Network Development of Mathematics and Science Senior High School Education in Provincial Administrative Organization of Nakhon Ratchasima' School

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Abstract

The purpose of this research was to develop a network of mathematics and science senior high school education in provincial administrative organization of Nakhon Ratchasima' school in order to enrich the student academic achievement towards mathematics and science teaching by using instructional media as a network building tool. The study sample consisted of 28 senior high school education teachers from 17 schools. Twenty-two instructional media were developed to enrich the student academic achievement towards mathematics (n = 6), physics (n = 8), chemistry (n = 1), and biology (n = 7). The instructional media efficiency was evaluated in students who enrolled in the first semester during the 2010 academic year. The instruments used for data collection included the instructional media, an achievement test using t-test single-group pretest-posttest design, and a questionnaire on student satisfaction and attitude towards teaching. The research findings show that the efficiency level (E_1/E_2) of most instructional media developed (71%) reached standard level, the student academic post-achievement was higher when compared with pre-achievement ($p < 0.05$) in all subjects, and that the student satisfaction towards teaching was highly positive in all subjects. However, the student attitude towards teaching was highly positive in all subjects except for physics. By using these instructional media as a network building tool, other 30 senior high school education teachers from 8 schools were recruited and connected. In addition, it also created a network between senior high school education teachers and higher education commission instructors within Nakhon Ratchasima for at least 30 instructors.

Keywords: curriculum, instructional media, network, provincial administrative organization, senior high school education

Introduction/Problem

Mathematics and science are two areas of knowledge that are critical to the innovation, development and sustainability of technology and the human way of life (Institute for the Promotion of Teaching Science and Technology, 2010). As with other countries, Thai's educational institutions prepare students for participating within the country development by strengthening them in areas of mathematics and science. The Ministry of Education recognizes the need for better mathematics and science education for Thai students. The recruitment, training and retention of teachers with strong mathematics and science backgrounds as well as discovering new ways to improve student knowledge and efficiency with mathematics and science have been initiatively and continually promoted.

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In B.E. 2552 (A.D. 2009), however, the International Institute for Management Development (IMD) ranked Thailand 26th of 57 countries globally for overall competitiveness. Results from the Program for International Student Assessment (PISA) showed that 15-year-old school Thai students' scholastic performances were below average in science, mathematics, and reading and in the second-lowest in Asia. Moreover, in B.E. 2547 (A.D. 2004), Breuer of Educational Testing showed that general attitude test (GAT) average scores in mathematics, physical science, chemistry, and biology of Mathayomsuksa 6 students were 34.75, 44.30, 35.13, 41.86, and 34.86%, respectively. Taken together, the results of those reports showed that student education performances of Thailand did not meet the world standard. These included senior high schools education in provincial administrative organization of Nakhon Ratchasima' school.

There is a lot of learning success factors. These include academic administration, teachers, students, and the environment and atmosphere for learning. Among these factors, teachers are very important as they have to translate standards and substances of learning written in literatures into appropriate and attractive learning activities as well as a variety of learning processes. In addition, teachers need to be able to use a variety of learning materials and use of information technology (Department of curriculum and instruction development, 2001). This will help students to gain more academic success. Instructional media is also necessary for teaching and learning process. It works as a key tool to change student learning behavior and to help teachers to improve their teaching and achieving teaching goals (Promwong et al., 1994). In urban area, however, there is not enough investment in the school infrastructure and teaching materials. This includes senior high schools in provincial administrative organization of Nakhon Ratchasima. Thus, a network of teaching is important for teachers to share and exchange their instructional media and practices.

The purpose of this research was, therefore, to develop a network of mathematics and science senior high school education provincial in administrative organization of Nakhon Ratchasima' school in order to enrich the student academic achievement towards mathematics and science teaching by using instructional media as a network building tool.

Design/Procedure

The development of the network was divided into 4 steps as follows:

1. The step of recruitment. Twenty-eight teachers from 17 (out of 58) senior high schools in provincial administrative organization of Nakhon Ratchasima were recruited by taking a test based on their teaching curriculums (mathematics, physics, chemistry, biology).
2. The step of instruction media development. After recruitment, teachers had to develop their instructional media based on their teaching curriculums and experiences. The processes of developing instructional media included 6 steps as fallows.
    a. The step of review. This included the review of instructional media development, the basic education core curriculum B.E. 2551 (A.D. 2008) in the group of substance of learning mathematics and science both national level and school level, content of mathematics and science curriculums, the ability to use computer/media of students, and computer/media infrastructure of their schools.
    b. The step of design. This included the design of lessons, aims of each lesson, pre-and post-test for each lesson, contents in each lesson which composed of

fist page, introduction, statement, contents, the purposes of learning, pre-test with keys, main contents, course exercise with keys, and post-test with keys.

c. The step of development and production. This step was under the supervision of instructors from Suranaree University of Technology. The step included the literature review and the development and production of instructional media using appropriate software/materials.
d. The step of measuring the instructional media efficacy. This was done by using one to one testing, small group testing, and large group testing, respectively.
e. The step of implementation. The instructional media was implemented. The sample group consisted of at least 30 students (using cluster random sampling) at the 10^{th}-12^{th} grade levels (Mathayomsuksa 4-6) of senior high schools in provincial administrative organization of Nakhon Ratchasima, who were enrolled in the first semester during the 2010 academic year.
f. The step of evaluation/analysis. The data were analyzed using t-test single-group pretest-posttest design. Research instruments composed of the instructional media in each curriculum, the lesson plans including instructional media materials, an achievement test, a questionnaire on student satisfaction towards teaching, and an evaluation on learning activities.

3. The step of building a net work. After the development of instructional media, the net work was built by using instructional media as a network building tool. To do so, senior high school education teachers were voluntary recruited. Based on their teaching curriculums (mathematics, physics, chemistry, biology), these teachers could freely select the instructional media that had been developed. They then used the selected instructional media at their schools under the supervision of teacher who first developed the media and instructors from Suranaree University of Technology. The steps of using their selected instructional media were necessary the same as mentioned above (d-f).

Findings

The results shows that twenty-two instructional media were developed to enrich the student academic achievement towards mathematics (n = 6), physics (n = 8), chemistry (n = 1), and biology (n = 7). The research findings also show that the efficiency level (E_1/E_2) of most instructional media developed reached standard level. The percentage of the instructional media that reached standard level was 83%, 75%, 50%, and 71% for mathematics, physics, chemistry, and biology, respectively. The student academic post-achievement was higher when compared with pre-achievement ($p < 0.05$) in all curriculums. The student satisfaction towards teaching was also highly positive in all subjects. Thus, the score of satisfaction (5 points satisfaction scales) towards mathematics, physics, chemistry, and biology was 3.66, 3.68, 3.82, and 4.02, respectively. However, the student attitude towards teaching was highly positive in all curriculums except for physics. The student attitude (4 points attitude scales) towards mathematics, physics, chemistry, and biology was 3.86, 3.68, 3.82, and 3.84, respectively. By using the instructional media as a network building tool, other 30 senior high school education teachers from 8 schools were voluntarily recruited. Based on their teaching curriculums (mathematics, physics, chemistry, biology) and their school infrastructures, these teachers freely selected the instructional media developed. In addition a network between senior high school education teachers and higher education commission instructors within Nakhon Ratchasima for at least 30 instructors was also connected.

Recommendation

By using the instructional media as a network building tool, a network of mathematics and science senior high school education provincial in administrative organization of Nakhon Ratchasima' school could be developed. The advantages of the net work were not only for teachers to teachers, but also to enrich the student academic achievement towards mathematics and science teaching in urban areas of Thailand.

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