

## **THE EFFECT OF AUTHENTIC LEARNING APPROACHES AND ASSESSMENT TECHNIQUES ON STUDENTS' STATISTICS BASIC TEST RESULTS BY INTELLIGENCE CONTROL**

### **ABSTRACT**

This study aims to determine the Effect of authentic learning approaches and assessment techniques on students' essential statistical learning outcomes by controlling intelligence. This research is quasi-experimental research using a 2 X 2 factorial design which includes 80 samples of KPI students. The research data were analyzed using a two-way analysis of variance formulation. The results are (1) The results of the basic statistical basic test of students who use a scientific approach are higher than students who use a contextual learning approach (2) The results of the basic statistical test of students who use essay tests are higher than students who use portfolio assessment (3) There are the Effect of the interaction between the learning approach and authentic assessment techniques on the results of the basic statistical basic test of students (4) Especially for students who learn to use essay assessment, the results of the basic statistical test of student groups with a scientific approach are higher than contextual learning (5) Especially for students who learn to use portfolio assessment, the results of the basic statistical test of student groups with a contextual approach are lower than scientific learning (6) Especially for students who learn to use a scientific approach, the results of the basic statistical test of student groups with essay assessments are more higher score than using portfolio assessment (7) Especially for students who learn to use a contextual approach, the results of the basic statistical test for groups of students with portfolio assessment are lower than using essay assessment. Therefore, it is recommended for lecturers to know the students' success in receiving the material, and it is better to use a scientific approach and form of essay assessment.

**Keywords:** Authentic Assessment, Statistical Basic Tests, Intelligence, Learning Approach

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### **INTRODUCTION**

The success of student learning can be seen from how far students master the material being studied, from achievement index (IP) data, especially in introductory statistical basic courses. The results of the researchers' observations for the last three years showed that between the 2019 school year and the 2021 school year, the student achievement index ranged from 40%-60.5%; every year, to achieve graduation, lecturers often gave remedial to students, thus disrupting lecture time, although it was found there are doing remedial many times.

Students who often do remedial will impact the achievement of the student achievement index. The Achievement Index is obtained from the results of lecturer assessments, student

input, curriculum, quality of the learning process, facilities, campus environment, support for organizing costs, and parental involvement while at home (Barokah et al., 2020). Of these many factors, the factors of lecturers and students are considered the most dominant in influencing the results of the achievement index obtained (Kapur, 2018).

Lecturers have a strategic role in the learning process. That is one of the successes of a teacher or lecturer if they know the intent and purpose of the questions given through the stages of the learning process and solve the problems with group work. In the learning process in the classroom, teaching models can ensure the success of learning by the objectives. (Ahmad dan Yuliatrisa Wiyaya, 2011) So far, lecturers still use the conventional approach, and applying assessment techniques has not been optimal. Learning innovation and lecturer assessment are still low (Putra et al., 2020). (Annabi & Muller, 2016) Lecturers in learning mainly provide information according to estimates, imagination, and stories, without showing the truth that is happening around contextually, while students do nothing but listen to what the lecturer is informed, namely: the lecturer gives examples of questions, students listen, the lecturer asks questions. Questions, as well as completing tedious student practical work and so on. Thus, if the learning objectives do not reach the target, lecturers are expected to be able to innovate and try to find the best way to carry out the learning process. Therefore, lecturers must be professional in carrying out their duties and become one of the conditions for the creation of a responsible educational system and practice. Moreover, the situation that is always changing and complex requires lecturers to always explore knowledge and be responsive to changes, so that the patterns and approaches as well as assessment techniques applied on campus can be in accordance with expectations and changes in the learning environment.

