The Lesson Study with Multidisciplinary Teachers Involved: the Process, Strategies, and Effectiveness

Jiaping Yan, Shanghai Academy of Educational Science
Xingyu Lv, Shanghai Academy of Educational Science

At present, due to Teaching Research Group (TRG) composed of teachers from the same subject, lesson studies in primary and secondary schools, which are mainly organized in TRG are facing some problems that homogeneous participants are thinking inside the box and learning community culture is not really established at a school level.

Different from ordinary lesson study, heterogeneous participants including music teachers, visual art teachers, teaching-research staff and researchers are invited in this study. We took the Chinese traditional art appreciation as the organizing theme of the lesson study. Two music teachers and one visual art teacher were successively arranged to take three nine-grade classes with different contents, other teachers observed the classroom and interviewed with students after class, the teaching-research staff and researchers guided the discussion and reflection of multidisciplinary teachers from various perspectives. The whole process of lesson study is video or sound recorded, and then transferred into words to make text analysis.

We find that the lesson study with multidisciplinary teachers demonstrates different requirements and vitality, compared to the lesson study with single subject teachers. In detail, we find that following strategies contribute to the effectiveness improving of lesson study involved by multidisciplinary teachers: set a big idea as organizing theme, arrange teachers from different subjects to undertake teaching, observe diverse and useful teaching strategies of teachers and learning interests enhancement and methods mastering of students, encourage and guide multiple perspectives interdisciplinary communication.

The aim of the study is to provide insights that might inspire schools effectively organize multidisciplinary lesson study. Based on the evidence presented by above findings, we put forward some suggestions for schools to organize multidisciplinary teachers to participate in lesson study: guide teachers to identify the value of multidisciplinary and interdisciplinary lesson study, collect and analyze the commonly concerned research topics of different teachers, train group leaders characteristic of specific leadership, encourage teachers to break subjects boundaries to establish a real school learning community culture.
The Implementation of Lesson Study in Thematic Learning in Primary Schools in Anggrek District, Gorontalo Utara Regency, Gorontalo Province, Indonesia

Novri Youla Kandowangko, Universitas Negeri Gorontalo
Rusmin Husain, Universitas Negeri Gorontalo
Meylan Saleh, Universitas Negeri Gorontalo

Students-centred learning has been the foremost concern for teachers. The notion that teaching is the primary job of a teacher leads to a perception that teachers do not do anything if they only assign the students with homework. Consequently, a teacher-centred learning is inevitable. The same applies to the thematic learning in primary schools in which its implementation is for each taught subject. This affects the learning and the way the students shape their mindset. A school-oriented lesson study is conducted to address such an issue. The site is in Primary Schools within Anggrek district, Gorontalo Utara regency, Gorontalo province, Indonesia.

This study aims at describing the results of the implementation of lesson study in thematic learning in primary schools in the site object. The observation method was employed to explore the issue. Observers for the lesson study involved 15 teachers, 15 principals, three supervisors, three lecturers, and 30 university students. The implementation comprised of phases, such as Plan (discussion of the lesson plan), Do (Observation of the learning), and See (a reflection of the learning); this was conducted in three cycles. Furthermore, the data were from the activity and the learning outcome of the students. These were gathered from the video recording of the learning activity as well as the results of students' learning at the end of the class. The data were further analysed through the descriptive qualitative analysis. In the Cycle 1, it reveals that the students are individualist; they do not prefer working the students' worksheets with their peers. On top of that, the learning media do not provide a space for the students to have a sharing session. For instance, the students work the group assignment individually. The learning group loses its essence of having the students help each other in accomplishing a task. The results seen in Cycle 1 are the grounding for the revision in the Cycle 2. These encompass the preparation of students' worksheets as well as the implementation of the Think-pair-share method in the class. In Cycle 2, the students have one worksheet to work in pair. It reveals that a pair of two female students can cooperate with each other and work on the task favourably. On the other hand, a pair of male students does not seem to work side by side well. They argue for the paper and, as a result, one student dominantly works on the assignment. Students are further divided into groups of four or five in Cycle 3. This time, there are no worksheets to distribute. The teachers instead give an oral instruction to the students. The instruction is to observe and compare things inside the classroom, i.e., tables, erasers, rulers, pencils, and ballpoints. Moreover, the students are asked to compare the size of these objects. The results show that students are now able to work in a group to accomplish the assignment. There are even some dialogues between the students; usually, two or three students are engaged. Interestingly, the students start to let their peers borrow the objects that they have and compare these in the group. This promotes an
active and lively classroom whereas the interaction is not only limited to the communication between students but also communication with the teacher.

To conclude, the implementation of lesson study is able to improve students' learning outcome. To further enhance this, the teacher needs to consider the use of media, such as realia or pictures, the grouping of students based on their gender, as well as the classroom management.

Keywords: learning activities, media, lesson study
Research Synthesis in Lesson Study and Open Approach Context

Pongpat Daopa, Khon Kaen University
Auijit Pattanajak, Khon Kaen University

The objectives of this study were: 1) to survey the research of Mathematics Education, Faculty of Education, Khon Kaen University during 2006 ’2015; 2) to synthesize research in the context of Lesson study and Open Approach By content analysis. The target audience in this research is a thesis of master's degree or higher in the major of mathematics education, Faculty of Education, Khon Kaen University 2006 to 2015 collecting by the electronic database of institute. There are 130 researches and 74 of 130 was conducted in Lesson study and Open Approach context. Research tools for this study were research study summary form and Interview form. The statistical analyses were average to analyze characteristics of the research.

Results were as follows:

1. From the Thesis Survey of Mathematics Education has found 74 research in the context of Lesson study and Open Approach. The result from synthesis context in all research for classified research so this innovation can be divided into 3 phases: phase 1: Try out, Open Approach Innovation used to develop lesson plan to create Open-ended situation,according to the research in 2006, 14 subjects about 18.92%. Phase 2: Introduce, The introduction of innovation into whole school system, The Open approach used to development of professional teachers along with Lesson study. There are three steps: including 1) Collaboratively design a research lesson by used Open Approach Innovation 2) Collaboratively observe the research lesson and 3) Collaboratively discuss and reflect on the research lesson situation according to the research in 2007 to 2010, about 28 subjects in 37.84 %. And phase 3: Clear, Both innovation has clearly steps, which is Open Approach was used as a teaching method. There are four steps: 1) Posing Open-ended problems 2) Students' self-learning 3) Whole class discussion and comparison Whole class discussion and comparison 4) Summarization through connecting students' mathematical ideas emerged in the classroom and this innovation into the second step of lesson Study Compared with the research in 2011-2015, 32 researches about 43.24 %. Almost all research was analyzed by using qualitative research methodology focus on protocol analysis.

2. From the synthesis research by content analysis, it was found that the thesis using Lesson Study as a tool for collecting the data: create lesson plan by researchers, research assistants, and teachers in the research area to design open-ended situations. When the implementing lesson plan to use in classroom, there was one teacher in the Lesson Study team, to use open approach as the teaching method that focus on students' problem solving by them selves, present their ideas and discuss together. The remaining members of the team observe student's learning process. After completion of the teaching, they reflect together and all researches followed the process of Lesson study. However, the indicator of the difference in research will depend on the research issue identified in each research.

Moreover, the results also show that the data to be used protocol analysis from field notes, the
recorder and video recorder during problem solving. Including data from student's writings will help both researchers and teachers to see students' thinking processes in order to study the learning nature of their students and to encourage them to learn effectively in accordance with their potential.

Key word: Lesson Study, Open Approach, Research Synthesis
Collaborative Learning to Teach Student to Think Historically; Korean Independence Movement, May 1 in 1919

Minjung Kim, Sogang University
Jong-bae Yun, Jungpyong Middle School
ChunSan Lee, Seoul Osan Middle School
MiRan Jeong, Chodang Elementary School
Eun-Joo Lee, Jungchun Middle School
Chi-joong Song, Jangwi Middle School

This study aims to illustrate the collaborative learning and inquiry process of designing to teach historical thinking.

In The History Teaching Research Institute of the Republic of Korea, we carried out a seminar with the book "Reading Like a Historian: Teaching Literacy in Middle and High School History Classroom" (hereinafter referred to as "RLH") written by S. Wineburg since 2013. Through RLH, We looked at examples of teaching and learning methods that let students read and think like a historian, and selected replica research methods to apply similar methods to Korean history lessons.

RLH is a process of getting to know US history through eight themes in the United States history, and each student is able to grasp the time like a historian by various materials and tools in each chapter. RLH can provide students with everyday letters, first class secrets and various statistics, so students can become historians themselves and experience the American era.

The History Teaching Research Institute thought that it would be easier to apply the RLH method to the Modern/Contemporary Korean history than pre-modern history. We started to concentrate on studying RLH style of the most supported 3.1 Independence Movement after discussing various topics.

First of all, we examined research papers of the 3.1 Independence Movement and discussed the history-historical factors and achievement standards in the national curriculum and textbooks. Until now, there have been a lot of researches on the March 1st Movement, mostly the character and significance of the March 1st Movement, and the evaluation of the March 1st Movement.

The History Teaching Research Institute has created three versions of class scenarios through several seminars. For elementary school students [Lesson Plan1]-What happened to March 1, in 1919? For middle school students [Lesson Plan2]-What did the national representatives do at the time of the March 1st Movement? [Lesson Plan3]-Who represents the March 1st Movement after all? Each scenario created a tutorial for each secondary school so that teachers could choose according to the classroom situation.

