Lin, P. J.（2008）. Supporting Mentors in Learning with School-University Partnership. Paper presented at the *11th International Congress on Mathematics Education (ICME-11, Regular Lecture)*. July 6-13, Mexico, Monterrey.

SUPPORTING MENTORS IN LEARNING WITH SCHOOL-UNIVERSITY PARTNERSHIP

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Supporting Mentors in Learning with School-University Partnership

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ABSTRACT

This lecture is intended to share with you the development of mentoring practices for supporting future teachers learning to teach under the impact of teacher education reform of Taiwan, particularly, in the internship. The lecture begins by introducing the change of teacher education reform issued in 1994, followed by the description of the impact of teacher education on quality control. Then, it describes six integrated reach projects funded by the National Science Council for fostering the quality of mentoring practices. One of the integrated research projects was designed to develop an innovative approach of internship through the school-university partnership. The innovation approach is intended to enhance mentors' knowledge and skill, such that mentors have better ability in mentoring future teachers. The aspects of innovation include the course of the mentoring, the process of mentoring, an integral model of mentoring, and its evaluation of the mentoring program. The lecture is ended with the issues associated with developing a mentoring program.

Key words: mentors, integrated model, internship, school-university partnership.

INTRODUCTION

Teacher preparation programs across countries have made considerable efforts to the content and the process of the practicum. The practicum stipulated allows future teacher (FT) to have field experience in school settings throughout the entire school year with the support of university faculty and school teachers. Due to much of the responsibility for mentoring FTs in Taiwan lie with the mentor in the schools who are not subject specialists rather than with university faculty. As a result, FTs have little professional learning with school teachers during practicum.

With drastic changes of economy, policy, and society, quality control have been an emerged issue since the teacher education reform was issued by the Ministry of Education (MOE) of Taiwan in 1994 (MOE, 1994). A great deal of teacher educators have paid a lot of attentions on the studies of teacher preparation, but these studies are limited on the learning opportunities for FTs provided by the teacher preparation program in teacher education institutes, for instance, the criteria of recruitment and selection, university-based course and practicum requirements, and accreditation systems for teacher education (Fwu & Wang, 2002). Teacher education reformers in Taiwan did not focus on the supports of FTs with creating opportunities for improving the quality of teaching, in particular in the internship until the privilege of teacher colleges or Normal university for teacher preparation was deprived. The main focus of the lecture is on the introduction of an innovative method that was designed to improve mentors' competence of mentoring for supporting FTs' quality of teaching with the support of school-university partnership in the internship.

THE INNOVATION OF TEACHER EDUCATION IN TAIWAN

The teacher education reform under the impact of economic, political and social contexts has been demonstrated a drastic change since the Teacher Education Act (TEA) of Taiwan was issued in 1994. The major changes included: 1) School-based practicum is reduced into half year from a whole year and attached in the fourth year of a four-year teacher preparation program; 2) Teachers are certified by the processes consisting of qualified a teacher while completed four-year courses, half-year practicum, and then certified a teacher after passing a certified teacher examination. 3) The teacher preparation can be offered from any institution in which has teacher education program (MOE, 1994).

The Impact of Teacher Education Reform

The TEA declared that all four-year public and private universities and colleges

are allowed to run teacher education programs for training teachers as long as they meet the requirement of the MOE. As a result, deprived of the privileges in teacher training, teachers colleges were suffered from lower popularity among high school graduates and a decrease in students' academic level. Under the situations, some teacher colleges upgraded to be a university of education or a comprehensive university. The declining government budget for higher education and the limited quantify and quality in faculty and facilities made the transformation of universities of education or to seek opportunities to integrate them into nearby universities. In addition, with the decreasing population of baby born, the supply of teachers from teacher education programs is much more than the demand. The number of teachers to be prepared from each university of education is required to be reduced into 50% as many as before (MOE, 2005).

The establishment of teacher education programs by any university or college needs to be approved by the MOE according to a set of official criteria for quality in the faculty, curriculum, and facilities of the programs. However, the process of training, curriculum, instruction, and practicum are various with different teacher education programs. Some programs in universities had inadequate number of faculties and a lack of practical experience in internship. To control teacher quality, a national examination of teacher inspection was ignited with 2004. However, only FTs' knowledge of general pedagogy instead of subject matter pedagogy is assessed in the inspection. The inspection is not able to assess how well the future teachers (FTs) performed in teaching learned from teacher education program.

Excepting the high percentage of FTs passing the national examination of teacher inspection to be achieved, the teacher educators of Taiwan were aware of the importance of FTs' ability in performing in classroom. They recognized the practicum as an important component in teacher education. Teaching is a form of highly complex and skilled practice depending on teachers' knowledge and skill. A knowledge base including a theoretical and a professional component underpins teaching. The theoretical component is taught in the years of teacher preparation program, while the professional component needs to be developed in the professional practice. However, the practicum provides FTs with an opportunity to develop the professional knowledge but it often results in FTs developing the technical skills of classroom management, rather than the wisdom of professional practice. Within ten years, a method of assisting FTs to develop professional knowledge is partnership formed between schools and universities where FTs have opportunities to be involved with day-to-day activities of professional practice. The studies on teacher preparation show that FTs complained that they are required to devote a great deal of time to

administrative affairs of schools. They were mentored by the mentors who do not have enough professional knowledge in mentoring (Lo, Hung, & Liu, 2002). Thus, their professional knowledge was not developed during the internship although the school-university partnership has been implemented.

