Research and Development in Curriculum and Instruction Field

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1. Introduction

Research and Development (R&D) is the research methodology that combines two approaches such as 1) research and 2) development for create some innovative curriculum and learning. The nature of R&D is systematic and relevance between research activities and development activities we call “the cycle of R&D”.

In many professions, R&D was used for developing some innovation. In general, the process of R&D composed of 4 steps, the 1st is context analyzing (R1), the 2nd is designing the innovation (D1), the 3rd is implementing the innovation (R2) and the 4th is evaluating the effectiveness of innovation (D2).

2. Foundation of R&D

Research and Development is the research methodology for creating innovation, this methodology integrates the research methods and development techniques we call “the cycle of R&D”. The cycle of R&D can device by two types, one is starting from research (R1 D1 R2 D2) and the other one is starting from developing (D1 R1 D2 R2) as the figure 1, 2 below.

Figure 1 R&D type 1 Start from Research

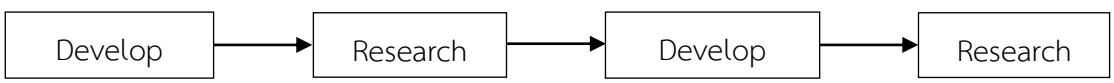

Figure 2 R&D type 2 Start from Development

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3. R&D model from His Majesty King Bhumibol Adulyadej

His Majesty King Bhumibol Adulyadej used the R&D methodology for developing many Royal Projects and all of Royal Development Study Center that very useful and important wisdom of Thailand and the world.

R&D model of His Majesty King Bhumibol Adulyadej is the systematic cycle of **Plan, Do, Check,** and **Reflection**. The **Plan** is analyzing information that relevance the projects such as statistical data, expert opinion, theoretical knowledge, research finding, and stakeholder opinion. The **Do** is implementing the projects suitable many contexts such as human culture, belief, economics. The **Check** is assessment and evaluating the effectiveness of projects by using empirical data, statistical data, and expert opinion. The **Reflection** is considering the evaluates results and improving the projects better. R&D model can present by figure 3 below.

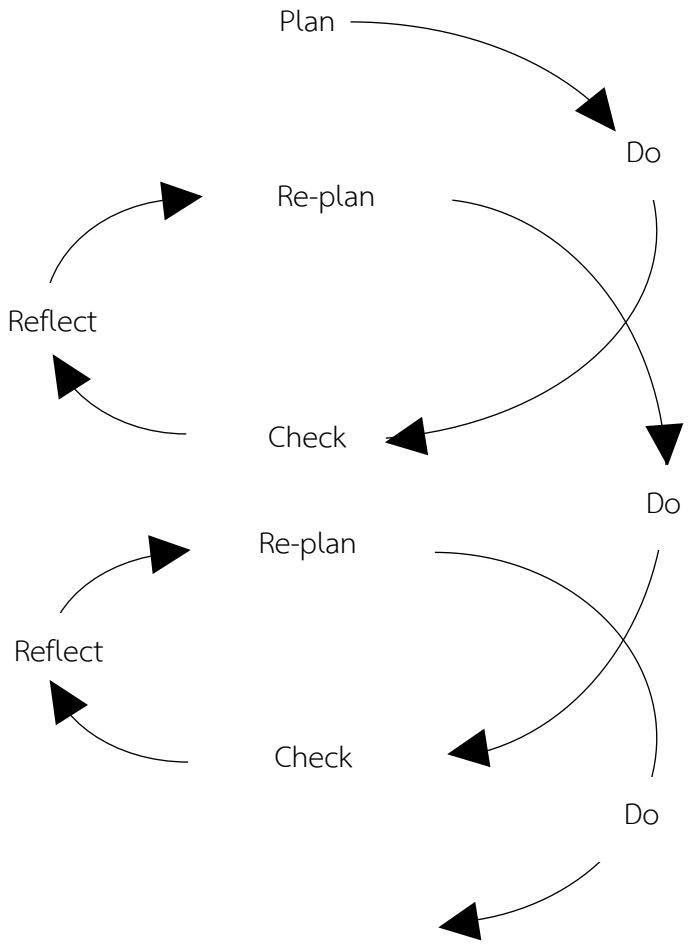

Figure 3 R&D model of His Majesty King Bhumibol Adulyadej

4. Research and Development in Curriculum and Instruction

In curriculum and Instruction field, research and development has been used for creating many innovations for increase students learning, teaching quality. Most of research topics that conduct by R&D methodology are about developing curriculum, developing teaching methods, developing teaching models, or developing assessment models.

