The Education University of Hong Kong

Teaching Development Grant project

Developing Personal Knowledge Management

Training Curriculum Guide and Resources

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Forward

This guide book provides tools and training activities for developing learners with personal knowledge management competencies. Personal knowledge management can be conceptualized as an intertwined macro-competency including cognitive and metacognitive, information, social and learning competencies. Developing learners with PKM competency is not simply a lifelong education issue, it is also an important teacher education issue in terms of sustaining a competitive human capital in the knowledge economy. This guide book contain 3 sections. Section 1 introduces the TDG project and the concept of PKM. Section 2 describes the freeware for developing PKM skills. Section 3 recommends teaching strategies for developing PKM skills.

Content

1. The TDG project "Developing Personal Knowledge Management Training Curriculum Guide and Resources"

Abstract

This project aimed to develop a Personal Knowledge Management (PKM) curriculum guide and resources for teacher educators to nurture pre-service teachers' PKM competencies and instructional design skills. Supporting the sustainable development of teachers as professionals in the knowledge society is a critical issue in teacher education. Developing a teacher education curriculum that could nurture pre-service teachers' sustainable professional competencies becomes a significant research agenda and a practical issue to be addressed in teacher education. This project intended to adopt Dorsey's PKM model to develop a curriculum guide and related resources that could be implemented in undergraduate and in-service teacher professional development programmes of our University for developing pre-service teachers' PKM competencies. The elements of PKM tools application, e-learning activities and collaborative action research were developed and injected to the experiment courses as an intervention to confirm the pre-service teachers' PKM competency framework. The courses provided teachers with different degrees of opportunities to carry out instructional design, lesson implementation and reflection through e-learning and collaborative action research activities. A Solomon four group quasi-experimental research design was used to collect data. The results were adopted to formulate a PKM curriculum guide as a reference for teacher education curriculum development.

1.1 Why is PKM important?

Recent education reforms in Hong Kong highlight the development of students' learning to learn skills for acquiring knowledge through various channels (Education Commission, 2000). To achieve this aim, teachers should learn how to teach their students learning to learn skills, and they are also expected to equip with this competency for learning pedagogical knowledge. The recent education reforms in Hong Kong (Education Commission, 2000) addressed this lifelong education issue by proposing a learning to learn slogan in the policy documents. Learning to learn is the basic skill for lifelong learning in a knowledge society (Hoskins & Fredriksoon, 2008). Learners should be well equipped with this skill to acquire new knowledge for effective learning. The policy suggests that teachers should develop students with self-regulated competency for acquiring knowledge through various methods. To develop students with knowledge acquisition, application and sharing skills, teachers should also be equipped with the competency for knowledge acquisition, sharing, creation and presentation. The abilities to carry out these skills could be conceptualized as personal knowledge management (PKM) competency. Developing learners with PKM competency is not simply a lifelong education issue, it is also an important teacher education issue in terms of sustaining a competitive human capital in the knowledge economy. Teacher development is viewed as an ongoing lifelong learning process as teachers strive to learn how to teach learners 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.

Recent literature has conjugated learning to learn competencies and information technologies closer to the domain of personal knowledge management (Dorsey, 2000). Frand & Hixon (1999) proposed personal knowledge management (PKM) for undergraduate students as a means of contextualizing a more integrated learning experience as well as an alternative to the traditional narrow focus of a declared major. PKM provides a strategy for transforming what might be random pieces of information into something that can be systematically applied and that expands learners' knowledge. Enhancing teachers' PKM competency is probably an effective way to support them to convert information into their pedagogical knowledge. Researches showed that

there is a predictive relationship between PKM competency and learning effectiveness (Cheng, 2011; Wright, 2005; Tsui, 2002; & Grundspenkis, 2007), in which learners can apply PKM competency to support their learning. PKM provides knowledge workers with both a common language and a common understanding of the intellectual and practical processes necessary for the acquisition of information and its subsequent transformation into knowledge. Teachers as knowledge workers could apply PKM to improve their instructional design capacities. The significance of developing PKM competency may contribute to human cognitive capabilities (Sheridan, 2008).

1.2 What is PKM?

The increases in the amounts and formats of information available do not automatically make learners more informed or knowledgeable, if a learner cannot manage and meld the accumulation of information through their daily experience and study to construct knowledge in a systematic fashion. This competency is referred by most literatures (Frand & Hixon, 1999; Dorsey, 2000; Wright, 2005) as personal knowledge management (PKM) competency. Personal knowledge management can be conceptualized as an intertwined macro-competency. Wright (2005) developed a PKM model that links distinctive types of problem-solving activities with specific cognitive and metacognitive, information, social and learning competencies to develop knowledge workers' PKM competency. As a knowledge management competency, PKM enables knowledge workers and learners to apply a set of learning skills that are essential to lifelong learning for information processing, knowledge application and decision-making. As a cognitive and metacognitive competency, it enables knowledge workers to apply complex thinking skills to solve problems. As an information competency, it enables knowledge workers to link technology tools with a set of information skills, thus providing an intentionality that moves the focus from the technology more directly to the information. As a social competency, its underlying principles include enabling knowledge workers to understand others' ideas, develop and follow through on shared practices, build win-win relationships, and resolve conflicts. PKM integrates human cognitive and metacognitive competency (Sheridan, 2008), social competency (Wright, 2005; Pettenati & Cigognini, 2009) and information competency (Tsui, 2002).

Frand & Hixon (1999) defined PKM as a conceptual framework to organize and integrate important information such that it becomes part of an individual's personal knowledge base. After they had outlined five PKM techniques as searching, classifying, storing, distributing, and evaluating and integrating skills, Dorsey and colleagues (Avery, et. al., 2001) broadened the Frand & Hixon's PKM framework well beyond its formulation. Central to PKM, as clarified by Dorsey, are seven information skills which when exercised together are integral to effective knowledge work. These seven PKM skills are retrieving, evaluating, organizing, analyzing, presenting, and securing information and collaboration for creating knowledge. The operationalized definitions of Dorsey's (2000) PKM skills are as follows:

1. Retrieving skill is the ability of learners to retrieve information from relational databases, electronic library databases, websites, threaded discussion groups, recorded chats, and moderated and unmoderated lists.
2. Evaluating skill is the ability to make judgments on both the quality and relevance of information to be retrieved, organized, and analyzed.
3. Organizing skill is the ability to make the information one's own by applying ordering and connecting principles that relate new information to old information.
4. Collaborating skill is the ability to understand others' ideas, develop and follow through on shared practices, build win-win relationships, and resolve conflicts between these underlying principles.
5. Analyzing skill is the ability to extract meaning from data and convert information into knowledge.
6. Presenting skill is the ability to familiarize with the work of communications specialists, graphic designers, and editors.
7. Securing skill is the ability to develop and implement practices that help to ensure the confidentiality, integrity and actual existence of information.

Teachers are expected to be knowledgeable and up-to-date in subject knowledge, pedagogical knowledge and educational knowledge, all of which require an intensive on-going learning process. If their PKM skills are further developed, known and utilized in each discipline across

the teacher education curriculum, they would come to understand how important holistic information skills and critical thinking skills are in processing, interpreting and synthesizing information and in producing and contributing knowledge in any content area. Actually, Dorsey emphasized the importance of injecting PKM into undergraduate curriculum in order to bridge the gap between general education and other subject disciplines. PKM could serve as a framework for integrating general education and majors and as an approach to technology integration initiatives throughout the curriculum.

PKM is an innovative idea in teacher education. The project tried to integrate e-learning activities, PKM tools and collaborative action research in the target courses to develop students' PKM skills. 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. 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. They could connect to both information and communities with their own preferred PKM tools. An authentic learning environment could be created to help them to achieve effective learning, particularly on instruction design.

1.3 PKM research

In Taiwan, Yeh et. al. (2012) identified eleven knowledge management competencies for elementary school teachers that could create an important impact on the development of school education. The KM competencies include identifying problems, knowledge adoption, activities recording, knowledge application on work planning, research data application, transforming knowledge into concrete actions, interpreting results and judging knowledge value. They suggested that more attentions should be paid to exploit these core competencies effectively and then develop the solutions, which should continuously strengthen the perspective of teachers in order to obtain the competitive advantages in the future.

In China, Zhao (2009) conducted a survey on teachers' PKM competency, and found that Chinese teachers were not good at making use of Web 2.0 technology to manage knowledge and communicate with other teachers. Zhao presented a framework of Web 2.0 including Blog, WiKi, RSS, Tag, SNS, Social Bookmark, Diido, and Podcasting to support teachers to exercise their PKM. The study also claimed that Web 2.0 provides a series of effective tools and platforms to develop teachers' PKM competencies.

In Malaysia, Abdullah and Talib (2012) conducted a study to examine the possibility of enhancing the teaching and management performance based on PKM techniques. They found that PKM skills are related with individual-level knowledge acquisition, storage, dissemination, and application, and collective-level teaching cooperation and knowledge sharing. However, teachers' pedagogical knowledge is not well managed because their PKM skills are scatted and that resulted in waste of time and cost.

In Singapore, Chai, Koh and Tsai (2011) suggested a technological pedagogical content knowledge (TPACK) framework which comprises seven constructs to describe teachers' technology integration expertise. They found that TPACK constructs had significant impact on pre-service teachers' TPACK perceptions. However, only technological pedagogical knowledge and technological content knowledge were found to be significant predictors of TPACK in their study. The TPACK constructs addressed a theoretical void in the area of educational technology and have been widely adopted by colleges of education for the planning of teacher technology integration courses. The finding of the study provided insights to educators on how to connect the pedagogical knowledge, content knowledge and pedagogical content knowledge learnt in methods courses to their ICT courses.