The failure of the partnership could be resulted from the unsuccessful mechanism of collaboration between school and university. When comparing the successful experience of other countries such as England and USA implementing the partnership of school-university in practicum, teacher educators of Taiwan attempted to reconstruct a new concept of the school-university partnership that was designed to enhance the mentors' knowledge and skill such that improving the quality of practicum by providing FTs with greater involvement with mentors in teaching. Since teacher education reformers of USA indicate that the structure of the relationship creates the opportunities for the FTs to relate the theoretical knowledge to the practical realities of schools and classrooms. They regard through the school-university partnership FTs as one of the important strategies to support FTs' learning to teach, and thus, to improve the quality of teaching (Odell, Huling, & Sweeny, 1999). In these experiences, the FTs are not focused on the technical skills of classroom management. Instead, the FTs are engaged in meaningful professional-related tasks.

The Issues of Internship Emerged Under the Reform

Since the enactment of the TEA in 1994, the issues of the ambiguity of FT's role, government's over-loaded on allowance of internship, and diversity in outcome quality control have emerged.

The ambiguity of FTs' role during practicum is an issue under the TEA impact. FTs in school placement were neither a student (because of their completion of courses of TE program) nor a teacher (because of no salary). FTs were dominated by mentors by school administrators to devote a great deal of time to doing school administrative affairs. The FTs were afraid of rebelling school teachers' authorities because the part of their grade of internship was graded by school teachers or mentors. Therefore, it leads to lack of professional learning during the internship.

Each FT gets NT$8000 monthly allowance for internship during school placement. It is overloaded for government in finance. On the other hand, for FTs, monthly allowance with NT$8000 is not sufficient for affording FTs' living. It is imbalance between the hours FTs worked and the pay they gained.

Diversity is another essential feature of the teacher education reform. Due to the huge variance in FTs' quality and the training process at individual universities, the MOE is worried that the mushrooming of TE programs in the past few years might

result in a decline in teacher quality. Thus, it is necessary to establish a uniform standard for assessing FTs' quality through a nationwide licensing examination to assure teacher quality.

MUSHROOMING OF INTEGRATED RESEARCH PROJECTS ON MENTORING

Due to the enactment of the TEA, the number of TE programs set by regular universities has accelerated, from the initial 9 programs in 1994 to 88 programs approved by the MOE in the year 2006 (MOE, 2005). Mushrooming of these programs has indicated the variance of the teacher quality. Due to the variance in training process at individual universities, the MOE is worried that the increment of the TE programs in the past few years might result in a decline in teacher quality. To overcome this problem, recently, the National Science Council (NSC) associated with MOE funded a goal-oriented research grant to call for research proposals for teacher educators. The goal-oriented program is to improve the quality of teacher education in mathematics and science. Within past three years, there were six integrated research projects approved by the NSC were investigated by mathematics and science teacher educators from University of Education and Normal universities (National Hsinchu University of Education, 2006). Four of them were at the primary level and two were at the secondary level. The six integrated research projects are displayed in Table 1 by level, subject-matter area, and goals.

Table 1: Introduction of Six Integrated Research Projects

characteristics \ projects		MP1	MP2	SP1	SP2	MC1	MC2
Establishing professional Standards	Mentors	○	○	○	○	○	○
	FTs	○	○	○	○	○	○
Mentoring program		○	○	○	○	○	○
School-based		○	○		○		
Subject	Mathematics	○	○	○		○	○
	Chinese	○	○				
	Science	○	○	○	○		○
Level	Primary	○	○	○	○		
	Secondary					○	○

M: mathematics S: Science P: Primary level C: Secondary level

Table 1 shows that only one project (SP2) investigated mentoring in science and only one project (MC1) involving in mathematics. There were two integrated research projects (MP1 and MP2) involving in three subject-matter areas, mathematics,

Chinese, and science. Each integrated research project is described briefly as follows.

The establishment of professional standards for mentors and for FTs and followed by setting up a mentoring program is common goal among the six integrated research projects. Although setting up a set of professional standards for mentors and for FTs respectively were the purpose of the integrated projects, the distinction among them was varied by subject area, level, and methodology. The design of a mentoring program, the development of a model of mentoring, and the evaluation of the mentoring program were the main focus among the six integrated projects. The introduction of each integrated project was not the purpose of the lecture. Instead, only one integrated research project MP1 is reported here.

AN INTEGRATED MODEL OF MENTORING PROGRAM FOR IMPROVING QUALITY OF INTERNSHIP

A Mentoring Program

The integrated research project MP1 includes four sub-projects which explored the literacy of subject-based teaching including mathematics, Chinese, science and non-subject based technology at primary level. The sub-project involving in technology was intended to be integrated into the three subject-matters. MP1 is a three-year research project. It was begun by establishing a set of professional standards for mentors and for FTs, respectively. The second year was to develop and design a mentor training program. The third year was to develop an interactive model of mentoring by integrated three subjects. The mentoring model of MP1 was to meet the need of teaching a range of subjects for a teacher at the primary level. It was called as a model of one-subject mentors with multiple-subject future teachers (OSM-MSFT). It means that each mentor was only trained to be specialized in one subject by subject-matter teacher educator of the university.