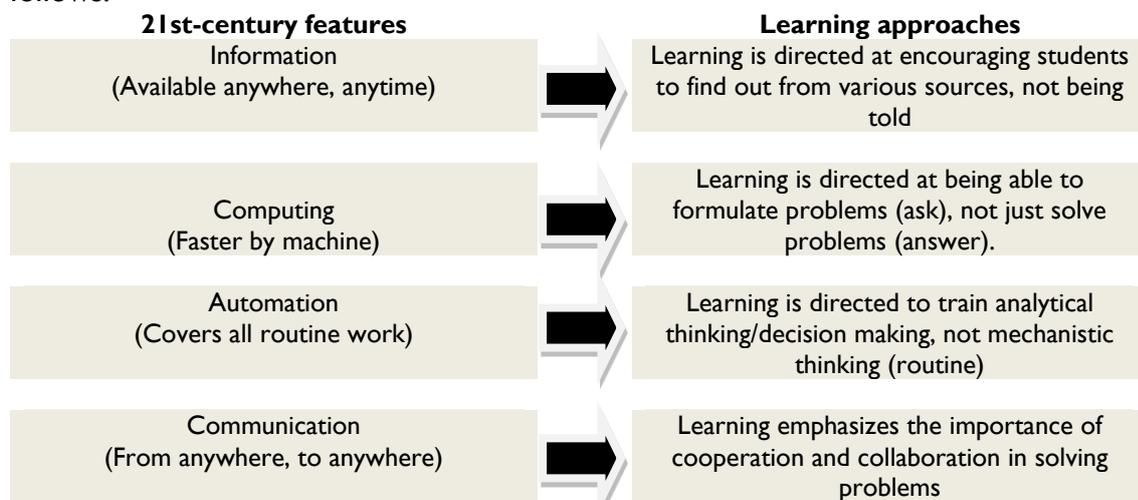
Today's learning conditions are to build concepts, develop thinking skills, explore new understandings, and propose and solve problems; students or students are low (Tisza et al., 2022). This situation means a learning process requiring students to memorize various pieces of information without being required to use them in their lives (Tisza & Markopoulos, 2021). The learning process must be more meaningful and build ideas to connect various experiences experienced and their symptoms. (Malone & Lepper, 2021)

A learning approach involving active students can be applied through a scientific learning approach appropriate to the pandemic situation. Learning activities encourage students to discover knowledge or skills using the scientific method. (Fukada & Seyama, 2022) This approach requires lecturers to manage to learn well so they get a team that can solve the problem completely. (Roscher et al., 2020) Thus, the scientific learning approach requires active involvement in responding to learning changes by optimizing learning resources optimally.

For the world to survive and prosper in the new century, people must learn more and learn differently. A child entering the new century will likely face more risk and uncertainties and need to gain more knowledge and master more skills than any generation." This statement shows that to face the 21st century; lecturers must master information technology well; lecturers are required to provide knowledge, attitudes, behavior, and skills through a learning approach based on the demands and assessment techniques (Wiseman, 2022). Students face various risks and uncertainties in line with the rapid development of the environment, such as technology, science, economics, and socio-culture, so students are required to learn more and be proactive to have more knowledge and skills (Shahidullah & Hossain, 2022).

A skill that reminds us that "today's education system faces irrelevance unless we bridge the gap between how students live and how they learn." This statement confirms that education will not be relevant if it does not bridge the gap between the reality of life and the reality that students will face in the 21st century and the education system, including teachers, in preparing learning approaches that are by the times that students will face as a product of

that education. (Ibanga & Ed, 2022) Teachers must carry out shifts in learning to anticipate the needs of the 21st century, namely information, computing, automation, and communication. (Sulaiman & Ismail, 2020) The steps for changing the learning approach are as follows:



**Figure 1.** 21st Century Learning Paradigm

Therefore, lecturers must be professional, and it is imperative to create graduates who can face the realities of life so that students' posture of knowledge and expertise can be achieved. In the 21st century, students as educational products must have the skills and needs needed, including Communication skills. Critical and Creative Thinking, Information Literacy, Digital, Inquiry, Interpersonal, Multicultural, Problem Solving, and Technology Skills. (van Laar et al., 2020) (Karatas & Arpaci, 2021).

Lecturers, as facilitators and learning partners, are expected to provide changes in the learning character of their students. Therefore lecturers are expected to provide excellent service in the form of authentic assessment techniques to evaluate student learning processes. This paper will discuss the quality of learning methods and forms of assessment in the learning process.