The examples of research title conduct by R&D are below:

- Developing the Model of Assessment for Learning of Graduate Students.
- Developing A Training Curriculum in Learning Management for Enhance the Creative and Innovation Skills for Basic Education Teachers

All most of Research and Development processes in Curriculum and Instruction field composed of 4 steps, describe follow type 1 of R&D.

The 1st is analyzing foundation data for designing innovation (R1). The objective of this step is analyzing some data that's important and needed for developing the innovation by focus on analyzing and synthesizing concepts, theory, research findings, expert opinion, and stakeholders wanted. Research techniques that used in this step are variations such as survey research, documentary research, meta-analysis, interviewing expert or academician, the researchers select one or more techniques suitable with the research objectives of R1 (R1 objectives). The results of this step will bring to design the curriculum and instruction innovation. The 1st steps can present by figure 4 below.

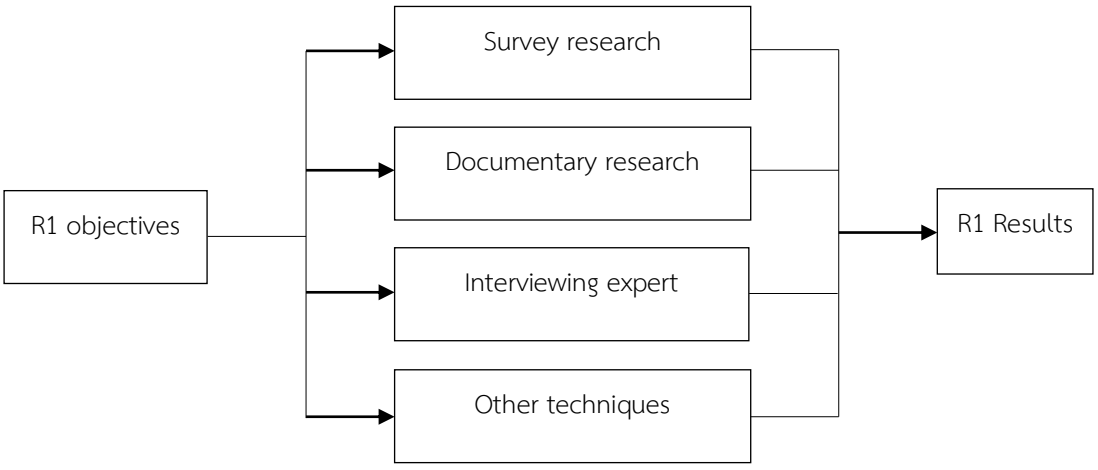

Figure 4 System of R1 in research and development

The 2nd is designing the innovation (D1). The objective of this step is designing the curriculum innovation or instructional innovation based on foundation data. For this step, the researcher attempts to design innovation relevant the R1 findings. The components of many innovations in curriculum and instruction field are 1) rationales 2) objectives 3) procedure or process 4) evaluation. After the researcher have finish to design innovation, the next activity is the quality checking of their innovation by using focus group discussion techniques or document considering by experts and then the researcher will try out the innovation before implementing in the real situation. The result of this step is the curriculum and instructional innovation that already in implementation. The system of D1 can present by figure 5 below.

