Title of the submission: A Study of Causal Variables Affecting Learning Achievement in Chemistry of Mathayomsuksa V Students of Khon Kaen University Demonstration School.

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ABSTRACT
The purpose of this research was to study causal variables affecting learning achievement in Chemistry. The sample consisted of 99 Mathayomsuksa V students of Khon Kaen University Demonstration School during the academic year of 2001. The independent variables were students' characteristics and parental involvements. The students' characteristic aspects were fundamental knowledge, achievement motivation, Chemistry attitude , study habit, additional study time, critical thinking, science process skills and numerical scholastic aptitude. The parental involvements were parental support and parental expectation. The dependent variable was the learning achievement in Chemistry. The data were analyzed using Path Analysis Technique. The results indicated that a group of best predictors which could predict learning achievement in Chemistry was consisted of fundamental knowledge (β=.379, $p < 0.05$) , critical thinking (β=.379, $p < 0.05$) and achievement motivation (β=.298, $p < 0.05$). The variance of these predictors accounted for the variance of learning achievement in Chemistry was 59.2% (R=.769). The standard error of estimate was 4.52.

INTRODUCTION
During the last decade, Thailand has developed from a developing country to be a newly industrial country, which can stand and survive by itself in many ways. Knowledge and understanding about science and technology is the most important factor for society, economic, environment and human way of life. According to the new Constitution of the Kingdom, the National Education Act B.E 2542 (1999) has launched and become effective since August 20, 1999. Learning reform is the vital part of education reform. The Act put emphases on the integration of scientific and technological knowledge and skill, as well as knowledge understanding and experience in management, conservation, and utilization of natural resources and the environment in a balanced and sustainable manner as stated in paragraph 2 of Section 23. Comparing to the international students, Thailand has much lower qualified students in science and technology than those in Asian countries (Office of National Education Committee, 1999).We need a very strong and efficient fundamental education in order to promote and develop the science and technology(Kaewdaeng, 2001).

For chemistry, it is one of the most important basic subjects in Science. The learning achievement in chemistry is the best indicator to predict the success of learning process management in school. According to KhonKaen Provincial Education office, the assessment of high school students (M.6) education in academic year 2001,

showed that KhonKaen University Demonstration school student passed a Satisfied Criteria in Chemistry learning achievement. Moreover, to be good at learning chemistry, there are factors that relate and affect to the process of learning achievement. So the researcher tried to study the thoughts and theories of many educators such as Bloom (1976) (Theory of School learning), the thoughts of Prescott (1961)., Klausmeir (1961) and Maddox (1965) for instance, including related field researches by interviewing the teachers, students and parents. It is concluded that, there are 3 factors relating to students' learning achievement. Those are; family involvement, school environment and students characteristics. The researcher is also interested in studying the causal relationship between some factors and chemistry learning achievement of Mathayomsuksa V students in KKU. Demonstration School, both direct and indirect ways, by using Path Analysis. For this reason, they will find ways to develop skills of learning chemistry better. The researcher has chosen the certain variable factor, which is causal, related to chemistry learning process, and the teachers in school are able to arrange the experience to help developing those variable factors. They build up a model direction according to hypothesis, independent factors, which affect to learning achievement of Chemistry as well. For students' characteristics, they should have fundamental knowledge, achievement motivation, Chemistry attitude, studying habit, additional study time, critical thinking, science process skills and numerical scholastic aptitude. For family involvement that the teacher is able to suggest parents comprised parental support and parental expectation.

See model from hypothesis direction in figure 1

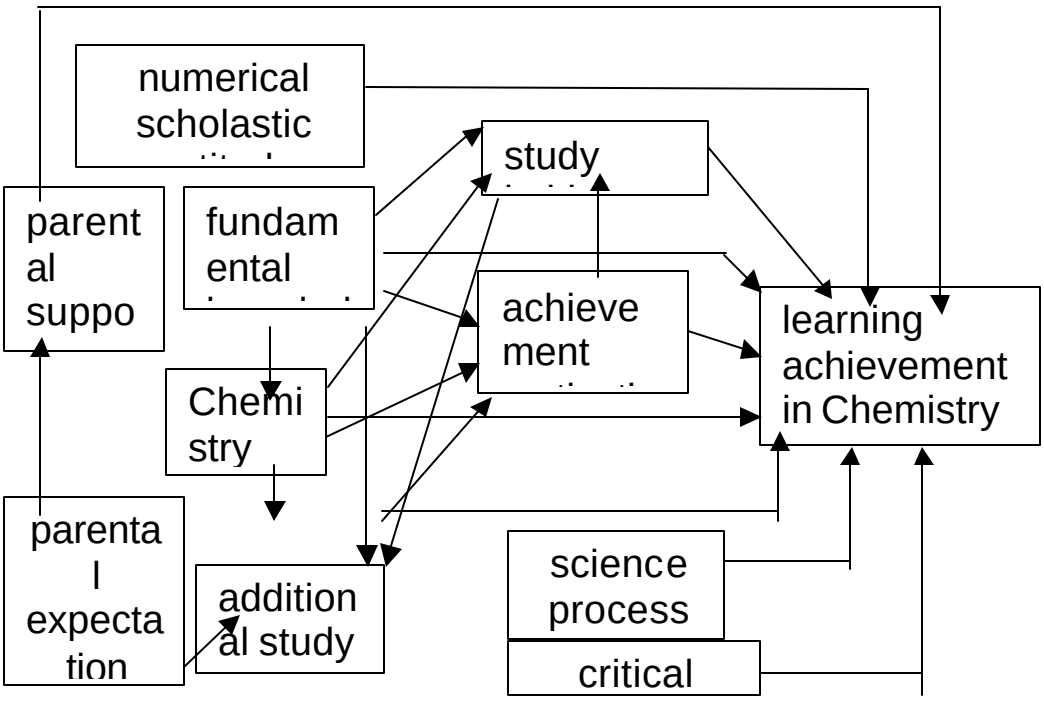

Figure 1 A proposed model of causal variables affecting learning achievement in Chemistry

PURPOSE OF THE STUDY

The purpose of this study was to study causal variables affecting learning achievement in Chemistry of Mathayomsuksa V of K.K.U. Demonstration school.

