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# The Effectiveness of Scientific Collaboration Model on Integrative Thematic Learning in Elementary Schools of Surakarta City

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**Abstract:** The process of learning in the level 2013 curriculum uses a scientific approach. By combining integrative thematic learning implemented in all classes in Elementary Schools, which includes all subjects presented in an integrative manner with the theme as a unifier. In particular, this study aims to conduct research and the effectiveness of the Scientific Collaboration learning model to be implemented in integrative thematic learning in Elementary Schools to improve student learning outcomes. The model used in this study is a quantitative descriptive model. This type of study is conducted by Research and Development (R&D) by producing certain products and testing the effectiveness of the products. The collection of the data was done using questionnaires, interviews, documentation, and observation. From the students' needs, students like to learn in a way that respects them as humans and can make them think critically so they can actively think and act. The two pre-research data from the questionnaire became a reference for researchers to make the Scientific Collaboration learning model effective to be implemented in appropriate integrative thematic learning to improve learning outcomes in the cognitive realm in Elementary Schools in Surakarta City. The effectiveness of the Scientific Collaboration learning model to be implemented in integrated thematic learning that is feasible to improve learning outcomes in the cognitive realm in Elementary Schools in the city of Surakarta.

**Keywords:** learning, scientific collaboration model, integrative thematic learning.

# 苏拉卡达市小学综合主题学习科学合作模式的有效性

**摘要：**2013
级课程的学习过程采用科学方法。通过结合在小学所有班级实施的综合主题学习，其中包括以综合方式呈现的所有科目，以主题为统一体。特别是，本研究旨在研究科学协作学习模式在小学综合主题学习中实施的有效性，以提高学生的学习成果。本研究中使用的模型是一个定量描述模型。此类研究由研发 (研发)
通过生产某些产品并测试产品的有效性来进行。数据的收集是通过问卷调查、访谈、文件记录和观察完成的。从学生的需求出发，学生喜欢以一种尊重他们为人的方式学习，可以让他们批判性地思考，从而积极地思考和行动。问卷中的两个预研究数据成为研究人员的参考，使科学协作学习模型有效地实施在适当的综合主题学习中，以提高苏拉卡塔市小学认知领域的学习成果。将在综合主题学习中实施的科学协作学习模型的有效性，这对于提高苏拉卡塔市小学认知领域的学习成果是可行的。

**关键词：**学习、科学协作模式、综合主题学习。

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# 1. Introduction

In some recent years, the major firms in Asian economies such as South Korea, Taiwan, and China have enhanced rapidly. Their own technological capabilities are increasingly leapfrogging over incumbents from advanced countries in certain education, technological fields, and industries [1]. Education is a very decisive process for individual development and community development to plan the intention of developing desired behavior. Alawiyah [2] argues that education is the current government's top priority as stated in the fifth point of the Nawacita program. It has the purpose to improve the quality of Indonesian human life through improving the quality of education and training [2].

Standardization is the embodiment of "all the things can be measured". When all can be measured, the efficiency will be achieved and the quality of a product or service will be known specifically [3]. Standards are required in all parts of education because education is a process with clear objectives to make a system that we know as the National Education System. In this case, the standard becomes the benchmark to determine the reference for the education implementation in an effort to achieve the goal [2]. The world of education is positioned as a service institution that provides services according to customer desires. The system is needed to civilize educational institutions so that they have a higher quality for the future [4].

Integrative thematic learning in Elementary Schools can be developed with Scientific Collaboration learning. The government's effort for improving the education quality is through Scientific Collaboration learning that combines the Scientific approach and the Collaboration approach. Scientific Collaboration Learning is presented by applying seven new syntaxes: (1) Observing, (2) Conveying Objectives and Coordinating Groups, (3) Presenting Information, (4) Trying to Do, (5) Guiding Groups, (6) Assessing Groups, and (7) Communicating [5]. The learning activities in thematic learning are based on a theme in which each theme covers several subjects combined into one theme [6].

