Addressing Student Learning Difficulties by Learning Study: A Personal Knowledge Management Perspective

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Abstract

This paper discusses effective training activities used to develop teachers' personal knowledge management (PKM) competencies for supporting students in remedial education. PKM competencies are conceptualized as knowledge retrieving, organizing, analyzing and collaborative skills. The paper explores how Learning Study, a collaborative action research approach, can be integrated with eLearning activities to enhance PKM skills for effective instructional design and assessment for learning so as to manage learning difficulties and diversity of students. The study adopts Cheng's (2011) PKM model to propose a curriculum framework for developing teacher PKM skills through a teaching development project conducted at The Hong Kong Institute of Education. Results showed that injecting eLearning activities in the Learning Study course can assist teachers in managing student diversity and learning difficulties.

Keywords: Learning Study, Personal Knowledge Management Competency, Teacher Professional Development

1. Introduction

Student diversity and learning difficulties present teachers with various difficulties and challenges in instruction design and curriculum implementation. Disconnection between theories and practices in teacher education cannot equip teachers with sufficient classroom research skills for constructing pedagogical knowledge so as to manage student diversity and learning difficulties. How to effectively develop teachers with such research competencies and assist them to construct pedagogical knowledge has become a significant research agenda in teacher education and school-based teacher professional development.

Teacher development is viewed as an ongoing lifelong learning process as teachers strive to learn how to manage student diversity and teach students to learn how to learn (Cochran-Smith & Lytle, 1999). Enhancing learners with learning competency for lifelong learning has become a core issue in teaching and teacher education. Personal knowledge management (PKM) is an innovative idea in teacher education. PKM competency is an intertwined macro-competency that involves cognitive, metacognitive, information, social and learning competencies. Developing a teacher education curriculum that can nurture pre-service teachers in sustainable professional competencies is a significant research agenda and a practical issue to be addressed in teacher education.

This paper addresses the issues of professional competencies for teachers who specialize in K-12 remedial education. It also addresses ways to develop teachers' professional learning competency. The paper discusses how Learning Study, an approach for teacher professional development in Hong Kong, has helped teachers develop their PKM skills for addressing student diversity and learning difficulties.

2. Literature Review

An effective approach to support students in remedial education can be implemented by helping students set individual learning goals, to develop learning and self-motivational strategies. Teachers require the necessary knowledge and skills in order to support students in this manner. In turn, students need to acquire such knowledge and skills, which will enable them to manage their learning.

2.1 Supporting students in remedial education

Students have different levels of learning abilities. As such, they would not achieve their learning goals all at the same time. Helping them to set individual goals can facilitate their understanding of their own learning tasks (Lei, Wang & Tanjia, 2001). The goals should be as specific, measurable, feasible and timely as possible. The progress in knowledge and skills made by the students should be highlighted instead of merely giving marks or grades, and individual student's mastery orientation should be developed. It not only reveals the weaknesses of students in learning but, more importantly, alerts them to the effectiveness of their learning strategies (Zimmerman & Paulsen, 1995).

Students are differentiated in terms of their attitude toward learning within the classroom. In this, comparing students' performances may frustrate some diligent students with lower achievement levels and lead them to give up on learning. Students should be encouraged to explain their perceptions on the subject knowledge. Helping students manage their learning motivation is an approach to enable them to manage their different learning abilities (Boekaerts, 1995; Corno, 1986, 1987; Pintrich & DeGroot, 1990). Separately, their strengths and weaknesses should also be pointed out, and a remedial plan should be suggested to them for improving their learning.

Students should be provided with attributional feedback and it must be emphasized that their progress is directly related to the efforts applied. They should be informed of the values of different subjects in class and relate subject topics to their real lives. Assignments that target problem-solving in real life situations should be designed and multiple teaching methods for increasing students' learning interests should be applied (Lin, 1997). If students consistently use the above strategies step by step, they will make progress. Teachers should guide students to use the above strategies independently in their work. Teacher education and training should equip teachers with the competencies to identify student learning abilities and attitude and the corresponding remedial teaching strategies.

2.2 The role of teacher education and development

Developing teachers' professional competency in inquiring into what and how to teach has long been one of the most important research issues in the education sector. Equipping teachers with a theory-based tool for instructional design and developing their PKM competencies may help teachers learn how to support students in remediate education more effectively and to develop long-term strategies for addressing the many unknowns that will arise as teachers mature professionally.

