KNOWLEDGE AND PRACTICES OF PRIMARY TEACHERS ON SCIENCE TEACHING FOR PROMOTING STUDENTS' CRITICAL THINKING SKILLS

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Abstract

The main aim of this study is to investigate knowledge and practices of primary teachers on science teaching for promoting students' critical thinking skills. Specific aims of the research are to study the variations of primary teachers' practices on science teaching for promoting students' critical thinking skills in terms of their knowledge levels, types of school and personal factors. Quantitative and qualitative methods were used in this study. A total of one hundred and sixteen teachers were selected as subjects from fifty six schools in Paung Township, using the purposive sampling method. This questionnaire included demographic data, teachers' knowledge, and practices on science teaching for promoting students' critical thinking skills. Instrument was reviewed by a panel of experts. The reliability coefficient for the whole instrument was 0.90. Descriptive Statistics, Independent Samples *t*-test and One-Way ANOVA were utilized to analyze the quantitative data. The result found that upper primary teachers' knowledge on science teaching for promoting students' critical thinking skills were satisfactory level (50%-74%). The mean value of level of primary teachers' practices for promoting students' critical thinking skills was moderately high. There was no significant variation in any three groups of teachers with different knowledge levels for teachers' critical thinking practices. There were significant differences in the practices of promoting students' critical thinking skills among the teachers grouped by types of school and academic qualification. There were no significant differences in the practices of promoting students' critical thinking skills grouped by teaching service and position. Information from teachers' interview, observation and documentation were complementary to each other.

Keywords: primary science education, critical thinking skills

Introduction

We need citizens with problem solving and critical thinking skills to adapt to these constant changes and improve the world we live in. Students are not born with these skills. We need to create a nurturing learning environment for our students in which they get exposed to opportunities to think, inquire, discover, learn, and apply.

In a classroom, learning science needs an agreeable blend of cognitive skills through hands-on, minds-on, and hearts-on activities that help develop critical thinking habits in students (Gardner, 2008). For young students, their entire world is their laboratory; they continually seek to know, understand and question all things. Though their efforts are often fumbling, students readily search for data and want verification.

There is no better way to help students satisfy their wanting to know, the questioning and searching, than to allow them to interact with objects and events of the natural world.

Significance of the Study

Brown indicated that students can internalize critical thinking skills for problem-solving when these skills are modeled by teachers, suggesting that teachers' epistemological approach

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and instructional choices can make a difference to students' critical thinking development. However, research has indicated that teachers have intensely held epistemological views of science as a body of scientific facts to be transmitted to students. In studies examining the science teaching practices of elementary teachers in schools, teachers described themselves as facilitators of students' critical thinking and science learning; yet, their practice was more didactic and expository in nature.

Kuhn's emphasis on the value of promoting students' ability to think and critically evaluate assertions can serve all students as future citizens. Yet, teachers' competency and explicit planning for critical thinking can impact the critical thinking skill development of their students.

Aims of the Study

- To study the knowledge levels of primary teachers on science teaching for promoting students' critical thinking skills.
- To study the extent of primary teachers' practices on science teaching for promoting students' critical thinking skills.
- To study the differences of primary teachers' practices on science teaching for promoting students' critical thinking skills according to types of school and personal factors.
- To study the variations of primary teachers' practices on science teaching for promoting students' critical thinking skills in terms of their knowledge levels.

Research Questions

The research questions are as follows;

- What are the knowledge levels of primary teachers on science teaching for promoting students' critical thinking skills?
- To what extent do primary teachers practise on science teaching for promoting students' critical thinking skills?
- Are there any significant differences in primary teachers' practices on science teaching for promoting students' critical thinking skills according to types of schools and personal factors?
- What are the variations of primary teachers' practices on science teaching for promoting students' critical thinking skills in terms of their knowledge levels?

Theoretical Framework of the Study

Facione (1990) led a large effort to define critical thinking with forty-six academics recognized as having experience or expertise in critical-thinking instruction, assessment, or theory. The experts reached an agreement on the core dimensions of critical thinking: Interpretation, analysis, evaluation, inference, explanation and self-regulation.

Interpretation means being open-minded and to understand various phenomena, as well as considering different cultural or individual perspectives that can shape each phenomenon. This requires embracing multiple views simultaneously in order to understand the different perspectives on a phenomenon.

Analysis refers to identifying stated and unstated relationships between ideas from different sources in order to evaluate information and evidence, gain different perspectives, or to solve problems.