1.4 PKM in an Empirical model or 4-factor PKM model

Recently, a few empirical teacher PKM studies have been conducted in school setting to verify its impact on improving education. In Hong Kong, Cheng (2011) conducted a survey to explore the relationship between PKM and knowledge acquisition of pre-service teachers. A four-factor

PKM model, which consists of retrieving, organizing, analyzing and collaboration skills, was empirically constructed. Pre-service teachers' PKM competency is identified to be a predictor for learning effectiveness. The result showed that PKM is a means for enhancing pre-service teachers' professional competency in learning instructional design, classroom management and assessment skills. Incorporation of PKM skills in teacher education curriculum was recommended to teacher education institutions for enhancing pre-service teachers' PKM competency.

1. Freeware for developing PKM skills

1.1 Zotero for collaborative research

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 can be embedded into MSWord processing programs for supporting citation of articles. Application of Zotero can develop learners' retrieving skill, organizing skill and analyzing skill.

Retrieving skills	Zotero enables learners to make judgements on the quality and relevance of information and sources to be retrieved from relational databases, electronic library databases, websites, threaded discussion groups, recorded chats and moderated and unmoderated lists. All sources of citation will be automatically saved in different folders of the Zotero.
Organizing skill	Zotero allows students to create, edit and delete collections and sub-collections to categorize sources, as well as to add tags to information and sources retrieved from websites or relational websites. By categorizing information and sources retrieved from relational databases or websites, learners' organization skills can be enhanced by applying ordering and connecting principles that relate new information to old information.
Collaborating skill	Zotero allows students to share research papers to their group members. Information and sources stored in the group library collections are shareable to all group members. Group members can be authorized to revise and edit the sources and information retrieved from websites. Students' collaborating skills can be enhanced in win-win relationships that are built among the group members.

	Students can create their own private library collections and group library collections including useful books, articles, websites, blogs, etc. Information and sources stored in private library collections are confidential.

1.2 Google Alert for retrieving sources

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 and blogs that match the user's search term.

Retrieving skill	Google Alert provides learners with a proactive information delivery service. By creating Google Alerts, learners can receive email notifications to indicate new and updated information they want.

1.3 Google Drive

Google Drive serves as a storage that allows students to store electronic files and folders. It initially provides 17 GB of storage for free. It is synchronized across computers and smartphone apps. Files in Drive can be reached from any smartphone, tablet, or computer. Files can be shared with targeted people and can be edited in real time.

Collaborative skill	Collaborative skills can be developed through using the Google Drive as a platform for file sharing. The files stored in Google Drive is shareable. The group leader can serve as an owner of the Google Drive who has the right to regulate the public visibility of the file or folder. The ownership is transferable. Owners could share documents with collaborators via email for

	co-editing anytime and anywhere.

1.4 Prezi

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 collaboratively for presentations by multiple users who have the access right. Users can edit the same work collaboratively.

Collaborative skill	Prezi allows students to share their ideas, knowledge and information, as well as to collect comments from co-editors. Prezi can work as an online collaboration platform that allows up to 10 co-editors to comment or view the same file and to show their presentations in real time. Through group discussion and co-edition, students can have a better understanding on others' ideas and can build win-win relationships for enhancing their collaborating skill.
Presenting skill	Using Prezi with the functions of work communication and graphic designers for presentation could strengthen students' presentation skill in term of delivering graphic ideas and messages. Works in Prezi can automatically synchronize across PCs, laptops and smartphones. Smartphones installed with Prezi app can serve as a remote control for presenting works stored in a PC or laptop.

1.5 EverNote

Evernote is a cloud-based cross-platform and a free 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. 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 and also offers online synchronization and backup services.

Collaborating skill	Evernote can develop students' collaborating skill by offering work chat group to students for discussion, notes sharing and editing in real time. Through online discussion, co-edition, and sources sharing, students can understand others' ideas, develop and follow through on shared practices, build win-win relationships, and resolve conflicts between these underlying principles.
Organizing skill	Evernote is a storage that allows students to upload images, documents, files, audios, videos, website resources and organized notes. Evernote enables learners to sort notes into smaller and more specific categories. Through utilizing Evernote as an information and sources retrieving instrument, learners can organize purposefully clipped information and sources such as video, images, copied texts, websites, etc. from relational databases and websites. Learners can organize notes into a notebook by applying ordering and connecting principles that relate new information to old information, and therefore their organizing skill can be developed.
Presenting skill	Utilization of Evernote can enhance learners' presentation skills. Notes can also be presented to audience in real time, and learners are provided with chances to convey their ideas and messages to their audience.

2.6 Google Docs, Google Sheets, and Google Slides

Google Docs, Google Sheets, and Google Slides are a word processor, a spreadsheet, and a

presentation program respectively. They are free and web-based office suites offered by Google within its Google Drive platform. The suite allows users to create and edit documents online while collaborating with other users in real time.

2.6.1 Google Docs

Collaborating skill	Google Docs is a web-based word processing software that allows learners to work collaboratively. Learners' collaborating skills can be enhanced by coediting and revising documents. Their works can also be traced by collaborators. Documents can be shared, accessed, created, edited, chatted and commented by using smartphones, tablets and computers.

2.6.2 Google Slides

Analyzing skill and Presenting skill	Google Slides enables learners to present their ideas more attractively with a variety of presentation themes, thousands of fonts, embedded videos, animations, and etc. Through utilization of Google Slides, learners can have a chance to develop their understanding of the presentation purpose, familiarize with the work of communications specialists, graphic designers, and editors, extract meaning from data and convert information into knowledge. By utilizing Google Slides as an e-learning tool, learners' analyzing and presenting skills can be developed.
Collaborative skill	Google Slides allows learners to invite collaborators to work together in the same document at the same time. Slides can be shared with anyone, and accessed, created, edited, chatted and commented by using smartphones, tablets, or computers. Learners' collaborative skill can be enhanced through the collaborative process of document coediting and

	resource sharing.

2.6.3 Google Spreadsheets

Analyzing skill	The utilization of Google Sheets enables students to extract meaning from data and convert information into knowledge, so that their analyzing skills can be enhanced.

2.6.4 Google Forms

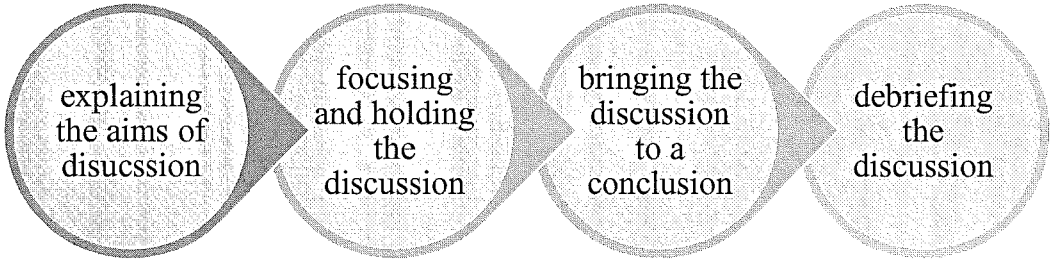
Analyzing skill	Google Forms allows students to invite an unlimited number of individuals to respond to surveys by sharing the URL or emailing an embedded form. Individuals can respond to the surveys by clicking the URL or directly filling in the embedded form. Responses to the surveys are neat and automatically collected in Google Sheets, and real-time response information and charts can be produced by the Forms. Through adopting Google Forms as a data collection instrument, students can be trained to extract meaning from the data collected from respondents and convert the information into knowledge, by which students' analyzing skills can be developed.

2. Teaching strategies for developing PKM skills

This section illustrates five strategies including Discussion, Cooperative Learning, Task-based Learning, Modelling, and Direct Instruction for developing learners with PKM skills.

3.1 "Discussion"

Discussion is an ingredient for provoking students' thinking and integrating the cognitive and social aspects of learning. Discussion is a central teaching strategy to all aspects of teaching. As a teaching strategy to develop learners' PKM skills, discussion enables learners to organize their understanding of academic content, and to communicate their ideas and thinking process to others. Through discussion students' thinking process, engagement and learning will also be improved. Implementation of the discussion strategy involves four phases (see the following figure).



The general syntax for discussion

Phase 1: explaining the aims of the discussion;

Phase 2: focusing and holding the discussion;

Phase 3: bringing the discussion to a conclusion; and

Phase 4: debriefing the discussion.

Students are required to report the conclusion of their discussion, which will facilitate students to categorize, organize, and reconstruct the information before debriefing to audience. Students' organizing skill will be developed during this process.

Discussion is a teaching strategy to develop students' PKM skills. The utilization of discussion strategy provides opportunities for learners to collaborate with others for co-construct of knowledge through organizing and analyzing the subject content. Discussion helps learners to construct their understanding of the teaching content and to reconstruct knowledge. In the discussion process, learners can internalize the learning content into their own knowledge. Their organization skill and analyzing skill can also be developed. A group discussion facilitates learners to work with each other and enables them to engage in learning activities. They communicate with each other, share ideas and information, and transfer knowledge. Learners can understand others' ideas through communications, develop and follow through on shared practices, build win-win relationships, and resolve conflicts under this principles, therefore their communication skill and collaborative skill can be enhanced through discussions. The following cases illustrate the use of discussion strategy for developing students' PKM skills.

