

Analytical Thinking Development in Early Childhood with Environmental Science Activities

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Abstract

This research has an objective for studying the development of analytical thinking with providing experimental science activities in early childhood. Samples are 15 pre-school children (2nd Grade Kindergarten) of semester 1, year 2016 from Koh Sieng Wai School that affiliated with Saraburi Primary Educational Service Area Office 1 (small school) by using Purposive Sampling technique. A form of Learning Experience Plans of Analytical Thinking for Teachers, Analytical Thinking Test of Pre-School Children 2nd Grade Kindergarten, a Quality Assessment of Analytical Thinking Development Plan are studied. The statistical techniques as followed: Mean, Standard Deviation, T-test (Dependent Sample) were used

From the results found that:

1. Overall, the analytical thinking ability level of both classification and correlation analysis in early childhood before obtained the experimental science activities are higher.
2. Comparison of analytical thinking ability in early childhood with experimental science activities is significantly different at .05, that is in line with proposed assumptions.

Keywords: Analytical thinking, Experimental Science Activities

Background and the Problem Significance

Asa National Education Act of B.E. 2542 (1999) – in articles 22 – 30 that focused on education; it must be based on the importance of the learner. Educational management have to naturally develop and fully potential encourage learners, especially, all educational institutions have to adapt the learning process to be a desirable learning process, that is, an intellectual process that develops people throughout their life. Creating Teaching and learning program in accordance with the children' interests and aptitudes. Practicing them an analytical thinking skill from direct experience. Instilling virtue into them and providing suitable environment for learning (Office of the National Education Commission. 2005: 12). Thus, early childhood education for first 6 years' children is an education for take care, and encourage them to be potentially developed by correctly and clearly learning (Khunlaya Tuntipalachiva. 2004:1). Therefore, based on the principle of educational management, there is a curriculum that focuses on all aspects of child development including physical, emotional, psychological, social and intellectual based on the existing experiences that children have. The new experience which is consistent with age and differences between individuals. Allowing a learning

process that responds to nature, and the development of children according to potential balance in all approach (Department of Curriculum and Instruction Development. 2003: 1).

Providing an experimental science activities is a process of encouraging children to be curious about surrounding environment. Because everything around them is composed of physical abstract notion; that is practiced by observing, trying out, and wondering or asking about science experience that early childhood should be obtained in everyday life. Prasart Nuang-chalerm (2003: 46) said that; the use of scientific teaching methods in early childhood learning will encourage children to thinking systematically, and they will use the science experimental skill to activate their learning skill, and perfectly permit all aspects of their progress potentially.

As importance and mentioned above, the researcher is interested in providing experimental science activities measure (outside) to develop an analytical thinking in early childhood. By focusing on practicing, trying out by themselves – the analytical thinking in early childhood will be activated. They can divide, consider, explain, classify all of elements that is a good basic for children in a higher education level following a National Education Act of B.E. 2542 (1999) further.

Research Objectives

1. Overall, from using experimental science activities, the analytical thinking ability level of both classification and correlation analysis in early childhood are higher.
2. Comparison of analytical thinking ability in early childhood with experimental science activities is significantly different at 0.05, that is in line with proposed assumptions.

Definitions of specific terms

1. **Experimental Science Activities** is the process of organizing learning experiences for pre-school children - by allowing students to study outside the classroom, to learn the environment outside the classroom purposefully. Moreover, children gain more directly real-world experience that may concern about analytical thinking in both classification and correlation analysis.

2. **Analytical Thinking Ability in Early Childhood** is an ability of basic element classifying, identifying information differences and similarities, that was divided into 2 types as:

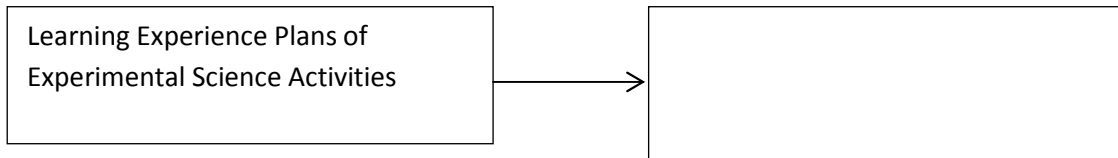
2.1 Classification is an ability of classification in the same things from considering, observing, and comparing. For example, classifying the type of fruit, stationery, or maybe toy, etc.

2.2 Correlation Analysis is a causation ability in classifying, analyzing, comparing, considering, and realizing all factors.

3. **Early Childhood** means boy-girl students between the ages of 5 and 6 years that are being in the 2nd Grade of Kindergarten.