Evaluation is used to determine if a stated or unstated statement or argument is valid. This is done by looking at the evidence and taking into account different perspectives and relationships between the statements.

Making inferences is being aware of unstated or stated views and to be able to use these views to form conclusions, hypotheses, or judgments.

Explanation is demonstrating one's thoughts in a rational manner, providing clarity and accuracy, so that these thoughts cannot be misinterpreted.

Finally, **self-regulation** refers to monitoring one's own thoughts, being aware of personal biases, and understanding the reasoning behind one's own thinking.

Piaget and his colleagues supported by other researchers found that children pass through for qualitatively different stages of mental or cognitive development (Carin & Sund, 1989).

1. Sensorimotor stage (0-2 years)
2. Preoperational stage (2-7 years)
3. Concrete- operational stage (7-11 years)
4. Formal- operational stage (11-14+ years)

Among these four stages, the upper primary students are concrete-operational stage. In this stage the children can now perform logical operations. They can observe, judge, and evaluate in less egocentric terms than in the preoperational stage, and they can formulate more objective explanations. As a result, they know how to solve physical problems. Because their thinking is still concrete and not abstract, they are limited to problems dealing with actual concrete experiments. They cannot generalize, deal with hypothetical situations, or weigh possibilities. They are capable of decentralization, which means that they no longer "centers" their thinking on just one property or aspect of an object, but can now "centers" on two or more at one time. They can now understand multiple relationships and can combine parts into a whole.

They acquire good motor skills and can move objects around to make them fit property. They can make multiple classifications and they can arrange objects in long series and place new objects in their proper place in the series. They begin to comprehend geographical space and historical time. They develop the concepts of conservation according to their ease of learning: first, numbers of objects, then matter, length, area, weight, and volume, in that order. They also develop the concept of reversibility and can now reverse the physical and mental processes when numbers of objects are rearranged or when the size and shape of matter are changed.

Definition of Key Terms

(1) Knowledge

Knowledge is a generic form of knowledge that is involved in all issues of student learning, classroom management, lesson plan development and implementation and student evaluation (Koehler, 2011).

(2) Practice

Practice is the wide range of individual activities, policies, and programmatic approaches to achieve positive changes in student attitudes or academic behaviors (EOA center).

(3) Critical Thinking

Critical thinking is the ability to think clearly and rationally about what to do or what to believe (Facione, 2000).

Operational Definitions

Knowledge of primary teachers on science teaching for promoting students' critical thinking skills is the upper primary teachers' knowledge on the nature of children, science teaching and basic understanding of essentials for promoting students' critical thinking skills.

Practices of primary teachers on science teaching for promoting students' critical thinking skills are the essential conditions, materials, and activities for promoting students' critical thinking skills.

Methodology

Quantitative Methodology

Sample

There are 116 primary teachers who have experience in science teaching from Basic Education Schools in Paung Township, Mon State by using purposive sampling method.

Table 1 Demographic information about the respondents

Variables	Group	No. of respondents
Teaching Service	1-10	45
	11-20	30
	21 and above	41
Position	P.T	63
	J.T	53
Qualification	BA	64
	BSc	52
Types of School	Primary	104
	Middle	6
	High	6

Instrumentation

A three-part questionnaire was constructed for the study. The first part is to collect the demographic information concerning types of school, teaching service, position and academic qualification.

The second part is teachers' knowledge. The questionnaire consisted of 25 items (True/ False, Matching, Multiple-choice) for knowledge of primary teachers on science teaching for promoting students' critical thinking skills.

The third part is practices of primary teachers on science teaching for promoting students' critical thinking skills. This section consists of thirty-two items. These items are assessed on a five-point likert scale with anchors that read, 'Never', 'Rarely', 'Sometime', 'Often' and 'Always'.

Open-ended questions on teacher's knowledge and practices for critical thinking skills were part of the larger survey instrument measuring.

Instrument Validity: In order to obtain the content validity for questionnaire, expert review was conducted by nine experienced educators, who have special knowledge and close relationship with this area, from the Department of Educational Theory.

Instrument Reliability: According to the test of pilot study, the reliability coefficient (Cronbach's alpha) were 0.90 for teachers' practices on science teaching for promoting students' critical thinking skills questionnaires.