2.1.1 Case study of Curriculum and Assessment Course

In the Curriculum and Assessment course, *discussion* took up 20% of total assessment score. There were face-to-face discussion and virtual discussion. The instructor explained the issues or questions with clear objectives to the students. Learners worked in collaborative groups and played in different roles. Students were required to form a group with 3-4 other course participants and work with them to discuss the issue through face-to-face meeting or online meeting. Students were required to complete the online activities and submit reports via Moodle. The topics for discussion were listed as follows.

- *What factors have shaped assessment practices and policies in Hong Kong?*
- *How have these changed throughout the years?*

In this learning activity, students did not need to meet up with each other. Discussions were

conducted through Moodle. In each subject group, students were assigned with different learning tasks and played different roles, e.g. *the discussant, the policymaker, the curriculum specialist, the implementer,* and *the assessor*.

The Discussant was responsible for starting the conversations on line, asking questions on possible topics for the group presentation, and inviting group members to play their roles during the discussions. The Discussant should ensure that all group members draw upon and reflect on their own school experiences to discuss the model's implementation in the local context.

The Policymaker was responsible for introducing the policy/approach/model and its purposes. This student should articulate what is the model about, and what are its aims.

The Curriculum Specialist should be responsible for asking questions regarding the policy/approach/model and how it reflects the curriculum orientations. The subject group was encouraged to discuss how global influences have shaped the model and Eisner's three dimensions of curriculum.

The Implementer was responsible for discssing the role of teachers and students. This student was required to articulate how teachers should teach and how students should learn.

The Assessor was responsible for discussing how learning and teaching would be assessed and how assessment of learning and assessment for learning can take place.

Students applied Moodle as a platform to conduct online discussions, so that they built on each other's knowledge and understanding. This learning activity facilitated students to utilize e-learning tools to support their study in the "Big Data Era". Students discussed the topics collaboratively and completed learning activities assigned by the instructor through the Moodle. With the different assigned roles in their minds, the students co-constructed the solutions or knowledge regarding the discussion topics with different perspectives. They analyzed the topics from the perspectives of different stakeholders and offered feedbacks to various stakeholders. For example, the policymakers introduced the policy/approach/model and its purposes to other stakeholders including the discussants, the curriculum specialists, the implementers and the

assessors to convey the message to them.

The curriculum specialists analyzed how the policy/approach/model reflects the curriculum orientations and its feasibility when it is implemented in local context. They analyzed this problem from the perspectives of local schools, teachers and students. The implementers analyzed the policy/approach/model from teaching and learning perspective and articulated how the policy/approach/model could be implemented effectively. Finally, the assessors summarized the viewpoints form the policymakers, curriculum specialists, implementers, and themselves to propose a feasible assessment mechanism for evaluating the model. During the process of the online activities, students played as different stakeholders, and analyzed the topics and problems from multiple perspectives. They shared ideas, information and knowledge to peers and to develop a collaborative relationship. They received information from their peers and converted the information into knowledge. They organized and reconstructed the knowledge before presentation. Students were able to externalized their tacit knowledge into explicit knowledge when giving opinions and providing feedbacks. These learning activities could develop students' organizing skill, analyzing skill and collaborative skill.

2.1.2 Case study of Learning Study Course

In the Learning Study course, the instructor used the discussion strategy to engage students actively in a discussion environment and to develop their collaborative skill. The instructor applied assessment score as an incentive to engage the students in contributing their ideas during the learning process. The discussion activity took up 30% of the total assessment score. Students' contributions to the learning process included their ideas and subject knowledge, the critical features of the learning objectives, the test items of the pre-/post-test, and the instruction design of the lesson plans. The instructor also spared 30 minutes to the students for the face-to-face discussion during every lecture. In this leaning activity, students were assigned with a learning task of designing a pre-test paper for their teaching topic. They were required to form a group with 5-8 peers and design various types of test items based on the identified Critical Features. Students had to identify the Critical Features of their research teaching topic and each student was required to draft at least one test item for each Critical Feature. Students examined the test items drafted by each other. Students had to explain the rationales for designing the items and

articulate how the items were related to the Critical Features. They kept discussing until they reached agreement on the most suitable items to check learners' understanding regarding the Critical Features. This process ensured a shared accountability among group members and a collaborative pre-test paper was co-constructed.

This learning activity enabled students to contribute the design of the pre-test paper. Students searched information via multiple serching tools and evaluated validity of the items regarding the learning objectives and the Citical Features. They retrieved information from the EDB website, workbooks, exam papers, etc. The face-to-face meetings provided them with an opportunity to exchange ideas, share resources, explain their rationales for designing a particular test item, clarify doubts in a timely manner and transfer knowledge. They reflected on the weaknesses of the test items and modified them according to the others' feedbacks. Students' retrieving skill, analyzing skill and collaborative skill would be further enhanced upon successful completion of this learning activity.

2.1.3 Case study of Pedagogy Course

In a pedagogy course, the lecturer developed students' analyzing skill and collaborative skill through a group discussion. He assigned students into groups for discussing the following worksheet.

工作紙：誰是自主學習者

試評價下面四位學生的學習模式，並就「自我管理學習」而言，辨識成功和失敗的案例。又「自我管理學習者」的特徵為何？

小明是一位中六級的學生。就學期間兼任一份補習工作，以支付自己的生活費。他是一位非常有「紀律」的學生，將自己上課與補習工作的時間一一記載於隨身攜帶之記事簿中。小明偶而會因事缺課，但他一定會向同學借筆記或向教師詢問有關課堂的內容。他一向準時繳交作業。他的成績保持在水準之上，順利畢業不是問題。

瑪莉非常喜歡閱讀書籍。在閱讀時，她常只對著書本內容逐字逐句的閱讀，不大理會自己是否對內容有所瞭解。有時她甚至已翻閱到某章的最後一頁，卻還未察覺到自己一路讀來時，都在做「白日夢」。瑪莉也會察覺到自己的不專心，卻因為有太多其他的事等待著要完成，也就沒再行複習。她想：「考試前我會再複習」。但很不幸地，瑪莉常「忙」得找不出時間作考前總複習。她的成績平平，讓她困惑的是：「每天都花了三、四小時讀書，卻落得如此成績。」

彼得修讀了一些與醫學有關的預科課程(生物、化學和微積分)。彼得初中時成績優異，在自然科學方面的成績特別好，然而卻常有考前緊張的問題。升上高中後，班上有來自不同中學的優秀同學。他常覺得自己的表現不如其他同學，開始懷疑自己的能力，於是他更勤力讀書，考試焦慮的困擾亦更深。花了許多時間背誦的資料，在考試時只覺得腦袋空白一片。彼得擔心自己會否考試失敗而不能繼續唸大學，而令父母失望。

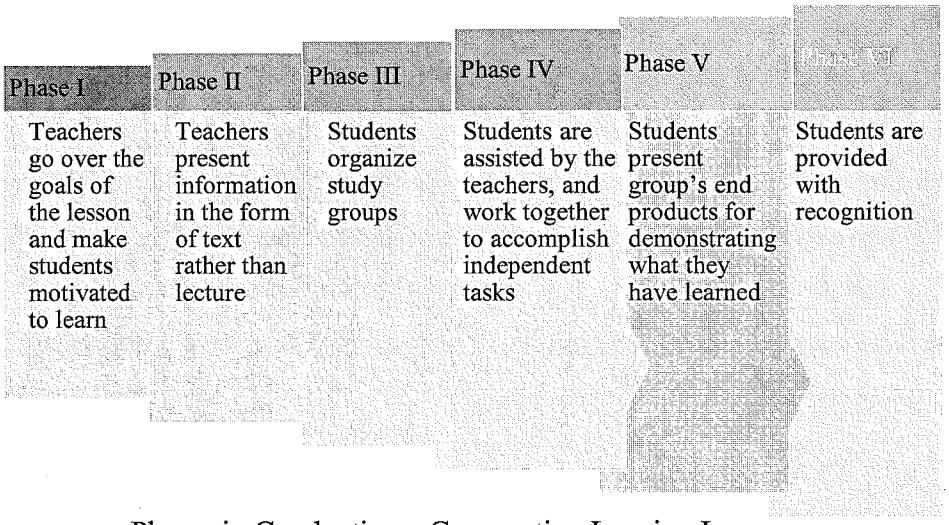
小玲是一個在課堂中很投入的學生。她不僅全神貫注的聽課，同時也勇於發問。她用心閱讀教材，記筆記，做讀書摘要，也不時比較自己閱讀時的發現與教師授課所提及的不吻合或不足之處，並與教師討論。考試前，小玲會想像可能出現的試題模式與內容，隨之作相應的準備(例如準備選擇題考試與準備申論題考試的方式不一樣)。無庸置疑，小玲總是名列前茅。

Worksheet for Classroom Discussion in a Pedagogy Course

Students were required to judge the effectiveness of the learning patterns and elaborate and articulate rationales. They were required to report the features of an effective self-regulated learner. Students gave responses to the questions raised by the lecturer and resolve them in the

collaborative groups. They retrieved information from websites for defining self-regulated learning and summarized the features of self-regulated learners from the lecturer notes, handouts, and websites. Students shared ideas and information to peers during the 15-min discussion period. They reported discussion results to the course lecturer after the 15-min discussion. They articulated the features of self-regulated learners which may include goal setting, planning, implementation, self-monitoring, evaluation, etc. Students elaborated rationales why they considered a case as an effective or ineffective self-regulated learner. They found evidences from each case to support their arguments. This learning process provoked students to think, evaluate and analyze. They converted information into knowledge so that their retrieving skill, analyzing skill and collaborative skill could be developed.

