Effect of 5P model on mathematics achievement and mood

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Abstract. This study examined significant changes on the mathematics achievement and mood of Grade 9 students after the intervention of the 5P model and 5E model with an experimental group and control group, respectively. The 5P model is an integrated between educational neuroscience and research-based learning. In total, 77 out of 411 Grade 9 students were purposively selected from high school located in Buriram province, Thailand. The sample comprised of 38 students of the experimental group and 39 students of the control group for randomized pretest-posttest control group design. One-way analysis of variance is utilized for analysis of variance. The findings revealed that the effect of 5P model was found be greater compared to the 5E model.

1. Introduction

To date, teaching model is continuously developed for improved student learning outcomes. Neurocognitive-based Model (5P model) of teaching is design and is integrated research-based learning (RBL) and educational neuroscience (EN) for enhancing learning outcomes, too [4]. Moreover 5P model is the innovative teaching model and is produced for educational reform in 21st century. Consequently 5P model are recognized as important model of teaching to prove student learning outcome and has should become the new teaching model of student’s learning process.

2. Significant of the Study

Despite its 21st innovative teaching model, little research has study the effect of 5P model, and only a few study have research the effect of 5P model. For example, S sanit, T Bunterm, T Nethanomsak, and T K Ngang study a comparative study of the effects of 5P model and 5E model on learner’s attention, working memory, and mood [6], they study the effect of 5P model on academic achievement, creative thinking, and research characteristics [7]. Both research study the effect of 5P model on only science content knowledge. Moreover mood is the important factor as the effect on learning information processing for all phrase [1]. Consequently researcher should study the effects of 5P model on the mathematics achievement and mood. To date, this research aimed to examine the effect of 5P model on mathematics achievement and mood for proving the effect of 5P model.
3. Conceptual Framework

5E model is the instruction model used by control group. This 5E model is supported by the Institute for the Promotion of Teaching Science and Technology (IPST) in standard classroom, Thailand [3]. 5E model is consisted of 5 phases namely engage, explore, explain, elaborate, and evaluate. The 5E model allows teachers and learners to experience common activities, build on prior knowledge and experience, construct meaning, and continually assess their understanding of a concept.

5P model is constructed with integrated RBL and EN. RBL can enhance the academic achievement, promote learning on how to learn and construct the new knowledge by one’s self. These capabilities are essential for education in the 21st century [5]. EN is interdisciplinary science and have a role to play in education reform [9]. Consequently 5P model is emerged from integrated RBL and EN for educational reform [5]. It covers 5 main phases namely persuasion, planning, performance, production, and presentation [6]. S sanit T Bunterm T Nethanomsak and T K Ngang report that 5P model can enhancing science achievement, attention, working memory, mood, creative thinking, and research characteristic but none research study the effect of 5P model on mathematics achievement. This research study to comparative the effects of the 5P model and 5E model on mathematics achievement and mood.

![Figure 1](image_url)

**Figure 1** the effects of the 5P model and 5E model on mathematics achievement and mood

4. Aim of the Study

5P model should be generally used and studied the effects on the mathematics achievement and mood. This study aimed to examine the effect of 5P model on mathematics achievement and mood.

5. Research Methodology

5.1. Sample of this Study

Researcher utilized the randomized pretest-posttest control group design. The randomly select sample consisted of 77 from 411 Grade 9 students in twelve classes in a high school located in Buriram province, Thailand during the second semester of 2015 academic year. The 77 sample were divided into two group consisting of 38 student in the experimental group (5P model) and 39 student in the control group (5E model).

5.2. Research instrument

Research instruments were two type of tests used: mathematics content knowledge test (40 item) and Bond-Ladder visual analogue scale (16 item). Mathematics content knowledge test is developed to be multiple choice and was evaluated with 5 experts for content validity. Bond-Ladder visual analogue scale were evaluated the construct validity using S Srikoon, N Viriyapong, N Chutiman [8].
5.3. Data Analysis
The research use mean and standard deviation (S.D.) for analysed descriptive statistics. One-way analysis of variance (ANOVA) is utilized for tested the mean score of two group.