Procedure

After receiving permission from the Director General (Education) of DBE (Department of Basic Education), the questionnaires were distributed to the schools between 29th October, 2018 and 1st November, 2018. Distributed questionnaires were recollected by the research after one week later and were completely answered.

Data Analysis

The data were analyzed using the Statistical Package for the Social Science (SPSS) software version 24. Descriptive, one-way ANOVA and independent samples *t*-test were used to examine the responses. Primary teachers' knowledge for promoting students' critical thinking skills were determined by using Item Percent Correct (IPC) value of each item included in the questionnaire and average score percent.

Qualitative Methodology

According to the related literature review, three open-ended questions were administered in order to obtain in-depth information about teachers' knowledge and practices on science teaching for promoting students' critical thinking skills. Reliability and content validity was taken as in quantitative method.

Findings

Research findings are presented by using descriptive statistics: means and standard deviations, independent samples *t*-test and one-way ANOVA. Teachers' responses to open-ended questions were also presented.

1. Teachers' Knowledge Level on Science Teaching for Promoting Students' Critical Thinking Skills

In scoring these items intended for investigating teachers' knowledge on promoting students' critical thinking skills, 1 mark was given for one correct answer.

Table 2 IPC (Item Percent Correct) Values Showing the Participant Teachers' Knowledge on the Nature of Primary Children (True-False Items) (N=116)

No	Items	Number of Correct Participants	IPC
1	Can perform logical operations.*	108	93.1%
2	Do not know the law of conservation.	41	35.3%
3	Are unable to manipulate the things well.	60	51.7%
4	Believe only when they see and touch everything themselves.*	93	80.2%
5	Teachers should take into account each student's prior knowledge and interests.*	116	100%
6	Teachers should not be taught the processes in which they can think critically what to study the things in their environment.	113	97.4%
7	Having children carry out the practical activities and group discussion induce advantages.	115	99.1%
8	Link science with students' developmental stages.*	115	99.1%
9	Reduce students' interests for linking science lessons with the daily life.	116	100%
10	Make students interested in natural process and form habits of observation.*	115	99.1%
11	Make students appreciate and maintain the environment.*	115	99.1%
12	Teach students to apply the knowledge of personal and family hygiene to daily activities.*	115	99.1%
13	Do not create a safe environment where students feel comfortable challenging each other's ideas.	114	98.3%

Note: * = correct items

Table 3 Numbers and Percentages of Participant Teachers Showing Knowledge Levels on the Nature of Primary Children (N=116)

Variable	No. of Teacher (%)	Remark
Teachers' Knowledge Level	112 (97%)	Above satisfactory Level
	4 (4%)	Satisfactory Level
	0 (0%)	Below satisfactory Level

Scoring Range: <50%=below satisfactory 50%-74%=satisfactory level ≥75%=above satisfactory

Table 4 IPC (Item Percent Correct) Values Showing the Participant Teachers' Knowledge on Critical Thinking Skills (Matching Items) (N=116)

No.	Items	Number of Correct Participants	IPC
1	Interpretation is the ability to understand various phenomena.	24	20.7%
2	Analysis refers to identifying stated and unstated relationships between ideas from different sources.	44	37.9%
3	Evaluation is used to determine if a stated or unstated statement is valid by looking at the evidence.	47	40.5%
4	Inference is being able to use these views to form conclusions, hypotheses, or judgments.	32	29.3%
5	Explanation is demonstrating one's thoughts in a rational manner, providing clarity and accuracy.	52	44.8%
6	Self-regulation refers to monitoring one's own thoughts, being aware of personal biases.	64	55.2%

Table 5 Numbers and Percentages of Participant Teachers Showing Levels of Knowledge for Critical Thinking Skills (N = 116)

Variable	No. of Teacher (%)	Remark
Teachers' Knowledge Level	8 (7%)	Above satisfactory Level
	52 (45%)	Satisfactory Level
	61 (53%)	Below satisfactory Level

Scoring Range:
<50%=below satisfactory 50%-74%=satisfactory level ≥75%=above satisfactory

Table 6 IPC (Item Percent Correct) Values Showing the Participant Teachers' Knowledge on Science Teaching Strategies (Multiple-Choice Items) (N=116)

