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# The Effect of Science Kit and Supervision Models on The Implementation and Implications on The Evaluation of Science Practicum Distance Learning

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**Abstract:** The implementation of science practicum is one of the challenges in the open distance education system. The purpose of this research is to examine the effect of the Science Kit variable and the pattern of guidance on the implementation and evaluation of Science Practicum activities in Distance Learning. The type of research in this study is an explanatory research with a quantitative approach involving a number of 306 students who have taken the Science Practicum course in the Elementary School Teacher Education program. Respondents' responses were analyzed using a Likert scale and data analysis using the Structural Equation Model (SEM). The results of the data have met the Model Suitability Test (Goodness of Fit Test) which includes: Science Kit and Guidance Patterns have a significant effect on Practicum Implementation. Guidance pattern has a significant effect on practicum evaluation, but Science Kit and practicum implementation have no significant effect on practicum evaluation. The implication of this research is that it provides the potential for improvement in the implementation of science practicum in distance education due to the needs of the educational community.

**Keywords:** Science Kit; Supervision model; Implementing practicum; Practicum evaluation; Distance learning.

## Introduction

Distance learning allows students to interact with teachers through learning media. Distance learning keeps students face-to-face with the teacher and allows students and teachers to study in different places, separated by distance and time (Moore et al., 2011). Distance learning has advantages in the training process in that it gives opportunity to the participants or students who do not gather together in one place regularly to obtain lessons directly from the instructor. Specific materials and detailed instructions are sent or provided to students who then carry out tasks that will be evaluated by the tutor (Appolloni et al., 2021). In reality, the tutor and the participant can be separated not only geographically but also over time.

The Open University, in its implementation, uses the Open Distance Education System (hence shortened as PTJJ). Learning at the Open University applies a distance learning system that promotes independence and adult learning. The PTJJ system has a similar main activity to the face-to-face education system consisting of teaching and learning activities. The main characteristic of the PTJJ between students and lecturers is that they cannot interact directly and physically (Maulidia et al., 2021). Face-to-face meetings between teachers and students are very few compared to interactions between students and teachers in face-to-face/conventional education systems. The PTJJ system requires the students to be able to learn independently. Students can also learn on their initiative and in their way, such as studying in groups or studying alone (Nugraheni & Pangaribuan, 2006).

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The implementation of face-to-face tutorials is almost the same as conventional lectures. The implementation process is also almost the same, including planning, activities, learning evaluation. However, what distinguishes students in distance learning and face-to-face learning, is the number of meetings and student learning styles (Foo et al., 2021). The standard for conventional lectures is that there are 16 meetings in one semester. Meanwhile, in face-to-face tutorials, there are 8 meetings, and the rest are held through online learning activities or independent study. Students who carry out distance learning are required to be more independent than students who carry out conventional lectures (Richardson, 2016).

One of the successes of learning with a face-to-face non-tutorial package system is determined by the teacher in this case is the tutor. Meanwhile, the limitations existing in the face-to-face non-tutorial package system demand tutors be able to use the right strategy, so they get maximum students' learning outcomes. The role of tutors in the success of learning with a face-to-face non-tutorial package system is strategic. Therefore, the implementation must be evaluated regularly and continuously. The quality of tutors can be seen from their mastery of the material, attitude, communication style, and discipline (Arhin et al., 2021). The quality of learning with this face-to-face non-tutorial package system can be seen based on its application, whether it has followed the standard or not it is following the standards. It includes whether there is a link between the implementation of introduction, core, and closing lessons. In addition, it also includes whether or not the lessons delivered by the tutor follow the material that has been determined in the module. Based on the fact above, it is necessary to evaluate the implementation of face-to-face non-tutorial package system activities so that the quality of face-to-face non-tutorial package system tutorials and student learning outcomes can be improved (Suswanto et al, 2021).