3.2 Cooperative Learning



Phases in Conducting a Cooperative Leaning Lesson

Adapted from *Learning to Teach* (Arends, 2005)

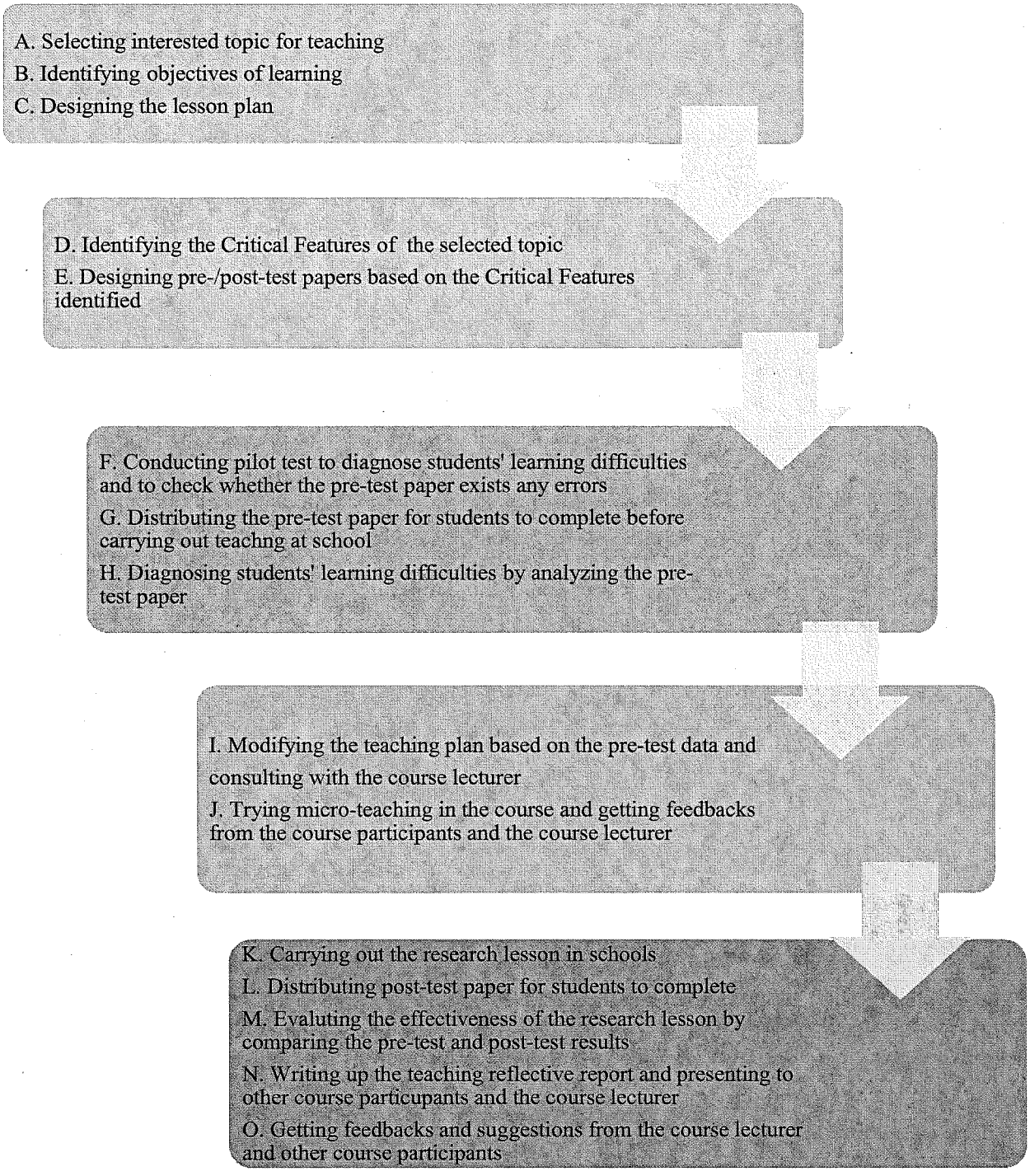
Cooperative learning is characterized by cooperative tasks, goals, and reward structures. Students in cooperative learning situations are encouraged and/or required to work together on a common task, and they must coordinate their efforts to complete the task. Cooperative learning can benefit students' academic achievement, tolerance and acceptance of diversity, and social skill development. The syntax for cooperative learning relies on small-group work rather than whole-class teaching and it includes six major phases (see the above figure).

The cooperative learning task structure requires students to work together on academic tasks in small groups. The goal and reward structures require independent learning and recognize group as well as individual efforts (Arends, 2005, p. 356). Conducting a cooperative learning lesson changes the teacher's role from one as center stage performer to one as choreographer of small-group activities. Cooperative learning environment requires cooperative tasks rather than competitive tasks or reward structures. The learning environment is characterized by democratic processes in which students assume active roles and take responsibility for their own learning (Arends, 2005).

Cooperative learning can develop students' collaborative skill. In a cooperative learning lesson, teacher's role changes from an instructor to a facilitator. Both low-achieving and high-achieving students work together on tasks assigned by teachers. Students face-to-face interact with each other and they coordinate their efforts to complete the tasks. They understand others' ideas, develop and follow through on shared practices, build win-win relationship, and resolve conflicts between these underlying principles, so that their social skill and collaborative skill will be developed in this way. The following examples demonstrate how course lecturers develop students' PKM skills through adopting cooperative teaching strategy.

3.2.1 Case Study of Learning Study Course

In the Learning Study course, collaborative learning tasks were assigned to students. The collaborative learning activities were as follows.



Students formed groups and worked with 5-8 other course participants. They collaboratively selected interested topic for teaching, identified the Critical Features of the selected topic, designed pre/post-test papers based on the Critical Features identified, diagnosed pupils' learning difficulties by analyzing the pre-test data, designed teaching plans, participated in consultation meetings, modified the initial research teaching plan, teaching strategies, and assessment approaches, tried out the micro-teaching, carried out the research lesson in schools, evaluated the effectiveness of the research lesson by comparing the pre- and post-test results, provided formative feedbacks, and wrote up the teaching reflective report.

Upon successful completion of these collaborative learning tasks, students' retrieving skill, organizing skill, analyzing skill, and collaborative skill could be developed. For example, each teaching group retrieved information and teaching materials to capture the knowledge relating to the topic for teaching from the EDB website and Google website. They made judgement on the relevance and quality of information to be retrieved, organized and analyzed. Students converted the information into knowledge and they shared knowledge and collaborated with group members to co-construct these knowledge. Their retrieving skill and collaborative skill could be developed through this learning task.

Then they organized the information and teaching materials by applying ordering and connecting principles that relate new information to old information for designing the teaching plan, for example they applied the concept of Critical Features in Variation Theory to design the teaching plan and pre-/post-test paper. Students' organizing skill could be developed through this training process.

The purpose of the pre-test paper is to diagnose pupils' learning difficulties, and the comparison of the pre- and post-test results helps to evaluate the teaching effectiveness. Pupils completed the

pre-test paper before the pre-service teachers carried out the research lesson at school. The pre-service teachers input the data collected from the pre-test and analyzed the data by utilizing Excel, which could present the pre-test results in the format of chart bars and graphs. Each chart bar illustrated the correct rate and error rate of each test item. Through analyzing the pre-test paper, pre-service teachers identified pupils' learning difficulties. They extracted meaning from the quantitative data and chart bars, and they converted the information into knowledge, so that their analyzing skill could be developed.

Based on the quantitative results, the pre-service teachers interviewed three pupils of different ability levels, if possible, to identify the causes of their learning difficulties, and to triangulate the quantitative data with the qualitative data. Results from the quantitative and qualitative data facilitated the pre-service teachers to reflect on their initial research teaching plan. They then modified their initial research teaching plan and adjusted teaching strategies and assessment approaches according to the findings. This learning activity enabled students to make individual contribution to designing the pre-test paper. The face-to-face interaction provided the students with an opportunity to exchange ideas with each other, share resources, explain their rationales for designing a particular test item, clarify doubts in a timely manner, and transfer knowledge. The face-to-face discussion was more effective than using the online discussion forum as students could be provided with immediate feedbacks. They reflected on the weaknesses of the test items and modified them according to the suggested feedbacks. Students' collaborative skills could be further enhanced upon successful completion of this learning activity.

3.2.2 Case Study of Chinese Communication Course

In the Chinese Communication course, the lecturer set collaborative tasks as 30% of the total assessment score. Students were divided into 7 subject groups and worked with 4-5 other course participants in a group. They selected the topic that they are interested for presentation. The course lecturer uploaded seven different situational learning tasks to Moodle for students to

select as their group presentation topics. Moodle was applied as a learning and teaching platform for sharing teaching materials and each collaborative group created a WhatsApp group for discussion, resources sharing, and knowledge transfer.

- Facilitating students' engagement

According to students' prior knowledge, the course lecturer assigned a leaning task of "Designing a Printed Advertisement" for students to complete in a collaborative group. The content of the printed advertisement should contain headline, copied text, slogan, logo, illustration, etc. Information should be clear and effectively delivered to target audience. Students formed collaborative groups and worked with their like-minded friends. Working with like-minded friends facilitated students to communicate, cooperate and get on well with each other. They identified the subject for advertisement through group discussions, and submitted related materials to the course lecturer via Moodle. The subject for the advertisement was "*Durex Condom*". The product's market targets are those born in the 1980s. The course lecturer conducted consultation meetings and tutorials to support the students in the preparation period.