Based on this, We conducted research lessons at Seoul Noil Elementary School, Seoul Osan Middle School, and Suwon Jacheon Middle School in the autumn of 2014. At Seoul Noil Elementary School, students took a close look at the pictures of Jong-no Street at the time of the 3.1 Independence Movement and also made a scene of the protest at the elementary school graduation ceremony. A group of teacher research community observed in the series of lesson study, one conducted in two-hour block lessons at Osan
Middle School in Seoul. In the first lesson, students examined the activities of the national representatives by focusing on the historical painting of 33 national representatives. In the second lesson, students studied the Yoo Kwan-Soon's records of the prisoners in Seodaemun prison. In Suwon Changcheon Middle School, students performed activities to find out the representative of the March 1st Movement. through the imaginary prisoner card of four independent activists who were active during the March 1st Movement.

We did not have enough understanding of RLH to apply the teaching and learning methods in S. Wineburg's book to the March 1st Movement. In fact, there were many insufficient points during the lessons. However, it showed the possibility that it is possible to 'think like a historian' through history materials in history lessons. The research produced a positive feedback from history teachers as well as parents because it revealed its applicability in a similar way at various schools.
An Analysis of Students' Learning in Career Course with Comment Sheets

Miyuki Kikuchi, Nagoya University
Takahiro Suda, Nagoya University
Yushi Tange, Nagoya University
Kyoko Murakami, Nagoya University

University graduates' unemployment rates and their turnover rates within 3 years of employment have been increasing since the effete of the traditional Japanese employment system which values lifetime employment by hiring new graduates all at once and carries out an in-service training program. Due to the change of employment system, the importance of career education has been emphasized by the Central Education Council since 1999. Since then, most universities in Japan have started to conduct career courses to increase employability: that is, courses designed to encourage students' self-exploration, vocational knowledge and career planning. However, past studies show that the career courses are considered unhelpful for their job hunting activities by university students. Thus, it is important to develop curriculum that delivers meaningful learning to students. In order to find the problems of the current curriculum, this paper investigates what students learn though a career course.

For this purpose, 3rd year students who have attended the ‘Career Design’ course at a university were chosen, and 25 of them were eventually selected at random for analysis. The university is one of the few universities that have permanent faculty members for career courses. All 13 lessons of the course in one semester were observed, recorded and transcribed into lesson transcripts. Comment sheets were distributed and collected in every lesson. To clearly and systematically understand what students learn in the course, this study analyzed the comment sheets by using a developed version of 'Intermediate factors' proposed by Suda (2017).

The result of the study is that learning in the course was divided into 3 types of learnings: skill acquisition, knowledge acquisition and thinking training. First, students were satisfied with acquiring certain skills. Second, students were satisfied with acquiring basic knowledge of business practice. Third, students were able to reflect on themselves. The skill acquisition type and the knowledge acquisition type are regarded as shallow learning and the thinking training type is regarded as deep learning. The present study found that the differences in the quality of the lecturer's questions corresponded to different learning types. Good questions encouraged students' self-reflection and led students to deep learning.

The active learning style of lessons is recommended strongly in Japan in recent years. However, this study suggests that the active learning style doesn’t always lead students to deep learning. The quality of questions is more important for students' deep learning than the style of lessons.
Strengthening Character Education toward Matsamutu Malang Students through a Collaborative on Mathematic Teaching

Iin Hindun, University of Muhammadiyah Malang
Nur Widodo, University of Muhammadiyah Malang
Eko Susetyarin, University of Muhammadiyah Malang
Sri Wahyuni, University of Muhammadiyah Malang

This study attempts to described the implementation of strengthening character building in Madrasah Tsanawiyah Muhammadiyah 1 Malang in learning math. The competence base of comparison value with an implement lesson study that is follow the plan, do and see. The qualitative methode was conducted by observation and documentation on the process of lesson plan, implementation and reflection. The data is teachers model activities, the perception of the observer involved instruction media and video document. The data are narrative teacher model, teachers supervisor, students activities, media and learning process. Analysis techniques using video analysis, analysis of students learning activities, narrative analysis of the observer perceptions and teacher model respond.

The results show that learning is planned by stage aperseption, the resolution of problems and jumping. In phase of resolution problems are designed by various problems related comparison value in realistic math. The learning process not only occurs in of the group but also individually. Group learning occurred when there is any working together among group to solving the problem. The process of individual learning happens when teachers instruct to solving the problem by their selves.

The conclusion can be note are (1) learning math in collaborative with lesson study has successfully upgrading students character (2) learning math in collaboration with lesson study have managed to strengthen character of students to cooperate and respect his friend (3) collaborative learning with lesson study able to increase of students ability reach the jumping, (4) collaborative learning on math strengthening the students integrity.

Keyword: Strengthening, Character Education, Collaborative
From University Classrooms to Real-World Settings through Project-Based Learning

Naoko Osada, Ritsumeikan University

In higher education classes, the use of project-based learning (PBL) is increasing in popularity, as an approach that encourages students to exploit and utilize their learned knowledge. The field of PBL requires students to engage in project activities to find and solve an authentic problem. Instructors of PBL classes tend to be under pressure to organize effective learning activities.

Meanwhile, design research in the learning sciences has presented useful findings to help design PBL classes effectively. However, practitioners in higher education have not yet exploited these findings to design PBL classes. There are additional issues for PBL in universities. Particularly, for university students, instructors of PBL should aim to promote students' autonomy as much as they can, taking on the extra risks involved in relaxing control. They should also be careful to combine students' knowledge and field activities, despite the diversity of students' academic backgrounds.

To clarify these issues, this study investigated two PBL classes. PBL 1 consisted of students who were majoring in cognitive sciences. In PBL 1, students conducted observational projects in a science museum to present their ideas for improvement of the museum displays or workshops. In PBL 2, participating students produced a college public newspaper as a project activity, utilizing the contents of their major subjects, such as regional media, marketing, information design and other related topics. Afterwards, they conducted individual studies on problems which they discovered by themselves through the project activity. The focus of the productive activities was to engage them in the human-centered design process. Following this, the students conducted individual research in the same context.

The results from the two PBL classes have shown that instructors can exploit the findings of learning sciences to design PBL in university classes, and by focusing on the knowledge construction process, they can improve class design and deepen the students' learning. The results also demonstrate that social structures and processes are important for driving student activities in the field of PBL.
Religion Learning Lesson Study for Elementary Level Slow Learners

Nurafifahkhurin M Afifah, Muhammadiyah Malang University

Religion learning for slow learners is part of Religious Psychology Course, which aims to prepare religious teacher candidates who can teach the lessons of religion and morals professionally. The teaching is for children with special needs, both special and gifted, through material discussion, lesson planning, and implementation of multiple cycles for small class simulations. A special type of need in this subject is the religious learning of slow learners.

For the course with this specified theme, students are expected to have theoretical knowledge about the religious development of learners at various age levels along with their characteristics, types of personality, intelligence levels, conditions of limitations and advantages accompanied by their own characteristics, learning styles, mindsets, and teaching strategies to achieve teaching and learning objectives. Therefore, in this course, students are expected to master theoretical foundations of teaching slow learners, which will be implemented in lesson planning and simulative teaching for a small class.

There are two cycles in teaching slow learners based on their characteristics. Lesson study steps, consisting of Plan, Do, and See were implemented in each cycle. The first cycle, the students identify, examine and find out about the theme of "responsibility" through stories and sociodrama. The goal of the students is to define the meaning of responsibility and to describe the forms of responsibility in the story. Furthermore, students identify the usual forms of responsibility they often do and are often committed by others around them, so the goal is that they understand that, in some cases, the form of responsibility they must take is to follow or in accordance with the case. The second cycle, telling identification results of responsibility stories to friends, teachers, parents and family in short. The result of the story is followed by the invitation and motivation (affirmative statement) about the solicitation to be responsible to his friends. The assignment given to the student is to find a solution when his or her friends are difficult or unwilling to take responsibility.

By implementing Lesson Study, it is found that students have higher eagerness and spirit to join learning for students with special needs course, and to have an overview to teach students with the use of Lesson Study. To conclude, Lesson Study can improve students' understanding of learning, especially for special needs slow learners.
Lesson Study and Individualized Education Plan for Children with Special Educational Needs in Mongolia

Tetsuya Ishii, Koei Research & Consulting Inc.
Sayaka Suzuki, Koei Research & Consulting Inc.
Kumiko Nishimura, Koei Research & Consulting Inc.
Shoko Uehara, Koei Research & Consulting Inc.
Kimika Moriya, Koei Research & Consulting Inc.
Ryohei Sakurai, Koei Research & Consulting Inc.

1. Purpose
The purpose of this case study is to analyze the result of Lesson Study (LS) for children with intellectual disabilities in Mongolia.

2. Background
In Mongolia, Children with special needs are enrolled either in 6 special schools located in Ulaanbaatar (Capital city) or in regular schools.

Out of the 6 schools, there are 4 special schools accommodating children with intellectual and physical disabilities.

The LS was introduced to the teachers, education administrators, and university teachers in 2006 by Japan International Cooperation Agency (JICA)'s technical cooperation project on teaching method improvement for primary and secondary school teachers.

