

Developing Learning Activities with the 5 Steps Learning Process to Promote Learning Achievement in Suzhou No.12 Primary School

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Abstract

Background and Aims: Primary science education in China faces persistent challenges such as limited hands-on experimentation, weak understanding of scientific methods, and underdeveloped analytical and problem-solving skills. To address these issues, this study applies the 5-Step Learning Process—a constructivist, student-centered model emphasizing active engagement and collaboration—to improve science learning outcomes among primary students. The research aimed to (1) develop learning activities based on the 5-Step Learning Process with an efficiency criterion of 75/75; (2) compare students' learning achievement before and after the intervention; and (3) examine student satisfaction with the developed learning activities

Methodology: A one-group pretest–posttest experimental design was employed with 30 third-grade students from Suzhou No. 12 Primary School during the first semester of 2023. Instruments included lesson plans, a learning achievement test, and a satisfaction questionnaire. Data were analyzed using percentages, means, standard deviations, and paired t-tests.

Results: The learning activities achieved an efficiency level of 76.67/76.83, exceeding the 75/75 criterion. Students' post-test scores were significantly higher than their pre-test scores ($t = 41.38$, $p < 0.05$). Overall satisfaction with the 5-Step Learning Process was high ($\bar{x} = 4.47$, S.D. = 0.53), with students particularly noting improvements in learning efficiency and interest in science.

Conclusion: The 5-Step Learning Process effectively enhances science learning achievement and fosters positive attitudes toward learning among primary students. It is recommended for broader implementation in primary education, with potential adaptation to other subject areas and integration with digital learning tools.

Keywords: 5-step Learning Process; Learning Achievement; Satisfaction; Science Education; Primary School

Introduction

Research background and motivation are crucial for designing and implementing effective teaching activities. In China, primary science education faces challenges such as a lack of hands-on experimentation, limited understanding of scientific methods, and underdeveloped scientific thinking and problem-solving skills among students (Zhang & Liu, 2020). These issues hinder deep understanding and reduce interest in science learning.

While existing studies have emphasized the importance of inquiry-based learning, few have systematically implemented and evaluated the 5-step learning process in the context of Chinese primary science education. This study addresses this gap by developing and assessing learning activities based on the 5-step model to enhance both learning outcomes and student engagement.

The 5-step learning process promotes active learning through structured steps: stimulating interest, searching for information, collaborative knowledge construction, communication and reflection, and application of knowledge. This approach aligns with constructivist theories and has shown promise in fostering scientific skills (Khaemmani, 2013; Dechakupt & Yindeesuk, 2020).

Moreover, teachers often struggle with designing engaging and challenging tasks that align with curriculum goals (Wang, 2021). This study also considers these practical challenges and explores how the 5-step process can support teachers in facilitating effective science instruction.

Objectives

1. To develop learning activities using the 5-step learning process with an efficiency of 75/75.
2. To compare students' learning achievement before and after using the 5-step learning process.
3. To examine student satisfaction with the 5-step learning activities.

Literature Review

The researcher has conducted a study and research of documents, textbooks, books, and related research

Khaemmani (2013). The 5 Step Learning Process (5 STEPs Learning Process) is a teaching method that emphasizes learners creating knowledge by themselves, including applying knowledge based on scientific methods. Students practice group activities with everyone working together. Good students help slower students, and more skilled students help less skilled students, to have fun learning. Teaching using various types of diagrams also helps

learners to connect new knowledge with their existing knowledge, creating meaning and understanding. The content or information learned with diagrams and graphics will make it easier to remember, and learners will know the content they are learning. In addition, they will learn to use various types of graphic diagrams, which learners can apply to many other subjects.

Toedam et al (2022). The theory proposers are Associate Professor Dr. Pimpan Dechakupt and Associate Professor Payao Yindeesuk. They have introduced the 5-step learning process, 5 STEPs Learning Process, or 5STEPs for short, which is a teaching method adapted from the 5-step learning process by adding collaborative group work to organize learning based on scientific methods.

Dechakupt and Yindeesuk (2020). Finally, the 5-step learning process is also based on the systematic teaching theory, emphasizing the systematization and integrity of the teaching process. This is in line with the attention of systematic teaching theory to the structure and organization of the teaching process, advocates scientific teaching design and teaching management, and realizes the effective implementation of teaching objectives.

Saengsri (2017: 39) describes learning achievement as the outcome of teaching, training, and the learner's experiences, resulting in quantitative or qualitative changes in knowledge, abilities, behavior, or mental characteristics. These outcomes are measurable through various testing methods.

Um-ongart (2018) defines learning achievement as the intellectual ability of learners after completing learning activities, training, or individual experiences. It can be assessed using achievement measurement tools such as knowledge tests, which must be within the scope of the learning content. Learners can use this knowledge to answer questions and solve problems as specified. Learning achievement can also serve as a criterion for evaluating students' proficiency levels.