Practicum plays a crucial role in face-to-face tutorials because it can provide students with scientific method training by following the instructions detailed in the instruction sheet. Practicum is a learning interaction between students and learning materials to observe and understand material about nature (Nirmala & Darmawati, 2021). By doing practicum, students will become sure of one thing. It is more meaningful than just receiving information from tutors and modules. It also can enrich their experience, develop their scientific attitudes, and the learning outcomes will last longer in their memories. Four main reasons why implementing practicum activities are crucial for the students are that practicums generate student learning motivation, develop basic skills in carrying out experiments, become the means for learning scientific learning approaches, and support understanding of subject matter (Malik & Ubaidillah, 2021).

Science course tutorials are not only learning about natural science products but also how the scientific method can produce these scientific products by paying attention to scientific attitudes. The purpose of special science tutorials is to develop students' high-level critical thinking skills that allow them to be applied in everyday life (Budiastra et al., 2020). The combination of scientific processes and attitudes in the investigation of scientific phenomena becomes meaningful in the form of scientific products. Therefore, students need to realize that there is a process that cannot be abandoned in learning science. It is the scientific method, a form of critical thinking that will be reviewed and duplicated independently to reduce the level of uncertainty (Hofstein & Mamlok-Naaman, 2007).

Science practicums must proportionally develop students' declarative abilities, which can be expressed both orally and in writing, and the students' procedural skills, about the steps that must be carried out sso that it can expand the function of the laboratory as part of science practicum activities (Budiastra et al., 2019). For this reason, it is necessary to strive for the availability of science laboratory equipment of good quality and in sufficient quantities in schools. The Science Kit is a teaching aid used in proving science theories related to the natural environment to encourage students to develop their potential. Science Kit needs to be used to help and make the students easier to understand science concepts. For example, the concept of a simple plane so that learning becomes active, appealing, communicative, meaningful, and not dull. The results showed that the aspects of student skills studied include recording the results and the accuracy of discussions; communicating the results of the discussion; and the ability to ask questions (Budiastra et al., 2020). In addition, good use of existing teaching aids will make students more active, interested, and enthusiastic in following tutorials.

Practicum is a form of exercise that aims to develop fundamental skills, such as using tools, measuring, and observing (Leden et al., 2020; Setiawan et al., 2019). The supervision model in science practicum can affect the understanding of science concepts. In the tutorial process, students must pay attention to their prior knowledge. It is an alternative in accommodating students' prior knowledge in practicum activities. Second, in science practicum tutorials, it is more advisable to use science practicum instructions. It is because, in the learning process, students are facing a misconception, then they will obtain the presentation of scientific concepts after carrying out practicum activities presented in the science practicum instructions (Defersha, 2017). The tutorial process can involve students actively in learning activities. If there is a good

knowledge construction process, students can improve their understanding of the materials. The process of problem-solving actively and independently in the learning process can encourage students to be more enthusiastic about finding solutions to problems.

Evaluation is an inseparable part of the learning process from teaching activities. In educational activities, evaluations have a very important meaning since it is a measuring tool or process to determine the level of achievement of success achieved by students on teaching materials or the delivered materials. Therefore, by conducting an evaluation, the learning objectives will be presented accurately and convincingly (Walid & Hadiwinarto, 2021). By conducting an evaluation process, students can discover the success achieved, while following the science practicum tutorial (Jadhav, et al., 2020). Students by getting satisfactory grades will affect a comprehensive understanding. The assessor can see which parts have been achieved and which parts have not so that actions and efforts can be made to improve them. The evaluation is carried out by comparing the criteria for a good science practicum tutorial process with the ongoing learning process. From this comparison, it can be seen that there is a match or gap between the supposed learning process and reality. This study aims to examine the effect of the Science Kit variable and the supervision model on the implementation of practicum and evaluation of science practicum activities in distance learning.

## Method

The research applied is explanatory research through a quantitative approach regarding the effect of Kit and the supervision model on the implementation and implications for the evaluation of science practicum in distance learning. Explanatory research is a study that examines each variable in depth to obtain results regarding whether there is a relationship between the symptoms obtained from each variable (Tritama, & Tarigan, 2016).

