

THE MEASUREMENT DESIGN OF A STUDY: A CASE STUDY

Research Title: The Development of Daily-life problem-based learning on mathematics for Grade 4 students at Cristasongkrao School, Thailand

Research Objectives

1. **To develop a package of daily-life problem-based learning** on mathematics course for grade 4 students at Cristasongkrao School.
2. **To evaluate the effectiveness of the developed package** of the daily-life problem-based learning on mathematics in terms of (1) student Achievement on mathematics(2) the satisfaction of students with regards to the learning package.

Variables of the study

Independent Variable: a daily-life problem-based learning package on mathematics

Dependent Variables:

1. **Preliminary Quality indicators of the package;** propriety, feasibility, and accuracy of the developed Package
2. **Effectiveness of the Developed Package**
 - 2.1 student achievement on mathematics
 - 2.2 the satisfaction of students with regards to the learning package.

Definition of Variables

A daily-life problem-based learning package on mathematics is a learning package that covers the content of fractions, finding area and volume, and proportion and percentage. The situations used in the learning package are consistent with daily-life problems and the abovementioned content. A learning package is composed of a learning plan, a set of learning activities, teaching media, and a quiz for each topic.

Preliminary Quality indicators of the package are the indicators in the dimension of *Propriety*, *Feasibility*, and *Accuracy*.

Propriety of the learning package refers to the characteristics of learning activities that are appropriate to; the age of the learners, the learning objectives, the duration of each learning session, the use of media related to daily life, the congruency with the Context of schools and daily-life situations, etc. It was measured by an Assessment form developed by the researcher

Feasibility of the learning package refer to; the learning activities that are easy to understand, convenient to practice, can be carried out during class time, can be studied and understood by oneself, No need to invest a lot, etc. It was measured by an Assessment form developed by the researcher

Accuracy of the learning package refers to; the use of language is correct, the content is correct according to the subject matter, the learning activities are consistent with the objectives, the activities aim to develop analytical thinking skills, and the use of media is consistent with subject matter, teaching and learning activities that focus on the student centered, etc. It was measured by an Assessment form developed by the researcher

Effectiveness of the Developed Package refers to the effect of the package on (1) *the Student Achievement in mathematics* and (2) *the satisfaction of students with regards to the learning package*.

Student Achievement in mathematics refers to the knowledge on the topic of area, volume, fraction, and percentage. It was measured by the test according to the Test Blueprint that was developed by the researcher.

Satisfaction of Students with regards to the learning Package refer to the reaction of students related to *learning activities* and *the learning Achievement*. It was measured by a rating scale questionnaire developed by the researcher

The Development of Research Tools

The research tools in this study are composed of 4 important tools include; a daily-life problem-based learning package on mathematics, an assessment form for evaluating the preliminary quality of the learning package, an achievement test on mathematics, and a rating scale questionnaire for measuring student's satisfaction.

Development of a learning package on mathematics; the package is developed in the following steps:-

Step 1: Review related literature and study case studies on developing any learning packages.

Step 2: Creating the first draft of a daily-life problem-based learning package on mathematics

Step 3: Preliminary Quality assessment by Expert judgment; Propriety, Feasibility, and Accuracy of the package.

Step 4: Adjust the created package to be the second draft.

Step 5: Try out the second draft to a small group of samples that possess the same characteristics as the target group.

Step 6: Adjust the 2nd draft to be the 3rd draft of the package and prepare for use in the real context; Experiment with the target group with the collection of data both before and after the operation.

Development of an assessment form for Expert Judgement; will be developed in the following steps:-

Step 1: Review related literature and study case studies on developing any assessment form for expert judgment.

Step 2:

Step 3:

Step 4:

Step 5:

Development of an achievement test on mathematics; will be developed in the following steps:-

Step 1: Review related literature and study case studies of test development.

Step 2: Create a Test Blueprint.

Step 3: Create test items and prepare them as a test form.

Step 4: Let the experts consider and judge the content validity of the test items.

Step 5: Try out with a sample group that has characteristics equivalent to the real sample group.

Step 6: Analyze the quality of the items in terms of difficulty, Discrimination Power, and overall Reliability of the Test.

Step 7: Select the high-quality items or improve the inappropriate items and then prepare as a complete test.

Development of the student satisfaction rating scale questionnaire; will be developed in the following steps:-

Step 1: Review related literature and study case studies on developing any rating scale questionnaire for assessing satisfaction toward the learning package.

Step 2:

Step 3:

Step 4:

Step 5:

Step 6:.....

Data Collection

Important data collection activities are as follows:

1. After creating the learning package, let experts evaluate the propriety, feasibility, and accuracy of the learning package by using the developed preliminary quality assessment form.
2. Measure knowledge before and after studying with the developed package, and compare the achievement scores between after and before studying.
3. Evaluate student satisfaction with teaching activities and the benefits gained from using the learning package by comparing it with the specified criteria.

Group 3

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Statistical analysis:

Given the measurement design of the study focused on developing and evaluating a daily-life problem-based learning package for mathematics among Grade 4 students, the statistical techniques suitable for analysis would be as follows:

1. Descriptive Statistics:	To summarize the preliminary quality indicators (propriety, feasibility, and accuracy) of the learning package and the basic characteristics of student achievement and satisfaction scores. This includes calculating means, standard deviations, and ranges to provide an overview of the data.
2. Inferential Statistics	Paired t-test or ANOVA (Analysis of Variance): To compare student achievement in mathematics before and after the implementation of the learning package. This test is appropriate if the data is normally distributed and will help in understanding the effectiveness of the package on student learning outcomes. Chi-Square Test: To explore the relationship between categorical variables, for instance, if

	you want to see if there's a significant difference in the proportion of students satisfied with the learning package across different categories (e.g., gender or age groups).
3.Non-parametric Tests:	Mann-Whitney U Test: If the data does not meet the assumptions of normality, this test can compare student satisfaction or achievement scores between two independent groups (e.g., boys vs. girls). Wilcoxon Signed-Rank Test: For comparing pre-test and post-test scores on student achievement or satisfaction when the data is not normally distributed. The choice of statistical techniques should be guided by the nature of the data (e.g., normality, scale of measurement, independence of observations) and the specific research questions or hypotheses being tested.

Qualitative Data Analysis	For qualitative data such as student feedback or observations are collected, thematic analysis or content analysis can be used to identify recurring themes or patterns in the data. This can provide valuable insights into students' experiences with the PBL module.
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Correlation Analysis

Explore correlations between various factors such as student engagement, participation, and achievement outcomes. **Pearson correlation coefficient or Spearman rank correlation coefficients** can be calculated to assess the strength and direction of relationships between variables.