In designing the "*Durex Condom*" poster, students were assigned with different tasks and worked as different roles. For example, some students were assigned with the role of IT technicians to apply Google Drive for group members to upload materials and conduct online discussions. Some students were tasked with collecting data and searching information from the Google websites, which included images, background pictures, slogans, and headings. Some students played consultant role to provide professional advices for the Sales Managers. Some students performed as Advertising Specialists to apply "Prezi" to design the Poster. And some students performed as Sales Managers of the Durex Condom Cooperation to promote the product of "Durex Condom" to the customers.

In the co-editing process, all retrieved information was stored in the Google Drive and shareable to all group members. They were authorized to co-edit the poster and provided ideas through the Google applications. In the preparation period, students were able to obtain supports from the

course lecturer via consultation meetings. The course lecturer provided feedbacks for students so that they could refine their work.

Students were tasked with presenting the product to the course lecturer and participants. The Advertising Specialist presented the poster and explained the inspirations and rationales of the design. The designer articulated the rationales of adopting a Western female image rather than Asian female image in the poster and explained the meanings of slogan they adopted. The Market Sales Manager illustrated that because the target customers of the product are those born in the 1980s, the poster will be presented in the MTR stations where it can be seen by most of the target customers.

By the end of the group presentation, group members were required to conduct self-evaluation on their performance and the advantages and weaknesses of their work. To further develop students' reflective skill, the course lecturer asked the group members questions like "Why" "What if", and "How" so as to facilitate their reasoning. The following questions were asked by the course lecturer to facilitate students' self-reflection.

i. *How to design an eye-catching poster to arouse the interest of the people and get them to stop for viewing?*
ii. *If you are allowed to modify your poster, which parts will you modify?*
iii. *What if you change the pattern like this/like that?*
iv. *What else should be taken into consideration for improvement next time?*

These questions provoked students' reflection on how to their work. This process enabled students to reconstruct and externalize their tacit knowledge into explicate knowledge.

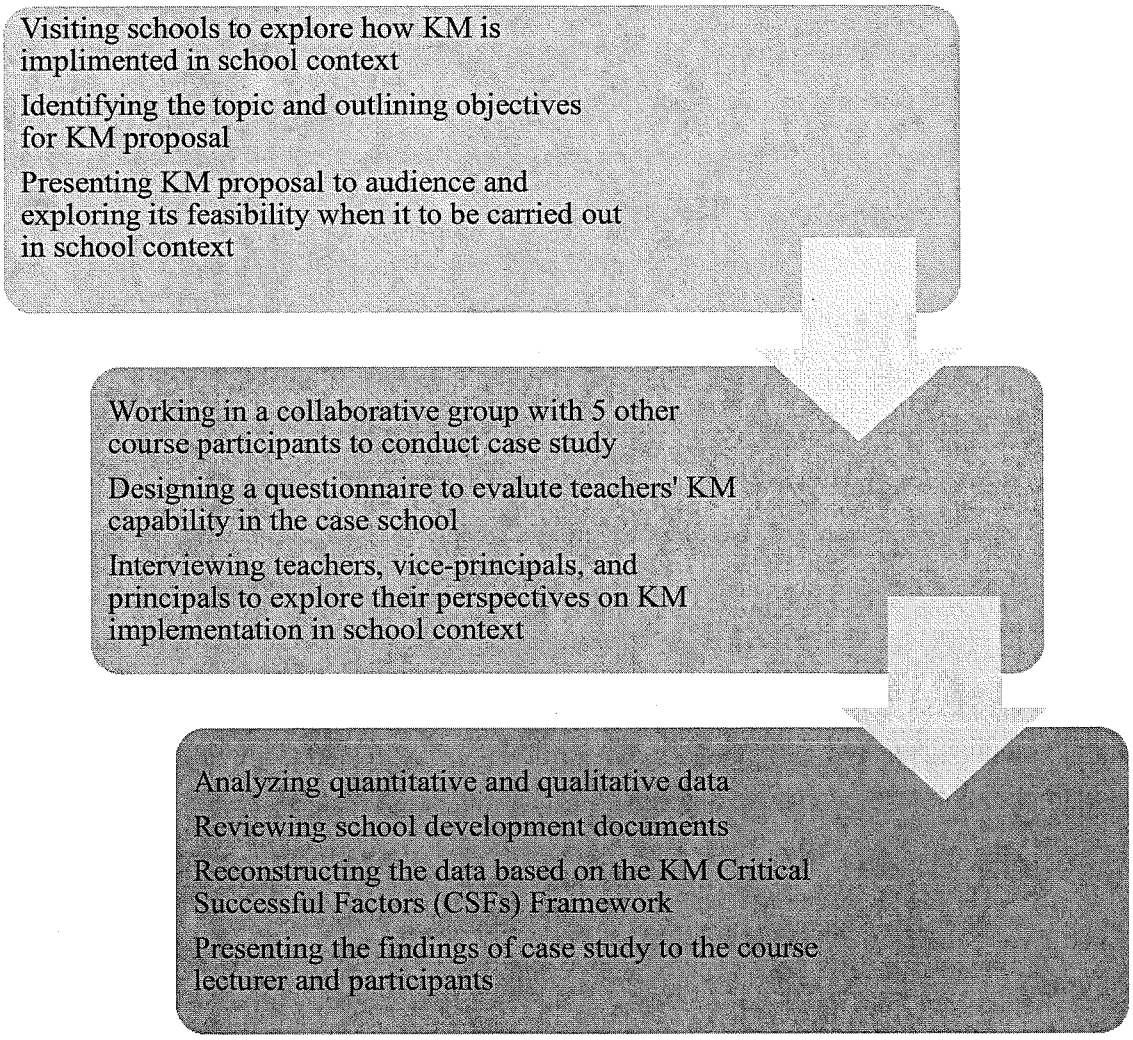
- *Providing feedback*

The lecturer commented on students' presentations, explanations and evidences collected and provided feedback for improvement. Upon successful completion of this learning activity,

students' retrieving skill, analyzing skill, presenting skill and collaborative skill could be developed. For example, students formed collaborative groups with like-minded friends and they met up with each other to identify the subject for advertisement. They searched information from the Google websites and made judgements on the quality and value of information to be retrieved, such as the images, background pictures, slogans, headings, etc. All the information was sharable to group members. Students shared their own ideas in designing the poster and consulted the course lecturer for acquiring feedbacks. Under this situation, students understood others' ideas, and tried to build a win-win relationship with peers. During the presentation, students applied "Prezi" as a tool to demonstrate the poster to the audience. They explained the communicating strategies and skills they had applied in designing the poster, and illustrated the objectives they expected to achieve. Students extracted meaning from the poster and converted the information into knowledge, so that their analyzing skill and presenting skill could be developed in this way. By the end of their presentations, students reflected on their work and were questioned by the course lecturer. The questions initiated and facilitated students to reflect on their works, and this questioning process enabled students to organize and externalize their tacit knowledge into explicate knowledge. Students' analyzing skill could be developed in this way.

3.2.3 Case study of Knowledge Management Course

In the Knowledge Management course, the lecturer created an authentic learning environment for learners to work collaboratively on KM projects. Different cooperative learning tasks were assigned to students for developing their problem-solving skill, retrieving skill, organizing skill, analyzing skill and collaborative skill, such as conducting case study, reviewing school development documents, designing questionnaires, interviewing school principals and vice-principals, analyzing quantitative and qualitative data, reconstructing the data and writing it up in a pilot KM proposal, participating in group situational activities, and reporting the findings of the pilot KM proposal.



Cooperative learning activities in the KM course

The course lecturer created an authentic context for students to learn. Students were provided with opportunities to visit schools so that they would be able to explore how schools applied KM systems to store, organize and classify important information. School visits not only aimed to provide students with opportunities to explore how KM could be implemented in school context but to stimulate students to consider the existing discrepancies when KM theory was carried out in their own schools.

After the school visits, students were required to prepare their KM proposals and outline the objectives for the proposals, which should be based on the development of their respective schools or the subject panel they were teaching. Each student needed to present their proposal to the course lecturer and other course participants for evaluating its feasibility when it is carried out in their schools.

Then students were divided into 2 groups to conduct case studies in 2 different secondary schools. Carrying out case studies aimed to confirm the feasibility of implementing KM proposal in each case school. Each team member was assigned with different tasks and took charge of different roles. The group leader was in charge of arranging the team members for school visit. Students should review the school development documents of the case school. They collaboratively designed a 21-item KM questionnaire and distributed it for teachers in the case school to complete so as to evaluate the teachers' KM capability. Students also interviewed teachers, vice-principals, and principal to explore their perspectives on KM. Then they organized and analyzed the data, and wrote it up in a pilot KM proposal for the case school. Finally, they presented the proposal to the course lecturer and other course participants.

Upon successful completion of these learning tasks, students' retrieving skill, organizing skill, analyzing skill, collaborative skill, and presenting skill could be developed. For instance, students needed to retrieve 3-year/5-year school development documents from the case school's website. They searched literature related to "KM" so as to identify "instruments" for testing KM capability. These learning activities enabled students to make judgments on both the quality and value of information to be retrieved, organized and analyzed, so that their retrieving and evaluating skill could be improved.

Students utilized SPSS 21 to analyze data collected from the questionnaire survey and applied

Excel to create graphs and chart bars for presenting. They triangulated the quantitative data with the qualitative data, such as the interview data and school development documents. These learning activities facilitated students to apply the statistical software to analyze data, and apply graphic designers to create graphs and chart bars. They could extract meaning from quantitative and qualitative data and convert this information into knowledge, so that their analyzing skill could be developed through completing these learning activities.