A total of 306 students were involved in the survey. Determination of the sample is purposive sampling, which has special requirements according to its purpose. Students involved in the survey are students who have taken the Science Practicum course in the Elementary School Teacher Program, Distance Learning at the Universitas Terbuka.

Data collection techniques used to obtain information that is relevant, accurate, and can be used appropriately according to research objectives include: (1) observations: carried out based on descriptive survey methods and verification for explanatory, evaluation, and prediction of the sample that has been determined and captured by using a questionnaire as the primary data collection tool; (2) documentation: carried out to find data regarding student identity as research subjects and photos of the tutorial process; and (3) questionnaires: used to reveal respondent data on the indicators that have been developed as shown in Figure 1. X11: There are sufficient science Kits available at the tutorial site; X12: The science Kits used for the science practicum are in a well-maintained condition; X13: Practical guides are available in sufficient quantities A3, and X14: The practical guide is easy for A4 students to understand. X21: Read and understand the science practicum guide well; X22: Ask for tutor/instructor supervision when you do not understand the science practicum material; X23: Look for replacement science practicum tools and materials if there are incomplete practicum materials in the Science Kit; and X24: Tutor's supervisions are very useful for students in preparing reports on Science Practicum. Z1: All experiments required in the science practicum manual can be carried out properly D1; Z2: Science practicum material can be implemented following the provisions in the practicum guide book; and Z3: The tutor/instructor provides direction if any tools and materials available in the Science Kit are incomplete or damaged so that the science practicum can still be carried out. Y1: Students can prepare reports on implementing the science practicum properly following existing provisions; Y2: Tutors do the scoring using the scoring guidelines in the science practicum manual; and Y3: Students are satisfied with the scores they get.

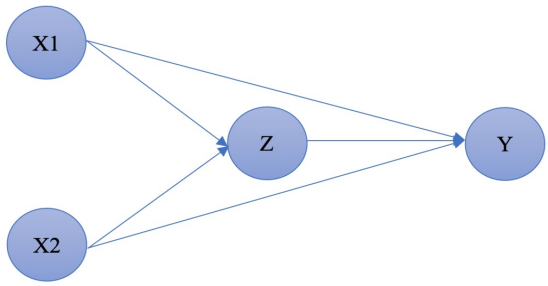


**Figure 1.** Fit Model

The data obtained were analyzed using an interactive method. Interactive analysis consists of 3 components: data reduction, data presentation and conclusion drawing. Data reduction is the process of selecting, focusing, and abstracting data. Data reduction in this study was carried out before the researcher collected data. Selected and selected data on TV shows that students like. Presentation of data is the central information in research. The presentation of the data in this study is in the form of a description of the TV shows that students like. Followed by Withdrawal of Conclusions. Conclusions are drawn in the presence of a less significant cause in a study of the chain process, so that from this stage a cycle is formed. At this stage, the researcher analyzes the data from all the data that has

been collected through several stages of analysis. Respondents' responses analyzed using a Likert scale include: Strongly Agree (SS) (5), Agree (S) (4), Hesitate (R) (3), Disagree (TS) (2), and Strongly Disagree (STS) (1) (Wallen, & Fraenkel, 2013). Data collection in this study was carried out using a survey, by directly distributing a list of questions in the form of a closed questionnaire filled out by students who are also in-service teachers at the targeted schools. The questionnaire consists of 2 parts: the demographic identity of the participants and some structured statements about the research.

The data obtained must be valid and reliable. The testing data validation was done by using Cronbach's Alpha to see the Intraclass Correlation Coefficient (ICC) including Single Measures (rα) for validity and Average Measures (α) for reliability. The conditions met for data are N, valid if rα > rtable, and reliable if $0.6 \leq \alpha \leq 1.0$. Primary data analysis was performed using the Structural Equation Model (SEM). Testing the structural model aims to determine the percentage of the variance of each endogenous variable in the model explained by exogenous variables by looking at R-squares, which is the value of the squared multiple correlations.