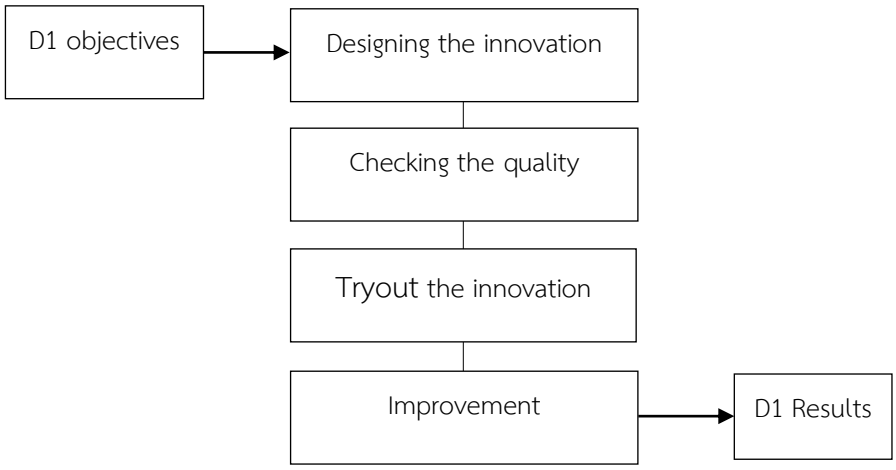

Figure 5 System of D1 in research and development

The 3rd is implementing the innovation (R2). The objective of this step is implementing the curriculum innovation or instructional innovation with the sample or target group of research. For this step, the researcher applies experimental /quasi - experimental design to study the effectiveness of their innovation by selecting the most suitable of experimental /quasi -experimental design that can test the hypothesis. There are several of experimental /quasi -experimental design that the researchers selected for implementing the innovation such as the One Group Posttest Only Design, the One Group Pretest – Posttest Design, Control Group Pretest – Posttest Design, One Group Time Series Design, and Factorial Design. The findings of this step will bring to evaluating the effectiveness of innovation. The system of R2 can present by figure 6 below.

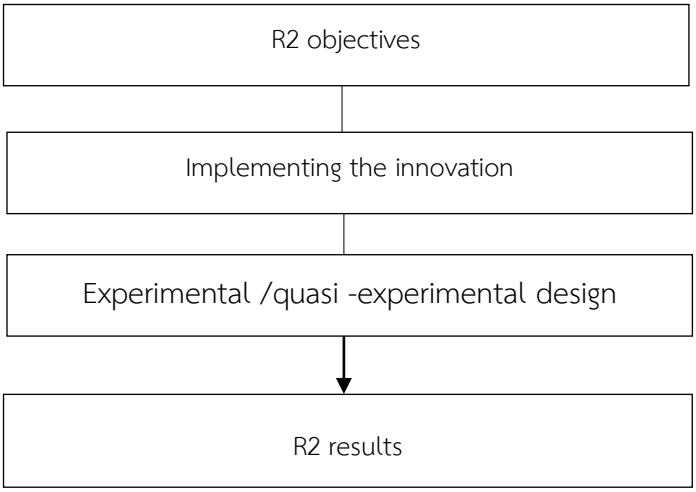

Figure 6System of R2 in research and development

The 4this evaluating and improving the innovation (D2). The objective of this step is evaluating the effectiveness of curriculum innovation or instructional innovation and improve it to complete. For this step, the researcher will evaluate the effectiveness of innovation follow some criteria that the researcher set before implement the innovation. There are many patterns of criteria that relevance with the research hypothesis and experimental /quasi -experimental design. The researcher will bring the results of implementing the innovation to compare with the criteria, if the results of comparing is according to the criteria then the researcher will conclude about the effectiveness of innovation. The system of D2 can present by figure 6 below.

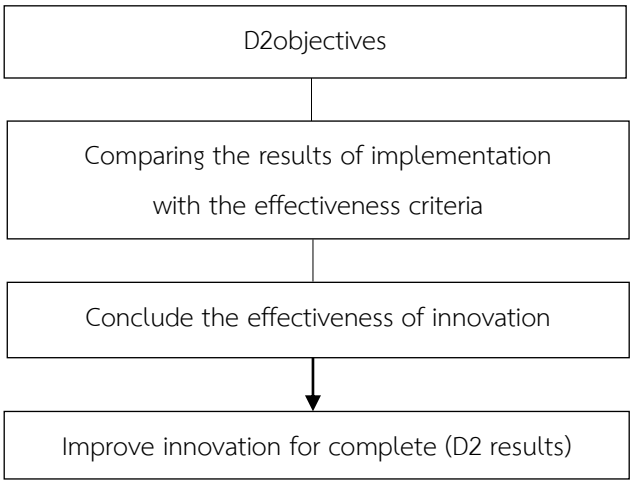

Figure 7 System of D2 in research and development

All of 4 steps of Research and Development as described above, can summarize the procedures of Research and Development in curriculum and instruction by figure 8 as follows.