2.3 Learning Study in Hong Kong

For enhancing learning and teaching effectiveness, teachers are expected to acquire the skills to conduct classroom research for improving teaching and learning, so as to develop their understanding of how students learn and, at the same time,

develop their own instructional design skills. With the purpose of providing teachers with classroom research tools and skills, a Hong Kong research team has developed Learning Study, a theory-based collaborative action research practice, for teacher professional development. Learning Study was also developed as a school improvement project which aimed to improve the quality of student learning by enhancing teacher competencies in the design, implementation, evaluation and dissemination of a research lesson (Cheng, 2009). Apart from offering research-based opportunities for teachers, the distinctive feature of Learning Study is that it introduces variation theory (Marton & Booth, 1997) in teaching and learning. The theory postulates that learning is always directed at an object and is related to how people make sense of it. Specifically, the theoretical assumption of Learning Study consists of three elements: focusing on the object of learning (OL) and its critical features, adopting the view that knowing is a way of seeing and building on three types of variation: variation in students' understanding of the OL (V1), variation in teachers' ways of dealing with OL (V2), and using variation as a guiding principle of pedagogical design (V3) (Lo, Pong & Chik, 2005).

The Learning Study course in Hong Kong is a 39-hour course offered to student teachers in all five-year Bachelor of Education programs at the biggest teacher education institute in Hong Kong. The course plays an important role in preparing student teachers to conduct their individual teaching practices of their study. The course comprises a series of theory-based tutorials, supportive consultation meetings, and a research lesson practicum. During the course, pre-service teachers are taught the theories and practice of Learning Study in tutorials. They are then required to work in small subject groups with support and guidance from the instructors to implement the Learning Study project. The pre-service teachers have to take part in the Learning Study groups, and contribute to the planning and evaluation of the research lesson to implement two research lessons. Figure 1 illustrates the steps in a learning study and the use of variation.

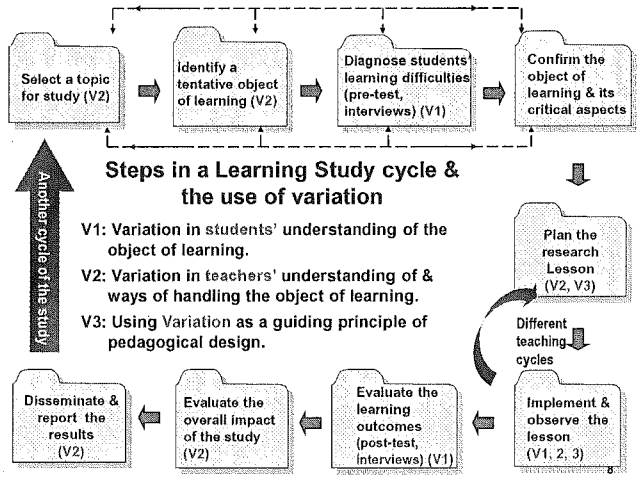

Figure 1: Steps in a learning study and the use of variation

The course design is based on Grossman et al.'s (2009) framework of representation, decomposition, and approximation of practice. Grossman et al. (2009) developed the framework to describe and analyze the teaching of practice in professional education programs. Representations of practice comprise different ways that practice can be represented through lectures, tutorials, and workshops of a

professional education program. Decomposition of practice involves breaking down practice into its constituent parts and engaging instructors to provide consultative support to the novices. Approximations of practice refer to the opportunity to engage in teaching practices. Grossman et al.'s (2009) framework of representation, decomposition, and approximation of practice is adopted as the theoretical framework of this study. It is conceptualized by the learning process of theory-based tutorials, consultation meetings, and research lesson practicum, which are assumed to be the predictive variables of the learning outcomes of the course. The learning outcome includes skills for assessment for learning, instructional design and personal knowledge management.

2.4 Skills and competencies developed by Learning Study course

Assessment for learning, instructional design and personal knowledge management competencies are essential professional competencies for teachers who specialize in K-12 remedial education.

2.4.1 Assessment for learning

Assessing student performance is a critical aspect in teaching practices. It provides feedback to determine the extent to which instructional objectives have been met, and guides decisions about large-group instruction or the development of individualized instructional programs. Research reveals that there is a causal relationship between classroom assessments and student performance in standardized tests (Stiggins, 1999). Pre-service teachers are expected to demonstrate their assessment skills to support student learning by asking student questions and providing assignments so as to evaluate and monitor student learning progress. After collecting students' feedback, pre-service teachers need to take students' learning difficulties and their misconceptions into the instructional design and formulate the next lesson plan in their teaching practicum.