Research Framework

Independent Variable Dependent Variables



Method

Populations and Samples

Populations in this research are 67 pre-school children (2nd Grade Kindergarten) from Wiharn Dang Kao Na School Cluster that affiliated with Saraburi Primary Educational Service Area Office 2.

Samples are 15 pre-school children (2nd Grade Kindergarten) of semester 1, year 2016 from Koh Sieng Wai School that affiliated with Saraburi Primary Educational Service Area Office 2 (a small school) by Purposive Sampling.

Instrumentation consists of:

1. Learning Experience Plans - Analytical thinking by using 24 experimental science activities, and there is 40 minutes for practicing in each activity as followed:

2. Analytical Thinking Test

Creating and Searching for Quality Tools

1. Creating Learning Experience Plans of Analytical Thinking

1.1 Calculate an index of Item Objective Congruence and rectifying a learning experience plans of analytical thinking with providing experimental science activities according to a professional specialist instruction (IOC = 1.00).

1.2 A professional specialist estimate the learning experience plans of analytical thinking. The results are considered from a consensual average score according to professional specialists' agreement as followed:

| | | |
|-----------|------|-------------|
| 4.50-5.00 | mean | "Very Good" |
| 3.50-4.49 | mean | "Good" |
| 2.50-3.49 | mean | "Moderate" |
| 1.50-2.49 | mean | "Bad" |
| 1.00-1.49 | mean | "Very Bad" |

There is an average between 4.00 - 4.80.

2. Creating Analytical Thinking Test in Early Childhood

2.1 Study associated articles and a lot of research about the test creation as followed:

2.2 Create an analytical thinking picture-based questionnaire with 3 choices that is divided into 2 set as:

- 1) 10 articles of Classification set
- 2) 10 articles of Correlation Analysis set

2.3 Create a handbook for conducting an analytical thinking questionnaire for pre-school children in accordance with each created questionnaire set.

2.4 Submit the questionnaire to 5 professional specialists (as in 1.5) for calculating a validity value of the questionnaire by submitting them an analytical thinking questionnaire.

2.5 Calculate an index of Item Objective Congruence of analytical thinking questionnaire that was qualified from professional specialist; found that, both the 1st questionnaire "Classification", and the 2nd questionnaire "Correlation Analysis" have an index of Item Objective Congruence at 0.80 – 1.00.

2.6 The improved analytical thinking test is applied with 30 kindergartens grade 2 who are not the samples. The results are quality analyzed for each item. The test that has difficulty index (p) between 0.20 – 0.80 and discrimination value (r) more than 0.20 is selected. From the results, quality for each item of the 1st set of analytical thinking test (classification) has difficulty index (p) between 0.30 – 0.66 and discrimination value (r) between 0.28 – 0.56. The 2nd set (correlation) has difficulty index (p) between 0.38 – 0.64 and discrimination value (r) between 0.26 – 0.52.

2.7 Calculate a reliability value of both qualified analytical thinking questionnaire set by using Kuder – Richardson formula (KR-20) (Luan Sai-yod; and Angsana Sai-yod. 1995: 197 – 498); found that, the 1st questionnaire "Classification", and the 2nd questionnaire "Correlation Analysis" have a reliability at 0.86, and 0.84, respectively.

3. Creating a quality assessment of analytical thinking development plan

3.1 Creating a quality assessment of analytical thinking development plan is a questionnaire of satisfaction survey about suitability of quality assessment of analytical thinking development plan in 5 levels of Rating Scale as:

| | |
|--------|-------------------|
| Level5 | means "Very Good" |
| Level4 | means "Good" |
| Level3 | means "Moderate" |
| Level2 | means "Bad" |
| Level1 | means "Very Bad" |

3.2 Submit a quality assessment of analytical thinking development plan that the researcher created to 5 professional specialists for calculating an Index of Item Objective Congruence (IOC); found that, the questionnaire has a IOC value at 0.08 – 1.00.

3.3 Rectifying a quality assessment form of learning experience plans and analytical thinking development according to professional specialist instruction.

Statistics of data analysis

In this research, the researcher used statistics for data analysis as followed:

1. Basic Statistics are:
 - 1.1 Percentage
 - 1.2 Mean
 - 1.3 Standard Deviation
2. The statistical techniques that were used for searching quality of tools are:
 - 2.1 Calculating an Index of Item Objective Congruence: IOC, by using average value
 - 2.2 Calculating an Index of Reliability Value of Kuder – Richardson formula (KR-20)(Luan Sai-yod; and Angsana Sai-yod. 1995: 197 – 498).
3. The hypothesis is tested by statistical technique:
 - 3.1 T-test value

The Results of Data Analysis

1. Analytical results - level of analytical thinking ability of pre-school children that were obtained the experimental science activities.

