

## **The Influence of Applied Educational Statistics Courses on the Competency of Students' Quantitative Research**

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**Abstract:** Quantitative research competence is the main asset for students to be able to carry out quantitative research well and produce quality research results. One of the things that affect the quantitative research competence of a researcher is the mastery of applied statistics. This study aims to determine the effect of Applied Educational Statistics Courses on student competence in quantitative research. For this purpose, the researcher used a survey quantitative research method. The populations of this study were all students of the Madrasah Ibtidaiyah Teacher Education (PGMI) Master Program for the 2021-2022 Universitas Islam Negeri Sunan Kalijaga Yogyakarta who took the Applied Education Statistics course. The sample was taken using the proportional random sampling technique using the Slovin formula, to obtain a total sample of 12 students. Data were collected using a technical questionnaire that had proven its validity and reliability and analyzed by regression analysis. The results of this study indicate that the value of  $R^2$  (coefficient of determination) or R Square is 0.259 or 25.9%. This value can be interpreted that changes in student competence in quantitative research by changes in the value of the independent variable in statistics courses are 48, 54 % while 51,46 % is determined by changes in other factors. The calculated value for the Statistics course variable is 2, 203 with sig. 0.052 is smaller than 0.05. This shows that there is an influence of statistics courses on students' quantitative research competence and the factors that influence it.

**Keywords:** statistics education; competency of quantitative researchers, competency of student.

### **A. Introduction**

Statistics is part of mathematics that studies the collection, processing and analysis of data, as well as concluding (Sudjana, 2009; Amalia, 2020). This science is known to have two branches, namely mathematical statistics and applied statistics. Mathematical statistics is used to study various statistical techniques and probability distributions that are more conceptual than theoretical (Anas, 2012). Meanwhile, applied statistics is more practical and is applied in various fields of science, including the field of education (Dzakwan et al., 2021). Applied educational statistics is a means of developing educational knowledge, both practical and theoretical, which is expected

to provide solutions to problems in the field of education (Sukardi, 2003; Atmarita & Syarifuddin, 2021; Ashidiqi & Setiawan, 2021). Applied educational statistics is one of the knowledge given and must be mastered by students, both at the undergraduate, master and doctoral levels in educational faculties (Dzakwan et al., 2021). They are prepared to become professionals in various fields, including competent researchers and academics in the field of educational research (Agus et al., 2021; Fitriyah, 2021). For this purpose, competency and quantitative reasoning are needed to make it easier for them to construct, manipulate, and solve problems in the field of education that require a quantitative approach (Maclaren et al., 2016; Moore et al., 2014; Weber et al., 2014).

Quantitative research competence for students is needed to improve the quality of research related to educational problems which are empirically observable, classifiable, measurable, and based on rules regarding logic, laws, and predictions (Watson & Sottile, 2010). To be able to carry out this research properly, competence as a quantitative researcher is needed (Nursoleha et al., 2021; Anas, 2012; Amalia, 2020). Several competency criteria must be possessed as a quantitative researcher, namely; 1) understanding the educational insights of the studies studied; 2) being able to analyze problems accurately; 3) using the right educational theory 4) understanding the type of quantitative research; 5) understand sampling techniques; 6) develop test and non-test instruments; 7) collecting data, presenting, analyzing, and interpreting research data; 8) make reports; 9) create abstractions; 10) communicate research results (Yuliana et al., 2020; Zulfikri, 2017; Ghozali, 2016; Degeng & Darmawan, 2017).