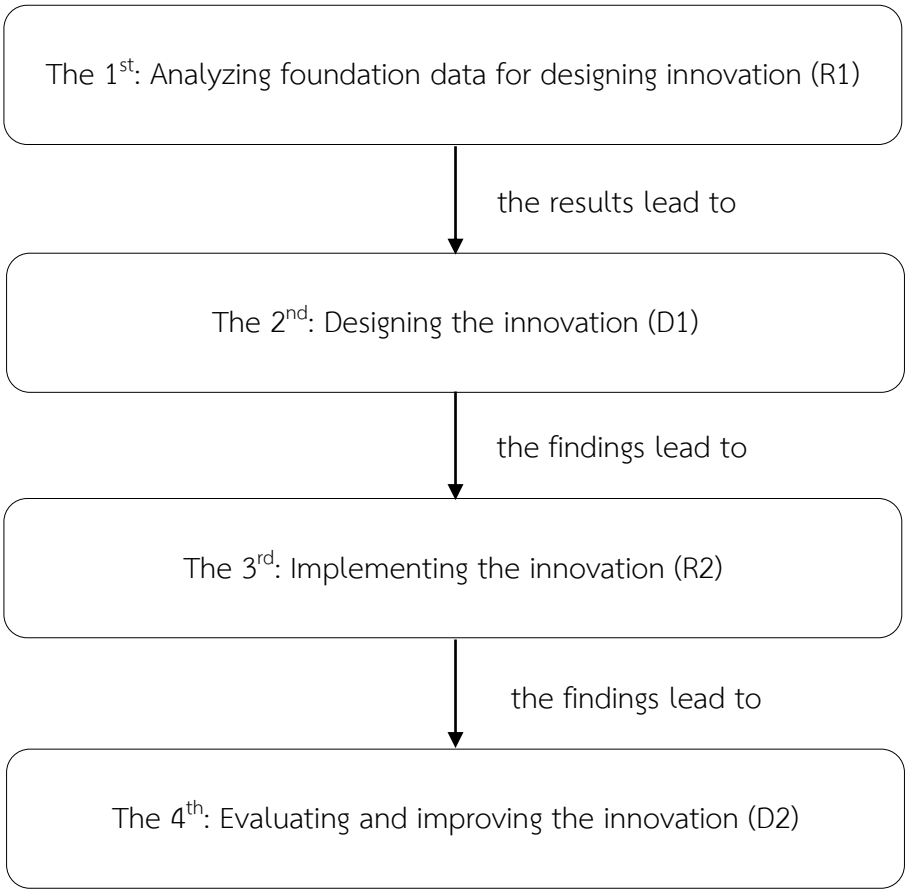

Figure 8 summarize the procedures of Research and Development in curriculum and instruction

5. Past Research and Development in curriculum and instruction

In curriculum and instruction field, there are many researches that used R&D methodology and the results of the synthesized R&D methodology since2010 to 2018 (21 titles) found that almost researchers designed their research follow 4 steps according to described above that can show by table 1 below.

Table 1 Research and Development processes in curriculum and instruction field

Steps	Focus points	Methods
1	Analyzing foundation data for designing innovation (R1)	1. Documentary analysis 2. Need assessment 3. Survey research 4. Synthesis research 5. Evaluation research 6. Focus group discussion 7. Interview the expert 8. Observe the situations
2	Designing the innovation (D1)	1. Develop the original of innovation 2. Set the effectiveness criteria 3. Check the quality by expert 4. Focus group discussion 5. Connoisseurship 6. Improve before tryout 7. Tryout 8. Improve before implementing
3	Implementing the innovation (R2)	1. Implement in real situation based on experimental designs - The One – Shot Case Study - Equivalent Time – Series Design - One Group Repeated Measures - Multi – factor between factorial Design - Control Group Pretest – Posttest Design - The One Group Pretest – Posttest Design 2. Analyze data after implementation
4	Evaluating and improving the innovation (D2)	1. Evaluate the effectiveness of innovation 2. Improve innovation for complete 3. Conclude the overall of research 4. Disseminating the innovation

From table 1 will found that, the methodology of research and development in curriculum and instruction field have many various methods that link or integrated into develop innovation to meet the effectiveness criteria of innovation.

