

High School Learning Management System Using iLearning Approach

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Abstract

iLearning Class is an electronic learning that utilizes the internet (online learning). iLearning class makes learning more interactive because it integrates 4B, Learning, Praying, Playing and Working. Currently the iLearning Class learning method is suitable to complement traditional learning (face to face in class). But after iLearning Class is implemented, there is no rank given by the teacher for student activities in the learning process. This research decides the achievement of each student in online study activities using the iLearning approach correctly and accurately. Student activities in learning classes include students doing tasks, daily tests, quiz and practice. In determining the rank of students required an objective and correct decision making, therefore we need a decision support system to overcome these multi-criteria problems. Analytical Hierarchy Process (AHP) method is part of a decision support system that is used to rank students in learning activities in learning classes. After the teacher makes an assessment, then determine the ranking using the AHP method. Student ranking is needed so that teachers know the quality of insight and competence of participants in the subjects on iLearning class. Using AHP method to rank students has proven to be able to help teachers decides achievement from the many participants doing learning in iLearning Class.

Keywords: *iLearning, Decision Support System, AHP Method*

1. INTRODUCTION

The world of education has experienced a lot of rapid changes. This change can be found from the increasing and variety of uses for study [1]. The way of learning is used a lot by utilizing various media in order to increase score and learning achievement. changes in this way of learning because of the many media as a form of technological advancements [2]. Science of Technology learned several years ago began to be replaced with new technology including various conventional learning methods [3].

The development of information technology that can be utilized as a learning medium is iLearning class [4]. The learning media is an innovative learning model that can be utilized in the learning process, because in it there is an assessment given by the teacher that can be accessed through the view board [5]. Therefore, learning using iLearning class is more interesting and more dynamic so that it can motivate students to further enhance their knowledge and competence in the learning process.

Learning media for iLearning class has been thoroughly studied and implemented so that it suits the needs of students in the teaching and learning process [6][7]. But in the application of iLearning class there are no ratings given by the teacher as an evaluation of the learning process, so the teacher cannot provide a measure relating to the knowledge and skills of each student on subjects uploaded to the iLearning class. Ranking is important in implementing iLearning class because it serves to measure the achievement of students' knowledge and competencies during the learning process in the iLearning class. In connection with the Minister of Education Regulation concerning educational evaluation parameters. The regulation explained that after conducting the learning process, the accumulation and preparation by the teacher was carried out as an evaluation of student learning outcomes [8][9]. Ranking

is an evaluation of student learning outcomes and includes a series of learning processes undertaken by students and teachers. In evaluating student learning outcomes required grades and ranks so that teachers can measure the achievement of knowledge and competencies of each student objectively, correctly and accurately [10][11]. Therefore, it is necessary to do research on ranking student learning outcomes in the implementation of learning media iLearning class correctly, accurately and objectively.

The objective of this study is to help decision makers in this case the teacher to decide the score so that achievement of students increased in the implementation of the iLearning approach with the Analytical Hierarchy Process. so that the results of student ranking are objective, correct and accurate. In order that the results of ranking are objective, correct and accurate, the Analytical Hierarchy Process method is required. This method works in decision making for multi criteria criteria (Multi Criteria Decision Making or MCDM) [12]. The ranking process using the AHP method is done in 3 stages, namely 1) determining objectives, 2) calculating the value of criteria, 3) calculating alternatives from the value of existing criteria. In determining the ranking of iLearning class activities there are four (4) criteria [13][14], these criteria covers tasks, daily tasks, quiz and practice. The series of criteria calculations and alternative criteria produces a level of accuracy so that it can avoid subjectivity to the ranking of students in iLearning Class activities.

The use of the AHP method in student ranking is proven to help the teacher to decide the achievement from the many student actions in the iLearning Class, so the teacher can measure the knowledge and competence of each student while attending learning through iLearning class.

2. LITERATURE REVIEW

The revolution in technology is changing rapidly, producing new models and educational methods for the future. Due to technological advancements, the education sector must begin its technological revolution, focusing on educational innovation, dexterity, ultimately transforming traditional learning methods[15][16]into electronic learning methods by utilizing internet technology as a medium for student learning, so as to increase student motivation[17][18]

iLearning is a best practice learning technology developed by integrating hardware, software, application, ICT [19], and iPad devices that are owned by learners in a unity that is unique to each learner participant, and becomes an enabler for implementing level learning high (high level learning) because of its high potential and able to stimulate the development of various types of intelligence possessed by humans. Therefore, iLearning is packaged in such a way with supporting content as a support for modern teaching and learning activities [20][21]. iLearning integrates technology for learning, playing, praying and working. to improve the quality of national education and also face the challenges of the disruption of the industrial revolution 4.0. [22]. Other iLearning research explains that by using iLearning Media (iMe) accompanied by concepts and business intelligence dashboards by adding to the system, it can be stated that student enthusiasm in productivity and good interaction between lecturers and students or between students can be measured and the learning process is proven further increase motivation[23].

In principle, when a system (including calculations, parameters involved, determining the amount of its values, and interactions in it; or whatever it is) supports / supports (decision) decision makers (decision makers) in making decisions (which logical, rational and structured, correct) for complex (or semi-complex) problems that have so many parameters that must be considered [24], then we call the system SPK (Decision Support System), regardless of whether it is computer based or not [25]. SPK or also known as Decision Support System (DSS) is present as a domain of knowledge (not only seen as

technology or computer-based information systems) to help make objective decisions in the right way. There are two keywords, firstly the decision making must be the right way (verified, structured, logical and rational abash), and the second is the decision produced is an objective decision. The conclusion is SPK only supports decision makers in decision making, SPK does not have a role to replace decision maker in decision making [26]. Analytical Hierarchy Process techniques are one of the approaches to alternative objectives of existing criteria by accumulating calculations for existing criteria and alternatives. used in deciding the relative importance of a set of attributes or criteria. AHP (Analytic Hierarchy Process) was developed by Thomas L. Saaty of the Wharton School of Business in the 1970s. According to Saaty, AHP has a functional hierarchy with the main input being human perception. With hierarchy, a complex and unstructured problem is solved into groups and organized into a form of hierarchy [27]. AHP is a method for making an alternative sequence of decisions and selecting the best alternative when a decision maker with several goals or criteria for making certain decisions [28]. Analytical Hierarchy Process allows users to convert intangible factors into numerical values and evaluate weights (preferences) through a series of comparisons using factors involved in decision making situations. Analytical Hierarchy Process helps decision makers to choose the best decision[29].