In regular schools, lessons based on national curriculum are conducted. On the other hand, children's physical and cognitive development is diverse in special schools. Therefore, lessons need to be planned by giving due consideration to individual needs.

In Mongolia, the Individualized Educational Plan (IEP) had been utilized for children with severe disabilities to set their goals for learning at special schools. However, adequate education in accordance with each child's need is not always provided.

3. Project Approach to the Issues
JICA has been implementing the project for developing models for early detection, developmental support, and improving quality of education for children with disabilities since August 2015, in collaboration with the Ministry of Education, Culture, Science and Sports, and Ministry of Labor and Social Welfare.

Prior to the commencement of the Project, there were different Lesson Plan formats at each special school for conducting the lessons.

However, the formats did not require teachers to write objectives of the lesson, special educational needs of children, or the means of teacher support.

Under the project, new format of IEP and Lesson Plan were developed.
With the advice from Japanese experts, a working team (WT) was formed at each special school, and each WT started developing IEP for a selected child to identify the educational needs, and to formulate strategy to facilitate each student's growth.

In the course of IEP development, a series of workshops were organized for the WT members. LS were conducted twice at each school to improve lesson delivery based on selected child's disability and developmental status.

Not only teachers from special schools, but also teachers from neighboring regular schools observed the research lesson, and wrote their comments on an Observation Sheet.

Experts from Mongolian State University of Education, Mongolian Institute of Educational Research, Institute of Teacher's Professional Development also participated and made their comments during the review session.

4. Findings

Teachers noted that the following are effective to deliver lessons consistent with the needs of a child: (1) observing students from the various aspects, and (2) understanding their developmental status.

According to the post LS questionnaires to WT members, 72% answered that a series of workshops and LS were 'Very useful' and 28% answered 'Useful'

5. Way Forward

Change /Achievement of a case child was not evaluated so far.

Key words: Individualized Education Plan, Lesson delivery for diversified students
Training Students Attitudes in Environment Science Lecture through Lesson Study

Fida Rachmadiarti, Universitas Negeri Surabaya
Sunu Kuntjoro, Universitas Negeri Surabaya
Herlina Fitrihidajati, Universitas Negeri Surabaya
Widowati Budijastuti, Universitas Negeri Surabaya

Environment science lecture is a lecture which is programmed for second semester students. This lecture consists of 3 credit semesters (semester credit system). In this lecture, the core competence to be achieved is to communicate and to understand the concepts of natural resources and environment, to solve related problems, and to have an environmental awareness. To date, the environment science lecture is still focused on knowledge and skills. The attitude competence has not been continuously trained, therefore, this lecture needs to train students’ attitudes to support their environmental awareness competence. The purpose of this research was to evaluate how to train the attitudes of biology education study program students in the second semester who were taking the environment knowledge lecture. This purpose was to explore the learning process of environment science lecture, to train the attitudes related to the environmental awareness in addition to training concepts and skills, as well as the results of the attitude assessment during the learning. The method used in this research was quantitative and qualitative interpretation research by observing the learning process of Biology education students. The research stages include plan, do, and see. During the plan stage, lecturers and team and lecturers of other subjects designed and discussed the lesson plans; do stage, the implementation of the lesson plans on the material of environment and population issues for two meetings; see, observations during the learning process by observers from teams and lecturers of other subjects, and reflections on the results of observations and the learning process. The collected data covered the results of observation on the learning process by the observer, the lecturers’ assessment related to the skills and attitudes during the learning process, and the students’ self assessment on their attitudes. The data were descriptively analyzed. The research results related to plan were changing the structure of the lesson plans, clarifying the indicators and learning objectives, and not yet entering the quiz component in the lesson plans using student team achievement division type in cooperative learning model. The implementation of the learning. In Do and See, what had been good from the observation was the implementation of the lesson plans, the steps of learning were implemented according to the lesson plans designed, the students learned actively, they cooperated within groups, the class cleanliness was an indicator of attitude to environmental awareness because the lecturers always reminded the students related to the indicators of keeping the environment clean and treating garbage, the learning resources used challenged the students to work and discuss. What needed to be improved from the learning was the provision of time limit in finishing the tasks, so that when the students were performing presentation, no students were still working on their tasks, the students should have received clear instructions related to cooperation within the group because there were two groups that were still sharing the work in completing the tasks, and there should have
been a poster related to attitude to environmental awareness. This research indicates that students' attitudes towards environmental awareness are categorized as good - very good, the results of the lecturers' assessment of the attitudes are classified as good, and results of the students' presentation skills are classified as good - very good.

Keywords: Lesson study, Environmental Science, environmental awareness
Using the Concept of Participation Structure to Improve Teachers' Professional Development

Yuko Kaneta, Miyagi University of Education

The purpose of this research is to examine how doing intensive Lesson Study and feedback can improve a teacher's professional development. Lesson Study improves teachers' professional learning through cooperative investigation of their own lesson with their colleagues. The most important question is what teachers and researchers should analyze and learn from the process of lessons and how they can practically apply that knowledge. This study focuses on collaborative learning and teachers' perspective about their own lessons and how they should reflect on their own support for their students. This research was conducted in collaboration with an in-service teacher belonging to the Graduate School of Education, which trains teachers to deepen their knowledge of teaching and learning.

This study contains three phases. At the first phase, we designed mathematics lessons in a secondary school, which include student discussions as the main activity. At the second phase, the teacher carried out the lessons and the researcher recorded them on videos. To capture the detail of students' relationships, we used the concept of ‘Participation structure’ (Erickson, 1977). The concept can be defined as the process of the rights and obligations concerning who can say what, when, and to whom (Cazden, 1986). We investigated how students interact each other during solving a mathematical question and how the teacher connected students. At the third phase, based on the investigation, we reflected on the design of the next lesson and how the teacher should intervene in the group discussions. This study involved the interview of the teacher about what is useful about lesson analysis.

Two results were obtained from the data analysis. First, we found various types of student participation and teacher roles in small group discussions. For example, many students engaged in reciprocal learning by constantly asking each other questions and providing support. However, other groups of students failed to both communicate and solve the mathematical questions. Second, we found a gap between teachers' intentions to support their students and students' needs for help. These findings can be a clue to changing the design of collaborative learning lessons and how teachers improvise to help their students become more responsive to students' relationships.
Critical Succession of Lesson Analysis in Japan: Focus on the Theory of Shigematsu Takayasu

Megumi Tamura, Ochanomizu University

The purpose of this paper is to describe the formation process of ‘Lesson Analysis’ (jugyou bunseki) in Japan by using a historical approach. Therefore, this study focuses on ‘Lesson Analysis’ that was developed by Shigematsu Takayasu (1908-1995), and clarifies its implication for modern education. Shigematsu Takayasu was an educational researcher and professor at Nagoya University. The theory was developed only in the genealogy of lesson study in Japan, without using theories developed in foreign countries (Mitsuhashi 2002).

Since the presenter has examined Shigematsu's idea of the principle of lesson analysis, particularly in the period before the Second World War, we conducted our research based on these results. In this research, we focused on Shigematsu's education and research activities after the Second World War and examined materials such as literature materials and policy documents as analysis targets.

In the 1960's, Japanese 'Lesson studies' (jugyou kenkyu) began as collaborations between universities and schools (Usui 2009). The lesson analysis developed by Shigematsu and his colleagues at Nagoya University is one such collaboration. In that method, emphasis was placed on objectively recording classes by using detailed records in daily school life and discussing remarks at the time of the class (Shigematsu 1961). In addition, Shigematsu emphasized that teachers should discuss the facts of the lesson in their own words. This was considered to be a pioneering measure that raised collective autonomy in school teacher culture and still attracts attention in today's lesson studies in Japan. However, the problem with Shigematsu's method is that the act of dividing the lesson into several meaningful groups (bunsetsu) in order to understand the structure of the lesson and the relations between each group, depends on the viewpoint of the analyst. Recent lesson studies aim to solve this problem, and it seems that various analytical methods such as quantitative and qualitative approaches have been developed.
When Lesson Study Researchers Become Lesson Study Participants: Unpacking Reform-Based Fraction Standards

Bridget K Druken, California State University, Fullerton
Alison S Marzocchi, California State University, Fullerton

Purpose: While lesson study has been described as useful for understanding reform implications (e.g. Lee & Lo, 2013; Lewis & Takahashi, 2013), efforts to systematically use lesson study as a tool for improving teacher education are few (see Lewis & Perry, 2015 for an exception). Many elementary pre-service teachers (PSTs) will be expected to teach fractions differently than how they first learned fractions themselves, presenting a challenge to mathematics teacher educators. Thus, it is crucial to think critically about introducing fractions to elementary PSTs given the current state of mathematics education reform. In this study, four cross-departmental university faculty members became lesson study participants in seven different contexts for the purpose of systematically improving the teaching of reform mathematics content, specifically fractions, to future elementary teachers of mathematics.

Design: In this study, faculty members were both lesson study participants and researchers of this process. Data came from seven iterations of lesson study involving four cross-departmental mathematics education faculty who comprised a lesson study team at a large, southwestern university in the United States. Iterations were taught in a variety of contexts including mathematics methods courses, mathematics content courses, and conferences for practicing teachers. Lesson plans for each iteration and field notes from each team debrief meeting were analyzed. Additionally, a final focus group of the lesson study team was audio-recorded, fully transcribed, coded, and analyzed. Emergent themes are reported to better understand the use of lesson study for teaching fractions as aligned to new reform-based standards.