In line with [7], critical thinking, problem-solving, communication, collaboration are the top four drawers of expertise in our toolbox for studying, working, and living in the 21st century. In Scientific Collaboration Learning, students' participation is influenced by individual characteristics, teacher feedback, and student reflection [8]. The learning process in all level 2013 curricula is carried out using a scientific approach [9]. In the 2013 curriculum, integrative thematic learning is implemented in all elementary school classes, including all subjects presented integratively with the theme as a unifier.

The way for teachers in carrying out learning is still classical. Another phenomenon that exists when it shows that students' learning activities are generally still limited from teacher instructions, students are less active. Students do not have the courage to spontaneously express their own opinions. So that the learning atmosphere in the classroom is not conducive and stiff. This condition happened because many teachers did not have creativity in communicating [10]. The principal must have the ability in management to mobilize unexplored potentials such as internal and external factors that contribute to student achievement [11]. The present research asks how higher education faculty and students perceive and understand what is meant by the student-centered learning process [12]. Promoting the engagement of students has been of great interest to engineering educators. It can be associated with better teaching and learning effectiveness [13]. Thematic learning has a notable weakness that occurs when a single teacher does not thoroughly master the elaboration of a specific theme, thereby making it difficult to link it to the main subject's theme. Teachers should pay attention to the basic needs of learners so that the learners' motivation and attention are well developed [14].

The results of the study conducted by Fitri Indriani and Atiaturrahmaniah indicate that the implementation of integrative thematic learning using the 2013 curriculum in Muhammadiyah Suronatan Elementary School, Yogyakarta, assisted considerably in the planning, implementation, assessment process, and learning outcomes [15]. Furthermore, the results of the study conducted by Sary Rahmadhani, Yunisrul, and Yullys Helsa in elementary school students demonstrated that the discovery learning model in integrated thematic learning for students, especially elementary school students, is effective in improving students' learning activities and learning outcomes [16]. In this case, the teachers need assessment tools that are practical and effective for facilitating learning [17].

Results from other studies further show the influence of collaboration learning, such as the lesson study for learning community (LSLC), on the opportunities students receive based on their learning outcomes. This is indicated by the analysis of the test results. The post-test shows the following values: $F_{count}$ = 11.67 and $F_{tabel}$ = 3.08. From the data obtained, $F_{tabel} < F_{count}$. Thus, H0 is rejected. This means that learning outcomes are affected by learning [18]. Moreover, Yunos explained that collaborative learning is the most effective learning strategies to develop student's communication skills. This strategy could provide a media to support learners in assisting their peers during the learning process by indirectly communicating with other students [19].

Upon observing the presentation of integrative thematic learning used during the teaching and learning process, it can be deduced that there are several weaknesses faced by teachers and students that have not been tackled yet. However, of all these weaknesses, there are positive sides and beneficial and on all

parties. Regarding problems that have arisen in the existing research, this paper proposes a new approach for researching "The Development of Scientific Collaboration Models in Integrative Thematic Learning in Elementary Schools in Surakarta City". The approach consists of integrative thematic learning conditions, developing a Scientific Collaboration learning model, and testing the effectiveness of the Scientific Collaboration learning model in thematic learning in Elementary Schools.

## 2. Research Methods

This study is structured using Research and Development (R&D). It aims to conduct research and development of Scientific Collaboration learning models in integrative thematic learning for elementary schools to improve student learning outcomes. Three stages in research and development have to be done: (1) preliminary study which examines theories and observes the provided product; (2) conducting product's development processing or new activity program; then (3) validating the product or new program [20].

The location for this research is in the Surakarta City Education Office. Statistical tests are used to analyze data that require assumptions for the results to be valid and trusted [21], [22]. The subjects of this study were the Principal of SD Surakarta City, teachers, and students by purposive random sampling.

The normality tests are supplementary to the graphical assessment of normality [23]. The normality test was used to determine the use sample from a population with a normal distribution. The technique to collect data uses descriptive data analysis quantitatively to get the effectiveness of the Scientific Collaboration learning model for Elementary Schools' integrative thematic learning.

The homogeneity test was used to determine the variance between groups of data obtained between the tested groups. The studies in the literature show that many methods are proposed to test homogeneity and applied for various places [24].