From the results of table 1, we can create the system of research and development in curriculum and instructional field that compose of 4 steps and 7 core activities present by figure 9 following.

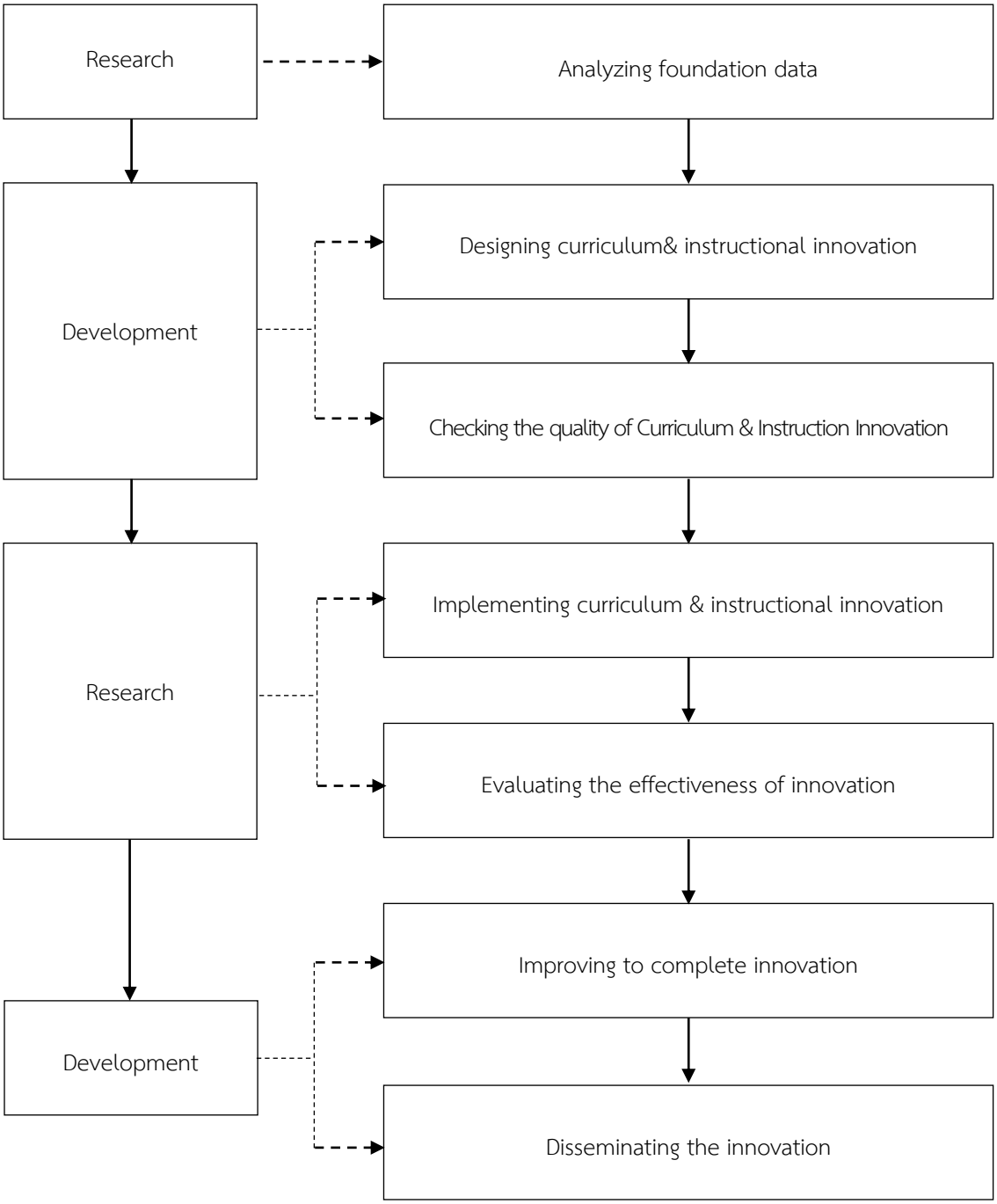

Figure 9 The system of research and development in curriculum and instructional field