No	Items	Number of Correct Participants	IPC
1	Having children make the groups according to the number of petals by giving them the flowers having different numbers of petals.	46	39.7%
2	Having the children predict the possible dangers of water pollution after it is taught.	13	11.2%
3	Having children think what will happen when air is blown into the plastic bag, close it and then press any place of the air bag.	28	24.1%
4	Having children record and describe the rate of air within one week by graph.	45	38.8%
5	Having children study what happens if ice is heated and discuss the need of heat energy to change from solid to liquid.	22	19%
6	In teaching about the different parts of a plant, having children bring the plants growing around the school and retell different parts of these plants.	25	21.6%

Table 7 Numbers and Percentages of Participant Teachers Showing Levels of Knowledge on Science Teaching (N = 116)

Variable	No. of Teacher (%)	Remark
Teachers' Knowledge Level	2 (2%)	Above satisfactory Level
	23 (20%)	Satisfactory Level
	91 (79%)	Below satisfactory Level

Scoring Range: <50%=below satisfactory 50%-74%=satisfactory level ≥75%=above satisfactory

Table 8 Numbers and Percentages of Participant Teachers Showing Levels of Overall Knowledge for Promoting Students' Critical Thinking Skills (N=116)

Variable	No. of Teacher (%)	Remark
Overall Teachers' Knowledge	4 (4%)	Above satisfactory Level
	107 (92%)	Satisfactory Level
	5 (4%)	Below satisfactory Level

Scoring Range: <50%=below satisfactory 50%-74%=satisfactory level ≥75%=above satisfactory

2. Upper Primary Teachers' Practices on Science Teaching for Promoting Students' Critical Thinking Skills

Table 9 Mean Values and Standard Deviations of Primary Teachers' Practices for Promoting Students' Critical Thinking Skills (N=116)

Variables	Mean	SD	Remark
Interpretation	3.93	.48	moderately high
Analysis	3.72	.66	moderately high
Evaluation	4.17	.48	moderately high
Inferences	4.03	.64	moderately high
Explanation	4.07	.54	moderately high
Self-Regulation	4.01	.60	moderately high
Overall Teachers' Practices	**3.98**	**.46**	**moderately high**

Remark: 1.00-1.49=very low 1.50-2.49=moderately low
2.50-3.49=satisfactory 3.50-4.49= moderately high 4.50-5.00=high

3. Differences in Primary Teachers' Practices on Science Teaching for Promoting Students' Critical Thinking Skills Grouped in terms of the Demographic Data

First of all, the mean values and standard deviations of primary teachers' practices for promoting students' critical thinking skills grouped by their types of school.

Table 10 Mean Values and Standard Deviations of Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Types of School

Variable	Types of School	Mean	SD
Overall teachers' Practices	Primary	4.04	0.50
	Middle	3.51	0.45
	High	3.49	0.43

Scoring Direction: 1.00-1.49=never 1.50-2.49=seldom 2.50-3.49=sometimes
3.50-4.49=often 4.50-5.00=always

It can be analyzed that Basic Education Primary and Middle Schools teachers group were found as ***often practiced*** and Basic Education High School teachers group was found as ***sometimes practiced*** in the overall critical thinking practices.

Table11 One-Way ANOVA Results Showing Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Types of School (N=116)

Variable		Sum of Squares	*df*	Mean Square	*F*	*p*
Teachers' Practices	Between Groups	3.10	2	1.55	8.20	.000***
	Within Groups	21.34	113	.19		
Total		24.43	115			

Note: ***p<.001

Table 12 Tukey HSD of Teachers' Practices on Science Teaching for Promoting Students' Critical Thinking Skills Grouped by their Types of School (N=116)

Variable	(I) Group	(J) Group	Mean Difference (I-J)	*P*
Overall Teachers' Practices	Primary	Middle	.526*	.013*
		High	.547*	.009*

Note: *p<.05

As shown in Table 12, Tukey test shows that primary teachers differ significantly from middle and high teachers in the teachers' practices for promoting students' critical thinking skills classified by their types of school.

Table 13 Mean Values and Standard Deviations of Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Teaching Service (N=116)

Variables	Service	Mean	SD
Overall Teachers' Practices	1-10 years	3.94	0.50
	11-20 years	3.98	0.45
	21 years and above	4.09	0.43

Scoring Direction: 1.00-1.49=never 1.50-2.49=seldom 2.50-3.49=sometimes 3.50-4.49=often 4.50-5.00=always

All three groups of teachers perceived as having ***often practiced*** mentioned in this study.