The extent to which students absorb the subject matter given in the learning process is significant for assessment because, with the assessment process, the lecturer can not only give tests that produce scores but more than that. Assessment is gathering information about the learning process, which relates to the early learning process, during learning activities, at the end of learning, learning impact, and learning impact. (Karunanayaka & Naidu, 2021) (Syaifuddin, 2020) By using authentic assessment techniques, for example, we can find out the effectiveness of the learning, be it materials, media, or learning approaches. Lecturers conduct assessments to monitor student learning characteristics, progress, and improvement. (Schultz et al., 2022) (Saher et al., 2022)

The understanding and learning character obtained depend on the readiness of students to accept the material and avoid non-optimal assessments. The series of activities to obtain, analyze and interpret data about the process and results of tests carried out systematically and continuously are assessments carried out by lecturers to be used as meaningful information in decision making. Authentic assessment techniques are used as direct assessments, in the sense that lecturers carry out assessment activities according to the needs of students needed in their current lives, so that this assessment technique describes the actual abilities of students, in this case, competence in the form of competence, the value of knowledge, skills, and attitudes shown in the habit of thinking and acting to solve a problem. (Stokes, 2021) (Damayanti et al., 2017) Authentic assessment is also a measurement activity

focused on developing students' abilities and ways of learning about these subjects.(Karunanayaka & Naidu, 2021). This assessment should describe what attitudes, skills, and knowledge students have or have not had, how they have applied their knowledge, and how they have been unable to apply the learning outcomes(McArthur, 2022).

Several forms of authentic assessment techniques can be applied in the classroom, including performance appraisal, self-assessment, project assessment, and portfolio assessment. In introductory statistics courses where authentic assessment techniques can be applied in the form of essays and portfolios, these two forms of authentic assessment do not only take a long time because they can be adapted to schedules, and materials are also often used by lecturers. Students' abilities can be measured from the readiness possessed, in this case, intelligence as the basis for progress obtained during the teaching and learning process. The general problem in this study is the influence of learning approaches, authentic assessment techniques, and student intelligence on students' direct statistical test results. In detail are:

1. Is there a difference in the results of the basic statistics test of students using a scientific learning approach and students using a contextual learning approach after controlling for student intelligence?
2. Is there a difference in the results of the basic statistical test of students who apply authentic assessment techniques in the form of essays and those who apply authentic assessment techniques in the form of portfolios after controlling for student intelligence?
3. After controlling for student intelligence, is there an interaction effect of learning approaches and authentic assessment techniques on students' basic statistical test results?
4. Is there a difference in the results of the basic statistical tests of students who use a scientific learning approach with groups of students who use a contextual learning approach, especially for students who apply authentic assessment techniques in the form of essays after controlling the intelligence of students?
5. Is there a difference in the results of the basic statistical test of students who use a scientific learning approach with groups of students who use a contextual learning approach, especially for students who apply portfolio assessment techniques, after controlling for student intelligence?
6. Is there a difference in the results of the basic statistical test of students between those who apply authentic assessment techniques in the form of essays and students who apply special portfolio assessment techniques for groups of students who use a scientific learning approach after controlling for student intelligence?
7. Is there a difference in the results of students' basic statistical tests between those who apply authentic assessment techniques in the form of essays and students who are taught to apply special portfolio assessment techniques for students who use portfolio assessment techniques in groups of students who are taught with a contextual learning approach, after controlling for student intelligence?

## **METHOD**

The method used to conduct this research is an experimental method with a 2x2 factorial design.(Mainardi & Bidoia, 2022)(Ditzhaus & Smaga, 2022) The treatment factors are (1) learning approach and (2) authentic assessment technique, each of which has two levels of treatment, and the response variable is the results of the Basic Student Statistics test. Before the implementation of this research, the researcher obtained the intelligence value data first, which was also used by the researcher as a covariate or covariate in applying the linear model. The target population in this study were FADA students and the population of KPI affordability semester 4. Two classes used a scientific approach with authentic assessment techniques in the form of essays, and two other classes used a contextual approach with authentic

assessments in the form of portfolios, the four classes were randomly selected. The research data were analyzed using a two-way analysis of variance formulation.

## RESULTS AND DISCUSSION

Each group presented data according to the research requirements in the form of an average as a measure of concentration, standard deviation as a measure of dispersion, a frequency distribution table, and a histogram graph. A summary of the research results is described as shown in the table below.