The goal of the half-year mentoring program for mathematics mentors group as part of the integrated research project MP1 was to enhance mentors' knowledge and skill of mentoring. The mentoring program was based on the professional standards of mentors that were conducted by the author in the first year of MP1 project (Lin & Tsai, 2007). The professional standards describe the indicators of preliminary knowledge and skill of a teacher to be a mentor.

The course of mentoring program includes two parts, professional knowledge and skills of mathematical teaching and mentoring. Each part includes five topics: curriculum, pedagogy, assessment, social mathematics norm, topics about individual students. Curriculum topics refers to the objectives for instruction, the scope and sequence of the content to be learned, the sequence of activities, textbook, resources

of teaching, and the plans and schedules for teaching. Pedagogical topics cover the discussions on subject matter knowledge, instructional strategies, clarity of explanation, questioning, problem-posing, and analyzing students' various solutions. Assessment topic related to assessing students' learning and performance as well as their progress. Social mathematics norm topic is the issues about social interaction in mathematics classroom, the norms of groups of students in a class. Topic about individual students included discussions about the background, learners' needs, behavior, and progress of an individual student (Lin, 2007).

The courses of mentoring program provided by the researcher, who is the teacher educator of university, including theory and practice of mathematics teaching and mentoring were implemented in a six-day summer workshop with 36 hours and half school-year with 42 hours. The summer workshop was to conceptualize mentors' and FTs' knowledge of teaching mathematics toward learner-oriented, while the course of the school year was to enhance mentors' knowledge and skills in mentoring and FTs' knowledge of teaching.

An Integrated Model of Mentoring

An integrated model of mentoring was explored in the integrated research project MP1. The purpose of the MP1 was to improve the knowledge and skill in mentoring for mentors via the partnership of school-university. In developing the school-university partnership on FT preparation, there were five main considerations. First, the school to be recruited was dependent on the willing of the mentors and the FTs. Second, the school to be recruited at least consists of the mentors from mathematics, Chinese, and science. Third, the school has a commitment to maximize the FTs' involvement in the community of mentors while at the same time minimizing the possible disruption this participation might cause the mentors and schools. Fourth, some kind of ancillary benefits and feedbacks for giving back to the school from the partnership were also a consideration for the university when designing the mentoring program, for instance, minor finical support and certified hours of institutes. Fifth, the school needs to offer mentors and FTs supports on professional practices. The final consideration was that the supervisors (or teacher educators) of the FTs during practicum are the researchers involving in the integrated research project. This consideration is intended to reduce FTs' burden from the researchers and supervisor of practicum as possible.

It is not possible for developing FTs' professional knowledge if the mentors' mentoring knowledge and skills have not been developed well. The mentoring program associated with school-university partnership was designed to assist mentors in developing mentoring knowledge and skills, and then to enhance FTs' professional

practice during practicum. The mentoring program included three subject mentoring programs, mentoring in mathematics, mentoring in Chinese, and mentoring in science, as part of an integrated research project. Due to FTs to be a primary school teacher who teach several subjects, mathematics and Chinese are required to be taught for a home-room teacher. To meet this need, an integrated model of mentoring was developed. The integrated model of mentoring was that each participant FT was mentored by a mentor in mathematics and mentored by another mentor in Chinese. Mathematics future teachers group consisting of FTm1, FTm2, FTm3, and FTm4 were mainly mentored to be a professional teaching in mathematics. They were mentored by mathematics mentors group consisting of A, B, C, and D, and were also mentored to be a professional teaching in Chinese assisted by Chinese mentors group consisting of P, Q, R, and S. Each FT in mathematics group was mentored by a mentor from mathematics mentor group and a mentor from Chinese mentor group.

Likewise, Chinese future teachers group consisting of FTc1, FTc2, FTc3, and FTc4 were mainly mentored to be a professional teaching in Chinese. They were mentored by Chinese mentors group and also were mentored by mathematics mentors group. Each FT in Chinese group was mentored by a mentor from Chinese mentor group and by a mentor from mathematics mentor group. Science future teachers group consisting of FTs1 and FTs2 were mentored to be a professional teaching in science and were mentored by science mentors group consisting of I and J. Each FT in science group was mentored by a mentor in science mentor group.

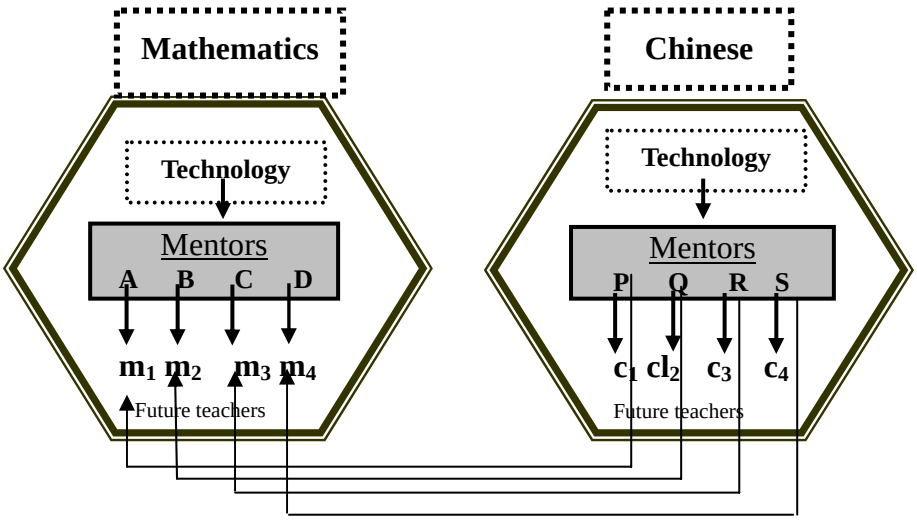


Figure 1: The integrated model of one-subject mentors with multiple-subject future teachers (OSM-MSFT)

