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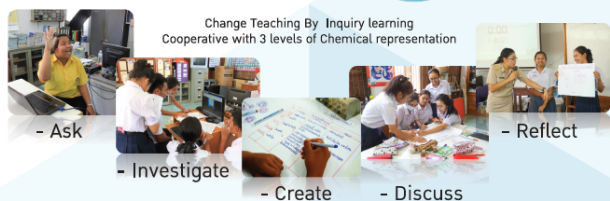
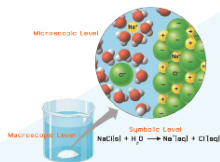
INTRODUCTION

Chemistry is so hard



- To be dazed
- To wonder

Chemistry is about 3 levels of chemical representation



Change Teaching By Inquiry learning
Cooperative with 3 levels of Chemical representation

- Ask
- Investigate
- Create
- Discuss
- Reflect

OBJECTIVES

The objectives of this research include:

- to develop a set of activity based on the inquiry-based learning and the three levels of chemical representation about the Stoichiometry for the 11th Grade students by using the standard criteria of efficiency (E1/E2) and effectiveness index (E.I)
- to compare students' learning performance before and after participating in the activity
- to assess the students' satisfaction for participation.

THE DEVELOPMENT OF ACTIVITY SET

The teacher applied the inquiry-based learning approach and the Three Levels of Chemical Representation Method and evaluated by using the One-Group Pretest-Posttest Design.

1. The development of activity set based on the inquiry-based learning and the three levels of chemical representation about Stoichiometry	Identify the form and component of activity set based on the inquiry-based learning and the three levels of chemical representation about Stoichiometry	1. Evaluate by the experts 2. The 1st revision
2. The 1st development of activity set based on the inquiry-based learning and the three levels of chemical representation about Stoichiometry	Test with individual (1:1:1)	Calculate the value of E1/E2 and E.I The 2nd revision
3. The 2nd development of activity set based on the inquiry-based learning and the three levels of chemical representation about Stoichiometry	Test with sub-group (3:4:3)	Calculate the value of E1/E2 and E.I The 3rd revision
4. The 3rd development of activity set based on the inquiry-based learning and the three levels of chemical representation about Stoichiometry	Test in the field (10: 10: 10)	1. Calculate the value of E1/E2 and E.I. 2. Compare the value of E1/E2 and E.I. benchmark

References

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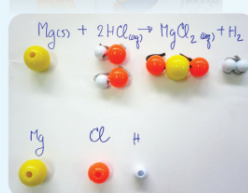
THE METHOD OF ANALYZING DATA

The cluster random sampling technique was applied. The sampling target was 35 students in the 11th Grade of Suratpittaya 2 School under the Office of the Secondary Education Service Area 11. The test duration was made on the first semester of 2016 academic year. The research tools include the learning package, a 30-items conceptual test and a questionnaire to evaluate satisfaction. The statistical analysis in terms of percentage, mean, standard deviation and one-sample test were taken into account and used to evaluate data statistically.

ACTIVITY OF INQUIRY-BASED LEARNING



- Three levels of chemical representation



- Microscopic Level (particles)



- Macroscopic Level (physical phenomena)



Reaction Stoichiometry
 $Pb(NO_3)_2 + 2NaI \rightarrow PbI_2 + 2NaNO_3$
The reaction is expressed on the microscopic scale, in terms of the number of molecules.
But our question is on the macroscopic scale, phrased in terms of grams of a substance.
So we need to use the molecular weight, to move between the two scales.

- Symbolic Level (chemical language and mathematical models)

CONCLUSION

The study outcomes could be concluded as follows:

- The development of the activity set based on the inquiry-based learning and the three levels of chemical representation about the Stoichiometry for the 11th Grade students met the standard criteria. Its efficiency score was 78.56/76.00 and its effectiveness index was 0.65.
- After participating in the developed learning activity set, the conceptual test scores were increasing at the confidence level of 95%.
- The level of students' satisfaction toward the learning package was ranked in a "very high" category because the mean of the students' response was 4.77 on a 5-Likert-scale.

The development of a set of learning package about the Stoichiometry based on inquiry-based learning and the three levels of chemical representation: Macroscopic level, Microscopic level and Symbolic level enabled the students to have understanding in difficult issue in the microscopic level. The students were regularly encouraged to inquire knowledge by themselves. This resulted their higher performance and satisfaction. As a result, the three levels of chemical representation together with activity-based approach should be applied in the study of Stoichiometry which was the vital foundation for studying chemistry.