Results: We first discuss the crafting of learning goals informed by reform standards for introducing fractions to PSTs and the process of using lesson study to design a lesson to address these goals. We then describe how the evolving lesson plan afforded us the opportunity to learn about PSTs’ fraction understanding with greater attention to detail than a solo instructor could achieve. The lesson study team identified and used numerous student (mis)conceptions of fractions to build their own knowledge of student understanding of fractions.

Implications: This work uses lesson study as a tool to design, develop, and systematically improve the teaching of fractions under reform standards. Involving mathematics teacher educator faculty in lesson study revealed many insights regarding the teaching and learning of mathematics to PSTs. The university faculty reported benefits of lesson study participation both for the teaching of fractions aligned to reform movements and for their overall teaching of mathematics methods and content.

Originality/Value: This research examines lesson study researchers’ experiences as lesson study participants teaching seven iterations of a reform-based fractions lesson across varied contexts. The
experience allowed them to unpack the teaching of fractions conceptually for future teachers of mathematics. This study suggests that university faculty can purposefully use lesson study to systematically improve mathematics teacher preparation.

References


How to Improve Student Participation in a Large Science Festival

Lisbeth Charlotte Vive, Metropolitan University College

Science on Frederiksberg is a part of a nationwide science festival. Prospective teachers prepare a variety of different science stands, under the theme "Heart and Brain", which the many visiting students have the opportunity to experience. The festival contributes by increasing the interest and motivation for science and the individual student learning process. However, in such events, there is a tendency for students to just browse from one activity to another, without gaining the knowledge of science concepts or a deeper understanding of the subject. The activities should not only give the visiting students a positive hands-on experience, but also make sure that they actually learn something from the activities.

In teacher education one of the major challenges is to make the connection between education classes and teachers work in classrooms (Cajkler&Wood 2015). A teacher education also have to help the prospective teachers acquire the tools to be researchers in their own practice. (Hiebert, Morris&Glass, 2003).

‘How can we improve student participation and learning in a large science festival’  Our aim has been to ensure the connection between theory and practice, because that practical work as practiced in many schools is poorly understood, confused and unproductive (Hodson,1990).

Lesson Studies were used to develop and rethink the teaching. Lesson Studies can help to ensure the connection between, what is taught in education classes and at teachers' work in a classroom (Østergaard, 2016). For that, eight special courses was planned. The rooms were developed and designed specifically for the individual teaching courses. Among other things, a room was designed so that the students experienced to move around inside a body, while they learned about the heart's circulation.

The teaching in the different rooms was conducted five times during the three days the festival lasted. Data was obtained mainly in form of notes and video/audio-recordings of coursework and 5x8 LS-cycles. Focus has been in four stages ' preparing the lesson, teaching, reflection and revision, all of which are authentic part of a teacher's work. (Østergaard 2016 s. 64)

We find that the prospective teachers had a major focus on the communication with the students. For each session, they became more aware of how the dialogue could be improved and adapted. Another finding was that the prospective teachers became more aware of which of the science concepts, there was most important, so they were able to adapt the activities and dialogs in relation to the science concepts. From the visiting student we experience that not only did they have a positive experience with science, but also they have actually learn something. In the final dialogue, they were using science terms, and they were cable to reflect the science issues they got.

The development of the rooms and their educational courses became an innovative process, where the prospective teachers constantly were challenged in the many prospect, such as the effect the design of the rooms had on the students motivation and how some parts could be used to increase the student's learning process.
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Research on How to Make Interdisciplinary Teaching More Effective: Based on the Lesson Study of "Gift Packaging"

Jiaxin Yang, Zhejiang University

In the current educational background, single-subject teaching mainly focuses on the knowledge delivery, ignoring the cultivation of interdisciplinary competences which are becoming gradually important in our life, such as the ability of solving problems, communicating and cooperating. As key competences are constantly being mentioned, interdisciplinary teaching is increasingly concerned by some schools and teachers. However, there are many misunderstandings in practice. For example, teachers integrate subjects blindly, ignoring goals and the learning effect of students. Therefore, based on the lesson study in interdisciplinary teaching experiments in Jingdu Primary School, the research aims to investigate how to make interdisciplinary teaching more effective.

The research adopts lesson study based on the theory of Authentic Learning, which typically focuses on real-world, complex problems and their solutions, using role-playing exercises, problem-based activities and case studies. According to previous researchers, there are eight critical factors that must be aligned to ensure a successful learning environment, among which they are goals, content, instructional design, learner tasks, instructor roles, student roles, technological affordances and assessment. The following research, based on these factors, tries to improve the effectiveness of the lesson.

In the first round of experiments, the researchers integrated mathematics and art, choosing the theme of "gift packaging". The course focused on the relation between the surface area size and the stacked mode of the items as well as the calculation of the surface area size of the cuboid, which challenged a lot. However, it's found out that the course designed not only ignored the knowledge and skills of art, but also seemed unreasonable in real life.

In the second round, the researchers made improvements after reflection. Firstly, they attached more attention on the national textbooks so as to find out the related knowledge points. Secondly, they sorted out National Curriculum Standards, built KDB learning bridge, and then summed up the goals of the course based on the knowledge points. Thirdly, with the guidance of goals, they replanned the focus of teaching, including the understanding of the expanded view of cuboids, the application of skills of color matching, solving practical problems and cooperating. Fourthly, inspired by the concept of Authentic Learning, they considered the classroom as a store selling packaging paper. Students needed to cooperate in groups in order to choose appropriate paper and ribbons in size and color in the store, and finished gift packaging. Fifthly, according to the concept of Natural Learning Design, researchers divided the teaching process into four stages. From the feedbacks from 53 teachers and 20 students who participated in the course, the second round had obviously improved. Teachers thought highly of the content, hands-on practice, and the degree of integration of disciplines. Almost all of the students interviewed were interested in the content and processes of the course. Moreover, it was an interesting finding that compared with usual courses, students tend to have higher enthusiasm for course designed.
Based on the research, measures towards how to make interdisciplinary teaching more effective can be concluded in the following five aspects. Firstly, teachers are ought to design course goals based on the curriculum standards and the course content. Secondly, the teaching content should be close to life, fully mobilizing life experience and stimulating students' interests. Thirdly, teachers can consider using ICT, group cooperation, and designing authentic tasks in implementing the course. Fourthly, in interdisciplinary courses, the formative evaluation and performance evaluation should be mainly used. Self-evaluation and peer-assessment can also be adopted. Finally, teachers can try to apply advanced theory to doing action researches to improve their teaching.
Development of Early Childhood Outdoor Activities Demonstration School, KhonKaen University Nursery Education

Introng Nittayarote, Demonstration School, Khon Kaen University Nursery

The purpose of this research is to develop outdoor activities for preschool children. Demonstration School, KhonKaen University Nursery education Experimental research Target students of the Demonstration School of KhonKaen University. The study population was 120 persons. Data were analyzed using percentage mean by using Microsoft excel program. From the curriculum development of outdoor activities for preschool children. Demonstration School, KhonKaen University As a result, the physical fitness of the students developed as follows.

Before long, the students who jumped in the medium to good jump were 34.99 percent and were in low to very low. 65.01% and after school students found that the long jump. Medium to very good. 82.5% were low and 17.5% were low.

When comparing pre and post test results, students have greater leg strength by leaps and bounds. Ability is in the medium to very high level, 82.50 percent.

Before long, the students found that the jump in the medium to very good 51.66 percent and the low to very low. Accounted for 48.34 percent and after school students found that long jump. Medium to very good. Accounted for 77.49 percent and was low to low, accounting for 22.51 percent.

Compared to the pre-test and post-test results, the students' strength in the legs was higher. At the end of the study, students had the ability to be moderately to very good at 87.50 percent.

Development of outdoor activities for preschool children. Demonstration School, KhonKaen University Nursery education This book will be most useful for those who study. It is a guideline and can be adapted to suit outdoor activities for early childhood as much as possible to develop early childhood to mature as a quality adult. It has the potential of being able and able to bring our country into the global community.
Students Mathematical Thinking Development on Number More Than 10 Using Lesson study and Open Approach

Naphaporn Woranetsudathip, Demonstration School, Khon Kaen University

This study was aimed to improve student's mathematical thinking on number more than 10 for grade 1 students in classroom using lesson study and open approach. Target group were 69 students, grade 1 in academic year 2016, Demonstration School, Khon Kaen University where has been participated in the Students' Mathematical Thinking Higher Development Project in Northeastern of Thailand.