However, to reduce mentors' tension and burden from their participation in the mentoring program, each mentor was only trained to be specialized in one subject by subject teacher educator of the university. The subject teacher educators were the researchers, who participated in the integrated research project. For instance, the mentors A, B, C, and D were trained to be an expert in mathematics teaching assisted by the researcher from mathematics department, while mentors P, Q, R, and S were trained to be an expert in Chinese teaching assisted by the teacher educator from Chinese department. The integrated model displayed in Figure 1 is called as a model of one-subject mentors with multiple-subject future teachers (OSM-MSFT).

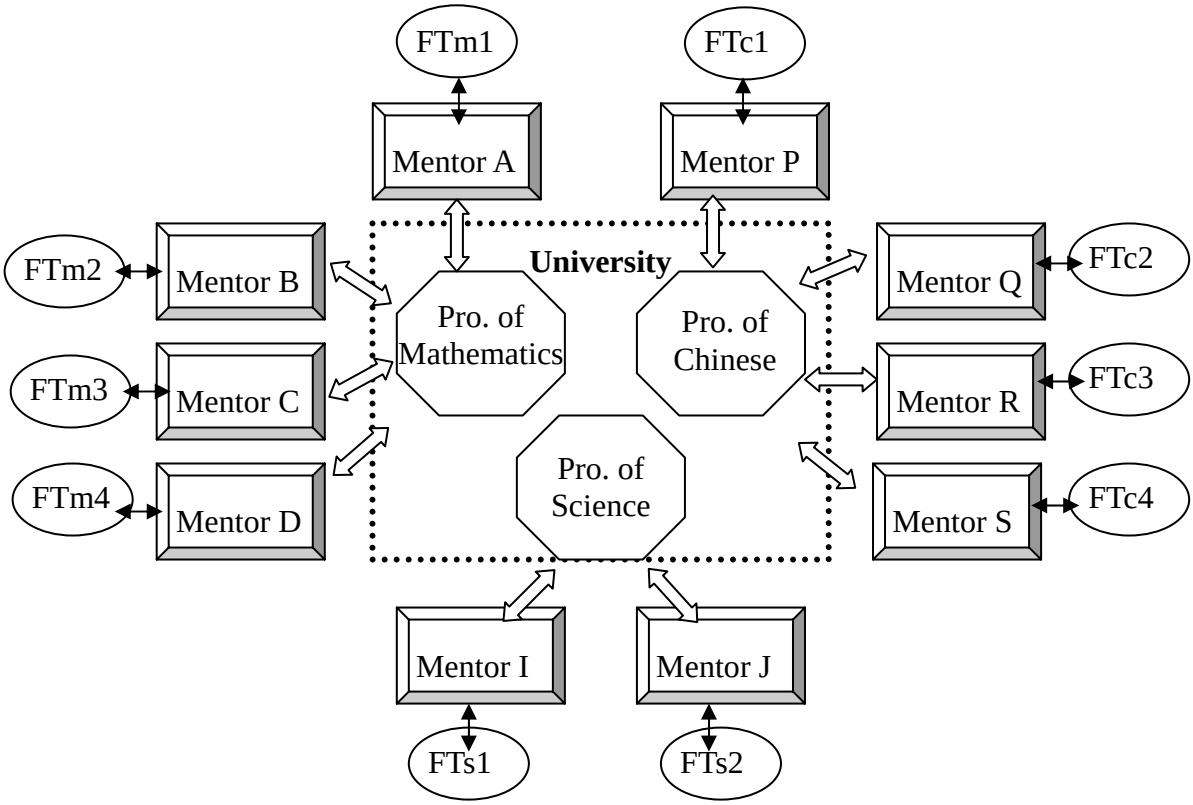
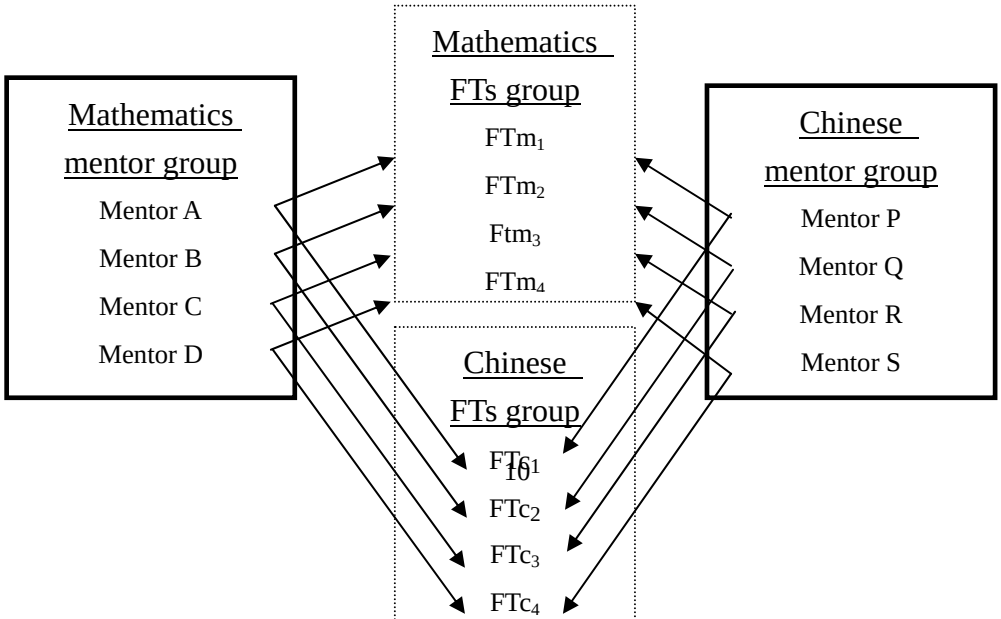