METHOD

The sample consisted of 99 students from three classes of Mathayoumsuksa V, Science and Mathematics section, K.K.U. Demonstration school, semester 2, academic year of 2001.

Research instruments

The research instruments were an achievement test in Chemistry, a critical thinking test, a scientific skill process test, a numerical scholastic aptitude test, a Chemistry attitude survey, an achievement motivation survey, a studying habit survey, an additional study time survey, a parental support survey and a parental expectation survey .

Data analysis

Using Path Analysis and SPSS for WINDOWS (Statistical Package for the social Science for windows) to analyze data.

RESULTS

The results of study indicated that the variance of 9 independent variables in the casual relationships model accounted for the variance of learning achievement in Chemistry was 60.5 % (R = .778). The standard error of estimate was 4.596

For the new improved model of causal relationship of achievement in learning Chemistry, this is the improved path coefficients which was already checked the matching to observed data as shown in Figure 2

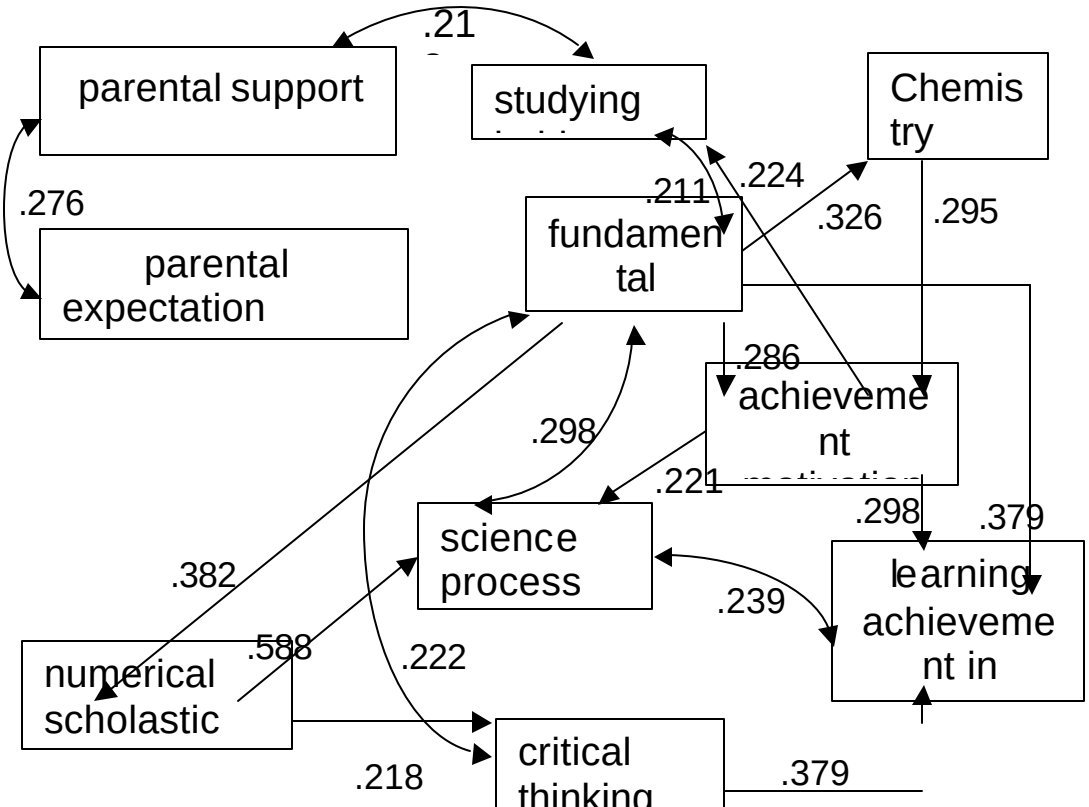

Figure 2 An improved model of causal relation in Chemistry achievement, which was audited the matching to observed data

From figure 2. Achievement in Chemistry has received the direct influence of 3 independent variables; they are fundamental knowledge (β=.379, $p < 0.05$) , critical thinking (β=.379, $p < 0.05$) and achievement motivation (β=.298, $p < 0.05$). The variance of these predictors accounted for the variance of learning achievement in Chemistry was 59.2% (R=.769). The standard error of estimate was 4.52.

CONCLUSION

Most factors that affect the result on achievement in learning Chemistry of K.K.U. Demonstration students are their characteristics. This is useful for the teachers of K.K.U. Demonstration school because they can arrange experience, which could be developed students' characteristics and give advice to parents about these factors. Therefore, school, teachers and parents should help each other promote the significant characteristics of the students.

Variety projects should be set up to promote good fundamental knowledge; make students ready to learn. In learning process, activities, which help critical thinking, should be prepared and be able to build achievement motivation in order to support the success of study. They are because these variables have direct effect to the achievement in learning Chemistry.

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