3. METHOD

The working principle of AHP is to cut a complex problem that is not structured, into parts and arranged in a level. The level of need for a variable is given a numerical value, Then an analysis is made to decide the factors that have high priority that play a role in mastering the calculation results[30]. The AHP's working principles:

- 1) Determine the Targets,
- 2) Make a priority structure in the form of a hierarchy,
- 3) Give values of criterias and alternatives
- 4) check the ratio and index consistency
- 5) Decide criteria and alternatives.

The most commonly used method in research is the AHP method; it is shown that of the 403 articles found between 1994 and 2014 about the AHP method [31]. The AHP method can determine factors that influence investment.

investigate and lay down the value of the factors that influence investors' investment decisions. Such a decision requires reviewing many criteria, the process of hierarchical analysis is the most widely used technique which involves the level and importance of many criteria and sub-criteria so that the resulting calculation is correct and accurate[32].

The AHP method calculation procedure :

Step 1: Identifying complex and unclear case becomes clear in order to set 'goals'

Step 2: The hierarchical forms are created by separating complex problems into several stages. Stage 1 or the highest level in the diagram represents the purpose of the problem. This goal is divided into several levels as criteria and sub-criteria. Decomposition of criteria continues until there is no selection of criteria anymore.

Step 3: comparison of criteria is made by comparison pairwise. The decision matrix is developed based on the Saaty scale shown in the table.

Table 1: Decision Matrix Grading [33]

Level	Remark
1	Two elements have the same effect on purpose
3	One element is slightly more important than the other elements
5	One element is more important than the other elements
7	One element is clearly more important than the other elements
9	One element is absolutely more important than the other elements
2,4,6,8	When compromise is needed

In pairwise comparisons, compare in pairs the entire criteria for each sub-system hierarchy. The comparison is then transformed in the form of a pairwise comparison matrix for numerical analysis. For example C_1, C_2, \dots elements, where C_1, C_2, \dots filled with criteria. Then do it calculations for ratios $1/2 \dots 1/9$, data must be filled with a new matrix of pairwise comparisons between criteria. Comparisons between alternatives for the hierarchical sub-system can be made in the form of matrix $n \times n$ matrix A , calculation matrik pairwise based on formulas:

$$A = [a_{ij}] = \begin{matrix} & C_1, C_2, \dots, C_n \\ \begin{matrix} C_1 \\ C_2 \\ \vdots \\ C_n \end{matrix} & \begin{bmatrix} 1 & a_{12} & \dots & a_{1n} \\ 1/a_{12} & 1 & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ 1/a_{1n} & 1/a_{2n} & \dots & 1 \end{bmatrix} \end{matrix}$$

in matrix A , arrange numeric weights to elements $n C_1, C_2, \dots, C_n$. If A is a consistency matrix, weights and values are only given by $W_i / W_j = a_{ij}$ (for $i, j = 1, 2, \dots, n$).

Step 4: according to pairwise comparison matrices, factor priority weights are calculated through eigenvalues and eigenvectors. According to Thomas L. Saaty, that the largest eigenvalue will be like the formula below

$$\lambda_{\max} = \sum_{j=1}^n a_{ij} \frac{W_j}{W_i}$$

If A is a consistency matrix, then the eigenvector X is calculated according to the formula:

$$(A - \lambda_{\max} I)X = 0.$$

Step 5: do synthesis by checking consistency. Inconsistencies can cause unclear results. In pairwise comparisons, the inconsistency limit is measured using a consistency ratio (CR), which is a comparison of consistency index (CI) with a random value (RI). This value depends on the order matrix n.

$$CI = (\lambda_{\max} - n) / (n - 1),$$

$$CR = CI / RI,$$

For the AHP model, a comparison matrix can be accepted if the ratio value is consistent <0.1. CR value <0.1 is a value that has a good level of consistency and can be accounted for. If the CI and CR values are more than 0.1, this indicates inconsistencies in the pairwise comparison matrix which would require that expert opinions be reconsidered [34]. RI values depend on the number of criteria as in the following table 2

Tabel 2: Average consistency values

Order Matrix	RI
1	0,00
2	0,00
3	0,58
4	0,90
5	1,12
6	1,24
7	1,32
8	1,41
9	1,45
10	1,49

If the value is more than 10% (0.1), then the judgment of judgment must be corrected. However, if the consistency ratio (CI / IR) is less or equal to 0.1, then the calculation results can be declared true and consistent.

4. RESULT AND DISCUSSION

Creating a hierarchical structure that begins with general objectives, criteria that are assessed and sub criteria / alternatives [35]. The first hierarchy is ranking student activities, the second hierarchy is criteria in deciding the achievement of students in this case tasks, daily tasks, quiz and practice students and the third hierarchy are students who become sub criteria or alternative choices in ranking students.