The methods were qualitative and quantitative. Data collected by using tools include: 1) lesson plan teaching by open approach for 7 lessons 2) Video recorders. 3) Cameras. 4) Reflection form. 5) Classroom observation form 6) Mathematics Achievement Forms. The data analyzed from 1) student work 2) post- reflective data 3) observation data 4) mathematics learning achievement

Research result found 1) Mathematical concepts of students on the number more than 10 of the students. Students have ideas for counting in group of 2 for strawberries, and counting in group of 5 for chocolate. 2) Students have concept of rearrange groups to count easier by grouping into groups of ten and the leftover into group of one. 3) Students used concept of group of ten and group of one to write number in place value. 4) Student's mathematics learning achievement: students, more than 70%, have the learning achievement was 74.17%.
Project Assessment in Learning Evaluation Course for Biology Education Students of University Of Muhammadiyah Malang East Java Indonesia

Yuni Pantiwati Yuni, University of Muhammadiyah Malang  
Fendy Hardianpermana Fendy, University of Muhammadiyah Malang

Students, as prospective teachers, should be equipped with skills needed for developing assessment instruments and assessment reports. Therefore, students were given project assignments in which they did self-assessment based on project accomplishment. This research aims to describe the application of project assessment in learning evaluation course for biology education students. The method employed in this study was descriptive qualitative to comprehend the phenomenon experienced by research subjects holistically. The research was conducted for one semester, with 35 subjects who participated in Learning Evaluation course of even semester, academic year 2016/2017. Data sources were informants which comprised of students and lecturers; whereas the data collection methods were interviews, observation, and documents. The data analysis was done through stages: data reduction, data presentation and conclusion. The implementation of project assessment that were: 1) the project focused on process and product, 2) project specifications were determining object, making test lattice, arranging test instrument, presenting test device, implementing the product, scoring, processing the scores, analyzing the quality of question items, analyzing the test results, 3) the process assessment including: skills in arranging trial test tool documents, presentation skills, skills in group assessment, 4) product assessed were: portfolio of trial test tool, trial report, oral examination of individuals and groups, 5) student responses were: it is easier to encompass both the concept and the nature of assessment; not only did the students gain experiences in developing instruments, but they also witnessed in analyzing the test results; the teacher candidates obtained experiences in school life; meanwhile, they possessed curiosity, independence, responsibility, and cooperation. Assessment results show that the students were able to develop the assessment instruments and gained valuable experiences to be the future teachers.

Keywords: Project assessment, assessment instruments, learning evaluation, assessment authentic
Mathematical Problem Solving Ability of Students in Classroom Using Lesson Study and Open Approach in Primary Demonstration School, Lao PDR

Khamla Khammeuangkhoun, Khonkaen University
Somkuan Srichompoo, Khonkaen University
Maitree Inprasitha, Khonkaen University

The aim of this research is to explore mathematical problem solving ability of students in the classroom using 'Lesson Study and Open Approach' context by the concept of Inprasitha (2011). This study was performed in the Demonstration Primary School in Pakse Teacher Training College, Lao People's Democratic Republic. The research was conducted in the second semester of the academic year 2016-2017 with 8 students divided into two groups (four students per each group) by purposive sampling. This research is a qualitative research collecting data by using lesson plans, video record, voice record and classroom observation sheet, emphasizing on protocol analysis supported by student's worksheet, pictures and observation result from research assistants. Then, consider about mathematical problem solving ability of students under research framework of Lithner (2010) in three steps: 1) Interpret, 2) Do and Use and 3) Judge.

The findings found that: the application of Lesson Study comprised of three steps: 1) Collaboratively design a research lesson, 2) Collaboratively observe the research lesson and 3) Collaboratively discuss and reflect on the research lesson. The Open Approach as a teaching methodology in the second step of Lesson Study consists of 4 steps: 1) Posing the open-ended problem found only step (1) Interpret: Student's behavior to understand the problems situations or questions. 2) Students' self-learning found all steps included: step (1) Interpret: Students understood problem situation or question, step (2) Do and Use: Students used many strategies to solve the problem and step (3) Judge: found students' behavior in checking problem solving within their group. 3) Whole class discussion and comparison found only step (3) Judge: Students' behavior for checking methodology and results of other groups and 4) Summarization through connecting students' mathematical ideas emerged in the classroom found only step (3) Judge: Students' behavior for checking all process of how to solve problems and checking final results together with the teacher.

Lesson Study and Open Approach is innovation that performed in the Demonstration Primary School in Pakse Teacher Training College, Lao People's Democratic Republic under cooperation and support from Faculty of Education, Khonkaen University, Thailand. This study promoted teachers having direct experience from academic training and lecturing, classroom observation in model schools in Thailand, national open class activity participation. The teachers from Lao PDR brought this experience and knowledge from training; they could use these in their school. The teachers learned to collaboratively and systematically work for discussing the content of textbook using in the classroom. They learned to design materials and open-ended problems to match with students' knowledge and ability to solve the problem. In each class, observation and reflection have been applied for further improvement. The teaching methodology
in open approach is designed systematically with explicit steps. The explicit procedure encouraged the students to learn as the student center and develop their problem solving. For this reason, the behavior about the mathematical problem solving ability of student has been developed and found all steps in the classroom using Lesson Study and Open Approach context.
Benefits of Lesson Study Assistance in Improving the Quality of Lesson Study Implementation in High Schools

Riandi Riandi, Universitas Pendidikan Indonesia
Pupung Purnawarman, Universitas Pendidikan Indonesia
Ari Widodo, Universitas Pendidikan Indonesia
Tati Hermawati, Universitas Pendidikan Indonesia

Senior High School 9 Bandung is one of the pilot schools in implementing various learning innovations resulting from the collaboration project between Japan (JICA) and UPI, UNY, and UM through the IMSTEP program (1998-2003), IMSTEP Follow-up program (2003-2005), and SISTTEMS (2006-2008). One of the activities related to the projects is teacher professional development through Lesson Study. Lesson Study in Indonesia has been initiated since 2004/2005 by Japanese experts who, with the help of Indonesian lecturers, socialized Lesson Study to the schools. Lecturers have played the role of assistance for lesson study implementation since the stages of Plan, Do, and See. The implementation of lesson study that has been organized so far is the teacher group-based lesson study (LSMGMP) and school-based lesson study (LSBS). Both forms of Lesson Study implementation are not yet optimal in several schools. LSMGMP often faces challenges in terms of scheduling, distance to lesson study location, and permission from school leaders. LSBS also often face challenges in terms of scheduling due to the many programs and activities in the schools. Organizing LS in the form of same subject teacher group is considered effective to accommodate the implementation of LS in the schools. Information (data) obtained from a survey related to the implementation of LS through language subject teacher group showed that there was high motivation of the teachers to improve their professionalism through LS. Based on the data collected through the survey, the teachers believed that they had a better understanding about lesson study. Those teachers also perceived that the implementation of lesson study has improved their horizon and knowledge about pedagogy and learning innovation. In addition, it was revealed that the teachers still needed some assistance from experts/lecturers for the sustainability and the improvement of Lesson Study implementation.

Keywords: LSMGMP, LSBS, same subject group, LS assistance
Abstract Number: 20050

A Lesson Study on the Effectiveness of a Blended Virtual Learning Community for Teachers in a Primary School

Jeanette Kang Nee Ong, Fuhua Primary School
Yan Ge, Fuhua Primary School
Ivy Chew Hoon Chia, Fuhua Primary School

This lesson study examines the effectiveness of a virtual learning community for teachers in terms of practical benefits’ improvements to teaching skills as well as their knowledge about their school subject. Past research studies report that a mixture of virtual and ‘Real-life’ interaction between some members provide more benefits to teachers in the whole community (Dede et. Al, 2009). Other researchers have also supported that online communities of practice are a good supplement to already existing local offline communities (Schlager & Fusco, 2003; Kling & Courtright, 2003). However, there have been few such studies conducted in East Asia on the benefits from a blended virtual learning community for teachers. This is a pilot study implemented in a Singapore primary school of 90 teachers. Besides, an hour of face-to face discussion conducted weekly for each lesson study team, a central google site was also set up which serves as the main portal for 24 lesson study teams to carry out further online discussions. Data were collected from all online forums and analyzed for their written contributions.

Research Question
What are the benefits and impact on teachers' professional development through the implementation of a blended virtual learning community?

Methodological approach
For measuring the effects of PD through a blended learning community, we analyzed the written contributions to the virtual learning community and categorized them according to 1) the collective making contributions, 2) whether the material was created by the participant or adapted from external source 3) the type of contributions. Interviews were also conducted with each of the lesson study team leaders to gather their feedback on their satisfaction with the blended virtual learning community. First results of the study will be presented on the poster. The next phase of the study involves scaling up and collaborating with other primary schools in the west zone.
Competency-based education has become a hot topic in higher education circles these days - it is becoming increasingly popular as the country searches for ways to improve college affordability and more accurately measure student learning (Mendenhall, 2012). National Council of Teachers of Mathematics (NCTM), 1989; 2000) proposed ideas of standards goals for all K-12 students that they become confident in their ability to do mathematics and become mathematical problem solvers. Niss (2015) spoke that carrying out the problem solving processes needed to solve the problems and identify mathematical competencies are eight competencies which can be said to form two groups are to do with the ability to ask and answer questions in and with mathematics. Making use aids and tools for mathematical activity is one of eight mathematical competencies and aids and tools competency are all activated as part of the process of solving the problem(s) posed (OECD, 1999). In problem solving classroom using an Open Approach as a teaching approach, Inprasitha (2010; 2011) put it; Open Approach is a new approach to teaching mathematics that addresses problem solving, encourage students to take open-ended activities to observe students' learning skills by integrating to Lesson Study; Collaboratively Plan, Collaboratively Do, and Collaboratively See. Lesson study teams are consisted of researcher, in-service teachers, internship students and principal. So that students show the process of mathematical problem solving independently (Inprasitha et al., 2003).