**Table 1.** Goodness of fit (GoF) Criteria

| Size Index Criteria | Reference Value |
|---|---|
| Chi-Square ($\chi^2$) | Probability (P) > 0.05 |
| CMIN/df | < 2.00 |
| Root mean square error of approximation (RMSEA) | < 0.08 |
| Comparative fit index (CFI) | > 0.90 (close to 1) |
| Parsimonious comparative fit index (PCFI) | > 0.60 |
| Akaike information criteria (AIC) | AIC < AIC |

Furthermore, in addition to the R-squares value, evaluation of the structural model can also be done by looking at the significance of the probability value as the basis for accepting or rejecting the null hypothesis. The significance value used is 5% or P < 0.05 and the value of c.r > 1.96. Overall fit model is based on the goodness of fit (GoF) value (Maydeu-Olivares & Garcia-Forero, 2010). GoF is an indication of the comparison between the specified model and the covariance matrix between indicators or observed variables.

## Result and Discussion

*Result*

This survey to examine the effect of the science Kit variable and the supervision models on the implementation and evaluation of science practicum activities in distance learning. The validity of the instrument shown shows the function according to the purpose of the measurement. The instrument validity is assessed from the loading factor of the variable indicator, when it has a value above 0.50 then it is valid. The test results can be seen in Table 2 and Figure 1.

Table 2 shows that the loading factor value is greater than 0.50 for each indicator used in this study. Thus, it can be interpreted that these indicators are feasible or valid to be used as data collectors.

**Tabel 2.** Validity Testing Result

| Variable | Indicators | Estimate | Notes |
|---|---|---|---|
| Science Kit (X1) | $X_{11}$ | 0.736 | Valid |
| | $X_{12}$ | 0.767 | |
| | $X_{13}$ | 0.703 | |
| | $X_{14}$ | 0.622 | |
| Supervision Model (X2) | $X_{21}$ | 0.573 | Valid |
| | $X_{22}$ | 0.568 | |
| | $X_{23}$ | 0.520 | |
| | $X_{24}$ | 0.627 | |
| Practicum Implementation (Z) | $Z_1$ | 0.687 | Valid |
| | $Z_2$ | 0.758 | |
| | $Z_3$ | 0.554 | |
| Practicum Evaluation (Y) | $Y_1$ | 0.609 | Valid |
| | $Y_2$ | 0.581 | |
| | $Y_3$ | 0.688 | |

Reliable indicates that an instrument is reliable or trustworthy. In this case, if the construct reliability is at least 0.70, then it is reliable (Solimun, 2002). The results of reliability testing can be seen in Table 3.

Table 3 shows the CR value which is 0.7 higher than the cut-off value for each latent variable, so that the latent variable in this study is reliable.

In this stage, the test aims to see the suitability of the model and to assess the feasibility of the model obtained. The results of the Goodness of Fit Test can be seen in Table 4. The results of the path coefficient can be seen in Table 5.

**Table 3.** Reliability Testing Result

| Variable | Indicators | Loading | λ 2 | 1 – λ 2 | CR |
|---|---|---|---|---|---|
| $X_1$ | $X_{21}$ | 0.820 | 0.672 | 0.328 | 0.718 |
| | $X_{22}$ | 0.885 | 0.783 | 0.217 | |
| | $X_{23}$ | 0.792 | 0.627 | 0.373 | |
| | $X_{24}$ | 0.819 | 0.671 | 0.329 | |
| | Total | 4.153 | | 1.546 | |
| $X_2$ | $X_{41}$ | 0.880 | 0.774 | 0.226 | 0.886 |
| | $X_{42}$ | 0.840 | 0.706 | 0.294 | |
| | $X_{43}$ | 0.860 | 0.740 | 0.260 | |
| | $X_{44}$ | 0.656 | 0.430 | 0.570 | |
| | Total | 3.236 | | 1.350 | |
| Z | $Z_1$ | 0.763 | 0.582 | 0.418 | 0.681 |
| | $Z_2$ | 0.783 | 0.613 | 0.387 | |
| | $Z_3$ | 0.688 | 0.473 | 0.527 | |
| | Total | 3.189 | | 2.847 | |
| Y | $Y_1$ | 0.744 | 0.554 | 0.446 | 0.765 |
| | $Y_2$ | 0.824 | 0.679 | 0.321 | |
| | $Y_3$ | 0.835 | 0.697 | 0.303 | |
| | Total | 3.135 | | 1.534 | |

