Development of Google Classroom - Based Inquiry Learning Model in Informatics Subject

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Abstract. The purpose of this study is to develop an inquiry learning model based on google classroom to improve student learning outcomes in the subject of informatics. The research was conducted at SMK Negeri 7 Semarang by taking the research samples were students of class X TJKT 2 using purposive sampling technique. The method used in this study is the ADDIE research and development model. The results obtained are (1) the implementation of the material in the google classroom in the inquiry learning model by using the features announcement, assignment, quiz assignment, question, and material; (2) the results of the validation of the inquiry learning model by media expert validators and material expert validators are considered very feasible. This is based on the scores obtained each of 87.4 7% and 88.63%; (3) the developed inquiry learning model is considered very practical to be used by teachers and students with scores of 84.6% and 87.6%, respectively; (4) the learning model developed is effectively used, this is evidenced by the results of the analysis of the paired sample t - test which obtained a value of $t = 5.987$ with a sig value of $0.000 < 0.05$. Thus, inquiry learning based on Google Classroom has a significant effect on improving learning outcomes for informatics subjects. The overall results show that the inquiry learning model developed based on google classroom is considered very feasible, very practical, and effectively used to improve student learning outcomes in informatics subjects.

Keywords: Google Classroom · Inquiry Learning Model · Informatics Subjects

1 Introduction

Education is the basic capital that needs to be owned to become a quality human being. Based on Law no. 20 of 2003 Article 3 mention that developing capabilities and building the character and civilization of a staid nation in the environment of educating the nation's life is a function of national education. Confirmed in PP No. 14 of 2005 Article 4 mention that Teachers and Lecturers explains that teachers have a role as learning agents whose function is to improve the quality of national education, so that teachers are required to provide optimal learning.

Industrial era 4.0 and society 5.0, education must begin to adapt to increasingly fast technological developments by adopting these technologies in the learning process [1]. Related to this, teachers are required to provide innovation in the learning process.

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The creativity of teachers in presenting learning activities can support development and stimulate students' intelligence [2]. One aspect that can be created by the teacher is a model in implementing learning strategies. There are many learning models that can be used by teachers. One of them is inquiry learning. The inquiry-based learning model combines theory and practice [3]. Learning based on the belief that learning science is not just memorizing scientific data and information, but more than that, which is about understanding and applying generalizations and scientific methods, is the notion of inquiry-based learning [4].

In another sense, inquiry-based learning is a strategy in education where students follow practices and methods similar to those of professional scientists to gain knowledge [5]. In this model, students are emphasized to participate actively to discover new knowledge [6]. In this case, students often carry out the learning process independently, partly inductively and partly deductively by investigating a relationship through experimentation for at least one set of independent and dependent variables [7].

Inquiry learning can be divided into 5 (five) phases, namely Orientation, Conceptualization, Investigation, Conclusion, and Discussion as shown in Table 1 [8].

In this study, an learning model based on inquiry was developed using Google Classroom. The research was conducted at SMK Negeri 7 Semarang by taking research samples, namely students of class X TJKT 2. The research sample was taken using purposive sampling technique. The vocational school was chosen because SMK Negeri 7 Semarang has become a driving school and a center of excellence vocational school by implementing the Merdeka curriculum for class X students.

Table 1. Inquiry Learning Phase

General phases	Definition	Sub-phases
Orientation	The process of stimulating curiosity and prostrating literacy challenges through problem statements on a content.	
Conceptualization	The process of stating theory grounded questions and or hypotheses.	- Questions - Hypothesis Generation
Investigation	The planning process for conducting exploration, data collection, and data analysis based on the experimental or exploration design made.	- Exploration - Data interpretation - Experimentation
Conclusion	Conclusions from the data are drawn in this process by comparing them based on the data with hypotheses or research questions.	
Discussion	Findings from a specific segment or whole cycle of inquiry are offered on this method via way of means of speaking with others and/or controlling the whole method or segment of gaining knowledge of via way of means of undertaking reflective activities.	- Reflection - Communication

The Driving School (Sekolah Penggerak) is a program from the Ministry of Education and Culture which is intended to realizing the vision of Indonesian Education, namely to realize an advanced Indonesia that is sovereign, independent, and has personality through the creation of students who have the spirit of Pancasila [9]. Meanwhile, the Central Vocational School of Excellence (SMK PK) is one of the priority programs from the Directorate General of Vocational Education (Dirjen Vocational Education) of the Ministry of Education and Culture in 2021 as an effort to develop Vocational High Schools with certain expertise programs in order to improve quality and performance, and focus on strengthening human resources and bringing the world of education closer with the professional world [10].