The purpose of this research was to investigate students' using aids and tools competency in mathematics classroom using Lesson Study and Open Approach. Target groups were 1st grade -13 students in mathematics classrooms using open approach as a teaching approach. Data were collected by classroom observation addition learning unit and video recording in the second semester of 2016 academic year and analyzed based on framework of PISA's students' mathematical competencies which was consisted of eights mathematical competencies that focused on aids and tools competency in Open Approach (Inprasitha, 2010).

The research findings found that students' using aids and tools competency in mathematics classroom using Lesson Study and Open Approach were as follows; 1) posing open-ended problem, teacher posed problem situation so that student try find how they can solve the problem. 2) students self-learning through problem solving, they used blocks to represent the number of animals which they want to solve the addition problem. And used diagram to find the solution. 3) whole class discussion and comparison, they used the materials such as the bigger blocks to represent their ideas in front of the classroom and try to present the different ideas with peers, and 4) summarization through connecting students' mathematical ideas emerged in the classroom, they presented their ideas with diagram, decomposing the number of animal and to make groups of ten, it's how to from the last period and discuss to summarize this period together.
Learning lesson: The Long-term Effect of Outdoor Teaching Compared to Traditional Classroom Teaching

Anders K Nilsson, Nacka gymnasium
Susanne M Mellvig, Nacka gymnasium

Teaching in ecology should, according to the Swedish curriculum for upper secondary schools, include field studies.

In our earlier studies, we found no difference in the short-term academic performance between students who experienced traditional classroom teaching and students who experienced outdoor education (Mellvig 2014). To further study the effect of outdoor education, we wished to investigate its effect on long term memory. In this study, we have compared the long term memory of two classes preforming outdoor education with three classes receiving traditional classroom teaching. The subject for this study was limnology.

Outdoor education covers a broad field of investigation and school activities. The expression includes social activities, experiences of nature and a more academic, learning-based approach. Since there are great differences in the scope of outdoor education among different countries, we found it valuable to find a definition that covers the subject as it applies to the Swedish curriculum for the teaching of ecology at the upper secondary level (Fägerstam 2012). Thus, in this study, we chose to use the definition of the subject expressed by Eton: ‘Outdoor education will be defined as all school-related academic education which takes place outdoors’ (Eton 1998). Since it has been shown that cognition results from interactions between several brain areas operating in large scale networks (Bressler 2010), it is reasonable to believe that learning is enhanced when several senses are involved in the learning process.

In outdoor education, we use nature both as an area of learning and, to an even greater extent, as the source of knowledge. This is in contrast to classroom teaching, where learning takes place in a classroom setting and the subject of ecology is only theoretically presented. Outdoor education offers the opportunity to use all the senses in acquiring knowledge and understanding.

In order to study a long term effect of outdoor education, we measured the retention of knowledge in the area of limnology several months after the subject had been taught. Preliminary results indicate that students who had experienced outdoor education scored higher in a post teaching test that was preformed after a substantial period of time than did students who had experienced traditional classroom teaching.
Creating Learning Environments through Lesson Study: An Experience in Initial Training for Early Years Teachers

Cristina Rodriguez Robles, Universidad de Malaga
Noemi Pena Trapero, Universidad de Malaga
Maria J. Servan Nunez, Universidad de Malaga
Encarnacion Soto Gomez, Universidad de Malaga
Rosa M. Caparros Vida, Universidad de Malaga
Angel I. Perez Gomez, Universidad de Malaga

This paper will present the Lesson Study developed during the first year of the Infant Education Degree Course at Malaga University, as part of a coordinated project based on the subjects Didactics, Organisation, and Inclusive Education. Students designed and implemented actual learning environments for an Early Years (ages 3 to 6 years) using Lesson Study. Our aims were to use practical training as a way to generate reflection-from-action and to ensure our students developed the teaching skills necessary for schools in the 21st century. The task revolved around 4 core areas:

A selection of contents based on relevance, depth and interdisciplinarity.
A methodology based on activity, experimentation and research.
A teaching role based on designing and accompanying students through tutoring.
Assessment for learning through an electronic portfolio.

The students were divided into eight small groups (of 4 or 5). We prepared a series of written guides which were used throughout the process, along with our presence in both the classroom and online during each of the phases. Our goal was for this group work to be the context ‘In the form of discussions and debates at the start, and design, experimentation and analysis at the end’ for the different theory contents worked on at the same time in the subjects. It was a way to involve students holistically in the process and for them to experience and feel it through their emotions and their bodies, aspects which are traditionally overlooked in university training contexts.

Living and building an educational experience requires an ongoing and cyclical transition from knowledge to practical thinking. The phases dedicated to searching for a focal point and a design gave students the opportunity to theorise on practice by reading, documenting themselves and researching ideas they could use to create within a living experience context. This process of reflection-on-action involves encouraging and stimulating the prospective teachers to identify, analyse and reformulate not only the proclaimed theories which adorn practice but also the theories-in-use which govern it. Furthermore, by developing and implementing the learning environments they had designed, the prospective teachers could experiment with the theory, leading to the construction of those teaching skills which are automatically
activated when we face new actions and new contexts.

One aspect we found striking when collecting evidence was how students overcame different cognitive conflicts during the process, and how they were able to directly experience the autonomy a teacher has to design learning contexts connected to childhood interests. Moreover, and more importantly, they saw first-hand how the Lesson Study process, with all its phases and cooperative work, allowed them to combine their creativity and singular talents in a common project. In this case, the Lesson Study process facilitated the construction of solid structures related to meaning, the educational process, and, above all, the need to recalibrate what it means to be an infant school teacher: a creative, relevant, complex experience that requires them to recreate the knowledge and experience which prospective infant school teachers bring to the university training process.
Enhance Teachers' Professional Development in Carrying Out Differentiated Instruction via Lesson Study in a Primary Science Classroom

Wei Fen Woo, Poi Ching School
Lee Hua Tan, Poi Ching School

Lesson study is used as a school-wide teaching improvement process to enhance teachers' professional development in Poi Ching School. Organised in Learning Teams, teachers in Poi Ching School analyse and improve their classroom practices through Lesson Study where they are engaged in an ongoing cycle of questions that facilitate team learning. Supported by data-driven knowledge and underpinned by sound pedagogical theory, teachers act on their findings to improve learning in their classrooms. This process enables the teachers to develop new skills and capabilities which in turn lead to new experiences and awareness in their own professional development.

The Science Department leverages on the Lesson Study platform during Learning Team sessions to collaborate in lesson planning, implementation, evaluation and refinement to raise teachers' competencies in incorporating Differentiated Instruction in their lessons.

Differentiated Instruction allows all students to participate in a conducive and respectful learning environment (Tomlinson & Kalbfleish, 1998). It also represents a pro-active approach to improving classroom learning for all students by redesigning instruction on the basis of student abilities, needs and even interests (Petting, 2002). The increased diversification in terms of students' interest, readiness and abilities in the classrooms in recent years has placed additional demands on teachers who strive to facilitate the learning and participation of all students. Our Science Department adopts Differentiated Instruction as an instructional approach to provide students with various avenues to learning in terms of acquiring knowledge, processing of information, constructing or making sense of ideas.

This paper documents the process that deepens the interaction of our school's professional learning community using self-reflection, critical thinking and collaboration among teachers. In our lesson study, teachers explore the impact of Differentiated Instruction lessons on student learning, thinking and behaviour. This practice of lesson study levels up teachers' classroom instructions as they become better equipped in understanding how students learn and how instruction affects their thinking. During our Lesson study meetings, teacher participants set goals and design the Differentiated Instruction lesson. A teacher will conduct the lesson whereby teacher observers document what they observed of the learning of students. Using structured observations and discussions, teachers are able to gain insights on how students internalise Science concepts during the lesson. The teachers then use the information about student learning to revise the lesson which will be used in Lesson Cycle 2. In this paper, we will discuss how Differentiated Instruction enables teachers to meet learners at their respective level of readiness and provide challenging and appropriate options for them to attain success and stretch their potential.
References


Abstract

Formulating Lesson Subject Matters From Students Mathematical Ideas through Lesson Study: Collaborative Planning Phase

Theaptithut Kheawkham, Chiang Mai University
Jensamut sangpun, Chiang Mai University

The purpose of this research project was study the formulating lesson subject matters from students' Mathematical Ideas through lesson study especially in collaborative planning phase. This is case study including 6 teachers in lesson study team and 35 second graders. The learning unit subtraction in vertical form in first semester of 2017 academic year of Tonkla school Chiang Mai, Thailand, which lesson study and open approach was conducted for three years. This research was used qualitative research by using action research according to lesson study with Mathematics for Elementary School (Study with your friends) books in Thai versions by Center for Research in Mathematics Education, Khonkaen University. Lesson study team determined lesson objectives through the framework of formulating Lesson Subject Matters from Students' Mathematical Ideas through of Inprasitha (2017). The data collected by using a) video recording b) photograph and c) interviewing. The data was analyzed by using a) lesson plan b) mathematics textbook. Data were analyzed through content analysis, protocol analysis show the results in analytical description.

The results showed that

The researcher formulate lesson subject matters from Students' Mathematical Ideas through 5 steps below.

1) Teacher analyzed content in each pages that has hint which suggest and thinking about of issue and looking for steps of teaching, symbols, numbers and words that is important

2) Teacher looked for students' problematic by solving problems through students' perspective and thinking of students' struggle.

3) Teacher anticipated the ways to solve problem of students by concerning previous experience and students' how to.