6. Research Finding
6.1. Descriptive statistics
The descriptive statistics of pre-test versus post-test mathematics achievement and mood for both 5P model and 5E model groups are presented in Table 1.

| Group   | n  | mathematics achievement | mood                  |
|---------|----|--------------------------|-----------------------|
|         |    | pre-test                 | post-test             | pre-test             | post-test             |
| 5P model| 38 | 23.79(0.76)              | 30.03(0.67)           | 111.76(2.38)         | 129.86(2.18)          |
| 5E model| 39 | 22.44(0.66)              | 24.59(0.83)           | 111.41(2.43)         | 116.28(2.74)          |

Table 1 show descriptive statistics of mathematics achievement and mood for 5P model and 5E model group.

6.2. Significant F-test for univariate ANOVA follow up tests for the mathematics achievement and mood

| Effect             | Sum of square | Mean square | df  | F     | p    |
|--------------------|---------------|-------------|-----|-------|------|
| mathematics        | achievement   |             |     |       |      |
| Between Group      | 35.26         | 35.26       | 1   | 1.82  | 0.18 |
| Within Group       | 1455.91       | 19.41       | 75  |       |      |
| Total              | 1491.17       |             | 76  |       |      |
| Mood               |               |             |     |       |      |
| Between Group      | 2.40          | 2.40        | 1   | 0.01  | 0.92 |
| Within Group       | 16726.30      | 223.02      | 75  |       |      |
| Total              | 16728.70      |             | 76  |       |      |

Table 2 show that the univariate ANOVA follow up pre-test for the mathematics achievement and mood does not provide a specific mean difference. It shows that pre-test for the mathematics achievement and mood do not differ between 5P model and 5E model group.
6.2.2 Significant F-test for univariate ANOVA follow up post-test for the mathematics achievement and mood

Table 3. Significant F-test for univariate ANOVA follow up post-test for the mathematics achievement and mood

| Effect              | Sum of square | Mean square | df  | F     | p     |
|---------------------|---------------|-------------|-----|-------|-------|
| mathematics         |               |             |     |       |       |
| achievement         |               |             |     |       |       |
| Between Group       | 568.86        | 568.86      | 1   | 25.95 | 0.00  |
| Within Group        | 1644.41       | 21.93       | 75  |       |       |
| Total               | 2213.27       |             | 76  |       |       |
| Mood                |               |             |     |       |       |
| Between Group       | 3552.75       | 3552.75     | 1   | 14.94 | 0.00  |
| Within Group        | 17830.24      | 237.74      | 75  |       |       |
| Total               | 21382.99      |             | 76  |       |       |

Table 3 show that the univariate ANOVA follow up post-test for the mathematics achievement and mood does provide a specific mean difference. It shows that post-test for the mathematics achievement and mood do differ between 5P model and 5E model group. Research conclude that pre-test of both the mathematics achievement and the mood do not differ between the control group and the experimental group but post-test of both the mathematics achievement and the mood do differ between the control group and the experimental group. Moreover researcher found that the post-test of the mathematics achievement ($\bar{x}=30.03$, S.D.=0.67) and the mood ($\bar{x}=30.03$, S.D.=0.67) greater than pre-test of the mathematics achievement ($\bar{x}=129.86$, S.D.=2.18) and mood ($\bar{x}=116.28$, S.D.=2.74), respectively. It concludes that the effects of 5P model was found be greater compared to 5E model.

7. Discussion

The findings of this study have revealed a greater understanding of 5P model on the improvement of learner outcomes (mathematics achievement and mood) and have the potential of making a significant contribution to education. The results of this study have supported the claim of effectiveness of the 5P model for enhancing learner mathematics achievement and mood. Researcher hopes that the 5P model will be applied in improving learner outcomes in the future. The finding of this research imply that current teacher should focus on 5P model to design the instructional model in order to enhance and improve the mathematics learning outcomes of their student. Teachers should utilized the 5P model for sufficient opportunities for student to develop theses domain. The results of this study are similar to S Srikoon, T Bunterm, T Nethanomsak, T K Ngang [6], S Srikoon, T Bunterm, T Nethanomsak, T K Ngang [7], and M Hardiman [2]. Ultimately, 5P model is the linking of RBL and EN for creation the teaching model and is the innovative education for developing classroom practices in 21st century [2]. In conclusion, there is an innovative revolution of the teaching model in education. This findings concerning the influence of RBL and EN, in particular, will have develop teaching model, eventually leading to innovative paradigm in practice and policy. It suggested that 5P model can effectively utilized for enhancing the mathematics learning outcomes and can present the new approach of development for the implementation in classroom and for the design of learning instruction.
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