Figure 2: The Partnership of School-University



The connection among future teachers, teacher educators of university, and mentors in a school is described in Figure 2. The partnership of school-university was designed to form three different professional mentoring groups, mathematics, science, and Chinese in the school. Mentors I, and J are trained to be an expert in science teaching assisted by a science teacher educator. This creates the maximum opportunity for FTs to learn the professional knowledge.

The integrated model of one-subject mentors with multiple-subject future teachers (OSM-MSFT) forms several teams of mentors with FTs. For instance, two mentors A and P working with two FTs, Fm1 and FTc1. FTm1 and FTc1 learned from Mentor A about how to teach mathematics, while they learned from Mentor P about how teach Chinese, as displayed in Figure 3.

To let FTm1 and FTc1 presented in mentor A classroom simultaneously to watch Mantor A's lesson, they were required to appear in Mentor P classroom simultaneously to watch Mentor P's Chinese lesson at other time. Mentor A and P needed to sit together to arrange their class schedules for FTm1 (displayed by 😐) and FTc1 (displayed by ☺), as depicted in Table 1.

Table 1 is an example of a weekly class schedule of mentor A (or mentor P) during school day. The mathematics class of the two mentors was arranged at the same time. Same as the Chinese class. Both Mentors A and P are fifth grade teachers. FTm1 and FTc1 were always appeared in the same classroom at the same time.

Table 1： A Weekly Class Schedule of Mentor A (or P) During School Day

	Monday	Tuesday	Wednesday	Thursday	Friday
Class 1 8:40-9:20	Chinese ☺ 😐	Chinese ☺ 😐	Mathematics ☺ 😐	Mathematics ☺ 😐	Mathematics ☺ 😐
Class 2 9:30-10:10	Mathematics ☺ 😐	Chinese ☺ 😐	Mathematics ☺ 😐	Chinese ☺ 😐	😐(or ☺)
Class 3 10:25-11:05	😐(or ☺)	😐(or ☺)	Chinese ☺ 😐	😐(or ☺)	😐(or ☺)
Class 4 11:15-11:55	😐(or ☺)	😐(or ☺)		😐(or ☺)	Chinese

					☺ 😐
Class 5 13:20-14:00	😐(or ☺)	😐(or ☺)		😐(or ☺)	😐(☺)
Class 6 14:10-14:50	😐(or ☺)	😐(or ☺)		😐(or ☺)	😐(☺)
Class 7 15:00-15:40	😐(or ☺)	😐(or ☺)		😐(or ☺)	😐(or ☺)

☺: FTm1 😐:FTc1

THE PROCESS OF HELPING IN IMPROVING MENTORS' PROFESSIONAL TEACHING AND MENTORING

The four mentors participating in the project had no experience of mentoring. To help them putting their visions for mentoring into practice, the mentors were supported via four phases. There was a one-hour classroom observation on every Thursday morning and a follow-up three-hour mentoring group meeting in the afternoon throughout each phase of the mentoring program. There are two groups. One is mathematics mentors group consisting of the researcher and four mentors. The other is mathematics FTs group consisting of four pairs of mentors-interns. Afterwards, each mentor required immediately share FTs with main ideas discussed in the mathematics mentor group meeting. The integrated model took the critical constructivist perspective on mentoring that knowledge is actively built by learners through the process of active thinking (Wang, & Odell, 2002). The researcher and the mentors were viewed as learners and generators of new knowledge and practices of mentoring. Likewise, the mentors and the FTs were also viewed as learners and generators of new knowledge, and they had to count on each other. The integrated model stressed mentors' active construction of mentoring knowledge through what they have leaned in practice and constant dialogue with teacher educators. The collaborative inquiry model of mentoring in school-university partnership is depicted in Figure 4 as follows.

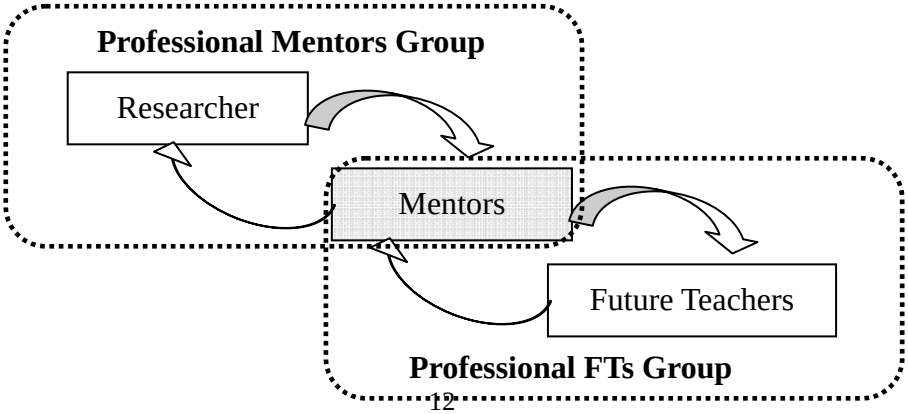


Figure 4: Collaborative Inquiry Model of Mentoring in School-University

Phase 1: In the first two weeks of the mentoring program as the first phase, the mentors were supported in gaining the idea of induction through mutually sharing among them. The mentors were encouraged to offer emotional support for interns to overcome reality shock and reduce psychological stresses caused by the conflicts between their personal lives and professional requirement. Each mentor took turns to report in public how she introduced her intern to students and parents in the first few days of the school year. Each FT was asked to report their feelings about the induction treated by mentor.