Learning achievement refers to the intellectual knowledge and abilities of learners, developed through educational activities aligned with specific learning objectives. It involves quantitative or qualitative changes in memory, cognitive performance, and various behaviors. These achievements are measurable through assessments and tests designed to evaluate learning outcomes against established criteria.

Toedam et al. (2022) and Maneephet et al. (2021) Studies such as those by have applied the 5-step process in science subjects, reporting improved analytical thinking and learning achievement. These findings support its relevance in promoting scientific process skills.

Saengsri (2017), Um-ongart (2018). Learning Achievement and Assessment. Learning achievement refers to measurable changes in knowledge, skills, or behavior resulting from

instruction, and it reflects intellectual development aligned with learning objectives. The 5-step process facilitates such development through structured, interactive learning.

Methodology

This research used an experimental design in the form of experimental research (Experimental Research), One Group Pretest-Posttest Design, and One Group Posttest Only Design (Worakam, 2021).

Table 1 Research plan: One Group Pretest-Posttest Design

Random	group	Test first	Experimental thing	Test after
-	E	O1	X	O2
When	E	means	Experimental group	
	O1	means	measuring variables before experimenting	
	X	means	giving an experiment	
	O2	means	measuring variables after the experiment	

The 5-step learning process is a student-centered teaching method designed to improve students' learning outcomes. This method emphasizes students' initiative, cooperation, and self-reflection ability and guides students to gradually learn and master knowledge through 5 steps. Here is a detailed definition of the 5-step learning process:

Step 1: Stimulating and Key Questioning (5 minutes)

In this step, teachers need to articulate the learning objectives of this lesson, ensuring that students clearly know what knowledge and skills they need to master. Learning goals should be set specifically, clearly, and measurably so that students can learn specifically.

Step 2: Searching and Analyzing (10 minutes)

In this step, students need to preview the relevant knowledge and report back in class. Preview reports can help students to consolidate the preview results, but also to help teachers understand the students' learning situation and to provide a reference for subsequent teaching. The forms of the preview report can be diversified, such as oral presentation, display board, group discussion, etc.

Step 3: Discussing and Constructing (45 minutes)

In this step, students need to explore new knowledge through group cooperation under the guidance of teachers. Cooperative inquiry can stimulate students' interest in learning and improve their initiative and cooperation. In the process of cooperative inquiry, teachers should give appropriate guidance and help to ensure that students can conduct inquiry learning smoothly.

Step 4: Communicating and Reflecting (15 minutes)

In this step, students need to consolidate the knowledge learned through exercises of

different difficulty. The design of gradient exercises should follow the principle of shallow to deep, from easy to difficult, so that students can gradually improve their ability. At the same time, teachers should give appropriate guidance and evaluation according to the actual situation of students to help them better master the knowledge.

Step 5: Applying and Serving (5 minutes)

In this step, students need to evaluate and summarize their own learning process. Independent evaluation can help students to realize their own advantages and disadvantages, to adjust their learning strategies and improve the learning effect. A summary can help students to sort out what they have learned and form a complete knowledge system. In the process of independent evaluation and summary, teachers should give students full guidance and support, and guide them to conduct self-reflection and improvement.

Through the above 5 steps, the 5-step learning process can help students to better understand and master the knowledge, and improve their learning effect and independent learning ability. At the same time, this method can also promote interaction and communication between teachers and students and enhance the students' learning experience and sense of belonging.

Results

The researcher presented the results of the data analysis in the following order

1. The learning activity efficiency of the science course is 75/75.

Analysis of student academic achievement using 5 5-step learning process activities, the researcher took the scores from the pre-test. Exercise scores for each lesson plan and scores from the post-test after studying basic science, from a total of 30 students, then using the results of data analysis to determine efficiency according to the 75/75 criteria, with details as follows.

Table 2 Student scores, Pre-test scores, Points collected during study, and Post-test scores

quantity	Pre-test (50 Points)	Collect points (50 Points)	Post-test (50 Points)
1	31	42	43
2	32	42	45
3	25	34	36
4	35	47	48
5	29	38	41
6	35	46	48



quantity	Pre-test (50 Points)	Collect points (50 Points)	Post-test (50 Points)
7	27	38	41
8	31	41	40
9	27	35	36
10	33	44	46
11	24	33	36
12	28	37	39
13	27	36	35
14	31	41	43
15	30	40	42
16	36	47	49
17	25	33	34
18	28	38	39
19	31	41	44
20	30	39	38
21	34	44	46
22	31	40	41
23	35	48	49
24	32	43	45
25	29	38	39
26	35	46	47
27	27	35	36
28	30	40	41
29	30	39	40
30	23	30	32
amount to	901	1295	1139
$\bar{X}$	30.0	39.83	41.3
S.D.	3.50	4.73	4.50

From the table above, it can be seen that students who continued their studies adopted the 5-step learning process activities method. Its efficiency value is 39.83/41.3, and since the test scores are out of a total of 50 points, the converted efficiency is 76.67/76.83. This aligns with the efficiency of 75/75 as specified by the researchers.

