles at all during blended learning".



learning".

Figure 3. The dynamics of coping mechanisms in students that "doesn't feel encountered obstacles at all during blended learning".

The Third are students who stated that they "doesn't feel encountered obstacles at all during blended learning" and have positive perceptions but also face problems in the middle of the lecture process, they can do emotion-oriented stress coping by doing Accepting responsibility and Positive reappraisal. Both respondents felt they did not experience problems in the lecture process. However, at the beginning of the lecture period, they felt disappointed because they found things that were not as expected. This is partly because they did not expect that the lecture this time was more dynamic than the online and offline methods. The dynamic in question is that there are two methods that are used interchangeably and each change of method they need to readjust themselves, this makes their mood tend. They immediately overcome these negative feelings or moods by improving their mood. The thing they

do to reduce these emotions is accept the consequence that the lecture process is not easy so that they will always encounter problems. In addition, they also practice positive reappraisal by motivating themselves by remembering the main goals of college and the sacrifices of their parents in paying for college.

Discussion

Any changes that occur in the social environment, especially those that occur globally, will certainly also affect changes in the learning system as a form of adjustment to the demands of existing changes. one of which is the implementation of a blended learning system at the university level, which is a response to the changing conditions of the Covid 19 Pandemic which is heading towards the endemic period of covid-19. The changes that occur also cause an adjustment response from students in the form of a coping response to these changes. In this study, it can be mapped into three forms of coping dynamics.

The first pattern is students who have negative perceptions of the learning process but fail to do coping because they fail to do Accepting responsibility. Someone who fails to do coping is strongly influenced by his perception of changes that occur. Person who can't do coping to his problems happened because they are didn't think would work, but at least "I was doing something"; that they have expressed anger to the person (s) who cause the problem; that they sometimes shop a big chance or do something very risky to solve the problem; and that they sometimes stood their ground and fought for what "I Wanted" (Yazon, Ang-Manaig, and Tesoro 2018).

However, the second respondent was successful in carrying out a coping mechanism. The second respondent are those who have succeeded in overcoming emotional-oriented stress by carrying out Accepting responsibility and Positive reappraisal as well as problem-oriented coping by

carrying out Planful problem solving. Individuals who succeed reduce their stress are more likely to use Restraint as a coping strategy, all of which suggest that in the context of a personal problem, individuals may be more likely to recognize that any solution will take time to solve, perhaps requiring "new thinking" (Explorer style), help from others (External style), and "hard" choices to be made (a Task-oriented decision-making style) as problem-oriented coping (Maghan 2017). Another research found 61.9% of Psychology Students Class of 2019 Andalas University when studying online, most of them carried out stress coping strategies in the form of emotional focused coping. The stress coping strategies of some of the Psychology students of class 19, Andalas University (51.2%), were in the quite good category (Purna 2020). So that someone who does emotional focused coping can succeed in doing this coping when they focus on forming new emotions related to changing environmental conditions.

Whereas in the last group of respondents or the third are students who have positive perceptions but also face problems in the middle of the lecture process, they can do emotion-oriented stress coping by doing Accepting responsibility and Positive appreciation. In this group a person tends to have self-compassionate. Self-compassionate people tend to rely heavily on positive cognitive restructuring and less so on avoidance and escape but do not appear to differ from less self-compassionate people in the degree to which they cope through problem-solving or distraction. And it relates to their good coping strategies (Allen and Leary 2010).

In this regard, students who are dealing with changes in the learning system, which in this case is the blended learning method, tend to develop two forms of stress coping mechanisms, emotional focused coping, and problem-oriented coping. However, the possibility of success for these students in carrying out these coping mechanisms is their ability to accept new and changing

responsibilities. But when they focus on their desire to remain in the old way of learning, then the stressful conditions caused by this change in learning methods. In addition, one of the studies corroborating these findings shows that, Students in higher education institutes are at risk of mental consequences due to COVID-19 but by finding a healthier coping system, increasing the availability of support within the family and community, as well as being active engaging in beneficial activities students may be able to alleviate general negative emotions and become individuals who are more resilient (Kaur et al. 2022; Rahmajati et al. 2022).

Conclusions

From the exploration results obtained an overview of the three patterns of coping strategies that were formed in these six students. The first pattern is students who have negative perceptions of the learning process but fail to do coping because they failed to do emotional-oriented coping, they failed accepting responsibility. While the second are those who have succeeded in overcoming emotional-oriented coping by carrying out Accepting responsibility and Positive reappraisal as well as problem-oriented coping by carrying out Planful problem solving and the third are students who have positive perceptions but also face problems in the middle of the lecture process, they are able to do emotion-oriented stress coping by doing Accepting responsibility and Positive reappraisal. the possibility of the success of these students in carrying out these coping mechanisms is, their ability to accept new and changing responsibilities that exist.

The limitation of this study is we didn't do the other type of coping strategies analyses like social support coping, religious coping, and meaning making.

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