2.4.2 Instructional design

Instructional design involves analysis, design, development, implementation, and evaluation of a lesson (Molenda , 2003; Strickland , 2006). It includes knowing how to analyze learner characteristics and tasks to be learned, and identify learner entry skills; how to design learning objectives and choose an instructional approach; how to develop instructional or training materials; how to implement the lesson and deliver the instructional materials; and how to evaluate the lesson plan and recommend the materials that achieved the desired goals. Pre-service teachers should demonstrate competency in selecting teaching materials, determining the subject knowledge of the topic before formulating a lesson plan, making a balance between the curriculum goal and students' individual needs, and broadening students' learning experience as their principle on designing teaching activities in their teaching practicum.

2.4.3 Personal knowledge management competencies

PKM is as an intertwined macro-competency that involves cognitive, metacognitive, information, social and learning competencies (Wright 2005). If PKM skills are taught, acquired and utilized in each discipline across the curriculum, pre-service teachers can organize and integrate information to provide strategies for transforming what might be random pieces of information into something that can be systematically applied and that expands their personal knowledge. Developing learners with PKM competency is not simply a lifelong education issue. It is also an

important teacher education issue in terms of sustaining competitive human capital in the knowledge economy. Cheng (2011) defines PKM as a conceptual framework to organize and integrate important information such that it becomes part of an individual's personal knowledge base.

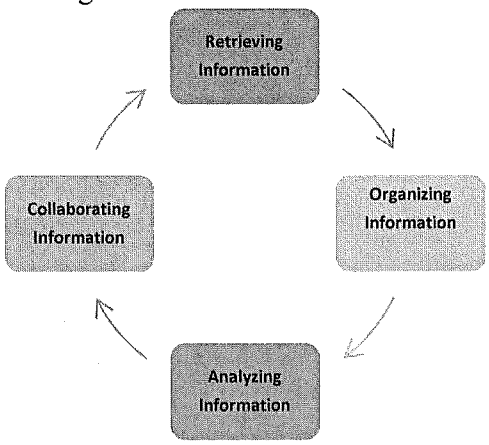

Figure 2. PKM skills for information acquisition

He conceptualizes PKM competencies by the following four PKM skills:

1. Retrieving skill: the ability of learners to retrieve and to judge the quality of the information from relational databases, electronic library databases, websites, threaded discussion groups, recorded chats, and moderated and unmodulated lists.
2. Organizing skill: the ability to make the information one's own by applying ordering and connecting principles that relate new information to old information.
3. Analyzing skill: the ability to extract meaning from data and convert information into knowledge.
4. Collaborating skill: the ability to understand others' ideas, develop and follow through on shared practices, build win-win relationships, and resolve conflicts between these underlying principles.

3. Research design of the study

3.1 The PKM curriculum

This study adopted Cheng's PKM model (2011) to propose a curriculum framework for developing pre-service teachers' PKM competencies. The proposed PKM curriculum was based on empirical study of a group of pre-service teachers enrolled in a bachelor of education program. The elements of PKM tools application, e-learning activities and collaborative action research were then developed and injected to the experiment courses. The courses provided pre-service teachers with different degrees of opportunities to carry out instructional design, lesson implementation and reflection through e-learning and collaborative action research activities. The study integrated eLearning activities, PKM tools and collaborative action research in the proposed courses to develop student PKM skills. The integration of all these possibilities on the web in a way that the learners can select, individualize and customize the learning resources and services according to their needs and interests can support learners and teachers, and enhance learning in general (Ebner & Taraghi, 2010). They can connect to information and to communities with their own preferred PKM tools. An authentic learning environment was created to help them to achieve effective learning, particularly in instruction design.

3.2 PKM tools

PKM can be analyzed from a technology-centric view that addresses the challenges and problems associated with the use of PKM tools (Tsui 2002). PKM is a set of information skills and describes several categories of tools for developing PKM skills. These PKM tools are search/index tools, meta-search tools, information capture and sharing tools, associative link tools and concept/mind mapping tools, email management, voice recognition, collaboration and synchronization, and learning tools. Learners can acquire relevant new knowledge by internalizing information from the following PKM tools.