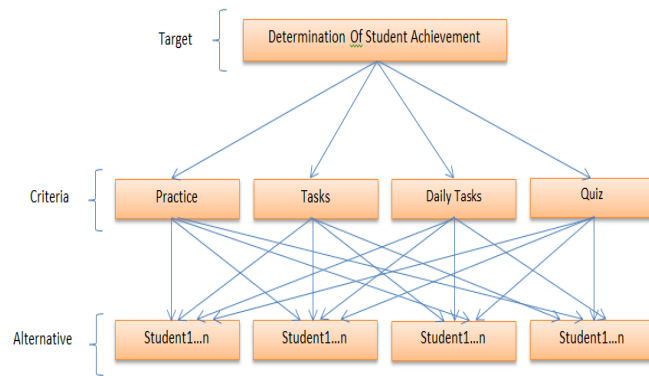


Figure 2: Hierarchical Structure

After making the AHP hierarchical structure, the next step is to calculate the criteria carried out by compiling a pairwise comparison matrix [36]. The determination of the criteria in this decision support system is based on the things that are very important in determining student achievement through the learning approach. Each criterion assigns different weights because each criterion has importance. in making pairwise comparison matrices. The first to do is to determine which criteria weights are most important, which in the terminology Analytical hierarchy process is called a pairwise comparison matrix. Each criterion influences the other criteria. Next tabulation results will be made tabulations:

Table 3: pairwise comparison matrix of criteria

CRITERIA	PRACTICE	TASK	DAILY TASKS	QUIZ
PRACTICE	1,0	2,0	3,0	2,0
TASK	0,5	1,0	2,0	3,0
DAILY TASKS	0,3	0,5	1,0	2,0
QUIZ	0,5	0,3	0,5	1,0
Total	2,3333	3,8333	6,5	8,0

Next change the value in the pairwise comparison matrix into decimal numbers to get the Total matrix (Priority Vector). Then normalize the values in the matrix to get the EigenVector (EV: the average value of the matrix). The trick is to divide the elements of each column by the number of columns in question. The Priority Vector is the sum of all cells next to the Kirinya (in the same row) after being divided by the number below it, then the sum is divided by the number of criteria.

Table 4: Results of matrix normalization and EV

CRITERIA	PRACTICE	TASK	DAILY TASKS	QUIZ	TOTAL	EV
PRACTICE	0,4286	0,5217	0,4615	0,2500	1,6619	0,4155
TASK	0,2143	0,2609	0,3077	0,3750	1,1579	0,2895
DAILY TASKS	0,1429	0,1304	0,1538	0,2500	0,6771	0,1693
QUIZ	0,2143	0,0869	0,0769	0,1250	0,5032	0,1258

Before checking consistency, calculations must be made to determine the maximum lambda (λ maks) value. if the next maximum lambda value is known, check the consistency of the matrix needed in a criteria matrix. This is so the calculations that we do if the data is inconsistent, it is repeated again by taking data as before, but if on the contrary the weighted data is classified which can then be searched for a Consistency Index (CI) value so as to produce a Consistency Ratio (CR) value [37]. the following calculation to produce a CR value:

$$\lambda \text{ maks} = (2,3333 \times 0,4155) + (3,8333 \times 0,2895) + (6,5 \times 0,1693) + (8 \times 0,1258) = 4,1857$$

$$CI = (\lambda \text{ maks} - n) / (n - 1) = (4,1857 - 4) / (4 - 1) = 0,619$$

$$CR = CI / RI = 0,619 / 0,90 = 0,688$$

calculate the maximum lambda by multiplying the Priority Vector with the EigenVector obtained previously. So, from the above matrix can be determined Consistency Ratio (CR) is 0.0688. And CR is smaller than 0.1, the calculation results state that the matrix is consistent. the results of calculations can be seen in table 5.

Tabel 5: Sintesis Konsistensi Rasio

Matrik Pairwise Comparison				EV	Total
0,4286	0,5217	0,4615	0,2500	0,4155	0,291
0,2143	0,2609	0,3077	0,3750	X 0,2895	= 0,1132
0,1429	0,1304	0,1538	0,2500	0,1693	0,0511
0,2143	0,0869	0,0769	0,1250	0,1258	0,0270
λ maks	4,1857				
CI	0,0619				
CR	0,0688				
Consistent					

Next is an alternative calculation in accordance with existing data. Alternative data are calculated according to each criterion[38]. The following are alternative student data to be selected based on each predetermined criterion. done by compiling a pairwise comparison matrix for alternatives for each criterion. The calculation and conversion of students' alternative data starts from tasks, daily tests, quiz, practice and student activeness into the matrix. Next is an alternative calculation in accordance with existing data. Alternative data are calculated according to each criteria. And the following is an alternative calculation of student data.

A. *Alternative calculation of the practice criteria*

The figure below is the result of the normalization of pairwise comparison matrices for practice alternatives. Total matrix used to normalize the matrix

Nilai Eigen									
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
0,05714	0,13333	0,03846	0,04651	0,03448	0,10256	0,05556	0,02778	0,07692	0,09302
0,02857	0,06667	0,07692	0,09302	0,13793	0,05128	0,11111	0,05556	0,03846	0,09302
0,11429	0,06667	0,07692	0,09302	0,06897	0,10256	0,11111	0,05556	0,03846	0,09302
0,05714	0,03333	0,03846	0,04651	0,03448	0,10256	0,05556	0,11111	0,03846	0,02326
0,11429	0,03333	0,07692	0,09302	0,06897	0,10256	0,05556	0,11111	0,03846	0,09302
0,02857	0,06667	0,03846	0,02326	0,03448	0,05128	0,11111	0,05556	0,15385	0,04651
0,05714	0,03333	0,03846	0,04651	0,06897	0,02564	0,05556	0,11111	0,03846	0,04651
0,11429	0,06667	0,07692	0,02326	0,03448	0,05128	0,02778	0,05556	0,03846	0,09302
0,05714	0,13333	0,15385	0,09302	0,13793	0,02564	0,11111	0,11111	0,07692	0,09302
0,02857	0,03333	0,03846	0,09302	0,03448	0,05128	0,05556	0,02778	0,03846	0,04651
0,05714	0,03333	0,15385	0,02326	0,06897	0,10256	0,02778	0,02778	0,03846	0,09302
0,11429	0,06667	0,03846	0,09302	0,03448	0,05128	0,05556	0,02778	0,15385	0,02326
0,02857	0,03333	0,03846	0,09302	0,06897	0,10256	0,02778	0,05556	0,15385	0,09302
0,11429	0,06667	0,07692	0,04651	0,03448	0,02564	0,11111	0,11111	0,03846	0,02326
0,02857	0,13333	0,03846	0,09302	0,13793	0,05128	0,02778	0,05556	0,03846	0,04651