Phase 2: In the second phase, from week 3 to 6, we supported the mentors in gaining a general picture of the kind of teaching and in understanding the basic procedures in their teaching through observation and reflection about other mentors' lessons. Each mentor was asked to teach several lessons for FTs in their own classroom. In this way, each FT could see how their mentor taught a lesson on the content that was going to teach. It was followed by a short conversation with the mentor concerning the relationship between the syllabus, students' performance in classroom, and the lesson actually taught. Before the FTs' observation, each mentor must elaborate the purposes of teaching she had for that lesson. Then, each mentor required FT to observe her lesson with these purposes in mind and to understand the reasons underlying the teaching. This phase provided the mentors an opportunity to support FTs on learning how to observe a lesson focusing on learners and supported mentors' learned the teaching with a learned-oriented approach.

Phase 3: The third phase, from week 7 to 10, we supported the mentors working with the FTs together in preparing a lesson and a peer observation (called as LPPO). The first opportunity was observing a mentor preparing a lesson with her FT sitting together and then observed the mentor to teach the lesson. It was followed by peers' observation on how the mentor carried out the lesson, and then observing the mentor asking her intern a series of questions, such as explaining how well the lesson plan was carried out, how well the objectives she have achieved in the lesson, identifying the changes she made in the lesson compared to the lesson plan. During the third phase, other mentors not only learned from the pair of mentor- intern about mentoring on lesson plan and teaching, but also gave the mentor comments or suggestion on mentoring. Each pair of mentor-intern took turns engaging in the activities of LPPO. The FT in each pair was asked to report what she learned in the activity of LPPO.

Phase 4: Each FT's teaching was arranged in the fourth phase, from week 11 to 14. The final phase was allowed the assigned mentor to passively work with FT altogether on lesson plan. The phase was to examine the effect of mentoring on interns' performance on mathematics teaching. The result accounts for an aspect of the effect of the mentoring program. During this phase, each FT was evaluated by other FTs, mentors and a researcher. The evaluation of mathematics teaching consists of two aspects: teaching preparation and teaching behavior.

MENTORS' AND FTS' VIEWS OF THE INTEGRATED MODEL

The four pairs of mentors and FTs participating in mathematics group as part of the integrated research project were interviewed individually about their views of integrated model. The consensus they made was on the class schedule. The two mentors working with same two FTs arranging at the same time for both mathematics and Chinese class respectively are preliminary requirement in the model of one-subject mentors with multiple-subject future teachers. Otherwise, the FTs were not allowed by their mentors to watch lesson without their mentors' permission.

All mathematics mentors committed the function of the integrated model because this model created the opportunity for them to learn the new pedagogy for teaching Chinese from their FTs who participated in the Chinese mentoring group. Conversely, the Chinese mentors have the same agreement. They also mentioned that two FTs working with each mentor had more opportunities to stimulate multiple perspectives than only one FT working with each mentor. The suggestion of the model the mentors made was that the two FTs worked with two same grade mentors since their concerns had readily on the same focus.

For FTs, the integrated model afforded them rich professional learning. For instance, on the phase of lesson plan, their mentors guided them the use of teachers' guide or resources. They said that they learned how to work on lesson plan for an effective teaching, since mentors asked them to predict students' various anticipated strategies or solutions and to ask students follow-up key questions in align with students' responses. These concerns should be written preciously on the lesson plan. Besides, the FTs learned to pay more attentions to the sequence of the activities to be taught. They also learned that the sequence of the activities were relied on the objectivities of the lesson, the context of the problems to be posed, the numbers involving in the problems, and students' prior knowledge.

THE EFFECT OF THE INTEGRATED MODEL OF MENTORING ON PERFORMING TEACHING

The effect of the integrated model of mentoring preparation can be documented on two aspects: on mentors' learning and on FTs' teaching. The result is organized at three levels in accordance with the model of Kirkpatrick and Kirkpatrick (2006). The first two levels were analyzed by the quantitative data and supported by the qualitative data, while the third level was illustrated in qualitative data. To help you understand coherently about the effect of the program, the qualitative data presented here is merely related to problem posing, even though posing appropriate problems, asking key and follow-up questions, and understanding students' various anticipated solutions were the focuses of the effect of the model.

The Effect of the Integrated Model of Mentoring Preparation on Mentors Learning

Reaction Level: Mentors' Satisfaction with the Course of Mentoring Program

Table 2 indicates that the mentors were satisfied with all topics of the summer workshop and half-year course of the mentoring program. The mentors had a slight satisfaction with the lesson plan engaged in school year ($\overline{M}$ =4. 5) than in summer workshop ($\overline{M}$ =4.25). Su made the distinction of lesson plan engaged in summer, a pair of mentor-FT mentoring, and practicing with their assigned FTs.