Table.I Recapitulation of Intelligence Data and Results of Basic Statistical Tests

	A	A <sub>1</sub>		A <sub>2</sub>		Jumlah	
B		X	Y	X	Y	X	Y
B <sub>1</sub>	N	20	20	20	20	40	40
	Mean	91,3	87,3	92,15	87	91,725	87,15
	Std. Dev	6,87	3,84	5,65	3,66	6,22	1,99
	Minim	80	82	78	83	78	83
	Maks	97	90	97	90	97	90
B <sub>2</sub>	N	20	20	20	20	40	40
	Mean	88,75	86,7	90,1	84,8	89,425	85,7
	Std. Dev	5,09	3,59	5,33	4,1	5,19	2,3
	Minim	80	82	78	81	78	83
	Maks	97	89	99	88	99	90
Amount	N	40	40	40	40	80	80
	Mean	90,025	87	91,125	85,95	92	90,58
	Std. Dev	6,104	1,96	5,52	2,37	6,22	5,81
	Minim	80	82	78	81	80	81
	Maks	97	90	79	90	99	90

The hypothesis testing of this research was conducted using the covariate analysis technique (ANAKOVA) by applying the GLM Univariate program SPSS (Statistical Program for Social Science) version 20.0 procedure, Effect of learning approach on students' basic statistical basic test results, after controlling for intelligence. The results of testing the research hypothesis show that there are differences in test results using a scientific learning approach with a textual learning approach after controlling for student intelligence and showing a significant value. This can be seen from the statistical calculation of the t-test:  $t_o = 2.628$  more than  $t_{table} (80) = 1.675$ . And the level of sig =  $0.001 < = 0.05$ . It can be concluded that there is an effect of the learning approach on test results, after controlling for student intelligence. The results of the calculations carried out support the conclusions above, where the results of tests using a scientific learning approach with an average of 87 and test results using a contextual learning approach with an average of 85.95. Thus, it can be concluded that research using a scientific learning approach is higher in achieving test results than the contextual learning approach. so that the proposed hypothesis is proven true.

The Effect of authentic assessment techniques on students' basic statistical basic test results, after controlling for intelligence. The results of testing the research hypothesis show that the difference in test results between those who apply authentic assessment techniques in the form of essays and authentic assessment techniques in the form of portfolios, after controlling for intelligence, shows a significant value. The results of the t-test analysis:  $t_o = 2.845$  more than  $t_{table} (80) = 1.675$  and the level of sig =  $0.006 < = 0.05$ . It can be concluded that there is a significant difference between the average corrected test results that apply authentic assessment techniques in the form of essays and authentic assessment techniques in the form of portfolios, after controlling for intelligence. Thus, it can be concluded that research that applies authentic assessment techniques in the form of essays is higher in achieving test results

compared to applying authentic assessment techniques in the form of portfolios so that the proposed hypothesis is proven true.

The Effect of the interaction between the influence of the learning approach and authentic assessment techniques on the results of the basic statistical tests of students, after controlling for students' intelligence. The hypothesis testing results indicate a significant interaction effect between learning approaches and authentic assessment techniques on test results after controlling for intelligence. The results of the  $t_{\text{test}}$  analysis:  $t_o = 2.125$  more than  $t_{\text{table}}(80) = 1.675$  and  $\text{sig} = 0.037 < = 0.05$ . After controlling for students' intelligence, it can be concluded that there is an interaction between the learning approach and authentic assessment techniques on students' mathematics learning outcomes. This means that the Effect of the learning approach on mathematics learning outcomes, depending on the precise assessment technique applied, or the influence of authentic assessment techniques on mathematics learning outcomes depending on the learning approach taken, both influence each other and complement each other so that mathematics learning outcomes achieve the planned goals. Previously. Thus, it can be concluded that using a learning approach and applying authentic assessment techniques interactively can affect the achievement of test results so that the proposed hypothesis is proven true.

The difference between students' mathematics learning outcomes using a scientific approach and a unique contextual learning approach for students who apply authentic assessment techniques in the form of essays, after controlling for student intelligence. The research hypothesis states that there are differences in test results between those using a scientific approach and a unique contextual learning approach for students who apply authentic assessment techniques in the form of essays, after controlling for intelligence. Based on the statistical calculation of the  $t\text{-test} = 1.758$  more than  $t_{\text{table}}(20) = 1.725$  with a level of  $\text{sig} = 0.048 < = 0.05$ . This means that there is a difference, where the test results using a scientific learning approach are higher than those using a contextual approach in the form of an authentic assessment in the form of a special portfolio for students who apply authentic assessment techniques in the form of a portfolio after controlling for intelligence, with an average of 87.3 and the test results are using a contextual learning approach with an average of 87.0, it can be concluded that the results of the basic statistical basic test at FADA where the research took place using the scientific learning approach were higher in achieving the results of the basic statistical basic test compared to using the contextual learning approach, especially for students who apply authentic assessment techniques in the form of essays, after controlling intelligence, so that the proposed hypothesis is proven true.