S11	S12	S13	S14	S15	Jumlah	Rata-Rata/Bobot
0,05714	0,02703	0,10526	0,02632	0,11429	0,99581	0,066
0,11429	0,05405	0,10526	0,05263	0,02857	1,10735	0,074
0,02857	0,10811	0,10526	0,05263	0,11429	1,22944	0,082
0,11429	0,02703	0,02632	0,05263	0,02857	0,78971	0,053
0,05714	0,10811	0,05263	0,10526	0,02857	1,13896	0,076
0,02857	0,05405	0,02632	0,10526	0,05714	0,88109	0,059
0,11429	0,05405	0,10526	0,02632	0,11429	0,93590	0,062
0,11429	0,10811	0,05263	0,02632	0,05714	0,94020	0,063
0,11429	0,02703	0,02632	0,10526	0,11429	1,38026	0,092
0,02857	0,10811	0,02632	0,10526	0,05714	0,77286	0,052
0,05714	0,10811	0,05263	0,10526	0,05714	1,00644	0,067
0,02857	0,05405	0,10526	0,10526	0,02857	0,98036	0,065
0,05714	0,02703	0,05263	0,05263	0,02857	0,91313	0,061
0,02857	0,02703	0,05263	0,05263	0,11429	0,92360	0,062
0,05714	0,10811	0,10526	0,02632	0,05714	1,00488	0,067

Figure 3: Results Of Normalization Of Practice Alternative

B. *Alternative calculations of the tasks criteria*

below is the result of normalization and EigenVector (EV) for alternatives to the task criteria

Nilai Eigen									
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
0,06250	0,10526	0,03448	0,10526	0,05714	0,12500	0,03226	0,06061	0,12121	0,04762
0,03125	0,05263	0,03448	0,10526	0,05714	0,03125	0,03226	0,06061	0,12121	0,04762
0,12500	0,10526	0,06897	0,10526	0,11429	0,06250	0,03226	0,12121	0,06061	0,02381
0,03125	0,02632	0,03448	0,05263	0,05714	0,03125	0,06452	0,12121	0,06061	0,09524
0,06250	0,05263	0,03448	0,05263	0,05714	0,06250	0,12903	0,06061	0,03030	0,04762
0,03125	0,10526	0,06897	0,10526	0,05714	0,06250	0,12903	0,03030	0,06061	0,09524
0,12500	0,10526	0,13793	0,05263	0,02857	0,03125	0,06452	0,12121	0,03030	0,09524
0,06250	0,05263	0,03448	0,02632	0,05714	0,12500	0,03226	0,06061	0,12121	0,09524
0,03125	0,02632	0,06897	0,05263	0,11429	0,06250	0,12903	0,03030	0,06061	0,09524
0,06250	0,05263	0,13793	0,02632	0,05714	0,03125	0,03226	0,03030	0,03030	0,04762
0,03125	0,02632	0,06897	0,10526	0,11429	0,12500	0,06452	0,12121	0,12121	0,09524
0,12500	0,10526	0,03448	0,10526	0,02857	0,03125	0,03226	0,06061	0,06061	0,09524
0,03125	0,02632	0,06897	0,02632	0,05714	0,03125	0,12903	0,03030	0,03030	0,04762
0,06250	0,05263	0,13793	0,05263	0,11429	0,06250	0,03226	0,06061	0,03030	0,02381
0,12500	0,10526	0,03448	0,02632	0,02857	0,12500	0,06452	0,03030	0,06061	0,04762

S11	S12	S13	S14	S15	Jumlah	Rata-Rata/Bobot
0,14286	0,02703	0,09524	0,06250	0,02500	1,10397	0,074
0,14286	0,02703	0,09524	0,06250	0,02500	0,92634	0,062
0,07143	0,10811	0,04762	0,03125	0,10000	1,17757	0,079
0,03571	0,02703	0,09524	0,06250	0,10000	0,89512	0,060
0,03571	0,10811	0,04762	0,03125	0,10000	0,91214	0,061
0,03571	0,10811	0,09524	0,06250	0,02500	1,07212	0,071
0,07143	0,10811	0,02381	0,12500	0,05000	1,17026	0,078
0,03571	0,05405	0,09524	0,06250	0,10000	1,01489	0,068
0,03571	0,05405	0,09524	0,12500	0,05000	1,03113	0,069
0,03571	0,02703	0,04762	0,12500	0,05000	0,79361	0,053
0,07143	0,10811	0,04762	0,03125	0,10000	1,23166	0,082
0,03571	0,05405	0,09524	0,06250	0,02500	0,95105	0,063
0,07143	0,02703	0,04762	0,06250	0,10000	0,78707	0,052
0,14286	0,05405	0,04762	0,06250	0,10000	1,03649	0,069
0,03571	0,10811	0,02381	0,03125	0,05000	0,89656	0,060

Figure 4: Results Of Normalizing Of Task Alternative

C. Alternative calculations of daily tasks criteria

The results of the normalization calculation and the EigenVector (EV) for an alternative to the Daily Test criteria