Table 1 Levels of Analytical Thinking Ability of Pre-School Children with Experimental Science Activities.

| Analytical Thinking Skills | Pre-Study | | | | | Post-Study | | |
|----------------------------|-----------|----|-------------|------|-------|-------------|------|-------|
| | n | K | \bar{x}_1 | S.D. | Level | \bar{x}_2 | S.D. | Level |
| Classification | 15 | 10 | 4.53 | 0.51 | Low | 8.60 | 0.50 | High |
| Correlation Analysis | 15 | 10 | 4.60 | 0.50 | Low | 8.80 | 0.41 | High |
| Total | 15 | 20 | 9.13 | 0.91 | Low | 17.40 | 0.50 | High |

Table 1 showed level of analytical thinking ability of pre-school children is higher after using learning experience plans with experimental science activities.

2. Comparison result of analytical thinking ability in early childhood with experimental science activities

Table 2 Comparison of Analytical Thinking Ability in Early Childhood

n=15

| Analytical Thinking Skills | | S.D. | t |
|----------------------------|------|------|--------|
| Classification | 4.06 | 0.88 | 17.82* |
| Correlation Analysis | 4.20 | 0.56 | 29.02* |
| Overall | 8.26 | 1.16 | 17.40* |

* Significantly Different at .05

From Table 2 Comparison of Analytical Thinking Ability in Early Childhood in all approaches are significantly different at .05.

Conclusion, Discussion, and Suggestion

1. Level of analytical thinking ability in early childhood is higher in both classification and correlation analysis.
2. Comparison of analytical thinking ability in early childhood in all approaches are significantly different at .05, that is in line with proposed assumptions.

Results and Discussion

From development of analytical thinking with experimental science activities, there is some point to be discussed as followed:

2. Levels of analytical thinking ability of pre-school children is in higher level, both in Classification and Correlation Analysis. In order that, it may cause from providing directly experimental activity that the children interact with real-objects, or real-stuffs, to improve their learning skill. Children will observe and solve the problems they face with. They use 5 senses for learning or moving, it may take time of realizing what they have done. Thus, giving them an opportunity joining in an entertaining experience science activities that focused on 5 senses performance to survey, try out, and observe; every week, they have tried out in all activities we provided, it made them interested and studied what they need to know from source of knowledge, environment around them, or any places outside their classroom. Children were excited and wondered in anything they have known or seen, they asked their teacher all the time of learning. Therefore, this causes a higher level of children' analytical thinking ability, that is in line with the research of Ladawan Deesom (2003: 59); it was written that, an activity that giving children a chance to try out by themselves is an activity that children experience the real-world that can develop their analytical thinking skill directly.

2. Comparison of analytical thinking ability in early childhood in all approaches are significantly different at .05, that is in line with proposed assumptions. So that, there is some point to be discussed as:

2.1 Analytical Thinking Ability in Classification

The result of studying an analytical thinking in Classification is higher than pre-study score. So that, maybe providing an experience science activities can activate children' analytical thinking ability and classification, from trying out by themselves, they can classify objects that is in line with the research of Lamduan Punsuntiar(2002: Abstract); that studied the result of providing directly experiment by doing project that affect in science process for early childhood skill. From the result found that, pre-school children, before and after providing experimental project that affect to science process are significantly different at .01. Overall, pre-school children after providing experimental project have a scientific skill higher than before. Moreover, it is in line with the research of Preeyawat Noi-klai(2010: 53); that studied about early childhood' analytical thinking skill that received an activity of playing game by image study providing, from the result found that; after playing the game, an analytical skill value is significantly higher than before playing at .01. On the other hand, Correlation Analysis, after joining in experimental science activities is significantly different at .05. In order that, maybe providing an experimental science activities can encourage children in analytical thinking, comparing a correlation in various matters, for example, where the sunlight comes from, why clothes we washed were faster dried in the sun, or is the air around us? The children have tried out and found the truth by themselves that is in line with the research of Pitakchart Suwantrai(2001:48 – 50); that studied about providing activities outside the classroom to develop spatial ability in early childhood ages between 5 – 6 years. From the result found that, the spatial ability in early childhood after joining an outside classroom activity is higher; when considering in each approach found that, identifying an object position that related to them is significantly different at .05.

Suggestion

Suggestion for Application

1. Providing activities for analytical thinking development should include various activities that suitable for pre-school children experience.

3. Teachers should have more important role for prepare and encourage children to be more enthusiastic in basic skills. Teacher observes children behavior from answering questions, sharing their opinion, and is ready for learning together with them.

Suggestion for Further Research

1. Levels of analytical thinking in early childhood with other activities should be considered; such as story-telling, or doing project, etc.

2. The result of learning experience plans asexperimental science activities should be considered,for example, language and communication skills in early childhood.

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