Contents of the course		$\overline{M}$	SD
Summer workshop	Scope and sequence of the activities	4.5	0.5
	Key and follow-up questions to be asked	4.25	0.83
	Problem posing	4.5	0.5
	Design of lesson plan	4.25	0.83
	Sharing experience of mentoring practices	4.5	0.5
	Analyzing students' various solutions	4.0	1.0
Half-year mentoring practices	Observing peers' lessons	5.0	0.0
	Working lesson plan with FTs	4.5	0.5
	Observing mentor-FT mentoring lesson plan	4.25	0.83
	Follow-up discussion of a lesson	4.25	0.83
	Discussion of MMG after own teaching	4.5	0.5
	Discussion of MMG after peers' teaching	4.5	0.5

Table 2 Mentors' Reaction to the Course of Mentoring Program

….What I learned in design of lesson plan in summer workshop was about the essential components, such as students' anticipated solutions, prior knowledge,

objectives of the lesson, and key questions to be asked. Based on this experience, it helps me to move to observe how Juei worked with her assigned FTs on planning a lesson and then wrote it into a lesson plan. I saw that Juei asked her FTs to read textbook and searching for relevant resources in advance. She asked them to make sure the objective of the lesson and to be aware of the need of adaptation of the activities covered in the textbook. With the help the program, I am getting used to tell FTs the ways of posing a contextual problem, anticipating students' possible solutions, asking students follow-up questions. (Su, Interview).

Learning level: Improvement of Mentors' knowledge of teaching and mentoring

Regarding to knowledge of teaching, the percentages of pre- and post-test four mentors performed were from 40% to 80%, from 53% to 80%, from 40% to 73%, from 40% to 67% respectively. The result indicates that the mentors enhanced their knowledge for teaching fraction as the mentoring program proceeded.

With regard to the conception of mentoring, initially, in their view of FTs' expectation for the role of mentors was to provide emotional and technical support. Learning to teach, in their view, was to be left FTs' own accumulation of teaching experience and lessons based on trial and error. Their little knowledge was also indicated in their responses to self-assessment questionnaire. Before entering the program, the mentors had no confidence in performing 7 items out of 16 items (termed as 7/16)of professional literacy, 18/34 items of mathematics teaching, and 22/36 items of mentoring practice, respectively. Through the process of mentoring, they gained more confidence in teaching and mentoring. Finally, only 5 items including 2 items of teaching and 3 items of mentoring were not improved. For instance, Juei was pleased to her more awareness of problem-posing.

…In support of summer workshop, I am aware of the importance of the problem posing for students' anticipated solutions. Furthermore, with the help of the MMG, I learned about various meanings of problem posing. For instance, students' specific solution to be anticipated is highly tied with the size of the number involved in the problem and semantic structure of the problems (Juei, interview).

Behavior Level: Transfer occurred in Mentoring FTs

The mentors transferred their knowledge of teaching into mentoring practice. The transfers of problem posing and lesson plan are presented here. The aspects the mentors attended to when working a lesson plan with FTs from Phase 2 to Phase 4 of the mentoring program are described in Table 2. Table 2 suggests that the mentors expanded their perception of lesson plan and improved their ability to help FTs in writing a lesson plan. Comparing to Phase 2, two more aspects the mentors learned from the mentoring program on preparing a lesson were the scope and sequence of the

mathematics contents and students' various anticipated solutions. They tried hard to ask FTs to put the possible key and follow-up questions on their own lesson plans.

In terms of the transfer of problem posing, the mentors learned about seven aspects of problems posing and brought them into mentoring practices. The seven aspects consisted of the resources, the size of the number involved in problem, semantic structures, contexts, representations, materials, and the problem meeting the need of students' anticipated solutions. The size of the number involved in the problem as an example is illustrated here. As observed, Ling asked her FTs to reflect if the problems covered in the textbook are enough to motivate students' attractions by checking either the size of the numbers or the contexts involving in the problems. As a result, they discussed about the revision of the size of the numbers involving in an equivalent fraction. The problem presented in the textbook was that *"A box has 12 oranges. What fraction of 4 oranges in the box?"* Students can only figure out three equivalent fractions 4/12, 1/3, and 2/6. Ling asked her FT, Ding, to revise the problem in which could have more equivalent fractions. Ding revised the problem as *"A box has 24 oranges. What fraction of 12 oranges in the box?"* In such a number, there are six equivalent fractions, 12/24, 1/2, 2/4, 3/6, 4/8, 6/12.

Phase 2 mentoring	**Phase 3 mentoring**	**Phase 4 mentoring**
Objectives of the lesson	Objectives of the lesson Objective of each activity	Objectives of the lesson Objective of each activity
--	Analysis of the scope and sequence of the content	Analysis of the scope and sequence of the content
Pupils' prior knowledge	Pupils' prior knowledge	Pupils' prior knowledge
Status of the lesson	Status of the lesson	Status of the lesson
Sequence of the activities	Sequence of the activities including the problems to be posed	Sequence of the activities including the problems to be posed
Settings of the teaching	Settings of the teaching	Settings of the teaching
Instructor's activities	Instructor's activities with key & follow-up questions to be asked	Instructor's activities with key & follow-up questions to be asked
--	Students' activities including anticipating students' various solutions	Students' activities including anticipating students' various solutions

Table3: Aspects of Lesson Plan the Mentors Attended to in Different Phase of Mentoring

The Effect of the Integrated Model of Mentoring Preparation on FTs' Teaching

The effect of the integrated model of supporting FTs on the preparation of mathematics teaching and classroom teaching are depicted in Table 4 and Table 5. The 5-scale average scores shown in Table 4 were evaluated by the participant mentors from the mathematics mentors group who observed the FTs' teaching.