Nilai Eigen									
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
0,06452	0,13333	0,03448	0,05714	0,12903	0,11765	0,06452	0,10811	0,02941	0,10256
0,03226	0,06667	0,13793	0,11429	0,06452	0,11765	0,03226	0,05405	0,11765	0,10256
0,12903	0,03333	0,06897	0,11429	0,03226	0,11765	0,06452	0,10811	0,02941	0,10256
0,06452	0,03333	0,03448	0,05714	0,03226	0,11765	0,03226	0,05405	0,11765	0,02564
0,03226	0,06667	0,13793	0,11429	0,06452	0,02941	0,12903	0,10811	0,02941	0,10256
0,03226	0,03333	0,03448	0,02857	0,12903	0,05882	0,06452	0,10811	0,11765	0,02564
0,06452	0,13333	0,06897	0,11429	0,03226	0,05882	0,06452	0,05405	0,11765	0,02564
0,03226	0,06667	0,03448	0,05714	0,03226	0,02941	0,06452	0,05405	0,05882	0,10256
0,12903	0,03333	0,13793	0,02857	0,12903	0,02941	0,03226	0,05405	0,05882	0,10256
0,03226	0,03333	0,03448	0,11429	0,03226	0,11765	0,12903	0,02703	0,02941	0,05128
0,12903	0,06667	0,06897	0,05714	0,06452	0,05882	0,06452	0,05405	0,05882	0,02564
0,06452	0,13333	0,03448	0,02857	0,12903	0,02941	0,12903	0,02703	0,02941	0,05128
0,03226	0,06667	0,06897	0,05714	0,06452	0,02941	0,06452	0,10811	0,05882	0,02564
0,03226	0,03333	0,03448	0,02857	0,03226	0,05882	0,03226	0,02703	0,11765	0,05128
0,12903	0,06667	0,06897	0,02857	0,03226	0,02941	0,03226	0,05405	0,02941	0,10256

S11	S12	S13	S14	S15	Jumlah	Rata-Rata/Bobot
0,03448	0,05263	0,11429	0,09091	0,02273	1,15579	0,077
0,06897	0,02632	0,05714	0,09091	0,04545	1,12862	0,075
0,06897	0,10526	0,05714	0,09091	0,04545	1,16786	0,078
0,06897	0,10526	0,05714	0,09091	0,09091	0,98217	0,065
0,06897	0,02632	0,05714	0,09091	0,09091	1,14843	0,077
0,06897	0,10526	0,11429	0,04545	0,09091	1,05729	0,070
0,06897	0,02632	0,05714	0,09091	0,09091	1,06828	0,071
0,06897	0,10526	0,02857	0,09091	0,04545	0,87134	0,058
0,06897	0,10526	0,05714	0,02273	0,09091	1,08002	0,072
0,13793	0,05263	0,11429	0,04545	0,02273	0,97405	0,065
0,06897	0,05263	0,11429	0,04545	0,09091	1,02043	0,068
0,06897	0,05263	0,02857	0,04545	0,09091	0,94263	0,063
0,03448	0,10526	0,05714	0,09091	0,04545	0,90930	0,061
0,06897	0,05263	0,02857	0,04545	0,09091	0,73447	0,049
0,03448	0,02632	0,05714	0,02273	0,04545	0,75932	0,051

Figure 5: Normalized Results Of Daily Tasks Alternative

D. Alternative calculations of the Quiz criteria

And here are the results of normalization and EigenVector

Nilai Eigen									
S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
0,06452	0,11903	0,03226	0,05714	0,12121	0,12121	0,10526	0,06061	0,03333	0,08511
0,03226	0,06452	0,12903	0,11429	0,03030	0,12121	0,05263	0,03030	0,13333	0,04255
0,12903	0,03226	0,06452	0,11429	0,12121	0,03030	0,10526	0,06061	0,03333	0,08511
0,06452	0,03226	0,03226	0,05714	0,12121	0,06061	0,10526	0,06061	0,03333	0,08511
0,03226	0,12903	0,03226	0,02857	0,06061	0,06061	0,10526	0,06061	0,13333	0,08511
0,03226	0,03226	0,12903	0,05714	0,06061	0,06061	0,05263	0,12121	0,03333	0,08511
0,03226	0,06452	0,03226	0,02857	0,03030	0,06061	0,05263	0,12121	0,03333	0,08511
0,06452	0,12903	0,06452	0,05714	0,06061	0,03030	0,02632	0,06061	0,13333	0,08511
0,12903	0,03226	0,12903	0,11429	0,03030	0,12121	0,10526	0,03030	0,06667	0,04255
0,03226	0,06452	0,03226	0,02857	0,03030	0,03030	0,02632	0,03030	0,06667	0,04255
0,12903	0,03226	0,06452	0,02857	0,06061	0,06061	0,05263	0,12121	0,13333	0,02128
0,06452	0,06452	0,03226	0,11429	0,12121	0,03030	0,02632	0,06061	0,03333	0,04255
0,03226	0,03226	0,06452	0,05714	0,06061	0,03030	0,02632	0,03030	0,06667	0,08511
0,03226	0,03226	0,12903	0,11429	0,03030	0,12121	0,10526	0,03030	0,03333	0,04255
0,12903	0,12903	0,03226	0,02857	0,06061	0,06061	0,05263	0,12121	0,03333	0,08511