Mastery of applied statistical techniques in educational research is a necessity for students (Prahesti, 2019; Hartawan & Suryawan, 2022). Applied statistics helps them in developing research designs, formulating hypotheses, developing instruments, determining samples, and analyzing data (Martias, 2021). Techniques for data collection, analysis (data processing), and drawing conclusions based on the data and results of the analysis that have been carried out are offered in this course (Sudjana, 2000; Martono, 2010). Learning in this course can foster quantitative competence which is built through understanding concepts and statistical thinking with mathematical calculations in data processing (Mbagho & Tupen, 2020; Mallete & Saldana, 2019). Therefore, it is very logical that this course equips students with quantitative research methods for solving practical problems in the field of education through a statistical approach (Nikifiridou et al., 2010; Nurhusain & Hadi, 2021).

This course needs to be strengthened by direct training and practice in learning so that students not only understand theoretically but can also put it into practice (Wahab et al., 2021). The application of educational applied statistics practice learning will strengthen students' quantitative competence (Rizki & Fauziddin, 2021). This learning also needs to be complemented by increasing competence through training in the use of various quantitative data processing software that is relevant to the needs of data analysis (Ramadani, 2021). Quantitative competence requires quantitative literacy that supports the development of quantitative analytical abilities to draw conclusions (Gray et al., 2017; Yosmar et al., 2019). These competencies are beneficial

for the development of educational science through research (Arifin & Retnawati, 2017; Syarifuddin, 2021).

Quantitative researcher competence is needed to improve the quality of educational research, especially in the quantitative approach (Cahyono, 2021). The quantitative approach is a scientific search effort based on rules regarding logic, laws, and predictions (Watson & Sottile, 2010; Irsyad et al., 2020). This approach can explain numbers, test relationships between variables, determine instrument quality, and test theories that have a symptom in the form of predictive value (Nursoleha et al., 2021; Irianto, 2010).

Based on research, there is still very little research that reveals the relationship between applied statistics courses and students' quantitative competence (Hardani et al., 2020; Irianto, 2019). One of the studies that were conducted found that the higher the score in the statistics course, the better the ability to process quantitative data (Zulfikri, 2017; Yam & Taufik, 2021; Walliman, 2010; Walliman 2011). From this research, a big question arises about how the influence applied statistics courses in education have on the ability or competition of quantitative researchers. It is in this context that the researcher is motivated to prove whether there is a significant positive effect between applied statistics courses in education on students' competence as quantitative researchers as seen from the 10 indicators described above.

## **B. Method**

This study aims to determine the effect of educational applied statistics courses on the competence of student quantitative researchers. This research was conducted in November 2021. Researchers used a quantitative survey research method with a population of Masters of Madrasah Ibtidaiyah Teacher Education (PGMI) students at Universitas Islam Negeri (UIN) Sunan Kalijaga Yogyakarta class of 2021-2022. The researcher chose to use a proportional random sampling technique with the Slovin formula in determining the research sample of PGMI Masters students. Researchers use data collection techniques through questionnaires that have proven validity and reliability. Proof of content validation is carried out through expert judgment which is calculated using the Aiken index (Aiken's V coefficient). Proving the reliability of the instrument using the Alpha coefficient from Cronbach (Creswell, 2019).

Data collection was carried out through a questionnaire technique by utilizing online Google Forms so that it can reach respondents effectively and efficiently. The questionnaire was distributed to students of the Tarbiyah Faculty of UIN Sunan Kalijaga. The data collected was then analyzed using the product-moment correlation coefficient and simple regression analysis techniques with the help of SPSS for Windows 21 software, where previously the researcher had carried out classical assumption tests consisting of normality tests, autocorrelation, multicollinearity tests, heteroscedasticity tests (Purwanto et al., 2020).

## **C. Result and Discussion**

### **1. Applied statistics course**

The results of this study state that the delivery of this course is carried out online using certain applications as an innovation in learning statistics (Widayanti, 2021). This is in line with research by Mustofa that learning for this course takes place online as a learning innovation that involves elements of information technology in learning. (Mustofa et al., 2019; Ulfa, 2021).