2. Compare the learning achievement in the science course with the pre-test and post-



test scores of students who learned using the 5-step learning process of students.

Table 3 Results of t-test statistics and the statistical significance level of learning achieve scores between before and after studying

Pair number	item	$\bar{X}$	S.D.	D	t	p
Pair 1	Post-test (50 points)					
	Pre-test (50 points)	41.30	5.59	11.27	41.38	0.000**

* $p < 0.05$ ** $p < 0.01$

From the table above, it is evident that using paired t-tests to study the differences in experimental data, the table shows that there is one pair of data, which all present significant differences ($p < 0.05$). Specifically, the analysis reveals a significant difference at the 0.01 level between the Post-test (50 points) and Pre-test (50 points) ($t = 41.38$, $p = 0.000$), and it is noted that the average score of the Post-test (41.30) is significantly higher than that of the Pre-test (30.03). All the paired data consistently show significant differences.

3. The students' satisfaction with the 5-step learning process activities in the science course.

Table 4 Results of measuring student satisfaction with the 5-step learning process activities

List of questions	$\bar{X}$	S.D.	Description
1. I like the 5-step learning process activities, which can help me improve my study of science.	4.5	0.5	High
2. I like the 5-step learning process activities, which increase my interest in science courses.	4.63	0.48	Very high
3. I like the 5-step learning process activities, which improve my understanding of the science courses.	4.5	0.5	High
4. I like the 5-step learning process activities, which increase the interaction between teacher and student.	4.53	0.6	High

List of questions	$\bar{X}$	S.D.	Description
5. I like 5 steps learning process activities, which increase my motivation to learn science courses.	4.03	0.6	High
6. I like the 5-step learning process activities, which improve your learning efficiency.	4.67	0.47	Very high
7. I like the 5-step learning process activities, which improve my understanding of the key points and difficulties of science courses.	4.57	0.5	Very high
8. I like the 5-step learning process activities; it is suitable for science courses.	4.23	0.67	High
9. I like the 5 learning process activities; it is more effective than traditional learning.	4.37	0.55	High
10. I like the 5-step learning process activities; they improve my grades in science courses.	4.63	0.48	Very high
Total	4.47	0.53	Very high

From the table above, it is found that students who study using the 5-step learning process activities have overall satisfaction at a high level. ($\bar{X} = 4.47$, S.D. = 0.53). Analysis results are sorted by every item from highest to lowest as follows: I like the 5-step learning process activities, which improve your learning efficiency ($\bar{X} = 4.67$, S.D. = 0.47). I like the 5-step learning process activities, which increase my interest in science courses ($\bar{X} = 4.63$, S.D. = 0.48). I like the 5-step learning process activities, which improve my grades in science courses ($\bar{X} = 4.63$, S.D. = 0.48).

Conclusion

The data collection phase of this study aims to comprehensively assess the impact of the 5-step learning process activities in science courses, as well as their satisfaction. This phase adopts a structured approach to ensure the validity and accuracy of the data.

1. Preparation

Before formal data collection, several preparatory steps were undertaken, including but

not limited to:

Selection of Data Collection Tools: Based on the research objectives and the variables to be assessed, carefully designed and selected data collection tools, including achievement tests and satisfaction questionnaires.

Pre-testing of Tools: To ensure the effectiveness and reliability of the questionnaires and tests, they were subjected to pre-testing, and necessary adjustments were made based on feedback.

Selection of Study Subjects: 30 students from the third year of Anhui, Suzhou No.12 Primary School were selected as research subjects to ensure the representativeness of the sample.

2. Data Collection Methods

Data was collected through the following methods:

Achievement Tests: Achievement tests conducted at the beginning and end of the course aimed at assessing changes in students' scientific process skills.

Satisfaction Questionnaires: Satisfaction questionnaires distributed at the end of the course were used to collect feedback and satisfaction levels of students regarding the 5-step learning process activities.

Observations and Interviews: To gain a deeper understanding of students' learning, the research process also included observations of classroom activities and unstructured interviews with students and teachers.

3. Data Entry and Processing

The collected data was first entered into electronic spreadsheet software (such as Microsoft Excel) for preliminary organization. Subsequently, the software was used for detailed analysis. To comprehensively assess the effectiveness of the 5-step learning process activities.