During the COVID-19 pandemic, it is imperative that learning in schools is carried out online. Class X students at SMK Negeri 7 Semarang use Google Classroom as a medium in carrying out teaching and learning activities. Google Classroom is considered as one of the platforms that can improve the workflow of teachers by taking advantage of advanced features that can help teachers save time, maintain class order, and improve communication between teachers and students [11]. The features contained in Google Classroom include assignments, questions, quizzes, etc. Google Classroom was chosen because of its ease of use and is free.

Features in Google Classroom can be used as a facilitator to develop their learning activities using the Technology Acceptance Model (TAM) which was conducted on 337 respondents et al. Buraimi University College (BUC) [12]. In another study also proves that the use of Google Classroom can effectively improve learning outcomes such as in mathematics [13, 14].

In this study, applying the inquiry learning model to informatics subjects for class X TJKT 2. The subject of informatics was chosen because informatics is an introductory subject for students to know current technological developments. In addition, because this teaching subject emerged from the implementation of the Independent Curriculum. So it is hoped that informatics subjects can be delivered by teachers not only through face-to-face learning but also by utilizing existing technology through features in Google Classroom. The inquiry learning model was chosen to deliver learning materials.

2 Research Methods

Research and Development (RnD) ADDIE model is the method used in this study. The process that occurs in the ADDIE model consists of the Analysis, Design, Development, and Implementation stages. The test subjects were 36 students of class X TJKT 2 SMK Negeri 7 Semarang to obtain an assessment of the feasibility, practicality, and effectiveness of the use of the inquiry learning model.

In the analysis process, work analysis and needs analysis are carried out by determining current conditions, desired conditions, and types of problems that arise from needs [15]. This analysis was obtained through direct interviews with teachers in the area of expertise of TJKT (Network and Telecommunications Engineering) at SMK Negeri 7 Semarang. From the results of the interview, it was obtained that it needed a development of a learning model that could combine the use of technology in informatics subjects. Informatics subjects are included in the new subjects for SMK Negeri 7 Semarang. This

is because informatics subjects arise as a result of the use of the Independent Curriculum which is applied to class X students. Thus, teachers still need to try various learning models that are suitable for achieving the objectives of the informatics learning. One of the learning models that are still widely used by teachers is the inquiry model. This research was conducted to see the effectiveness of the development of the google classroom based inquiry learning model which was applied to the informatics subject.

The design stage is the collection of teaching materials. This research focuses on the development of materials for the elements of the Social Dimension of Informatics. After that, the design of learning media using PowerPoint is based on the teaching materials that have been found. Followed by the preparation of test references for pre-test and post-test.

The development stage is carried out by developing the stages of the inquiry learning model by utilizing the features contained in the google classroom. See Table 2.

The implementation stage performs validation tests on a media expert validator and a material expert validator. Furthermore, improvements were made to the media according to the suggestions of the media and material validators. Followed by a trial of the learning model with the planned steps of inquiry learning based on google classroom.

In the evaluation stage, the evaluation criteria were determined, the evaluation tool was selected, namely the calculation of data from the questionnaire instrument that had been made, the feasibility analysis of the learning model, the practical analysis of the inquiry learning model, and the effectiveness of the inquiry learning model.

Methods of data collection is done by means of literature study, observation, interviews, questionnaires and tests. Meanwhile, the data collection instruments were in the form of a user practicality questionnaire on the learning model by teachers and students, a questionnaire on the feasibility of media experts and material experts, as well as pre-test and post-test questions as indicators of the effectiveness of the learning model.

The research data were analyzed qualitatively and quantitatively. Qualitative data obtained from criticism, comments or suggestions to improve the quality of media and materials. While quantitative data were obtained from the questionnaire assessment using a Likert calculation scale with 4 response points of choice, then the average percentage was calculated to determine the eligibility criteria, practicality, and assessment of the effectiveness of the learning model.

The conversion of qualitative to quantitative data in the feasibility test of learning models (media and material experts) and practicality tests by students and teachers has a value range of "1 4" with the criteria "Strongly disagree Strongly agree" [16]. Statistical calculations using paired samples t - test were used to determine whether the inquiry learning model was significant for improving learning outcomes.