S11	S12	S13	S14	S15	Jumlah	Rata-Rata/Robot
0,03333	0,05128	0,09524	0,11111	0,02778	1,12842	0,075
0,13333	0,05128	0,09524	0,11111	0,02778	1,16917	0,078
0,06667	0,10256	0,04762	0,02778	0,11111	1,13165	0,075
0,13333	0,02564	0,04762	0,02778	0,11111	0,99778	0,067
0,06667	0,02564	0,04762	0,11111	0,05556	1,03423	0,069
0,06667	0,10256	0,09524	0,02778	0,05556	1,01199	0,067
0,06667	0,10256	0,09524	0,02778	0,05556	0,88860	0,059
0,03333	0,05128	0,09524	0,11111	0,02778	1,03022	0,069
0,03333	0,10256	0,04762	0,11111	0,11111	1,20665	0,080
0,13333	0,05128	0,02381	0,05556	0,02778	0,67581	0,045
0,06667	0,10256	0,09524	0,05556	0,11111	1,13518	0,076
0,03333	0,05128	0,09524	0,02778	0,05556	0,85309	0,057
0,03333	0,02564	0,04762	0,11111	0,05556	0,75874	0,051
0,06667	0,10256	0,02381	0,05556	0,11111	1,03051	0,069
0,03333	0,05128	0,04762	0,02778	0,05556	0,94796	0,063

Figure 6: Result Of Normalization Quiz Alternative

E. Alternative Synthesis Results

To find the synthesis results in an alternative, the steps are the same as finding the synthesis results in the criteria. Need to know the results of calculating the consistency index (CI) and consistency ratio (CR) first.

1. Alternative Synthesis Practice Results

λ maks =

$$(17,5*0,066)+(15*0,074)+(13*0,082)+(21,5*0,053)+(14,5*0,076)+(19,5*0,059)+(18*0,062)+(18*0,063)+(13*0,092)+(21,5*0,052)+(17,5*0,067)+(18,5*0,065)+(19*0,061)+(19*0,062)+(17,5*0,067) = 17,15$$

$$CI = (\lambda_{maks} - n) / (n - 1) = (17,15 - 15) / (15 - 1) = 0,15$$

$$CR = CI / RI = 0,15 / 1,59 = 0,097$$

2. Results of Alternative Synthesis of Task

λ maks =

$$(16*0,074)+(19*0,062)+(14,5*0,079)+(19*0,060)+(17,5*0,061)+(16*0,071)+(15,5*0,078)+(16,5*0,068)+(16,5*0,069)+(21*0,053)+(14*0,082)+(18,5*0,063)+(21*0,052)+(16*0,069)+(20*0,060) = 17,13$$

$$CI = (\lambda_{maks} - n) / (n - 1) = (17,13 - 15) / (15 - 1) = 0,15$$

$$CR = CI / RI = 0,15 / 1,59 = 0,096$$

3. Alternative Synthesis Results of Daily Tasks

λ maks =

$$(15,5*0,077)+(15*0,075)+(14,5*0,078)+(17,5*0,065)+(15,5*0,07)+(17*0,070)+(15,5*0,071)+(18,5*0,058)+(17*0,072)+(19,5*0,065)+(14,5*0,068)+(19*0,063)+(17,5*0,061)+(22*0,049)+(22*0,05) = 17,08$$

$$CI = (\lambda_{maks} - n) / (n - 1) = (17,08 - 15) / (15 - 1) = 0,15$$

$$CR = CI / RI = 0,15 / 1,59 = 0,094$$

4. Alternative Quiz Synthesis Results

λ maks =

$$(15,5*0,075)+(15,5*0,078)+(15,5*0,075)+(17,5*0,067)+(16,5*0,069)+(16,5*0,067)+(19*0,059)+(16,$$

$$5*0,069)+(15*0,080)+(23,5*0,045)+(15*0,076)+(19,5*0,057)+(21*0,051)+(18*0,069)+(18*0,063) = 17,16$$

$$CI = (\lambda_{maks} - n) / (n - 1) = (17,16 - 15) / (15 - 1) = 0,15$$

$$CR = CI / RI = 0,15 / 1,59 = 0,097$$

To get the maximum Eigen (Principal Eigen) or also called

Principal Eigen Value (λ_{max}) matrix calculations by adding up the product of the number of times and priority vectors. So, from the matrix above can be determined the Consistency Ratio (CR) of the 0,097 practical alternatives, 0,096 alternative assignments, 0,094 daily test alternatives, and 0,097 alternative quizzes. And CR is smaller than 0,1 the matrix calculation results are stated consistent.

From the results of the calculation of global priorities, to get the ranking or ranking of the best students. Then the next step is only to sort the final results from the largest number [39]. As the following table is the results of deciding student achievement resulting from the calculation of criteria and alternatives using a decision support system that is an analytical hierarchy process.

NO	ALTERNATIVE	STUDENT NAME/ ALTERNATIVE	PRACTICE	TASK	DAILY TASKS	QUIZ	EIGEN VECTOR (EV)	RESULT	ACHIEVEMENT
1	S9	HAFNI SILFIANI	0,09202	0,06874	0,07200	0,08044		0,080436	1
2	S3	AHMAD RIFQY RAMDANI	0,08196	0,07850	0,07786	0,07544		0,079447	2
3	S11	HILDA ANDINI	0,06710	0,08211	0,06803	0,07568		0,07268	3
4	S1	ARIF RIZQI	0,06639	0,07360	0,07705	0,07523		0,071392	4
5	S2	AHMAD MAULANA	0,07382	0,06176	0,07524	0,07794		0,071089	5
6	S5	MAULANA MICHAEL	0,07593	0,06081	0,07656	0,06895	0,41546	0,070782	6
7	S7	DEVI RACHMAWATI	0,06239	0,07802	0,07122	0,05924	0,16929	0,068013	7
8	S6	BOHARI	0,05874	0,07147	0,07049	0,06747	0,28946	0,065512	8
9	S8	HARIS MUNANDAR	0,06268	0,06766	0,05809	0,06868	0,12579	0,064099	9
10	S12	ANNISA MULYASARI	0,06536	0,06340	0,06284	0,05687		0,063299	10
11	S14	ISMAIL	0,06157	0,06910	0,04896	0,06870		0,062514	11
12	S15	IMAM SUPIRMAN	0,06699	0,05977	0,05062	0,06320		0,061653	12
13	S4	AFRIZAL	0,05265	0,05967	0,06548	0,06652		0,058599	13
14	S13	KHAERUL LUTFIANDI	0,06088	0,05247	0,06062	0,05058		0,057105	14
15	S10	GILANG FIRDAUS	0,05152	0,05291	0,06494	0,04505		0,053381	15

Figure 7: Student Achievement Calculation Results

The results of calculations using the Analytical Hierarchy Process, obtained the rank 1 students from 15 students who took iLearning class named hafnisilfiani students, with results 0.080436.