Table 14 One-Way ANOVA Results Showing Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Teaching Service (N=116)

Variable		Sum of Squares	*df*	Mean Square	*F*	*P*
Teachers' Practices	Between Groups	.33	2	.17	.78	n.s
	Within Groups	24.10	113	.21		
Total		24.43	115			

Note: n.s=not significant

Table 15 Mean Values and Standard Deviations of Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Position (N=116)

Variables	Position	Mean	SD
Overall Teachers' Practices	JT	4.03	.41
	PT	3.94	.50

Scoring Direction: 1.00-1.49=never 1.50-2.49=seldom 2.50-3.49=sometimes 3.50-4.49=often 4.50-5.00=always

It can be said that all two groups of teachers perceived as having often ***practiced*** mentioned in this study.

Table 16 Independent Samples *t*-Test Results Showing Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Position (N=116)

Variable	Position	*t*	*df*	*p*
Overall Teachers' Practices	JT	1.13	114	n.s
	PT			

Note: n.s=not significant

Next, the mean value and standard deviations of teachers' practices according to their academic qualification are shown in Table 17.

Table 17 Mean Values and Standard Deviations of Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Academic Qualification (N=116)

Variables	Qualification	Mean	SD
Overall Teachers' Practices	BA	4.09	.46
	BSc	3.84	.43

Scoring Direction: 1.00-1.49=never 1.50-2.49=seldom 2.50-3.49=sometimes 3.50-4.49=often 4.50-5.00=always

It can be said that all two groups of teachers perceived as having often ***practiced*** mentioned in this study.

Table 18 Independent Samples *t*-Test Results Showing Primary Teachers' Practices for Promoting Students' Critical Thinking Skills Grouped by Academic Qualification (N=116)

Variables	Qualification	*t*	*df*	*P*
Overall Teachers' Practices	BA	3.04	114	.003**
	BSc			

Note: ***p*<.01

4. Investigating Upper Primary Teachers' Practices on Science Teaching for Promoting Students' Critical Thinking Skills in terms of Their Knowledge Levels

Mean values and standard deviations based on teachers' responses of upper primary teachers' practices on science teaching for promoting students' critical thinking skills ranked by their knowledge levels were shown in Table 19.

Table 19 Mean Values and Standard Deviations of Teachers' Critical Thinking Practices Grouped by Knowledge Levels (N=116)

Variable	Group	Mean	SD
Overall Teachers' Practices	Group 1	4.02	.50
	Group 2	3.99	.46
	Group 3	3.82	.46

Group 1 = Groups of teachers who are in above satisfactory level
Group 2 = Groups of teachers who are in satisfactory level
Group 3 = Groups of teachers who are in below satisfactory level

Scoring Range: 1.00-1.49=never 1.50-2.49=seldom 2.50-3.49=sometimes 3.50-4.49=often 4.50-5.00=always

The data in Table 19 informed that teachers from Group 1, 2 and 3 were perceived as ***often practiced*** with mean values between 3.50 and 4.49 in the overall teachers' practices.

Table 20 ANOVA Results of Teachers' Critical Thinking Practices Grouped by Knowledge Levels (N=116)

Variable		Sum of Squares	*df*	Mean Square	*F*	*P*
Teachers' Practices	Between Groups	.142	2	.07	.33	n.s
	Within Groups	24.29	113	.22		
	Total	24.43	115			

Note: n.s=not significant

There was no significant variation any three groups of teachers with different knowledge levels for teachers' critical thinking practices.

Qualitative Research Findings

In qualitative studies, the selected teachers were asked open-ended questions.

The upper primary teachers responded how to teach for improving students' critical thinking skills on science teaching as follow;

- give opportunities to do hands-on activities, small group discussion and investigation (n=54, 47%)
- use teaching aids to recognize the lessons confirmedly (n=37, 32%)
- encourage students' inquiry by asking thoughtful and open-ended questions (n=33, 29%)
- link lessons with the daily life to improve the interesting of the children (n=34, 29%)

The upper primary teachers responded the impact of critical thinking on student achievement;

- Seek reasons (N=18, 16%)
- Take into account the total situation (N=12, 10%)
- Take a position (and change a position) when the evidence and reasons are adequate to do so (N=7, 6%)
- Self-confidence – trusting one's reason ability (N=30, 26%)
- Deep understanding of the topics they study and apply in real-world situation (N=57, 49%)
- Promote empathy in his thinking processes (N=12, 10%)
- Improve their creative ideas (N=20, 17%)

