Item Development Online Courses for Science and Mathematics Teachers

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Keywords: Item Development, Online Courses, Science and Mathematics Teachers

Abstract: To improve the quality of science and mathematics teachers in Thailand, the Institute for the Promotion of Teaching Science and Technology (IPST) has developed a professional development online platform called "Teacher PD" since 2015. Various online training courses in science, mathematics and technology education are in this system. For the area of assessment, item development online courses are available for science and mathematics teachers at the lower secondary level. The purposes of these courses are to provide a big picture of school-based assessment and an opportunity to learn how to construct test items that aligned with the national curriculum. The courses are delivered online for teachers who registered through IPST Website. Each course was modified from the face-to-face training courses that had already been tried out and improved before putting in the platform. It has been designed to run with dedicated trainers over a period of eight weeks. The content consists of four modules: 1) Introduction to assessment, 2) Assessment framework, 3) Item development process, and 4) Constructing the test item. The trainees are assigned a variety of tasks that encourage them to improve their practical skills in assessment as well as a constructive discussion among trainees, while the trainers are responsible for giving effective feedback, criticizing and scoring assignments. At present, there are 402 teachers who passed the criteria and have received certificates. Certified trainees have become our networking in teacher professional development. IPST has learned that time constraint is the important factor for successfully completing an online course. Suggestions from participants are useful for further improvement.

Introduction

The Institute for the Promotion of Teaching Science and Technology (IPST), Thailand is an autonomous organization responsible for directing the country's educational approaches and improving the quality of science, mathematics, and technology (SMT) education. IPST initiates and promotes research and development programs in curriculum, teaching and learning and assessment in SMT for basic education level.

In 2015, IPST Learning Space has been launched as a nationwide digital learning center. This center offers students, teachers, and school administrators access to quality digital SMT resources. These increase opportunities and equality of access to quality learning media as well as more efficient learning environment. The system is available for self-learning anytime and anywhere. All contents are relevant and link to the national curriculum and used to support mutual learning and exchange of knowledge among students, teachers, parents, school administrators as well as the general public. IPST Learning Space can now handle as many as 6.6 million users.

Teacher Professional Development

Researches indicated that teacher professional development (TPD) impacts on teachers in the way they learn, they teach, and their job satisfaction (Desimone et al., 2002; OECD, 2016c). There is a correlation between sustained TPD and improvement in student achievement (OECD, 2014a). TPD is also more a cost effective way to improve student outcome than reducing class size or increasing learning time (Musset, 2010). Effective professional development needs to be continuous and has adequate time as well as follow-up support (OECD, 2012). To promote and support SMT teachers' self-development, IPST collaborated with the Office of the Basic Education Commission organized the training of in-service teachers to enable them to manipulate learning experiences in SMT effectively and efficiently. The training courses are systematically conducted in both face-to-face and e-training.

Teacher PD platform

Teacher PD platform is a part of IPST Learning Space for teacher training. The courses are delivered online to offer maximum flexibility. A variety of training courses in SMT education are available in this platform. For examples:

- Scientific Inquiry
- Questioning in Teaching Science
- Science curriculum and its Implementation
- Learning Algebra with the GeoGebra Program
- Learning Statistics with the GeoGebra Program
- Teaching and Learning Computing Science

For the area of assessment, there are two item development courses: 1) Item Development for Science Teachers and 2) Item Development for Mathematics Teachers. Both of them are modified from the face-to-face training courses.

Course Development Processes

Item development courses are created and follow IPST's standard as other learning resources. Normally, the processes start from studying related documents and designing an outline of course. Followed by developing content, reviewing, and conducting try-out. Then, constructing manuscript of course and implementing. Details of seven steps as the following:

Step 1: Studying related documents and literature review.

Step 2: Creating structures or components of training courses in accordance with the objectives, e.g. content, participants' qualifications, and activities during the course.

Step 3: Developing content of the course in line with objectives, time frame, and training methods. Learning materials comprise of a guideline for trainers, documents for participants, video clips, and questionnaires.

Step 4: Reviewing the course by a committee that comprises of IPST academic staffs, teachers, and outside experts. Feedbacks from reviewers are consider to revise the course.

Step 5: After revising course, a try-out process is conducted for improving the quality and modifying the course.

Step 6: Constructing manuscript by using feedbacks from a try-out process and from editor consideration. The editor will discuss to identify issues of the course and making corrections before implementation.

Step 7: After implementing, feedback from participants, trainers, and others are collected for revising the courses.

Item Development Online Courses

Purpose: After completing the course, the participant will be able to:

- understand and be aware of the importance of assessment,
- have knowledge and understand how to construct and use assessment tools, and
- construct, criticize and improve the test items.

Participants: The participants are science or mathematics teachers at the lower secondary level who are interested in assessment, have basic knowledge about constructing test items, and can attend the whole course.

Course Registration: To enroll in a course, participants need to create their accounts at the link "http://www.teacherpd.ipst.ac.th". When getting a confirmation e-mail, they can subscribe for member enrollment. Then, select "courses" and "subjects" as request.

Course Focus: Active participation are required for discussion to each other on the bulletin board. Trainers' feedbacks on assignment intend to motivate and improve participants.

Course Content: Participants can learn through four modules with dedicated trainers. The content are managed in four modules as the following:

- Module 1: Introduction
  - Overview of assessment
  - School assessment, National assessment and International assessment
- Module 2: Assessment framework
  - Linking between what students learn and how to assess
- Module 3: Item development process
  - Selected response and constructed response items
  - Appropriateness of situations and questions
- Module 4: Constructing the test item
  - Assignment (Construct, Review and Revise test items)
  - Feedback and course evaluation

Assignments: Participants are assigned a variety of tasks that encourage them to improve their practical skills in assessment as well as a constructive discussion among trainees, while the trainers are responsible for scoring and giving effective feedback. Participants require to do assignments via Google Forms and e-mails which included criticize the test, post the revised test on the bulletin board, scoring student work, and constructing the test item.

Duration: 8 weeks

Number of Participants: Maximum 50 persons per course

Certification: The criteria for receiving certificates are 1) finish studying all four modules, 2) participate in all activities, 3) submit all assignments, and 4) get at least 80 percent of the total score.

Conclusion

After operating the item development courses, only 20% of participants passed the criteria and have received certificates. Although many teachers are interested to register, they cannot participate the whole course. Most of them have a lot of responsibilities in school time so they do not sufficient time to study. They suggested that the course should be open during semester ends. IPST has learned that time constraint is the important factor for successfully completing an online course. During the course, trainers should frequently inform participants

by mail about the important dates of the course. They also follow-up the participants for collection of feedback data. Feedback from participants and trainers are useful for further course improvement. Certified participants have become our networking in assessment.

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