Discussion

Through the results of the learning activities developed in the science course of Anhui, Suzhou No.12 Primary School, several important aspects of the effectiveness of these educational strategies are revealed. This paper discusses and expounds how learning activities based on the 5-step learning process development affect academic performance and student satisfaction.

1. Improve academic performance

From the research results, it was found that the 5-step learning process activities had an efficiency value of 76.67/76.83, which the researcher stated was 75/75. This study showed that students had a measurable improvement in academic performance after the

intervention. This result suggests that the 5-step learning process learning activity not only met but also exceeded the expected educational criteria, possibly due to its interactive and situational nature that may better fit the learning style of the third-year students. This is consistent with the research of Sirivi & Singlop (2017, which found that the students who study with the 5-step learning process have an efficiency of 82.64 / 84.17, which the researcher stated was 80/80. And with the research of Maneephet et al (2021), they found that the students who study with the 5-step learning process have an efficiency of 80.75/78.13, which the researcher stated was 75/75.

2. Statistical significances

The improvement in academic performance was statistically significant and a significant improvement in post-study compared to the pre-study condition at the significance level of .05. This statistical validation underscores the effectiveness of the 5 steps of the learning process in promoting better understanding and retention of course materials, which may be attributed to the immersive and relevant context provided during the learning process. This is consistent with the research of Khuha et al (2017), who found that scores after studying were significantly higher than before studying at the .05 level, with a mean score. And with the research of Sukkasem et al (2019) they found that students' scientific analytical thinking posttest scores ($\bar{X}$ = 7.48, S.D. = 2.53) were statistically significantly higher than the pretest scores at the .05 level and students' learning achievement posttest scores ($\bar{X}$ = 22.10, S.D. = 1.67) were statistically significantly higher than the pretest scores and higher than the 70 percent criteria at the .05 level.

3. Student satisfaction

Analysis found that students who studied using the 5-step learning process activities had overall satisfaction at a high level. ($\bar{X}$ = 4.47, S.D. = 0.53). Analysis results are sorted by every item from highest to lowest as follows: I like the 5-step learning process activities, which improve your learning efficiency ($\bar{X}$ = 4.67, S.D. = 0.67). I like the 5-step learning process activities, which increase my interest in science courses ($\bar{X}$ = 4.63, S.D. = 0.48). I like the 5-step learning process activities, which improve my grades in science courses ($\bar{X}$ = 4.63, S.D. = 0.48). The high overall satisfaction of students indicates that the teaching method and the content of learning activities based on the 5-step learning process are welcomed. This satisfaction may stem from the engaging and interactive nature of the learning method, which may resonate more effectively with younger students, making learning a more enjoyable and influential experience. The positive correlation between the 5-step learning process, learning activities, and academic success and students' satisfaction suggests the feasibility of this educational approach in the context of an elementary science course. These approaches provide a dynamic environment where students can link theoretical

knowledge to real-world applications, thereby improving their understanding and appreciation of the topic. The implications of these findings are profound, suggesting that combining real-life contexts with applied educational strategies can significantly improve learning outcomes. This strengthens the need for educators to consider more comprehensive and applied teaching methods that not only attract students but also improve their learning abilities and satisfaction levels. This is consistent with the research of Sirivi & Singlop (2017) found that the students' satisfaction with the learning activity set using the 5-step learning process was at the highest level ($\bar{X}$ = 4.73, S.D. = 0.46); Maneephet et al (2021) found that the students' satisfaction with learning from science learning activity. And the research of Umyart & Wutchana (2023) found that the satisfaction of students is at a higher level ($\bar{X}$ = 4.5, S.D. = 0.54).

Recommendation

Further Applications of the Research Results

Expand the 5-Step Learning Process to Other Subjects

Based on the findings that this method increases academic achievement and satisfaction, it should be adapted for use in other primary school subjects, such as mathematics, Thai language, or social studies, to test its relevance and effectiveness across diverse content contexts.

Develop learning materials that support each step.

Create media and activity sheets specifically designed for each step of the 5-Step Learning Process, such as scenario videos, experimental worksheets, or online activities, to enhance student understanding and engagement.

Apply to Blended Learning.

Use the 5-Step Learning Process in conjunction with digital technologies, such as online learning platforms, educational games, or AR/VR, to enhance engagement and create a more diverse learning experience.

Establish a Long-Term Monitoring System.

Establish a continuous evaluation system to track student progress after completing the 5-Step Learning Process, examining its long-term impact on knowledge, skills, and attitudes. Analyze factors that facilitate and hinder learning.

Provide training for teachers to develop skills in using the 5-Step Learning Process. Organize workshops to provide teachers with a deep understanding of the principles, steps, and techniques of classroom management. To ensure the continuous and consistent quality of practical implementation.



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