The concept of applied statistics in education takes place through video conferencing applications such as Zoom and Google Meet while in class (Sintema, 2020). Lecturers provide teaching and direction related to the statistics learning process through manual counting processes through applications. At the end of the meeting, students are given lectures related to the use of applications as helpers in the process of calculating data through certain software (Sakina et al., 2021; Agus et al., 2021).

Applied educational statistics apply knowledge related to data processing where data is generated from accurate calculations (Subijanto, 2014). Learning applied statistics courses in education provides knowledge that can influence students in the activity of processing skills or competencies in managing statistical applications and calculating manually (Saputri, 2022). Based on the results of proving the validity of the instrument, it shows that the instrument items explaining the applied education statistics course variables (X) and student competency variables in quantitative research (Y) are declared valid because the Aiken index of 30 students is 0.327 with a significance level of 5%. Proving the reliability of the instrument in this study used Cronbach Alpha with the results of the reliability coefficient.

In the process of proving Cronbach Alpha, it is processed by researchers where the raw data obtained in the field is then processed by researchers using SPSS. Data processing shows that the data is reliable which is declared valid for the data in the field. The use of this test is so that the data processed by the researcher is more accurate and by the hypothesis set by the researcher. The Cronbach Alpha test was chosen by the researcher as a test for consistency between variables so that it shows a reliable number that corresponds to the Cronbach Alpha coefficient.

In testing the reliability of the instrument in this study, it can be seen that it is equal to 0.4 where the variable is quite reliable in applied educational statistics courses. Data collection was distributed to primary school teacher education master students using a Likert scale. The purpose of the test is to use regression to calculate the effect between variables. Based on the regression instrument, it was stated that the educational applied statistics course influenced the competence of student quantitative researchers.

The use of a Likert scale for variables related to applied statistics courses attended by PGMI Masters students. The scale is integrated into a questionnaire or questionnaire that is presented via Google Forms. Students as research subjects can fill out the questionnaire according to the scale values presented. The researcher makes it

easy for respondents or students to fill in the data based on their experience taking the course.

Researchers have concluded that the higher the influence of the course, the higher the quantitative competence of PGMI Masters students with the equation  $Y = 3.315 + 0.798 (70)$ . Research conducted by Zulkifli on the relationship between statistics course scores and the ability to analyze student quantitative data is said to be good because the higher the grades in statistics courses, the better the ability to process quantitative data (Zulfikri, 2017) so this becomes a guide for researchers in the process of data analysis and processing.

Testing the hypothesis using  $t_{count}$  and  $t_{table}$  values that  $df$  is 10 students with a significant level of 5%, so a  $t_{table}$  is 2.28, while the  $t_{count}$  is 2.203. Therefore, the magnitude of the alternative hypothesis is rejected and the null hypothesis is accepted. Even though the researcher's hypothesis is not following the results of the study, several things influence it, including the competence of quantitative researchers, which is not based on the practical implementation of research directly, which makes competence low. Students accept these courses as limited to material without being based on direct practice in the field so it affects these competencies.

Based on the following calculations, it is concluded that there is a significant positive effect between variable X (applied educational statistics course) on variable Y (competence of quantitative researchers). Based on this explanation, even though the hypothesis testing the researcher stated was not rejected or not following the initial hypothesis. Researchers analyzed several variables stated above. In the product moment test, both of them have a strong correlation between applied statistics courses and quantitative researcher competence of 0.52.

The researcher determines the research hypothesis that  $H_a$  is used as the basis for searching data where there is a significant effect of educational applied statistics courses on student research competence. In  $H_o$ , it is negative or there is no effect, but researchers have found that  $H_o$  is accepted where there is no influence of both. The researcher concluded that there were several obstacles and found that several respondents randomly said that the course was only a complement to lecture material or that respondents only answered soberly without any very in-depth consideration or analysis.