The data of Table 4 indicates the four FTs well-equipped on preparing a lesson before teaching, the average score of the most of the items is more than 4.0, excepting the consideration of assessment. With the help of mentors, they had good understanding on objectives and logic structure to the content to be taught. Their good preparation of the lesson and good organization of teaching activities were revealed in the performance on classroom teaching.

Table 4: Average Score of FTs on Readiness of Preparing a Mathematics Lesson

Readiness of Preparing a Lesson	FTm1	FTm2	FTm3	FTm4	Mean
1. Understanding of instructional objectives.	4.2	4.0	4.4	4.8	4.4
2. Understanding of the structure of materials.	4.6	4.2	4.3	4.6	4.4
3. Understanding of the mathematics content.	3.9	4.6	4.4	4.5	4.4
4. Preparation of lesson.	4.3	4.6	4.9	4.8	4.7
5. Activities building on students' pre-experience	4.6	5.0	4.6	4.6	4.7
6. Adaptation of teaching activities.	4.3	4.0	3.9	4.1	4.1
7. Lesson plan including assessment.	3.3	3.1	3.7	4.1	3.6

Table 5 shows that of the 15 items of mathematics teaching, FTs performing on the 13 items had average scores more than 4.0, other than two items with respect to dealing with students' thinking and solutions. FTs still had the difficulty with realizing the distinction among students' various solutions. They also needed to learn how to polish the strategy of stimulating students' thinking.

Table 5: Average Score of FTs Performing on Mathematics Teaching

Teaching Behaviors	FTm1	FTm2	FTm3	FTm4	Mean
1. Draw students attention by various strategies.	3.7	4.8	4.5	4.6	4.4

2. Using resources (e.g. manipulatives, ICT etc.).	3.6	4.9	4.9	4.6	4.5
3. Asking questions for evoking kids' thinking.	3.8	4.4	4.1	4.5	4.2
4. Posing daily life problems.	4.3	4.4	3.5	4.5	4.2
5. Posing problems by solving a specific strategy.	3.7	4.0	4.3	4.4	4.1
6.Good interaction between students and teacher	3.6	4.9	4.5	4.0	4.3
7. Questioning students' thinking.	3.9	4.6	4.1	4.5	4.3
8. Stimulating students' various strategies.	4.1	3.6	4.1	3.9	3.9
9. Comparing various solution given by students.	3.7	3.9	4.0	3.8	3.9
10. Default students' misconception.	3.6	4.3	4.3	3.8	4.0
11. Feedback to students' responses.	3.9	4.7	4.4	4.1	4.3
12. Affording equal opportunity for students.	3.8	4.0	4.3	4.4	4.1
13. Create secure environment of learning.	3.7	4.7	4.6	4.6	4.4
14. The activities are interesting.	3.3	4.9	4.8	4.8	4.5
15. Achieving instructional objectives.	3.4	4.1	4.3	4.4	4.1

DISCUSSION

With reconceptualizing the meaning of school-university partnership, the integrated model of mentoring provides some evidence for the crucial importance of the mentor in the development of the FTs' professional learning. It gives the view that simply placing FTs in school without adequate mentoring support would give FTs little chance to develop their classroom teaching skills and understanding. The teacher educators of university offered the support with an integrated model of mentoring for mentors in school. However, there were several tensions and difficulties emerged under the integrated model of mentoring.

Most of the mentors and FTs had the agreement of becoming the partnership of the university, but they felt that neither the school nor the university had provided a detailed enough about what was involved. There is little doubt that mentors were surprised by the unexpected tensions their role generated in the school. Initially the mentors showed hostility due to a belief that they had gained additional work. They were struggled with the additional work and the improvement of professional knowledge. However, the factors of additional work appeared not to play a significant part in influencing mentors choosing to take on the role. Gaining their professional confidence and professional knowledge became as an internal incentive. The

difficulties mentors encountered in the integrated model included additional work, tight schedule, and FTs' willing of participation. Likewise, additional work and tight schedule were the difficulties for the FTs need to face during practicum. The willing of FTs participating in the integrated model of mentoring are drastically decreasing, since they have little opportunity to become an initial teacher to be needed in school. Some of the FTs who planned to transit their profession to other occupation lacked professional engagement during practicum.

FTs had unequal professional knowledge before getting into school placement. It is suggested that some items of professional standards required for FTs should be achieved in the coursework of the teacher education program prior to practicum. Preliminary literacy of elementary school teachers teaching several subjects and practice-oriented method of teaching in subject area should be covered in the coursework of teacher education program. This indicates that it is necessary to construct an operational system for qualified a teacher. National-wide professional standards either across subject matter or subject-bounded, various professional standards for future teachers, internship, initial teachers, and expert teachers should be established in the contemporary teacher education in Taiwan. In addition, the policy-makers of teacher education are encouraged to associate with the researcher of professional development such as the model of mentoring and the model of evaluation of teacher professional development to set up decisive policies of teacher education.

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