5. CONCLUSION

Learning media iLearning class is an innovation that can be utilized in the learning process, because in it there is an assessment given by the teacher that can be accessed through the viewboard. AHP method is used so that the results of student ranking are objective, correct and accurate. The stages in the AHP Method are the first to arrange a hierarchy that aims to determine the objectives of the study. The second is to do the calculation of the criteria. Third, calculating the alternatives, in this study the intended alternatives are students who take iLearning Class and finally check the consistency of the criteria and alternative calculations. In calculating the Criteria, to get the maximum Eigen (Principal Eigen) Principal Eigen Value (λ_{max}) matrix calculations by adding up the product of the number of times and priority vectors.

The use of the AHP method in student ranking is proven to help the teacher to decide the achievement of the many student tasks in the iLearning Class, so that the teacher can measure knowledge and competence quantitatively towards students while learning through the iLearning class.

Further research is suggested to try to increase the number of alternatives or criteria used such as attendance and discipline. The method used for ranking students can use other methods that have a high degree of accuracy with fewer calculation processes

REFERENCES

1. A. Badia, D. Martín, and M. Gómez, “Teachers’ perceptions of the use of Moodle activities and their learning impact in secondary education,” *Technol. Knowl. Learn.*, vol. 24, no. 3, pp. 483–499, 2019.
2. E. T. Lwoga and M. Komba, “Antecedents of continued usage intentions of web-based learning management system in Tanzania,” *Educ. Train.*, 2015.
3. L. Juhaňák, J. Zounek, and L. Rohlíková, “Using process mining to analyze students’ quiz-taking behavior patterns in a learning management system,” *Comput. Human Behav.*, vol. 92, pp. 496–506, 2019.
4. B. Meskhi, S. Ponomareva, and E. Ugnich, “E-learning in higher inclusive education: needs, opportunities and limitations,” *Int. J. Educ. Manag.*, 2019.
5. Q. Aini, T. Hariguna, P. O. H. Putra, and U. Rahardja, “Understanding how gamification influences behaviour in education,” *Int. J. Adv. Trends Comput. Sci. Eng.*, vol. 8, no. 1.5 Special Issue, pp. 269–274, 2019, doi: 10.30534/ijatcse/2019/4781.52019.
6. Z. Zainuddin and C. J. Perera, “Supporting students’ self-directed learning in the flipped classroom through the LMS TES BlendSpace,” *Horiz.*, 2018.
7. Sudaryono, U. Rahardja, and N. Lutfiani, “The Strategy of Improving Project Management Using Indicator Measurement Factor Analysis (IMF) Method,” in *Journal of Physics: Conference Series*, 2020, vol. 1477, no. 3, doi: 10.1088/1742-6596/1477/3/032023.
8. *Peraturan Menteri Pendidikan Dan Kebudayaan No 23 Tahun 2016 Tentang Standar Penilaian*.
9. Henderi, Q. Aini, N. P. L. Santoso, A. Faturahman, and U. Rahardja, “A proposed gamification framework for smart attendance system using rule base,” *J. Adv. Res. Dyn. Control Syst.*, vol. 12, no. 2, pp. 1827–1838, 2020, doi: 10.5373/JARDCS/V12I2/S20201226.
10. Sudaryono, U. Rahardja, Q. Aini, Y. Isma Graha, and N. Lutfiani, “Validity of Test Instruments,” *J. Phys. Conf. Ser.*, vol. 1364, no. 1, 2019, doi: 10.1088/1742-6596/1364/1/012050.
11. S. Watini, Q. Aini, M. Hardini, and U. Rahardja, “Improving Citizen’s Awareness in Conserving Diversity of Malay Traditional Dances in Malaysia through the Art Appreciation Performed by Students of Early Childhood Education Study Program,” *Int. J. Psychosoc. Rehabil.*, vol. 24, no. 8, pp. 2730–2737, 2020, doi: 10.37200/IJPR/V24I8/PR280292.
12. A. D. Alvarenga, E. G. Salgado, and G. H. de Sousa Mendes, “Ranking criteria for selection of certification bodies for ISO 9001 through the Analytic Hierarchy Process (AHP),” *Int. J. Qual. Reliab. Manag.*, 2018.
13. A. Shahin and M. A. Mahbod, “Prioritization of key performance indicators,” *Int. J. Product. Perform. Manag.*, 2007.
14. Y. Wang, R. Y. Zhong, and X. Xu, “A decision support system for additive manufacturing process selection using a hybrid multiple criteria decision-making method,” *Rapid Prototyp. J.*, 2018.
15. U. Rahardja, Q. Aini, Y. I. Graha, and M. R. Tangkaw, “Gamification Framework Design of Management Education and Development in Industrial Revolution 4.0,” *J. Phys. Conf. Ser.*, vol. 1364, no. 1, pp. 0–13, 2019, doi: 10.1088/1742-6596/1364/1/012035.