The course lecturer suggested a framework for students to construct the information and write it up into pilot KM proposals for the case schools in a well-organized and logical order. Students constructed their knowledge based on the Critical Successful Factors Framework. These factors included：

- Knowledge sharing culture
- Strategic planning capacity
- IT support
- KM vision

Students categorized the school development documents and sorted out both the quantitative and qualitative data based on Cheng's (2013) framework. The information was divided into 4 domains, including *knowledge sharing culture, strategic planning capacity, IT support, and KM vision*. They applied the Google applications to convert the pilot KM proposal into slides and delivered the information to the course lecturer and other course participants. Students made the information their own by applying ordering and connecting principles that relate new information to old information, so that their organizing skill could be developed through this learning activity.

3.3 Task-based learning

In the task-based learning, task is defined as "target task, classroom task" (Shehadeh, 2010, p. 1), and pedagogical task (Ellis, 2003; Willis, 1996). A classroom task is defined as an activity which is goal-oriented and content focused, has a real outcome, and reflects real-life language use and language need. A pedagogical task is a work plan that requires learners to process pragmatically in order to achieve an outcome that can be evaluated in terms of whether the correct or appropriate propositional content has been conveyed (Nunan, 2004). In Willis' (1996) Task-based learning framework, task consists of 4 phases: pre-task, task preparation, task realization, and post-task.

In the IT in Education course, the lecturer assigned authentic learning activities to students for consolidating their subject knowledge. THE learning activity is designed in an early childhood education setting. Please refer to the following authentic learning activity.

香港教育學院 數學與資訊科技學系

嘗試完成以下內容：

1. Andrew Chan 的 Homework 總分是佔整科成績的 70%，在 F8 儲存格中輸入適當的公式；
2. 再用自動填滿功能將其餘學生的 Homework (70%)的分數計算出來；
3. 在 H8 儲存格中再利用公式計算出實際分數，再用自動填滿功能將其餘學生的 Reading Test (30%)分數計算出來；
4. 最後，將各學生的 Homework(70%)及 Reading Test(30%)的分數相加起來，顯示在儲存格 I8(Total Marks)中。

	A	B	C	D	E	F	G	H	I
1	Hong Kong Kindergarten								
2	Report Sheet								
3	K1A - Semester 1								
4	Class Mistress: Miss Wong								
5	Subject: English								
6									
7	Student Name	Homework: 1	Homework: 2	Homework: average mark	Homework: total mark	Homework (70%)	Reading Test (100)	Reading Test (30%)	Total Marks
8	Andrew Chan	35	30		65	45.5	80	24	69.5
9	Eunice Cheng	41	40		81	56.7	78	23.4	80.1
10	Lily Lau	48	25		73	51.1	91	27.3	78.4
11	Sandy Ma	38	47		85	59.5	74	22.2	81.7
12	Zeke Ng	35	37		72	50.4	85	25.5	75.9
13	Peter Parg	10	22		32	22.4	42	12.6	35
14	David Wong	41	36		77	53.9	55	16.5	70.4
15	Paul Wu	20	39		59	41.3	68	20.4	61.7
16	Joe Yeung	20	13		33	23.1	70	21	44.1
17									
18									

Authentic Tasks Assigned in the IT in Education Course

The course lecturer presented the learning objectives and learning content of the lesson and articulated how the learning content would be applied in the early childhood education setting. Then he demonstrated functions of Excel to students to teach how to use the related functions, such as SUM, AVERAGE, MAX, MIN, RANK, IF, and COUNTIF. The task was to analyze K1 students' English test results. The task was to calculate the scores of students, in which Homework 1 and Homework 2 took up 70% of the total score, and Reading Test took up 30% of the total score. Students were expected to complete the learning task within 20 minutes and present the outcome to the lecturer.

The task was assigned to students in an "early childhood education setting". The task was goal-oriented and content focused, had real outcomes, and reflected real-life applications. Students renamed the spreadsheet, analyzed the data, and they computed students' homework total marks, homework average marks, reading test marks, and total marks by utilizing the functions of "SUM" and "AVERAGE". By completing the tasks, the knowledge was used immediately in the real-world context, making learning authentic. Students analyzed and computed the data through applying the functions of Excel which had been introduced by the course lecturer. They extracted meaning from data and converted the information into knowledge, so that their analyzing skill could be developed through the authentic task.

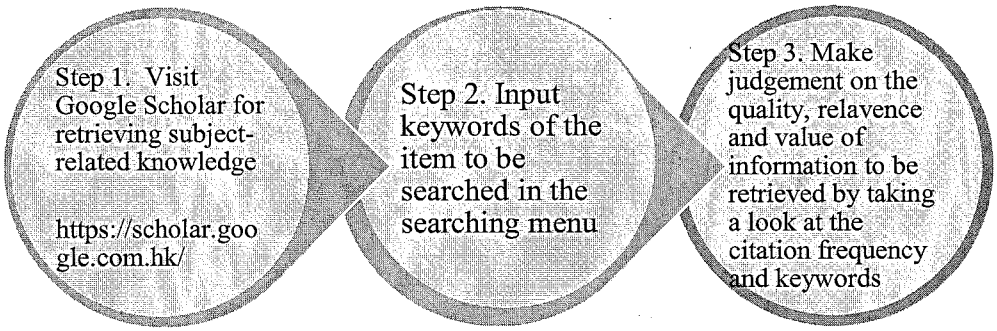
3.4 Modelling

"Modeling is a technique that can help students learn effectively in many situations"(Haston, 2007, p. 26). Whenever a teacher demonstrates a concept to students, the teacher is modeling. For example, a math teacher may work through a problem on the board, and a science teacher may demonstrate a portion of lab experiment. Students learn naturally by imitating models. "Learning by imitating a model results in learning about the structure of a fairly complex stimulus environment" (Haston, 2007, p. 26). "Modeling instruction supports high school students' engagement in the process and discourse" (Barlow et al., 2014, p. 14; Jackson et al., 2008). Modeling instruction emphasizes the importance of effective professional development. Through modeling instruction, pre-service teachers and in-service teachers have opportunities to play the roles of student and teacher as designed in the modeling instruction curriculum. This process not only strengthens their own understanding of the content but also their understanding of the pedagogy associated with modeling (Barlow et al., 2014; Jackon et al., 2008).

"The modeling cycle consists of two stages: model development and model deployment"(Barlow et al., 2014, p. 15). Model development begins with a laboratory investigation or demonstration, followed by small group collaboration, presentation of group findings to the whole class for clarification and justification, and then analysis to develop an overarching model. Model deployment gives students the opportunity to apply their understanding to new problems and situations. Modeling instruction is characterized by the development of understanding through cooperative inquiry and collective discourse (Barlow et al., 2014; Wells et al., 1995). Modeling enables students to develop more expertized problem-solving skills, leading to fewer mistakes and better understanding which could be translated into better achievement in learning. It has been shown that modeling instruction can provide other benefits excepting purely academic gains, such as increasing students' positive attitudes towards learning and facilitating the development of more student-to-student interactions while developing a sense of community within the classroom (Brewe, Kramer, & O'Brien, 2008) .

3.4.1 Case study of Learning Study Course

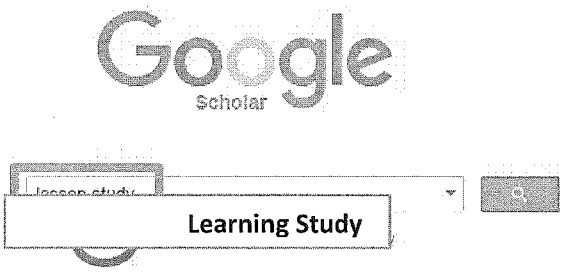
In the Learning Study course, the instructor played as a role model, demonstrating to the course participants how to search for subject-related books and articles from the Google Scholar. The instructor explained to students how to make judgements on the relevance, quality and value of information to be retrieved, organized, and analyzed. The following figure illustrates the steps for retrieving information from the Google Scholar.



3 Steps for Retrieving Information in the Google Scholar

The lecturer demonstrated how to retrieve subject-related information via Google Scholar, such as Variation Theory, Critical Features, the conceptual framework of Learning Study, formative assessment, summative assessment, etc. The website of Google Scholar is https://scholar.google.com.hk/

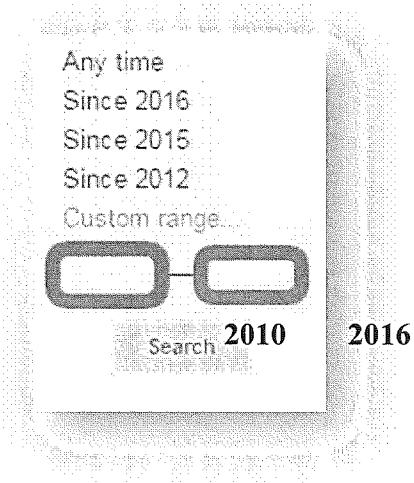
The course lecturer demonstrated to students how to search information by inputting keywords in the searching menu. She input "Learning Study", and selected "Articles" in the selection box. The following figure illustrates how the course lecturer taught her students how to retrieve information by inputting keywords.



The course lecturer modelled to students that if they want to search articles related to the topic of "Learning Study", they should input keywords "Learning Study" and choose "Article" in the tick box followed by clicking the "Search" button.

The course lecturer articulated that if students want to search articles published from 2010 to 2016, they should input "2010" and "2016" in the "Custom Range" menu, and click the "search" button to proceed.

The following figure states how the LSP2006/2007 Course lecturer modelled to students how to customize the searching scope.