## 3. Results and Discussion

### 3.1. Integrative Thematic Learning

The 2013 curriculum emphasizes integrative thematic learning and requires educational institutions to make changes in an integrated manner, including standards for educators and education personnel, process standards, and assessment standards. Learning is carried out using the scientific approach and authentic assessment. In an effort to optimize the implementation of the 2013 curriculum, a students' guide book containing the integrative theme, scientific approach, and authentic assessment of the curriculum must be developed to enable the students to search the main curriculum content [25].

Integrative thematic learning can be interpreted by linking and connecting various aspects between subjects. Integrative thematic learning is relatively new, and so teachers still experience confusion in planning, implementing and designing classes as well as conducting assessments. Thematic learning is integrated learning that uses themes to connect several subjects and provide meaningful experiences for many students [26]. In other research, thematic learning is defined as learning that uses a specific theme to combine various subjects of study [27].

The objectives of integrative thematic learning include three aspects, namely, cognitive, affective, and psychomotor. Teachers emphasize all three aspects. Cognitive learning leads to the goal of acquiring knowledge, understanding, intelligence, and thinking skills for students. The application of cognitive learning principles substantially broadens the reach of eLearning courseware [28]. Integrative thematic learning has helped many teachers and students collaborate to express something, find problems, determine alternative problem-solving methods, and interact with each other [29].

### 3.2. Scientific Collaboration Model

*Scientific collaboration* (Scicolla) is a learning process carried out together by a learning group. Here, students contribute ideas and opinions, share information, and are mutually responsible for solving problems. The Scicolla learning model in integrative thematic learning for elementary school education was developed so that the 2013 curriculum could be implemented immediately, the involvement of students is more active, teachers are able to manage learning more effectively, and learning strategies are more meaningful. Ultimately, these outcomes will lead to the effective, efficient, relevant and high quality of learning and education in Indonesia. The Scicolla learning model applies seven new syntax, including (1) Observing, (2) Delivering Objectives and Coordinating Groups, (3) Presenting Information, (4) Trying to Do, (5) Guiding Groups, (6) Assessing Groups, and (7) Communicating.

Questionnaire forms the backbone of any survey and the success in designing [30]. Pre-research data from questionnaires became a reference for researchers to develop Scicolla learning models that would be implemented in appropriate integrative thematic learning to improve learning outcomes in the cognitive domain in elementary schools in Surakarta City. Small group product trials were carried out at SD Negeri Mojosongo 3, SD Islam Bakti, SD Madyotaman, and SD Muhammadiyah 4. The control classes were SD Madyotaman and SD Muhammadiyah 4 with a total of six students. The implementer of integrative thematic learning was the fourth grade teacher in each school. Six students were involved as research subjects in a control class. The trial was carried out in two meetings,

starting with a pre-test and ending with a post-test. Cognitive domain testing aims to determine the effectiveness of the Scicolla learning model to improve the learning outcomes of elementary school students. The data on student learning outcomes in the small group test is displayed in Table 1. When data are presented visually (in a table or graph), the readers of an article can judge the distribution assumption by themselves [23].

Table 1 Student learning outcomes in control and experiment classes in small group trials

| No | Aspect | Experiment Class | | Controlling Class | |
|---|---|---|---|---|---|
| | | Pre-Test | Post-Test | Pre-Test | Post-Test |
| 1 | Average | 73.7 | 84.3 | 73.0 | 76.0 |
| 2 | Completeness | 50.0% | 100% | 33.3% | 66.7% |

The table shows the average increase in the experimental class, whose result is greater than that in the control class. The average student learning outcomes in the experimental class increased from 73.7 in the pre-test to 84.3 in the post-test. By contrast, in the control class, the average student learning outcomes increased from 73.0 in the pre-test to 76.0 in the post test. Students' learning completeness in the experimental class was also greater, from 50.0% in the pre-test to 100% in the post-test. Meanwhile, the control class increased from 33.3% in the pre-test to 66.7% in the post-test.