16. Q. Aini, A. Badrianto, F. Budiarty, A. Khoirunisa, and U. Rahardja, “Alleviate Fake Diploma Problem In Education Using Block Chain Technology,” *J. Adv. Res. Dyn. Control Syst.*, vol. 12, no. 2, pp. 1821–1826, 2020, doi: 10.5373/JARDCS/V12I2/S20201225.
17. Q. Aini, M. Budiarto, P. O. Hadi Putra, A. Khoirunisa, N. P. L. Santoso, and U. Rahardja, “Gamified education practice: Designing with e-commerce and ilearning concept,” *Int. J. Psychosoc. Rehabil.*, vol. 24, no. 7, 2020, doi: 10.37200/IJPR/V24I7/PR270799.
18. H. T. Sukmana, T. Hariguna, N. Lutfiani, and U. Rahardja, “Exploring the moderating effect of technology readiness of user intention in the context of mobile payment service,” *Int. J. Adv. Trends Comput. Sci. Eng.*, vol. 8, no. 1.5 Special Issue, pp. 249–257, 2019, doi: 10.30534/ijatcse/2019/4481.52019.
19. N. F. Rozy, R. Ramadhiansya, P. A. Sunarya, and U. Rahardja, “Performance Comparison Routing Protocol AODV, DSDV, and AOMDV with Video Streaming in Manet,” *2019 7th Int. Conf. Cyber IT Serv. Manag. CITSM 2019*, 2019, doi: 10.1109/CITSM47753.2019.8965386.
20. P. A. Sunarya, U. Rahardja, and D. I. Desrianti, “Development Assessment Module Portfolio E-Imei Students With Learning To Improve The Quality Of Concentration Case Study Mavib,” vol. 13, no. 8, pp. 3597–3606, 2016.
21. Q. Aini, U. Rahardja, and T. Hariguna, “The antecedent of perceived value to determine of student continuance intention and student participate adoption of ilearning,” *Procedia Comput. Sci.*, vol. 161, pp. 242–249, 2019, doi: 10.1016/j.procs.2019.11.120.
22. U. Rahardja, A. N. Hidayanto, T. Hariguna, and Q. Aini, “Design Framework on Tertiary Education System in Indonesia Using Blockchain Technology,” *2019 7th Int. Conf. Cyber IT Serv. Manag. CITSM 2019*, pp. 5–8, 2019, doi: 10.1109/CITSM47753.2019.8965380.
23. D. Sudaryono, D. Padeli, and E. Febriyanto, “Model of Learning Using iLearning on Independent Study Classes at University,” *Univers. J. Educ. Res.*, vol. 5, no. 8, pp. 1349–1361, 2017, doi: 10.13189/ujer.2017.050808.
24. S. Watini, Q. Aini, A. Khoirunisa, and U. Rahardja, “Assessment System for Testing the Evaluation of Diversity in Traditional Malay Dance by Early Childhood Students,” *Int. J. Psychosoc. Rehabil.*, vol. 24, no. 8, pp. 2721–2729, 2020, doi: 10.37200/IJPR/V24I8/PR280291.
25. U. H. Farhan, M. Tolouei-Rad, and A. Osseiran, “Use of AHP in decision-making for machine tool configurations,” *J. Manuf. Technol. Manag.*, 2016.
26. A. W. Labib and J. Shah, “Management decisions for a continuous improvement process in industry using the analytical hierarchy process,” *Work Study*, 2001.
27. I. Aşchilean, G. Badea, I. Giurca, G. S. Naghiu, and F. G. Iloaie, “Choosing the optimal technology to rehabilitate the pipes in water distribution systems using the AHP method,” *Energy Procedia*, vol. 112, pp. 19–26, 2017.
28. K. Benmoussa, M. Laaziri, S. Khoulji, M. L. Kerkeb, and A. El Yamami, “AHP-based Approach for Evaluating Ergonomic Criteria,” *Procedia Manuf.*, vol. 32, pp. 856–863, 2019, doi: 10.1016/j.promfg.2019.02.294.
29. O. Bayazit, “Use of AHP in decision-making for flexible manufacturing systems,” *J. Manuf. Technol. Manag.*, 2005.
30. R. Mishra, A. K. Pundir, and L. Ganapathy, “Evaluation and prioritisation of manufacturing flexibility alternatives using integrated AHP and TOPSIS method,” *Benchmarking An Int. J.*, 2017.
31. A. Mardani, A. Jusoh, and E. K. Zavadskas, “Fuzzy multiple criteria decision-making techniques and applications—Two decades review from 1994 to 2014,” *Expert Syst. Appl.*, vol. 42, no. 8, pp. 4126–4148, 2015.
32. M. Dhochak and A. K. Sharma, “Identification and prioritization of factors affecting venture

- capitalists' investment decision-making process," *J. Small Bus. Enterp. Dev.*, 2016.
33. T. L. Saaty, "How to make a decision: the analytic hierarchy process," *Interfaces (Providence)*, vol. 24, no. 6, pp. 19–43, 1994.
 34. A. E. Wolnowska and W. Konicki, "Multi-criterial analysis of oversize cargo transport through the city, using the AHP method," *Transp. Res. Procedia*, vol. 39, pp. 614–623, 2019.
 35. H. Singh and R. Kumar, "Hybrid methodology for measuring the utilization of advanced manufacturing technologies using AHP and TOPSIS," *Benchmarking An Int. J.*, 2013.
 36. S. D. W. Prajanti, "Strategy for controlling agricultural land conversion of paddy by using analytical hierarchy process in Central Java," *Manag. Environ. Qual. An Int. J.*, 2014.
 37. A. Hambali, S. M. Sapuan, N. Ismail, and Y. Nukman, "Application of analytical hierarchy process (AHP) and sensitivity analysis for selecting the best design concepts during conceptual design stage," *Multidiscip. Model. Mater. Struct.*, 2009.
 38. S. Kumar, S. Luthra, and A. Haleem, "Benchmarking supply chains by analyzing technology transfer critical barriers using AHP approach," *Benchmarking An Int. J.*, 2015.
 39. S. E. Strasser, C. Ozgur, and D. L. Schroeder, "Selecting a business college major: An analysis of criteria and choice using the analytical hierarchy process," *Am. J. Bus.*, 2002.