**Table 4.** SEM Conformity Index

| Criteria | CU-Off Value | Test Results | Notes |
|---|---|---|---|
| Chi Square | Expected to be smaller than $X^2$ at df = 306 that is 341.395 | 126.273 | Good |
| Sig. Probability | ≥ 0.050 | 0.000 | Marginal |
| RMSEA | ≤ 0.080 | 0.056 | Good |
| GFI | ≥ 0.900 | 0.945 | Good |
| AGFI | ≥ 0.900 | 0.911 | Good |
| CMIN/DF | ≤ 2 or 3 | 1.973 | Good |
| TLI | ≥ 0.950 | 0.971 | Good |
| CFI | ≥0.950 | 0.979 | Good |

**Table 5**. Causality Testing Result

| Impact | | | Estimate | S.E. | C.R. | P | Notes |
|---|---|---|---|---|---|---|---|
| Z | <--- | X1 | 0.164 | 0.051 | 3.190 | 0.001 | Sign |
| Z | <--- | X2 | 0.715 | 0.072 | 9.990 | 0.000 | Sign |
| Y | <--- | X1 | 0.016 | 0.051 | 0.313 | 0.754 | Not Sign |
| Y | <--- | X2 | 0.734 | 0.139 | 5.283 | 0.000 | Sign |
| Y | <--- | Z | 0.235 | 0.158 | 1.487 | 0.137 | Not Sign |

*Discussion*

Table 5 shows that the results of the path coefficient test for the effect of Science Kit (X1) on the Supervision Model (Z) have a positive path of 0.164 with a CR of 3.190 and a probability (p) of 0.001. It means that Science Kit (X1) has a significant effect on Practicum Implementation (Z). So, the hypothesis which states that Science Kit (X1) affects the students' Practical Implementation (Z) is proven true. It means that the better the Science Kit, the better the Practicum Implementation. Science Kit needs to be used so that it can help and make the students easier to understand science material so that learning becomes active, appealing, communicative, meaningful, and not dull. The use of the Science Kit as a tool in science learning using the experimental method is expected to maximize the students' knowledge and skills. For example, the use of a mechanical Kit on the subject of Newton's Law, and an anatomical model Kit on the subject of the human skeleton. From the aspect of practicum implementation, students agree that practicum equipment is easy to obtain, and practicum instructions are also easy to follow (Lam & Ching, 2007). Experiments carried out remotely and using available tools and materials are able to support students' practicum competencies (Budiastra et al., 2022). Science subject matter is related to understanding concepts. Therefore, students understand the concept, the teaching and learning process cannot be done in class. Students need to practice the direct application of theory to get a better meaning from the material they are studying (Dewi et al., 2021). Learning science using KIT or teaching aids is an additional point for students to understand the material, because they can understand more than one material simultaneously through the use of the environment (Erlina, et al., 2022).