As there were a number of references displaying on the webpage, the course lecturer explained to students how to evaluate the relevance, quality and value of articles to be retrieved in 2 steps.

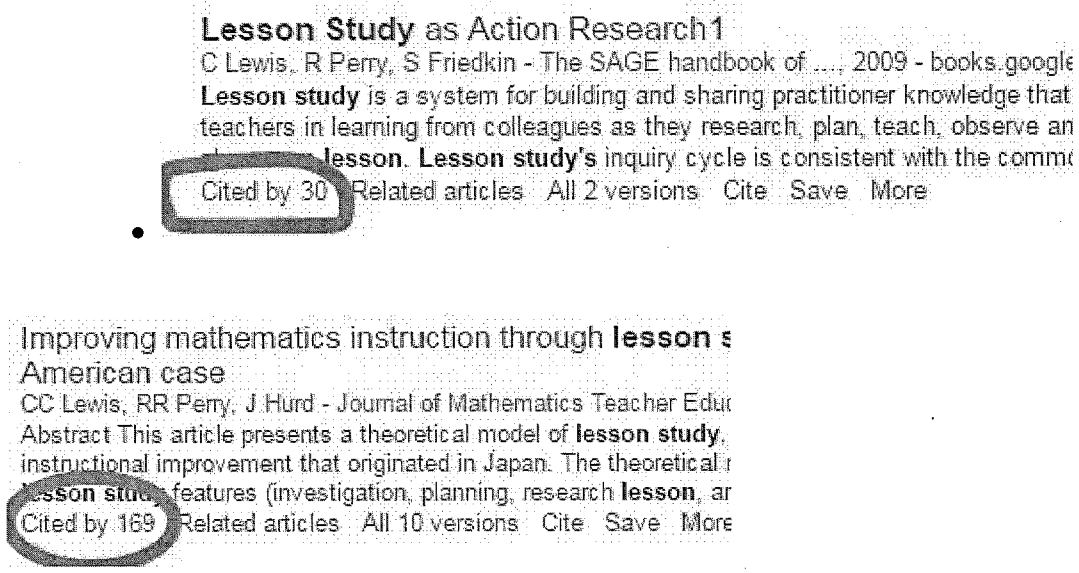
Step 1. Taking a quick look at the the abstract to evaluate whether the article is related to the searching scope

Step 2. Comparing the number of citations to evaluate the quality and value of the articles to be retrieved

2 Steps of Making Judgement of Information to be Retrieved

The course lecturer articulated to students the way to evaluate the relevance, quality and value of articles to be retrieved, organized and analyzed by taking a quick look at the abstract to evaluate the relevance of information, and viewing the number of citations to make judgement on the quality and value of information. For more details, please refer to Figure 5.

Figure 5



The course lecturer illustrated to students if the articles are respectively cited by 30 times and 169 times by readers, they should retrieve the one with a larger number of citations.

The course lecturer demonstrated to students how to retrieve more relevant information by making use of the in-text citations. If students find that the in-text citations meet their needs or fit their requirements, they can trace the references at the end of the article. This approach would enable students to retrieve more relevant information with effectiveness and efficiency.

To enable students to know more about the Learning Study cases in other countries, the course lecturer recommended some useful websites for students to visit and to explore how Learning Study is carried out overseas. These resources included how to apply the Variation Theory to design a research lesson plan (the case of catering for individual differences), learning study in Science Education in Japan and the USA.

In the Learning Study course, the lecturer worked as a role model in demonstrating to students how to retrieve relevant information by utilizing the search engine Google Scholar. She also introduced approaches to students on how to make judgements on the relevance, quality and value of information to be retrieved, organized, and analyzed. These approaches included taking a quick look at the key words and abstract of an article, comparing the number of citations, and tracing the in-text citations. In this way, students' retrieving and evaluating skills would be developed upon successful completion of this course.

The course lecturer introduced to student teachers the conceptual framework of Learning Study and its relevance in improving teaching and learning effectiveness by adopting the Theory of Variation developed by Ference Marton and the practices of Learning Study by means of lectures. She also introduced the significance of identifying the Critical Features of the selected Object of Learning (the teaching topic) to students and illustrated how to design learning activities to help pupils at schools discern the Critical Features related to their teaching topic.

The course lecturer assigned various kinds of collaborative learning tasks for students to complete so as to facilitate students' engagement in learning. These learning tasks included

selecting interested topic for teaching, identifying the Critical Features of the selected topic, designing pre/post-test papers based on the Critical Features identified, diagnosing pupils' learning difficulties by analyzing the pre-test data, designing teaching plans, participating in consultation meetings, modifying the initial research teaching plan, teaching strategies and assessment approaches, trying out the microteaching, carrying out the research lesson in schools, evaluating the teaching effectiveness of the research lesson by comparing the pre- and post-test results, providing formative feedbacks, and writing up group reflective reports. Upon successful completion of these learning activities, students' analyzing skill and collaborative skill could be developed.

Students were provided with a specific framework to write up their teaching reflective report and present the report to audience in a well-organized and logical order. Students co-constructed their group teaching reflective report based on the following key elements suggested by the course lecturer.

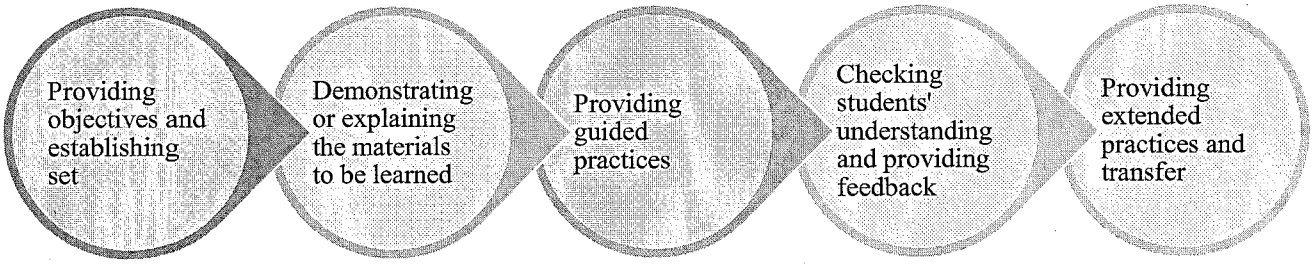
- Initial draft of the research lesson plan
- The predicted learning difficulties of the target pupils
- A pilot test to confirm the validity of the test items
- The analysis of the pre-test results to identify the pupils' learning difficulties
- Revision of the research teaching plan, such as adjusting the learning activities, teaching strategies and assessment approaches to address the learning needs)
- The experience gained from implementing the research lesson in school
- The comparison of the pre- and post-test results for evaluating the teaching effectiveness
- Group reflection and insight gained

Students wrote up their group teaching reflective report based on the framework suggested by the course lecturer. The course was featured by students' collaboration in planning, teaching and reviewing lessons with the Variation Theory of Learning developed by Ference Marton as its pedagogical guiding principle. Upon successful completion of this course, students would understand what Variation Theory is and how to apply its 4 patterns of variation in the design of their research lesson. In this process, students first identified the Critical Features of their selected Object of Learning before applying the patterns of variation to design their research teaching plan, which was followed by thinking about the teaching strategies and assessment approaches to be applied. Students related the new information to old information in designing their teaching plans, their organizing skills would be developed in this way.

3.5 Direction instruction

Direct instruction is an effective way to help students acquire the array of basic information and skills believed by the society as important for students to learn(Arends, 2005, p. 319). It aims to help students learn basic skills and knowledge that can be taught in a step-by-step fashion. Direct instruction is designed to promote mastery of skills (procedural knowledge) and factual knowledge taught in a step-by-step fashion. Direct instruction also aims at accomplishing two major learning outcomes: mastery of well-structured academic content and acquisition of all kinds of skills. Direct instruction can be described in terms of three features: the type of learning outcomes it produces, its syntax or overall flow of instructional activities, and its learning environment(Arends, 2005).

It is a teacher-centered model that has five steps:



Direct Instruction Model

Adapted from (Arends, 2005, p. 321) *Learning to Learn*

The direct instruction learning environment focuses mainly on academic tasks and aims at keeping students actively engaged. A direct instruction lesson requires a careful orchestration by the teacher and a learning environment that is businesslike and task-oriented.

Conducting a direct instruction lesson requires teachers to explain things clearly, to demonstrate and model precise behaviors, and to provide practices, monitoring of performance, and feedbacks. The use of the strategy should be guided by several principles: assigning short and meaningful amounts of practice, assigning practices to increase overlearning, and making appropriate use of massed and distributed practices (Arends, 2005). Teachers' use of direct instruction is prevalent everywhere and remains as the most popular teaching model.

Applying direct instruction for curriculum design supports students in mastering the knowledge of the subject content and learning skills including learning-to-learn skill, self-explanatory skill, and analyzing skill.

In a DI lesson, the course lecturer assigns guided practices for students to increase learning retention, developing students' learning motivation and enabling students to transfer learning to new situations. The course lecturer assigns all sorts of guided practices for students to evaluate their mastery of knowledge. Students present their job tasks and works to the course lecturer so that they will be provided with specific and immediate feedbacks from the course lecturer. This learning process provokes students' thinking and reflecting on their practices, which will facilitate students to analyze the problems, and to explain how to perform correctly on their own, so that students can improve their performance.