## **2. Student quantitative competence**

Testing the hypothesis using the calculated value of  $t_{count}$  and  $t_{table}$  that the  $df$  is as many as 10 students with a significant level of 5%, a  $t_{table}$  of 2.28 is obtained, while the  $t_{count}$  is 2.203. Therefore the alternative hypothesis is rejected and the null hypothesis is accepted. Even though the researcher's hypothesis is not by the results of the study, several things influence it, including the competence of quantitative researchers, which is not based on the practical implementation of research directly, which makes competence low. Students accept these courses as limited to material without being based on direct practice in the field so it affects these competencies. According to the research, applied education statistics courses affect students'

quantitative competence. Students have this ability supported by their analytical and mathematical process skills in processing data quantitatively (Putri et al., 2022).

The coefficient shows that B is the value which indicates the standard error is 24,881. The standard coefficient shows a coefficient of 0.572 with sigma  $t = 2.203$ . Statistical competency testing through the t-test can be obtained with these data. This test is marked on the standard distribution of man samples taken from this population (Sugiyono, 2013). Such uses are used in estimating and measuring statistical distributions. The error level or the researcher's error results that the value almost having a large variation where the error level is 10%.

In table "F" it is obtained by 10 which has a significance level of 5% obtained by Ftable of 2.98, while Fcount of 4.854 is greater than Ftable. Therefore, the calculation is  $F_{count} > F_{table}$ , so the alternative hypothesis is accepted and the null hypothesis is rejected. The regression test states that the correlation coefficient table is -1 which has a negative value, which means it has a perfectly negative relationship. The processing of the significance level states that Fcount obtained data following the results of the hypothesis made by the researcher.

Researchers conducted the F test to find out how far the independent variables jointly affect the dependent variable and this is evidenced in the calculated results. Although the results of the F test proved different from the hypothesis obtained by the researcher. It is influenced by several factors that influence it. The F-test analysis serves as a reinforcement or basis for the results of this study. In this test, the ANOVA or F test counted 4.854 with a sig of 0.052 which shows that the significance level indicates the probability of being accepted. This shows that applied statistics courses and the level of competency of quantitative researchers are equally influential.

Based on the analysis found by the researchers, the influence of educational applied statistics courses influenced the student's process of increasing quantitative competence. Students tend to be able to improve their abilities through arithmetic and data processing as well as other statistical calculation processes. Data processing for quantitative researchers can be assisted through certain software, but this requires knowledge regarding how to handle statistical software. According to Zulnaidi, the use of software and software-based data processing competencies can help with problems experienced by students (Zulnaidi & Zamri, 2017) so that data researchers improve their quantitative competence.

Based on the analysis that has been found, the researchers stated that the course of applied education statistics influenced students who took or received the course. Students can increase their knowledge and practice of calculating statistical concept manuals in education. Students need an applied statistics course, but based on data on quantitative analysis students don't need this course with several internal factors of students rushing to answer questionnaire questions. On the other hand, the data taken shows that applied education statistics courses affect students' quantitative competence. Of course, this is a provision for students to process data manually and through software.



## D. Conclusion

Based on the results of the study, it was concluded that the applied educational statistics course had an influence on the competence of quantitative researchers for PGMI Master Study Program Students Batch 2021-2022 UIN Sunan Kalijaga Yogyakarta. It is proved that the results of the study have a positive effect and on testing the results of the hypothesis state that there is no influence between the two variables X (applied educational statistics courses) and variable Y (quantitative student competencies). In the regression results, both stated negative interpretations because of student competence and not only on the theory that had been obtained after receiving the course.

This study shows that the value of  $R^2$  (coefficient of determination) or R Square is 0.259 or 25.9%. This value can be interpreted that the change in the quantitative competence of students with changes in the value of the independent variables in statistics courses is 48.54%. The calculated value for the statistics course variable is 2.203 with sig. 0.052 is smaller than 0.05. Statistical competence of students is very much needed for quantitative researchers and these subjects affect the process of increasing student competence. This influence can be seen from the results of quantitative calculations and this course is useful for student research.

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