After testing in small groups, it is necessary to re-evaluate the practicality of the Scicolla learning module in integrative thematic learning. The purpose of product revision is to refine tools that have been developed and adapted to real conditions in the field.

### 3.3. Normality Test

The normality test was conducted using the Kolmogorov-Smirnov test with $\alpha = 0.050$ and aided by the SPSS 23 program. $H_0$ expressed that the sample comes from a normally distributed population. If we get a sig value greater than $\alpha$ (sig > 0.050) and $D_{exp} < D_{table}$, then $H_0$ is not rejected.

Table 2 Normality test (Hasil Olah Data, 2021)

| Score | | Kolmogorov-Smirnov | | | Shaphiro-Wilk | | |
|---|---|---|---|---|---|---|---|
| | | Statistic | df | Sig. | Statistic | df | Sig. |
| Student Learning Outcomes | Pre-Test | 0.191 | 20 | 0.053 | 0.888 | 20 | 0.024 |
| | Post-Test | 0.165 | 20 | 0.154 | 0.924 | 20 | 0.116 |

The table of normality test results above shows that the significance value in the normality test with Kolmogorov-Smirnov is 0.053 (p > 0.050), signifying that the sample is from a normally distributed population.

### 3.4. Homogeneity Test

The homogeneity test of the learning model data used *Levene's* test with $\alpha = 0.050$ and assisted by the SPSS 23 program. $H_0$ expressed that each class does not have the same variant. If the sig value of the homogeneity test is greater than $\alpha$ (sig > 0.050), then $H_0$ is not rejected and is said to be homogeneous. The results of the homogeneity test are presented in Table 3.

Table 3 The homogeneity test

| | | Levene Statistic | df1 | df2 | Sig. |
|---|---|---|---|---|---|
| Student Learning Outcomes | Based on Mean | 0.062 | 1 | 38 | 0.805 |
| | Based on Median | 0.037 | 1 | 38 | 0.848 |
| | Based on Median and with Adjusted df | 0.037 | 1 | 29.229 | 0.848 |
| | Based on trimmed mean | 0.036 | 1 | 38 | 0.850 |

The SPSS output results above show a significance level of 0.805 (p > 0.050). This result means that the two classes are homogeneous. Consequently, the two classes can be compared.

### 3.5. Effectiveness Test Based on Pre-Test and Post-Test

The field effectiveness test was carried out to determine the effectiveness of the developed product and find out how big the effectiveness of the Scicolla learning model is in the integrative thematic learning of elementary schools. The effectiveness test is carried out by comparing the learning outcomes of students using the old model (before development) with students who are taught using the Scientific Collaboration learning model. The research targets for the field trial were all elementary school students in the Surakarta City area. Data obtained from the pre- and post-test results is in accordance with the before- and after-experimental model. The results of the effectiveness test could be observed in Table 4.

Table 4. Pre- and post-tests
Paired sample statistic

| | | Mean | N | Std. Deviation | Std. Editor Mean |
|---|---|---|---|---|---|
| Pair 1 | Pre-Test | 74800 | 20 | 4.32374 | 0.96682 |
| | Post-Test | 84100 | 20 | 4.56416 | 1.02058 |

Paired samples correlation

| | | N | Correlation | Sig. |
|---|---|---|---|---|
| Pair 1 | Pre-Test and Post-Test | 20 | 0.828 | 0.000 |

Paired samples test

| | | Mean | Std. Deviation | Std. Editor Mean | 95% Confidence Interval of the Difference | | t | dt | Sig. (2 tailed) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lower | Upper | | | |
| Pair 1 | Pre-Test and Post-Test | -930.000 | 261.775 | 0.58535 | -1.052.515 | -807.485 | -15.888 | 19 | 0.000 |

The table above shows that the average pre-test learning outcomes are 74.8, while the average post-test score of students is 84.1, with the number of respondents being 20 students. The standard deviation in the pre-test is 4.323 and in the post-test - 4.564. Because the average value of learning outcomes on the pre-test (74.8) is smaller than the average post-test score, it means that descriptively there is a difference in the average learning outcomes between pre-test and post-test.