The difference in the results of the basic statistical basic test of students between those using a scientific approach and using a special contextual learning approach for students who apply authentic assessment techniques in the form of a portfolio, after controlling for student intelligence. The research hypothesis states that there are differences in students' mathematics learning outcomes between those using a scientific approach and using a special contextual learning approach for students who apply authentic assessment techniques in the form of a portfolio, after controlling for student intelligence. Based on the statistical calculation of the  $t_{\text{test}} = 3.453$  more than  $t_{\text{table}}(20) = 1.725$  with a level of  $\text{sig} = 0.001 < = 0.05$ . This means that there is a difference, where the test results using a scientific learning approach are higher than those using a contextual approach in the form of an authentic assessment in the form of a special portfolio for students who apply authentic assessment techniques in the form of a portfolio after controlling for intelligence, with an average of 86.7 and the test results are using a contextual learning approach with an average of 84.8, thus it can be concluded that the results of the basic statistical basic test at FADA where the research takes place using the scientific learning approach are higher in achieving the results of the basic statistical basic test compared to using the contextual learning approach, especially for students who apply

authentic assessment techniques in the form of portfolios, after controlling the intelligence of students so that the proposed hypothesis is proven true.

The difference in the results of the basic statistical test of students between those who apply an authentic assessment technique in the form of an essay and those who apply an authentic assessment technique in the form of a special portfolio for students who use a scientific approach, after controlling for intelligence. The results of the  $t_{\text{test}}$  analysis:  $t_o = 1.827$  more than  $t_{\text{table}} = 1.725$  with a df of 40 and a sig value of  $0.033 < 0.05$ , meaning that there is a difference in test results and concludes that the average corrected test results that apply authentic assessment techniques in the form of essays are more than students who apply assessment techniques authentic form of a special portfolio for students who use a scientific learning approach after controlling for intelligence to find out which group is higher can be seen in the average of the two groups. The group of students who applied the authentic assessment technique in the form of an essay with an average of 87.3, while the group of students who applied the authentic assessment technique in the form of a portfolio averaged 86.7.

The difference in the results of the basic statistical basic test of students between those who apply an authentic assessment technique in the form of an essay and those who apply an authentic assessment technique in the form of a special portfolio for students who use a contextual approach, after controlling for intelligence. The results of the t-test analysis:  $t_o = 3.453$  more than  $t_{\text{table}} = 1.725$  with a df of 40 and a sig value of  $0.001 < 0.05$ , meaning that there is a difference in the results and concludes that the average corrected test results that apply authentic assessment techniques in essay form are more than students who apply authentic assessment techniques a special form of portfolio for students who use a contextual learning approach after controlling for intelligence to find out which group is higher, it can be seen in the average of the two groups. In the group of students who applied the authentic assessment technique in the form of an essay with an average of 87.0, the group of students who applied the authentic assessment technique in the form of a portfolio averaged 84.8. Thus, the hypothesis proposed was proven true.

## CONCLUSION

Based on the discussion of the research results, some conclusions can be drawn as follows: (1) There are differences in the results of the basic statistical tests of students who use a scientific learning approach and students who use a contextual learning approach, after controlling for intelligence. (2) There are differences in the results of the basic statistical test of students who use authentic assessment techniques in the form of essays with students who use authentic assessment techniques in the form of portfolios, after controlling for intelligence. (3) There is an interaction effect of learning approaches and authentic assessment techniques on students' basic statistical basic test results, after controlling for intelligence. (4) There is a difference in the results of the basic statistical basic test of students who are given a scientific learning approach and students who are given a contextual learning approach, especially for students who are given an authentic assessment technique in the form of an essay after controlling intelligence. (4) There is a difference in the results of the basic statistical tests of students who are given a scientific learning approach and students who are given a contextual learning approach, especially for students who are given an authentic assessment technique in the form of a portfolio after controlling intelligence. (5) There is a difference in the results of the basic statistical basic test of students between those who are taught using an authentic assessment technique in the form of an essay and students who are taught using an authentic assessment technique in the form of a special portfolio for students who use a scientific learning approach, after controlling for intelligence. (6) There is a difference in the results of the basic statistical basic test of students between those who are taught using an authentic

assessment technique in the form of an essay and students who are taught using an authentic assessment technique in the form of a special portfolio for students who use a contextual learning approach, after controlling for intelligence.

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