6. Conclusion

Research and Development in curriculum and Instruction field have 4 steps the 1st is analyzing foundation data for designing innovation (R1), the 2nd is designing the innovation (D1), the 3rd is implementing the innovation (R2), and the 4th is Evaluating and improving the innovation (D2). The core activities of research and development in curriculum and instruction, compose of 7 activities the 1st is analyzing foundation data, the 2nd is designing curriculum& instructional innovation, the 3rd is checking the quality of Curriculum & Instruction Innovation, the 4th is implementing curriculum & instructional innovation, the 5th is evaluating the effectiveness of innovation, the 6th is improving to complete innovation, and the 7th is disseminating the innovation. If you want to create some innovation in curriculum and instruction field you can apply many research methodologies and techniques suitable for every context and condition of your research then you will get the innovation that you want.

Bibliography

Best, John W., Kahn, James V. (2006). **Research in Education.** 10thed. New York: Pearson Education Inc.

Broderick, Sionhan., and Coughlan, Richard. (2002). **Research and Development in Education.** Ireland: Department of Education and Science. Retrieved from https://www.education.ie/en/Publications/Education-Reports/res_dev_94_00.pdf, 26 May 2018.

Chintana Sirithanyarat., and Maream Nillapun.(2015).**The Development of Science Instructional Model by Integrating Higher Order Thinking Strategies to Enhance Higher Order Thinking Skill in 21st Century and Scientific Mind of Secondary School Students.** Dissertation Ph.D. (Curriculum and Instruction), Nakornpathom: Graduate School, Silpakorn University.

Gall, Meredith., Gall, Joyce P., and Borg, Walter R. (2003). **Educational Research An Introduction.** (7thed.). Boston: Pearson Education, Inc..

Gall, Joyce P., Gall, M.D., and Borg, Walter R. (2005). **Applying Educational Research: A Practical Guide.** Boston: Pearson.

Institute of Education Sciences U.S. Department of Education and National Science Foundation. (2013). **Common Guidelines for Education Research and Development.** Retrieved from https://ies.ed.gov/pdf/CommonGuidelines.pdf, 26 May 2018.

Jiraporn Rodpuang., Marut Patphol., Wichai Wongyai., and Supin Boonchuvong. (2017). **Development of a Professional Learning Community Model to Enhance The Skills of Learning Management, Systems Thinking and Creative Innovation of Student Teachers.** Dissertation Ph.D. (Curriculum Research and Development), Bangkok: Graduate School, Srinakharinwirot University.

Kessirin Srisamrith., and Maream Nillapun.(2015).**The Professional Development Model for Enhancing Instructional Competency of Teacher to Encourage Science Process Skills and Scientific Minds of Early Childhood.** Dissertation Ph.D. (Curriculum and Instruction), Nakornpathom: Graduate School, Silpakorn University.

Kittikom Kaveerat., and Maream Nillapun. (2010). **The Development of Experientail Learning Model for Health Promotion of Rajabhat University Students.** Dissertation Ph.D. (Curriculum and Instruction), Nakornpathom: Graduate School, Silpakorn University.

Marut Patphol. (2018). **Developing A Training Curriculum in Learning Management for Enhance the Creative and Innovation Skills for Basic Education Teachers.** Bangkok: Graduate School, Srinakharinwirot University.

Mathuroth Paprachan., Marut Patphol., Wichai Wongyai., and Chotima Nooprick. (2016). **The Development of A Training Curriculum to Enhance Reading Instruction Competence and Reading Diagnostics for Lower Primary Teachers.** Dissertation Ph.D. (Curriculum Research and Development), Bangkok: Graduate School, Srinakharinwirot University.

Sawitree Sitthichaiyakarn., Marut Patphol., Wichai Wongyai., and Chotima Nooprick. (2017). **The Development of a Training Curriculum to Enhance the Ability of Secondary Teachers in the Learning Management of the Integrated Nature of Science.** Dissertation Ph.D. (Curriculum Research and Development), Bangkok: Graduate School, Srinakharinwirot University.

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