Based on the description of development model effectiveness results in the test above, inferential statistical analysis with the t-test using the help of the SPSS 23 analysis program, which is preceded by the prerequisite test, namely the normality and homogeneity test. It is concluded that there is a difference in the average value of learning outcomes between pre-test and post-test, which means that the development of a Scientific Collaboration learning model can improve the learning outcomes in elementary schools cognitive domain. Based on the results of product trials in large groups, data on student learning outcomes in large group trials can be seen in Table 5.

Table 5 Student's achievement of control and experiment groups: large group tryout

| No | Aspect | Experiment class | | Control Class cj | |
|---|---|---|---|---|---|
| | | Pre-Test | Post-Test | Pre-Test | Post-Test |
| 1 | Average | 74.8 | 84.1 | 74.7 | 76.9 |
| 2 | Mastery | 55.00% | 100% | 55.00% | 80.00% |

Table 5 shows that the increase of average and completeness of learning in the experimental class is greater than in the control class. The average student learning outcomes in the experimental class increased from 74.8 in the pretest to 84.1 in the posttest. On the other hand, the average student learning outcomes in the control class increased from 74.7 in the pretest to 76.9 in the posttest. Student learning completeness in the experimental class was also greater, increasing from 55.0% in the pretest to 100% in the posttest. Meanwhile, the control class increased from 55.0% in the pretest to 80.0% in the posttest.

The data collection results through questionnaires, interviews, and documentation, indicated that developing a scientific collaboration learning model to be implemented in integrative thematic learning was feasible to improve learning outcomes in the cognitive domain in elementary schools in Surakarta City.

The research data carried out at the Surakarta Elementary Schools means that development of a scientific collaboration learning model can improve the outcomes of learning in the cognitive domain of elementary schools. Even though they have implemented the scientific collaboration learning model, teachers still experience obstacles in applying scientific methods so that students can be more creative and achieve competence when the learning process can be achieved. If there is confusion, students are sometimes embarrassed and afraid to ask questions so that students become passive. This causes the learning process to be less effective and students are still less creative in coming up with new ideas in the learning process. It is possible that the Scientific Collaboration model in integrative thematic learning can help teachers and students be more creative.

## 4. Conclusion

Based on the data analysis results and discussion, it can be concluded that judging from the needs of students the conditions for integrative thematic learning in elementary schools are not optimal. This is because teachers find it difficult to combine the content of two or more lessons on the same theme into one. Consequently, the thematic learning that is carried out is not fully meaningful to the students as reflected in various available themes. The learning process has used a scientific approach, but still has problems in carrying out learning activities that apply that approach. Therefore, the stages of scientific application have not been carried out optimally by teachers and students.

The development of the Scientific Collaboration learning model is carried out by applying a new system, which consists of observing, conveying objectives and coordinating groups, presenting information, practicing, guiding groups, assessing groups, and communicating. The development of the Scientific Collaboration learning model is carried out in stages: preliminary studies, product design drafts, expert validation, small group trials, product

revisions, and mass production of books for students and teachers.

The effectiveness of the integrative thematic Scientific Collaboration learning model on the learning outcomes of elementary school students can be shown by comparing their average pretest and posttest scores. The average pretest score was 74.8 while the average posttest score was 84.1, with the number of respondents being 20 students. The standard deviation in the pretest was 4.323 and 4.564 in the posttest. Because the average pretest score is lower than the average posttest score, there is a difference in the average learning outcomes between pretest and posttest.

## 5. Suggestions

From the above conclusions, several suggestions can be made as follows:

1. The results of the Scientific Collaboration learning model in integrative thematic learning are expected to be used for social studies courses to make it easier for students to understand the material presented.
2. Since the results of research and development products can provide benefits for learning, it is advisable for teachers to develop this product with a wider scope or on other materials and subjects in the future.
3. Integrative thematic learning to form children's character has been tested for its feasibility and effectiveness, so it is recommended that teachers use this as an alternative for learning activities.
4. Additional evaluation of more diverse questions is needed.

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