3.2.1 Zotero is a free and open-source reference management software for managing bibliographic data and related research materials. It allows students to easily collect, manage, and save bibliographic information about the items they retrieve from websites. Zotero also works with word processing programs to help users easily cite their sources as they write. The utilization of Zotero will help cultivate students' PKM skills such as retrieving skills, organizing skills and analyzing skills.

3.2.2 Google Alerts is a content change detection and notification service, offered by the search engine company, Google. The service sends emails to the user when it finds new results such as web pages, newspaper articles, or blogs that match the user's search term.

3.2.3. Google Drive serves as a storage that allows students to store documents online. It initially provides 15 GB of storage for free. It is synchronized across computers and smartphone apps. Files in drives can be reached from any smartphone, tablet, or computer, and can be shared with anyone and edited in real-time. Through the utilization of Google Drive, the 'win-win' relationship will be built up among peers, and students will understand others' ideas, develop and follow through on shared practices, thereby developing students' collaborating skill.

3.2.4 Prezi is a cloud-based presentation software and storytelling tool for presenting ideas on a virtual canvas. Unlike slides, Prezi is a zooming canvas with unlimited possibilities. Prezi can be used by teachers and students to collaborate on presentations with multiple users having access and the ability to edit the same presentation, and to allow students to construct and present their knowledge in different learning styles. Prezi is also being used in eLearning and edutainment.

3.2.5 Evernote is a cross-platform, freemium app designed for note-taking, organizing, and archiving. The app allows users to create a "note" which can be a piece of formatted text, a full webpage or webpage excerpt, a photograph, a voice memo, or a handwritten "ink" note. Notes can also have file attachments. Notebooks can be added to a stack, while notes can be sorted into a notebook, tagged, annotated, edited, given comments, searched, and exported as part of a notebook. Evernote supports a number of operating system platforms (including OS X, iOS, Chrome OS, Android, Microsoft Windows, Windows Phone, BlackBerry 10, and webOS) and also offers online synchronization and backup services.

3.2.6 Google Docs, Google Sheets, and Google Slides are a word processor, a spreadsheet, and a presentation program respectively. They are all free, web-based software office suites offered by Google within its Google Drive service. The suite allows users to create and edit documents online while collaborating with other users

in real-time.

3.3 Data collection and analysis

A Solomon four-group quasi-experimental research design was used to collect data from self-response pre- and post-tests on PKM measurement for the Learning Study course. All items were measured using a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Another similar professional study course was set up as the control group. Lesson observation and qualitative interviews were conducted to evaluate students' PKM development. The effectiveness of the eLearning activities, the use of PKM tools and the collaborative action research approach were evaluated.

4. Findings and discussion

Table 1 shows the results of the pre- and post-tests of retrieving, organizing, analyzing and collaborating skills in the four groups. The net intervention effect for injecting the use of PKM tools in the Learning Study course impacted on the retrieving, organizing, analyzing skills, but not on the collaborative skills in this study.

Retrieving skill					**Organizing skill**				
		Pre-test Mean	Post-test Mean	Δ score			Pre-test Mean	Post-test Mean	Δ score
Experimental Group	G1	4.28	4.6	0.32	Experimental Group	G1	4.3	4.64	0.34
	G2	--	4.3	--		G2	--	4.44	--
Effect of pre-test on experimental group			0.3		Effect of pre-test on experimental group			0.20	
Control Group	G3	3.8	4.07	0.27	Control Group	G3	3.95	4.15	0.2
	G4	--	3.8	--		G4	--	3.73	--
Effect of pre-test on control group			0.13		Effect of pre-test on control group			0.42	
Net intervention effect				0.05	Net intervention effect				0.11
Analyzing skill					**Collaborative skill**				
		Pre-test Mean	Post-test Mean	Δ score			Pre-test Mean	Post-test Mean	Δ score
Experimental Group	G1	4.32	4.72	0.4	Experimental Group	G 1	4.7	4.47	-2.3
	G2	--	4.47	--		G2	--	4.78	--
Effect of pre-test on experimental group			0.25		Effect of pre-test on experimental group			-0.31	
Control Group	G3	3.8	4.1	0.3	Control Group	G3	3.97	4.13	0.16
	G4	--	3.5	--		G4	--	3.8	--
Effect of pre-test on control group			0.6		Effect of pre-test on control group			0.33	
Net intervention effect				0.1	Net intervention effect				-0.07

The retrieving skills for the pre-service teachers have been developed through searching out information for lesson planning, producing instructional materials, preparing for group presentation, and writing of individual reflective reports. They reported that they were able to retrieve appropriate teaching plans from the website of Education Bureau and relevant journal articles from the database of the Institute

library, public library in Hong Kong and Google Scholar. They were able to apply appropriate key words for information retrieval. This information included cases of Learning Study, samples of teaching plans and news from television.