Based on the data from the path coefficient test results for the influence of the Supervision Model (X2) on Practicum Implementation (Z) has a positive path of 0.715 with a CR of 9.990 and a probability (p) of 0.000. It means that the Supervision Model (X2) has a significant effect on Practicum Implementation (Z). Therefore, the hypothesis which states that Supervision Model (X2) affects the students' Practicum Implementation (Z) is proven true. This shows, if the Supervision Model is getting better, the Practicum Implementation will be even better. The approach in the tutorial suggests that the learning process can actively involve students in learning activities. When there is a good knowledge construction process, students can improve their understanding of the material being studied. The selection of a particular learning approach affects the students' learning motivation (Samsudin et al., 2021). A meaningful tutorial process must pay attention to students' prior knowledge which is an alternative in accommodating students' prior knowledge in practicum activities. In science practicum learning, it is more recommended to use science practicum instructions. The reason is that students experience misconceptions and students gain understanding after doing the practicum presented in the science practicum instructions (Kiray & Simsek, 2021).

Based on the data from the path coefficient test results for the effect of Science Kit (X1) on Practicum Evaluation (Y) has a positive path of 0.016 with a CR of 0.313 and a probability (p) of 0.754 which means that Science Kit (X1) does not significantly affect Practicum Evaluation (Y). Therefore, the hypothesis stating that Science Kit (X1) affects Practicum Evaluation (Y) is not proven true. It means that Science Kit is not a determining factor for Practicum Evaluation. The lack of students' understanding of the Science Kit affects the evaluation questions. The preparation of test questions related to the use of Science Kit by tutors is not optimal during learning so that it does not reflect the measurement of indicators. The dimensions assessed are learning objectives, learning materials, student conditions, and learning activities, teacher conditions and teaching activities, learning tools and resources used, techniques, and methods of implementing practicum evaluations (Antonio & Prudente, 2022). Some students still did not understand the learning well, due to a lack of skills in assembling, observing, and analyzing the tools in front of them, even after Science Kit was provided (Wan, 2021).

Based on the data from the path coefficient test results for the influence of the Supervision Model (X2) on the Practicum Evaluation (Y) has a positive path of 0.734 with a CR of 5.283 and a probability (p) of 0.000. It

means that the Guidance Pattern (X2) significantly affects Practicum Evaluation (Y). Therefore, the hypothesis stating that the Supervision Model (X2) affects Practicum Evaluation (Y) is proven to be true. That is, if the Supervision Model is getting better, then the Practicum Evaluation will be better. Tutors still play a considerable role in providing supervision to students. Tutors still have to ask students to ask questions and express their opinions. Tutors must also generate student confidence to answer and respond to questions and express their ideas (Akbari & Sahibzada, 2020). In the process of ensuring the effectiveness of students' communication skills, tutors must use several activities such as discussions and oral presentations in practicum activities (Rider & Keefer, 2006). The evaluation process obtained through reflection will become a reflection for tutorial improvements in the next cycle so that the aspect of student involvement during the learning process and also the results of student concept mastery take place.

Based on the data from the path coefficient test results for the influence of the Supervision Model (Z) on the Practicum Evaluation (Y) has a positive path of 0.235 with a CR of 1.487 and a probability (p) of 0.137, which means that the Guidance Pattern (Z) has no significant effect on the Practicum Evaluation. (Y). Therefore, the hypothesis stating that the Supervision Model (Z) affects the Practical Evaluation (Y) is not proven true. It means that the Supervision Model is not a determining factor for Practicum Evaluation. The last activity is the evaluation of the results of the practicum, which aims to find out how far the practicum activities are going and the results. With this aim, students' understanding of the practical material can be known (Dendler & Böl, 2021). At this stage, the teacher collects practicum reports and then checks and gives grades. And then with the students, the teacher holds a class discussion to make the appropriate conclusion about the results of the practicum which is linked to the existing theory (Gibert et al., 2018). The last is making conclusions. Students are then given a post-test with the aim of knowing the level of students' understanding of the material through the practicum carried out.

## Conclusion

Based on the descriptions presented in the discussion, several conclusions can be drawn as answers to the main problems proposed in this study. It includes the Science Kit and Supervision Model that have a significant effect on Practicum Implementation. The supervision Model affects practicum evaluation, while Science Kit and practicum implementation do not affect practicum evaluation. This study implies that it provides the potential for improvement in the implementation of science practicum in distance learning due to the needs of the education community.

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