4) Teacher classified the ways to solve a problem of students' mathematical ideas

5) Teacher formulate lesson subject matters from students' mathematical ideas from 4) for find the ways to solve a problem of students with how to of them through students' problematic. The objective was extracted from subject matters of the lesson lead to bridge the gap between Teaching objective and Learning objectives.

keywords

Lesson Subject Matters, Teaching Practices, Students' Mathematical Ideas
Transition of Misconceptions of the Length during Math Classroom Discussion: Merits and Faults of Prior Knowledge and Students' Interaction

Yoshiko Nakashima, Aichi Bunkyo University
Yoshiaki Shibata, Nagoya University

In Japan, students of second grade of elementary school learn to measure the length, but students often fail to learn because of misconceptions. In addition to teacher's experiences, the misconceptions of the length are well-known by the academic researches. Barrett et. Al (2003) clarified many types of misconceptions made by students, including incorrect ways of measurement. It can be seen that these misconceptions depend on the detached procedural knowledge without conceptual understanding.

Although the previous studies focused on the learner's understanding of the length individually, we have to pay more attention to the factors derived from social interaction during the lesson.

This study aimed to clarify how students made the misconceptions in practice in the class of measurement of the length, how forms of misconceptions transact with students' interaction, and how the teacher led a student to the correct answers.

The method of this study adopt transcript based lesson analysis (Matoba et. al 2013) to find out the factors of transition of misconceptions from whole class communication in a grade 2 math lesson.

In this class, students in the second grade of elementary school learned at first how to use the ruler. At the beginning of this class, student A and student B answered 8cm which was a correct answer of the given task by the teacher. But student C answered 9cm which was incorrect. After the utterance of student C in classroom discussion, student A and student B changed their answers to 9cm. The teacher taught the students the point of the edge and the stretch along the line with figure and motion repeatedly. As a result, student B answered it correctly, but student A was not able to understand it. Through the instruction of the teacher, student B might be able to link the conceptual knowledge to the procedural knowledge successfully.

It is clarified that students made the misconceptions by the utterance of another student, the instruction of the teacher was not effective for all students.

Instead of counting the interval between the scales, student A made the error of counting edges and dividers applying insufficient prior knowledge to Prior knowledge and students' interaction may produce a good effect, and also bad effect.
A Lesson Study about Logarithms to Enhance Learning for High School Students

Birgitta Nilsson, Nacka Gymnasium
Helena Buchberger, Nacka Gymnasium
Camilla Ekstrom, Nacka Gymnasium

Many of our students have a hard time remembering how to solve different equations with the common logarithm. They feel that they have been taught so many different methods that they do not know which one to use. We wanted to do a lesson study to develop our teaching of the common logarithm (base 10), our intention was also to help students see that they could use the definition \(10^{\lg x} = x\) to solve all equations with logarithms. Three teachers with a total of 200 students participated in the lesson study.

The students worked with exponential equations and common logarithms for eight lessons. Our lesson study focused on the fourth lesson when the common logarithm was introduced, but the project also included the lessons before and after. In the first phase of the Lesson study circle we discussed what we thought were key factors that the students needed to have previous knowledge about. Further, we analyzed how the mathematical method the students had been taught in our lesson could be used to solve more difficult problems in the subsequent lessons and in later courses (e.g. progressing to natural logarithms).

After the first implementation of the lesson, we made some changes in the lesson plan. Then we executed the lesson with six other classes, two of which were observed. When the lesson series was completed, we conducted a mutual exam. The students' solutions to some of the problems were analyzed. Doing this we discovered new types of errors, that we had not seen before, which we believe were results of our new way of teaching.

Although this was a limited lesson study, we thought the effects were substantial. Firstly, it resulted in a carefully thought through lesson series for the students. However, the lesson study also caused other positive effects. It increased the number of discussions about students' learning, opened up our classrooms to each other and increased the sharing of teaching material.
Representations in Flow of Lesson in Classroom Using Lesson Study and Open Approach

Wajeemas Chaiprueksathon, Khon Kaen University
Au-jit Pattanajak, Khon Kaen University

In mathematics instruction, accessing problems related to real contexts, so that mathematics is meaningful to students and it can link mathematics in the classroom to what is in everyday life. So the real world of students is so important for math classroom. But accessing the real world of students in order to design a situation is not easy. It takes a view of the individual in terms of teachers, teachers as observer, researchers, and experts to work together for designing a problem situation that can represent the real world for students to access and be able to transform into a variety representation to describe their ideas. Lesson study is a way to promote and allow teachers to have an opportunity to share, learn, and understand together for designing a real-world problem situation to their students. There are three steps to create and shared learning plan. In order for teachers and lesson study team to share ideas in problem-solving design that students have access to and become their own problems. By finding the real world of students in line of their daily lives and the content of the session. Observation of teaching together for teachers and teams to observe each other. Learn and understand what the real world or real-world representation of a student is through an open-minded teaching approach that emphasized student-centered ideas and representation in a variety of classes. And reflection of the lessons after teaching together. In order for the teacher and the team to exchange views by observing the performances taking place in the classroom, to improve and develop the next teaching.

Thus, this study aimed to explore representations in flow of lesson in classroom using lesson study and open approach. This research was the qualitative research that emphasized on protocol analysis and analytical description. The target group was 3th grade students at Lakmaungmahasarakham School in the first semester of 2017, where has been participated in the project for Professional Development of Mathematics Teachers through Lesson Study and Open Approach. The data was collected by using lesson plans, field notes, student worksheets, video recorders, audio tape recorders, and images recorders. The data used for analysis were composed of 1) protocols of the students' activities in the classroom, 2) photographs of the students' works and 3) data from field notes. Researcher had collected the data in classroom by using lesson study and open approach of Inprasitha (2011)'s framework. Researcher analyzed the data, according to Inprasitha (2016)' flow of lesson framework.

The results of this research were students, in classroom using lesson study and open approach, showed representations in flow of lesson in 3 steps; 1) Representations of real world, students can explain knowledge and experiences in their real life by their own understanding, according to content in each periods, by using various representations to explain their idea. 2) Semi concrete acids, students can explain how to solve the problems, according to content in each period to represent Mathematical world 3) Representations of mathematical world, students can explain the idea through rules, formulates, mathematical symbol and number that according to the content of each period.
Key words: Representations in flow of lesson, Lesson study, Open approach.
Design and Development of an Interactive Augmented Reality Edutainment Jigsaw

Hou Yi-You, National Kaohsiung University of Applied Sciences

This paper presents the design of an interactive jigsaw based on augmented reality (AR) technology in learning education. Augmented reality is a powerful well technology that allows the superimposing of computer-generated 3D virtual objects over real environment in real time. In the children's learning, the multimedia has provided various ways in teaching and learning. In addition to enriching the learning contents and to creating new interactive learning fun, children can play interactive games in more ways to enrich the learning experience. The main purpose is to enable children to improve their concentration and learning interest. This interactive learning device will be designed with jigsaw puzzles for children in the process of growing up a teaching and entertainment toy. Jigsaw is a teaching and entertainment toy that most of the children grow up. Jigsaw in addition to each piece has a different shape, the color and the picture is also different, for the newly contacted children is very attractive. But just in contact with the jigsaw will be more unfamiliar, and children in the process of groping, may often encounter difficulties to give up, so parents need to accompany the child's side to guide him to correct learning. Therefore, this study using the microcontroller ATmega 328 to do signal processing, the pressure-sensitive sensors, android studio, Unity and Maya software tools, so that children put the jigsaw in the right position, will make a sound to do auditory feedback, such as animal sounds, the name of the item. Combined with 3D AR visual technology and mobile phone application, so that children in the jigsaw can also give better impact to interactive learning motivation and immersion. Through the combination of virtual objects and reality scenes, children can use interactive augmented reality edutainment jigsaw to learn by playing animal cards. The preliminary implemented animal teaching material will be also integrated into other courses in the future.
Problem Based Learning Model In Increasing Students' Ability to Design Interactive Teaching Media

Eri Sarimanah, Pakuan University
Roy Efendi, Pakuan University

This research is aimed at improving students' ability to design teaching media as one of important components that can ease the learning process. The improvement of students' ability to design teaching media is important to face the teaching challenge of education world in globalization era. Through Problem based learning they are demanded to move fast and responsive to the world development. Thus, the media used should be up to date. Through the implementation of Lesson Study following plan, do, see steps the Problem Based Learning wrapped in chapter design and lesson design which includes orienting to a problem, organizing learning process, assisting investigation, developing and presenting product, analyzing and evaluating problem solving process. The research method used is experimental method. Data collection technique used is test, questionnaire and observation. The hypothesis that says, the implementation of Problem Based learning can improve students' ability to design teaching media, is proven by the score process in the treatment which the average score is 70, and the average score of the next treatment improves to 85 which belongs to very good level. It can be concluded that Problem Based Learning model by implementing Lesson Study succeeded to improve students' ability to design teaching media.

Key words: Problem Based Learning model, teaching media
First Grade Students' Concepts of Subtraction in Classroom using Lesson Study and Open Approach

Sawitree Phukongchana, Khon Kaen University
Sampan Thinwiangthong, Khon Kaen University
Maitree Inprasitha, Khon Kaen University

The purpose of this research was to analyze subtraction concept of students through mathematical representations in classrooms where use Lesson Study and Open Approach. Data were collected from 24 students in the first grade of elementary school in Chaiyaphum province, which one of the schools in the Students' Mathematical Higher Thinking Development Project in Northeastern of Thailand. Moreover this classroom is using continuous Lesson Study and Open Approach based on the Inprasitha's concept (2011). The data were: 1) protocol data transcribe from voice recorder and video recorders during instruction of the class 2) students' writings, and 3) protocols from interviews of students. The research based on Vergnaud's Conceptual framework (1996).