The calculation of the percentage of both feasibility and practicality uses formula 1 [16] while to find out the score for the increase in student learning outcomes, it is carried out using the Normalized Gain Score whose calculation is described in formula 2 [17].

$$Pecentage = \frac{score\ earned}{maximum\ ideal\ score} \times 100\% \tag{1}$$

$$N - gain = \frac{pre\ test\ score - post\ test\ score}{maximum\ score - pre\ test\ score} \tag{2}$$

Table 2. Utilization of the google classroom feature in the development of inquiry learning models

Inquiry Phase	Google Classroom Features	Explanation
Orientation	Announcement	The teacher provides an explanation through the announcement feature regarding the goals and process of learning activities that will be carried out that day.
Conceptualization	Question	The teacher asks questions about economic, legal, and IT career aspects through the Question feature based on several reference news links as problem statements. Students can answer it to understand the initial concept of the Social Dimension of Informatics.
Investigation	Materials, Assignments	The teacher provides supporting materials and assignments through the material and assignment features.
Conclusion	Quiz Assignment	To measure students' abilities, the teacher gives quizzes through the quiz assignment feature.
Discussion	Private Comment/Announcement	In communicating learning outcomes, students can give private comments or through announcements.

Table 3. Category level N-gain

Score	Level
$g > 0.7$	High
$0.7 > g > 0.3$	Medium
$g < 0.3$	Low

Source: Hake, RR, 1999

The learning model is said to be very feasible and very practical if all aspects in the expert validation sheet and teacher and student response questionnaires reach more than 81.25%. Meanwhile, the learning model is said to be very effective, if the value of Sig. (2-tailed) the result of statistical calculation using paired sample t-test is less than 0.05.

Then, to find out the increase in the results of the pre-test and post-test as supporting data for the effectiveness of the learning model, it was carried out through the normalized gain score. Where the division of the acquisition category N gain can refer to the Table 3.

3 Results Discussion

The development of the inquiry learning model by utilizing the features contained in the google classroom as shown in Table 2. The features used in the development of the inquiry learning model in this informatics subject are announcement, assignment, quiz assignment, question, and material.

Application announcement allows the teacher to present the material and provide an introduction (orientation) to informatics material. This feature provides an opportunity for students to comment on what the teacher has uploaded. See Fig. 1.

Question, this feature allows teachers to upload a question that can be answered by students. The students can discuss about the problem statement given by the teacher. Students can comment with each other (have discussions) through this feature. See Fig. 2.

Teachers can provide material through the material feature. In this feature, teachers can upload materials such as PowerPoint and other materials to support teaching and learning activities using the inquiry model. See Fig. 3.

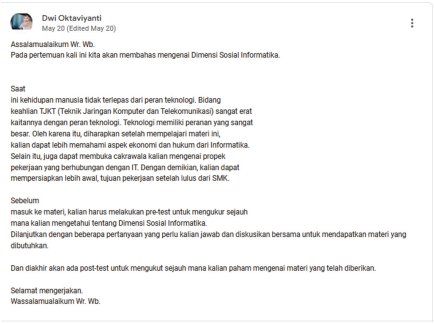

Fig. 1. Implementation of the announcement feature in google classroom

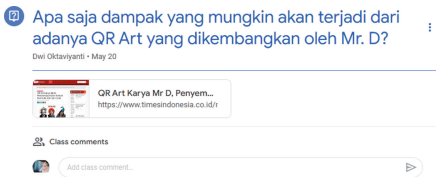

Fig. 2. Application of the question feature in google classroom

Fig. 3. Application of material features in google classroom

Fig. 4. Application of feature assignment in google classroom

Fig. 5. Application of the quiz assignment feature in Google Classroom

Fig. 6. Application of the grade feature in google classroom

Assignment allows teachers to assign assignments to students. The results of the material exploration assignment can be uploaded by students through this feature. See Fig. 4.

Test questions are used to measure the extent of student knowledge, both before the material is given and after the material is given to students. The teacher can provide pre-test and post-test questions through the Quiz Assignment feature which is connected to the google form service. See Fig. 5.

In addition, in the assignment feature, students can also add personal comments to the teacher if there are things they feel need to be communicated. Through the grade feature, the teacher can give a value for what students have done. See Fig. 6.

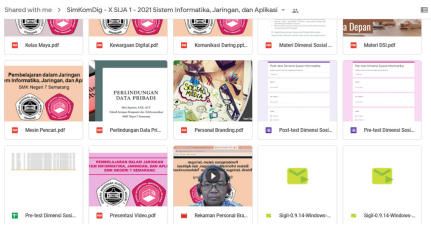

Fig. 7. The uploaded data in google classroom is also stored in google drive

Table 4. Media Expert Validation Results

Aspect	Score	%	Criteria
Media Display	11/12	91.6%	Very worth it
Display of Teaching Materials	10/12	83.3%	Very worth it
Accessibility	21/24	87.5%	Very worth it
Aspect	Score	%	Criteria

All media uploaded in Google Classroom will be automatically connected to the Google User workspace. So that the data in Google Classroom will be easier to access anytime and anywhere (Fig. 7).