Their organizing skills have been developed by utilizing Google Drive to rename, order, organize, and categorize information. Through the application of ordering and connecting principles that relate new information to old information, they were able to develop a set of taxonomy for managing information. Evidences illustrated that pre-service teachers can organize information in an inquiry process that focuses on making the connections necessary to link pieces of information. Their retrieval and organizing skills enabled them to design lesson plans and appropriate teaching materials.

Their analyzing skills have been developed by diagnosing the learning difficulties of their students, analyzing lesson observation cases, formulating pre- and post-test papers, evaluating students learning outcomes as well as analyzing the results of the pre- and post-test papers. Their students answered the pre-test and post-test papers regarding the subject knowledge taught. The pre-service teachers can analyze the learning difficulties and learning diversities of their students regarding the subject knowledge. They reported that they can compare the individual scores of each student with the mean score of the item to identify the learning problem of individual students and check the standard deviation of each item to identify the level of student diversity. This reflects that their analyzing skills enabled them to assess the learning problems and diversity of their students.

The utilization of a WhatsApp group and a Google application enabled them to discuss and share ideas for group projects with group members anytime and anywhere. This collaboration tool can strengthen the connections among peers. They applied Google Slides as a PKM tool for presentation and they can edit their slides anytime and anywhere. However, results from interviews indicated that some group members were not actively engaging in the group project. It was found that they relied heavily on Google Documents or the WhatsApp group for online discussions and lacked face-to-face in-depth sharing which, as a result, weakened their team spirit. Some teammates were passive learners or free riders who relied on others to complete the group project for them.

The injection of e-learning activities for using PKM tools in the Learning Study course has an impact on most pre-service teachers in terms of nurturing their competencies on instructional design and assessment strategies. The findings of this study confirmed the assertion of many studies relating to eLearning activities and action research. For example, it concurred with the study of Pettenati and Cigognini (2009) which stated that learner PKM skills can be developed by eLearning activities. These activities involved using the Internet for teaching PKM skills. This study is also similar to the study of Garner (2010) and Mitchell (2009) which proposed using web applications to support learners to analyze and collaborate around information, such that learners can acquire relevant new knowledge by internalizing information from using PKM tools and web applications. The result of this study is also similar to Zuber-Skerritt's model of action research and action learning (2005). Their study asserted that eLearning activities can be delivered by the action research approach to help knowledge workers access, communicate and manage personal knowledge. This

soft approach can help develop people's PKM competency.

It appears that providing training through eLearning activities (Pettenati and Cigognini, 2009) and conducting collaborative action research (Zuber-Skerritt, 2005; Cheng, 2009) can enhance PKM competencies. However, it is surprising that collaborating skills were not enhanced and even diminished. Blended learning approach would be recommended to the course to make use of the advantages of the virtue of communication and to retain face-to-face meetings that can facilitate in-depth discussions for co-constructing knowledge. By doing so, learners can learn cooperatively and become reflective practitioners (Schon, 1983) by practicing theories postulated from others through the collaborative action research process.

5. Conclusion and implication

A set of learning activities for planning the PKM curriculum can be articulated from the result of this study. For example, accessing databases and websites for information retrieval; operating electronic tools for information integration to design lesson plans; using spreadsheet and statistical software for data and information analysis for assessment for learning; using collaborative PKM tools for collaboration to support both synchronous and asynchronous communication for the purpose of learning; and constructing knowledge that is based on an appropriate understanding of the nature of data, sound inference, and an understanding of potentially meaningful relationships within a data set.

To support the sustainable development of teachers as professionals in the knowledge society, teacher education institutions should integrate PKM tools, eLearning activities and collaborative action research into the pre-service teacher education curriculum. This may be of significant assistance to pre-service teachers in retrieving, organizing, analyzing, and collaborating around information across all disciplines. If teacher education institutions really want to fully engage pre-service teachers with a professional and lifelong learning process, they should develop pre-service teachers' PKM competencies by making PKM tools available.

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