The upper primary teachers responded difficulties in taking action teachers for students' critical thinking in science;

- did not have enough teaching aids, time and large class size to do hand-on activities and to discuss relevant lessons (n=70, 60%)
- Adjusting the individual differences and low intelligence, teacher-pupils ratio (n=36, 31%)
- Need to the parents supports (n=7, 6%)

Discussion

In examining the extent of primary teachers' overall knowledge on science teaching for promoting students' critical thinking skills, there is 4% of the participant teachers have above satisfactory level, 92% of the participant teachers have satisfactory level and 4% of the participant teachers have below satisfactory level. So, overall knowledge of the participant teachers has satisfactory level for promoting students' critical thinking skills. It can be interpreted that teaching and learning science in primary classrooms often focus on content knowledge as determined by the teachers, use of closed questions, a method that provides less opportunities for interaction with students (Appleton, 2003, cited in Musikul, 2007).

According to research finding, teachers perceived that all items were ***often*** practiced because the total mean value and standard deviation were 3.98 and 0.46. According to qualitative finding, most of the primary teachers used teacher-led discussions, whole lecture and demonstration by science activities. When doing experiment, teachers can give a little chance of all students to do experiments because of time, large class-size and lack of teaching aids.

The variations of primary teachers' practices on science teaching for promoting students' critical thinking skills by types of school are that group of teachers in primary schools has the highest mean value (4.04) and SD (0.31) in all area for promoting students' critical thinking skills. Tukey test also shows that primary school teachers differ significantly from middle and high school teachers. So, it can be noted that teachers in primary schools do the most practice among three groups for students' critical thinking skills. It can be observed that the headmasters in primary schools supervised the school work and their staff at only primary level. So, they practice their teachers to use teaching methods to promote students' critically in science teaching. And it was observed that those schools give more opportunities for students to experiment, explore, manipulate, observe and invent than other schools.

The variation of primary teachers' practices on science teaching for promoting students' critical thinking skills by teaching service are that all three groups of teachers perceived as having ***often practiced*** in all categories of critical thinking. ANOVA result indicated that no significant difference was found. It can be interpreted that they may be active and may give attention for their students' critical thinking.

The variation of primary teachers' practices on science teaching for promoting students' critical thinking skills by position are that two groups of teachers perceived as having ***often teaching practiced***. According to observation, it can be interpreted that JT teachers group could perform more than PT teachers group in critical thinking practices. Because they may get a lot of experiences from their job and update their skills and knowledge throughout their careers by the process of professional development.

There was significant difference in promoting students' critical thinking skills among the group of BA teachers and the group of BSc teachers in the area of academic qualification. It was found that primary teachers who earn BA could perform more than teachers who earn BSc in critical thinking practices. Teachers who earn BA remarked that in order for a critical thinking methodology to be realized in the classroom, the teacher must create an environment that supports thinking and learning. They discussed small group work, instead of rows. This allows students the opportunity to talk and discuss concepts amongst themselves.

Recommendations

As all stakeholders concerned with education, the aspects that should be realized for promoting students' critical thinking skills systematically and successfully are reported as follows:

- Before teaching, teachers should understand the nature and developmental stages of children.
- Teachers should give opportunities to their students to do experiments and discussion. And they also should more emphasize the teaching of science process skills and critical thinking skills.
- Teachers should give enough time and support to the students for their experiment.
- Material resources and teaching aids should be used in classroom with the aim of ensuring that all pupils have appropriate opportunities to use the required resources and teaching aids during science lessons.
- There should be fairly arranged the class size so that they would enable to provide individualized attention to students and adapt the focus to best serve the students' interest and specific learning.
- They also developed skillful lesson plans that fostered thinking skills in their teaching and helped students to develop more effective ways to use their minds.
- Primary teachers in science teaching should read knowledgeable books to promote students' critical thinking skills.
- Teachers need to take appropriate pedagogical training program regarding teaching critical thinking skills. Not only had to learn the science practices as practiced by the scientists but as an effective citizen in their daily lives.

Needs for Further Study

This study investigated knowledge and practices of primary teachers on science teaching for promoting students' critical thinking skills at the upper primary level in Paung Township, Mon State. It is necessary to conduct that study in all levels as well as in other states and regions to represent the whole country. Further research and analysis could be needed to clarify the effects of applying critical thinking classroom and teaching-and-learning activities in science learning, as well as the effects of using science topics for improving students' critical thinking.

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