Students convert feedbacks provided by the course lecturer into knowledge, so that their analyzing skill will be developed in this way. Based on this situation, extended practices will be assigned for students so as to provide them with an opportunity to perform newly acquired skills on their own. The application of direct instruction strategy helps to develop students' learning-to-learn skill, self-reflection skill, self-explanatory skill and analyzing skill as students extract meaning from feedbacks that are provided by the course lecturer and convert the information into knowledge.

The course lecturer gets students ready to learn by presenting the learning objectives of the lesson, giving background information, and explaining why the lesson is important or demonstrating that what they learn from the lesson will help them with their study and work. The course lecturer assigns guided practice for students to evaluate their performance after presenting knowledge in a step-by-step pattern. Then the lecturer checks the students' mastery of knowledge and provides immediate feedbacks. The lecturer sets conditions for extended practices with purpose to transfer the use of the skills to more complex situations. The following examples indicate how course lecturers developed students' PKM skills via adopting direct instruction strategy.

3.5.1 Case study of IT in Education Course

The instructor applied P-D-P-E-P model (Presentation-Demonstration-Practice-Extension-Production) with Direct Instruction strategy in the IT in Education course. The lecturer demonstrated the use of basic functions of software/apps. Students practiced how to use the functions of Excel. Students were assigned with individual and collaborative learning tasks that should be completed through utilizing the software/apps. Individual tasks or group tasks should be presented to the course lecturer in the pattern of products.

presentation	Dmonstration	Practice	Extension	Production
In this stage, the course lecturer presented learning topic and leaning objectives to students. He illustrated how the learning topic related to their teaching in the pre-primary setting.	In this stage, the course lecturer demonstrated the learning materials to students on how to use basic functions of Excel.	After lecturer's demonstration and explanation, students were assigned with guided exercises or learning tasks to complete. This phase aimed at checking students' understaning of the learning content	In this stage, the course lecturer assigned extended exercises which were related to the teaching in the pre-primary setting for students to complete. The extended exercises were skill-oriented, which would be applied by students in authentic context	In this stage, students applied what they had learnt into practice. They evaluated their mastery of content and basic skills on their own. They prsented their work/products to the course lecturer

In the IT in Education Course, the lecturer presented learning topic and its application in the pre-primary setting. He demonstrated to students the objectives of learning which were listed as follows.

- Enable students to be familiar with Microsoft Excel and its application in working setting.
  - *Be able to input and edit data in spreadsheet*
  - *Be able to use Auto Fill functions*
  - *Be able to select "save" and "print" properties*

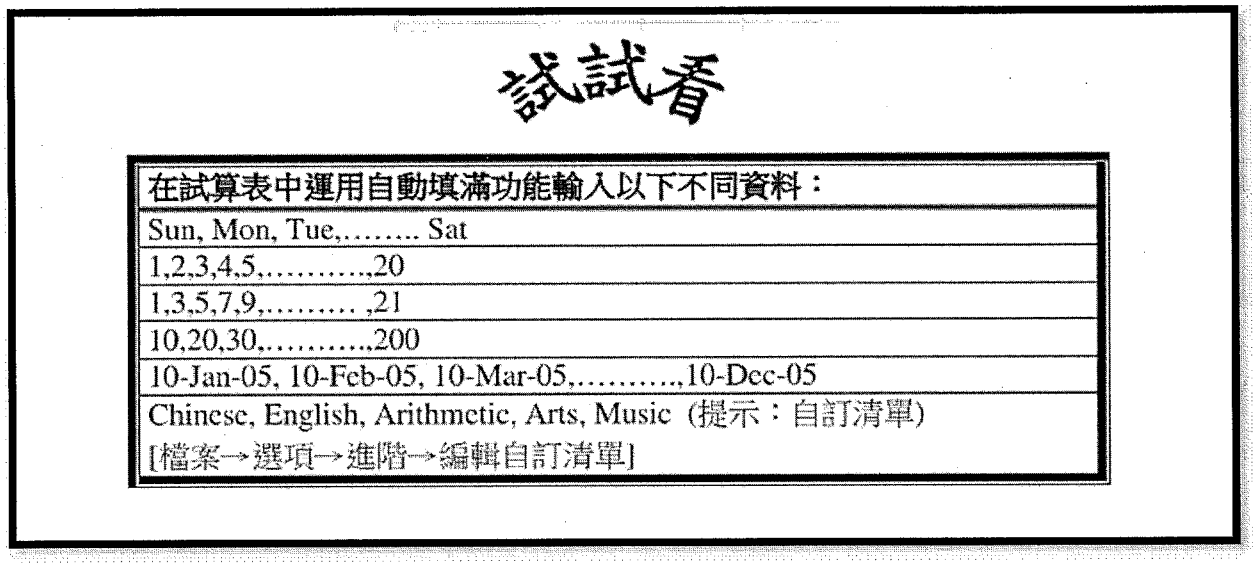
The course lecturer presented learning objectives to students, which provided them with "cues" about what was going to "happen". It is important for a skill-oriented lesson. The course lecturer enabled students to know the rationales for leaning a particular skill so as to motivate students to learn and initiate the desired commitment of students.

The course lecturer introduced the functions of Microsoft Excel and illustrated how it can be applied in the pre-primary setting. He demonstrated the learning materials to students on how to

use the basic functions of Excel, such as creating and renaming a spreadsheet, inputting data, computing data, adjusting width and height of columns, and so forth. Details are as follows.

At the beginning the course lecturer just demonstrated to students how to input a simple figure "300", text "'6265361", data "1/4/2006", and equation "9*9", and then used the "Full Auto Fill In" function to input numbers.

After the lecturer's demonstration and explanation, students were assigned with guided exercises to complete within 15-20 minutes so as to practice how to input data, edit data and compute data by utilizing Excel. Please refer to the following guided exercises.



試試看

在試算表中運用自動填滿功能輸入以下不同資料：
Sun, Mon, Tue,…….. Sat
1,2,3,4,5,……..,20
1,3,5,7,9,…… ,21
10,20,30,……..,200
10-Jan-05, 10-Feb-05, 10-Mar-05,……..,10-Dec-05
Chinese, English, Arithmetic, Arts, Music (提示：自訂清單) [檔案→選項→進階→編輯自訂清單]

Guided Exercise in the IT in Education Course

Learning tasks were as follows

- **input figure with radix points, e.g. "300.00"**
- **input a figure with "0" as the first number, e.g. "06265361"**
- **input dates and time in different formats**
- **utilize the "Full Auto fill in" function to input "January, February, …**

and December"

In this phase, students completed the guided exercises that were related to learning objectives on their own or in collaborative groups. The course lecturer worked as an instructor to provide technical supports and provide specific feedbacks to students if they have inquiries. Students presented their products to the course lecturer and gained feedbacks from the course lecturer. This phase aimed at checking if students understood how to use the basic functions of Excel. In the next phase, the course lecturer assigned extended exercises for students to complete. The extended exercises were authentic and skill-oriented which students would apply in the pre-primary setting. Please refer to the list of extended exercises as below.

動手做 – 成績評核 (一)

你是一間幼稚園老師，現正為 K1A 班學生進行英文科的評估，評核內容包括兩項課業(Homework 1, Homework 2)及一項閱讀測驗(Reading Test)，評估分數的分配為：課業佔總分 70%，而 Homework 1 及 Homework 2 評估比重相等；閱讀測驗佔 30%。請根據以上資料製作該班的成績表。

輸入資料

依照下圖在各個儲存格中輸入資料及將工作表 Sheet1 重新命名為 **"K1A"**：

	A	B	C	D	E	F	G	H	I	J
1	Hong Kong Kindergarten									
2	Report Sheet									
3	K1A - Semester 1									
4	Class Mistress: Miss Wong									
5	Subject: English									
6										
7	Student Name	Homework 1	Homework 2	Homework: average mark	Homework: total mark	Homework (70%)	Reading Test (100)	Reading Test (30%)	Total Marks	
8	Andrew Chan	35	30				60			
9	Eunice Cheng	41	40				78			
10	Lily Lau	48	35				91			
11	Sandy Ma	38	47				74			
12	Zeke Ng	35	37				85			
13	Peter Pang	10	22				42			
14	David Wong	41	36				55			
15	Paul Wu	20	39				68			
16	Joe Yeung	20	13				70			
17										
18										
19										
20										

6. 「Sheet1」標籤上，連按兩下滑鼠左鍵，便能修改名稱。

Supposing the students were in-service teachers in pre-primary schools, they needed to analyze K1A students' English final test results. The evaluation included Homework 1 and 2, and Reading Test. Homework 1 and 2 took up 70% of the course total value; and Reading Test took up 30% of the course total value. Students were required to complete the following extended exercises within 30 minutes.

Details of the tasks were as follows

1) Rename Spreadsheet 1 as K1A
2) Adjust width and height of column D7, E7, F7, G7, and H7
3) Merge and center the text "Hong Kong Kindergarten", "Report Sheet", and "K1A – Semester 1"
4) Format the table
5) Highlight text color
6) Set the color of text "Hong Kong Kindergarten", "Report Sheet", and "K1A – Semester 1"

Students should complete the learning tasks within 30 minutes and present their products to the course lecturer. In this period, students applied what they had learnt into practice in the pre-primary setting. This learning tasks enabled students to evaluate their mastery of the leaning content and basic skills on their own. Completion of the extended exercises created an authentic learning context for students' learning and enabled students to apply knowledge they had learnt into practice. They analyzed K1A students' English test results via adopting the functions of Excel and presented the data to readers using the ordering and connecting principles. During this process, students extracted meaning from data and converted the information to knowledge, so that their analyzing skill could be developed.

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Appendix PKM workshop elearning tool

PKM e-Learning
Tools Workshop 2