The feasibility test of the learning model was carried out to measure the quality of the media and materials developed. The data on the feasibility of the learning model was obtained through the assessment of media expert validators and material expert validators through a questionnaire. Parameters for measuring the quality of the feasibility of learning models through learning media consist of 3 aspects, namely media display, teaching material display, and accessibility. Meanwhile, the parameters for measuring the quality of the material feasibility consist of 4 aspects, namely the introduction aspect, content aspect, evaluation aspect, and closing aspect. The results of the practicality assessment of the use of the learning model were obtained from user responses, namely teachers and students. Then the effectiveness of the learning model was analyzed by statistical calculation of paired sample t test using students' pre-test and post-test scores.

Based on the results of the media validity test by media experts, the average percentage was 87.4 7%. Table 4 shows the data from the analysis of each aspect of the questionnaire from media expert validators. Based on the calculation results obtained, the media developed is very feasible to be tested in schools.

The results of the material validity test by the material validator, obtained an average percentage of 88.63%. Table 5 shows the data from the analysis of each aspect of the material validation questionnaire by material experts. Based on the calculation results obtained, the subject matter developed is very feasible to be tested in schools.

The practicality test includes the usefulness and ease of use of the inquiry learning model which was developed based on Google Classroom. User responses were given through an assessment questionnaire by a teacher in the field of expertise of TJKT and 36 students of class X TJKT 2 at SMK Negeri 7 Semarang.

Table 5. Material Expert Validation Results

Aspect	Score	%	Criteria
Introduction	14/16	87.5%	Very worth it
Contents	36/40	90%	Very worth it
Evaluation	21/24	87.6%	Very worth it
Closing	7/8	87.5%	Very worth it

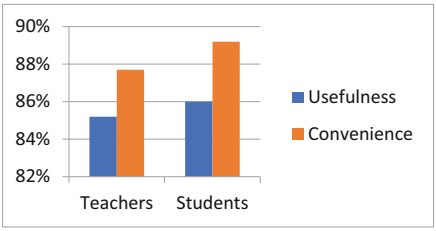

Fig. 8. Ease and Benefit Assessment Results

Table 6. Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Post-test	83.8889	36	10.63089	1.77182
	Pre-test	73.0556	36	14.35657	2.39276

Table 7. Paired Sample Correlations

		N	Correlation	Sig.
Pair 1	Post-test & Pre-test	36	0.351	0.036

The results of the analysis of teacher and student responses can be seen in Fig. 8. The aspects assessed are aspects of usefulness and convenience. The practicality value of the teacher's response was obtained by a percentage of 84.6%. While the student assessment obtained a percentage value of 87.6%. This shows that the learning model developed is categorized as very practical to be used by users for the inquiry model learning process.

The results of statistical tests are shown in Table 6, the average pre-test value is 73.056 while the post-test average is 83,889. So, there is an increase in learning outcomes of 10.8333. The magnitude of the increase in the value of the pre-test to the post-test can be known by looking for the N-gain score. Based on the analysis, the N-gain score was 0.4. It is included in the Medium category. Table 7 shows the correlation between pre-test data and post-test data is 0.659 with a probability of $0.659 < 5\%$, this means that the increase

Table 8. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of Difference				
					Lower	Upper			
Pair 1	Posttest - Pretest	10.83333	10.85620	1.80973	7.16012	14.60654	5,987	35	0.000

in student scores from pre-test to post-test is evenly distributed in other words, pre-test data has a relationship which is significant with the post-test data. Based on Table 8, the results of the paired sample test analysis obtained a t value = 5.987 with a sig value of 0.000 < 0.05. Thus, inquiry learning based on google classroom has a significant effect on improving learning outcomes for informatics subjects. Or in other words, the google classroom-based inquiry learning model is effective to improve student learning outcomes.

4 Conclusions

Based on the results of the development of the inquiry learning model, the assessment of media experts and material experts, user responses which include teachers and students as well as statistical analysis, the following conclusions are obtained:

1. Implementation of material in google classroom in the inquiry learning model by using the features announcement, assignment, quiz assignment, question, and material.
2. The results of the assessment by the media expert validator and the material expert validator on the inquiry learning model were declared very feasible. This is based on the scores obtained each of 87.4 7% and 88.63%.
3. The results of the analysis of user responses to the developed inquiry learning model are considered very practical for use by teachers and students with scores of 84.6% and 87.6%, respectively.
4. The learning model developed is effectively used, this is evidenced by the results of the analysis of the paired sample t - test which get the value of t = 5.987 with a sig value of 0.000 < 0.05. In this regard, inquiry learning based on google classroom has a significant effect on improving learning outcomes for informatics subjects.

The overall results show that the inquiry learning model developed based on google classroom is considered very feasible, very practical, and effectively used to improve student learning outcomes in informatics subjects.

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