The results of this research showed that the concept of students are three tuple of three sets 1) Set of Situations that meaningful for students : Pictures which have action of objects or people in the pictures along with the language of the action, situations was posted by teacher 2) Set of operational invariant to deal with these situations: removing block that represent number in situations and 3) Set of symbolic representations: line and arrow are represented action of subtraction, the natural language word and sentence for explain action (Remove, Take out, Scoop out and Eaten). These representations used to represent the relationships involved, communicate about them.
Effects of Critical Thinking Through Group Learning in Japanese Undergraduate Nursing Students

Yukari Sato, Aichi Medical University
Etsuko Masunaga, Ichinomiya kenshin University
Chie Yamada, Fujita Health University Hospital
Tsunehiko Ban, Sugiyama Jogakuen University

Previous studies have demonstrated the need for Japanese university students to employ logical thinking skills, including critical thinking (CT) skills. Nursing colleges have also indicated the need to improve these skills, and group learning (GL) is reported to be effective. This study aims to clarify existing knowledge about the effects of CT in nursing education by focusing on GL. A literature review was used. Using CT, 'Nursing,' and Student as search terms, the selection criteria were as follows: (1) undergraduate nursing students in Japan, (2) group learning, and (3) critical thinking findings (4) include the original work thesis. Selection method was searched in Japan Medical Abstracts Society WebVer.5 and Current Index to Japanese Nursing Literature web version, CiNii. A total of 77 results were obtained. Literature consistent with the study's purpose was read carefully and 10 papers were ultimately selected. In terms of research design, five were quantitative studies, three were qualitative studies, and two studies used both quantitative and qualitative research. The learning methods used in the selected papers were exercises, practical training, and extracurricular activities. Among the quantitative studies, four scales were used to measure the effects of CT and three learning methods were used. The common scale used in the literature was the 'CT Skills Self-Assessment Questionnaire' and two learning methods (exercises, practical training) were used among those studies. In the present study, we integrated findings from three papers that used the 'CT Skills Self-Assessment Questionnaire.' Results showed that 13 items were commonly improved. Three items improved with exercises, five with practical training, but there was no improvement in four of the items. The meta-integration results for qualitative studies consisted of two categories, eight subcategories, and 34 data items. The category 'Learning methods leading to effective self-reflection' comprised three subcategories: 'Theoretical utilization making sense of self-reflection,' 'The need to analyze self-reflections,' and 'GL methods leading to self-reflection.' The category 'Learning effects obtained through self-reflection' comprised five subcategories: 'Acquiring a critical thinking attitude,' 'Recognizing relationships with others,' 'Clarifying what is to be improved about oneself,' 'Noticing one's tendencies (weaknesses),' and 'Noticing one's tendencies (strengths). Based on the result of integrating quantitative research, CT skills acquired depend on the learning method used. In exercises, students acquire skills to understand the meaning of other students' remarks and to express personal opinions and exert group roles. In practical training, students acquire communication skills in a broad sense; these included interpersonal skills and skills to understand and predict patients' conditions and provide nursing care. The meta-integration results of qualitative studies revealed 'Learning methods leading to effective self-reflection' and 'Learning effects acquired through self-reflection.' In the qualitative research examined in this study, a GL method was used for practical training and exercises and
descriptive content from reflective journals (RJ) was used as data and analyzed. The importance of intentionally performing self-reflection has been noted for the development of practical nursing skills. In the present study, learning methods including CT acquisition were revealed and the usefulness of RJ as an assessment method for effects in GL was confirmed. Moreover, the need to use theory to analyze self-reflective content became clear as a 'Learning method leading to useful self-reflection.' It is suggested that the attitude learners have toward participation leads.
Using Variation Theory as an Approach to Teach Organic Chemistry Nomenclature

Miechie, University of British Columbia

The structure-property relationship is an important fundamental concept to understand other chemistry concepts. The basis of the understanding of the concept is knowing the Lewis structure of compounds. For organic chemistry, a good understanding of the nomenclature is required to draw a correct Lewis structure. However, a general performance on naming and drawing structural formulae of organic compounds for high school students is low (Adu-Gyamfi, Ampiah, & Appiah, 2013). Some of the difficulties in writing the name of an organic compound from its structure are the inability to: (1) identify the correct parent chain; (2) assign the number to the carbon in the parent chain; (3) name all the substituent groups correctly. Given the abovementioned students' difficulties, it is imperative for teachers to design pedagogical strategies targeted at tackling this issue.

A learning study framed with variation theory is designed and the object of learning selected is for students to identify the parent chain from the Lewis structure of an organic compound. The theoretical framework allows teachers to develop new ways of examining the object of learning. In variation theory, teachers are guided to focus on analyzing the critical aspects of the object of learning. The presentation entails the author's conceptualisation of her research study that involve pre-service Chemistry teachers learning to apply variation theory in planning a lesson on organic chemistry nomenclature and to explore whether the teachers' participation in a learning study improves teachers' content knowledge and pedagogical content knowledge and address the following questions which are pertinent to the research study: (1) What are some of the critical aspects pre-service teachers might need to determine in order to identify a parent chain? (2) What are some possible patterns of variation pre-service teachers could effectively employ to teach the select topic?

A literature review relevant to addressing the abovementioned questions will be presented. Studies have reported on how students often fail to notice the concept of a parent chain which is the longest continuous chain of only carbon (Adu-Gyamfi, Ampiah, & Appiah, 2012; Obummenye & Ahiakwo, 2013). Based on extant literature, the critical aspects identified as the element constituting the chain, the length of the chain, and the continuity of the carbon bonding in the chain (these aspects will be further ascertained through the author's research study). Four patterns of variation and invariance were designed and will be provided to the pre-service teachers as examples of how they might assist their students' discernment of the critical aspects; these will also be discussed in the presentation. What is interesting and novel about the patterns of variation is that the sequence of enacting the patterns is deemed crucial to learning, where the patterns of variation of critical aspects are contingent on simultaneous discernment of earlier critical aspects and where a careful instrumentation of variation could promote students' discernment of the relationships between each critical aspect.

The presentation, focusing on the author's own conceptualization of how variation theory could be
used to promote pre-service teachers' teaching of organic chemistry, further extends current understandings of the application of variation theory to teaching difficult schools topics. Concomitantly, it could benefit science educators who struggle with teaching the select topic. Although other approaches are available to guide students in learning nomenclature of both inorganic (Morris, 2011; Wirtz, Kaufmann, & Hawley, 2006; Wulfsberg, Sanger, Melton, & Chimeno, 2006) and organic compounds with the aid of visual models (Palacios, 2006; Sarkodie & Adu-Gyamfi, 2015), the theoretical paper proposes a pedagogical approach that is arguably more student-centred and theory-framed. How the proposed approach could be used to complement existing visual models will also be discussed.
The Implementation Combination Stad and Mind Mapping Based On Lesson Study to Improve Motivation and Concept Mastery of Seventh Graders

Elly Purwanti, University of Muhammadiyah Malang

Student Teams' Achievement Division (STAD) has put its emphasis on reward as a manifestation of reinforcement for what students have done/performed in class. The so-called reward aims at boosting students' motivation. Mind Mapping constitutes a method to holistically process information. In further details, Mind Mapping enables students to store information, organize information, make priority, learn to comprehend any information by its contexts, review certain materials, as well as memorize complete information. Accordingly, when coming to comprehending particular concept, the combination between STAD model and Mind Mapping is worth implementing for further investigation.

This current study aimed at: (1) improving the students' learning motivation particularly on Conservation material; and (2) facilitating the students to comprehend the concept of Conservation. Lesson Study-based Classroom Action Research was employed in this study. There were two cycles. This study was conducted in MTS Muhammadiyah 1 Malang, to be specific for the seventh graders (Class II of Natural Science stream) in the Odd semester, Academic Year of 2017.

It has been revealed that: (1) The combination between STAD and Mind Mapping has been well implemented during the Plan, Do, and See stages of Lesson Study. There has been improvement shown in every instructional session. (2) The implementation of the combination between STAD and Mind Mapping has improved the students' motivation and concept mastery. Further implications include designing clearer instruction and better time management.
Teachers' Mathematical Structures A Case Study of Lesson Plan Team in Classroom using Lesson Study and Open Approach

Natnicha Charernrak, Khon Kaen University
Auijit Pattanajak, Khon Kaen University

According to Shimizu (2017) state that Teachers' Knowing Mathematical Structures is important for teaching and learning Mathematics, in particularly designing lesson plans and predicting the ideas of students. Lesson Study as innovation to let many teachers work together like a team that called 'Lesson Study Team' for designing, observing and, discussing and reflecting lesson plans for developing their Mathematical knowledge and sharing their ideas together (Inprasitha, 2011).

The objective of this study to explore mathematical Structure of a Lesson Plan Team, a group of teacher who volunteer for participate in a team after they attended a workshop on how to use Mathematical textbook that translated from Japanese language to English, and using Lesson Study and Open Approach as the innovation in school by Faculty of Education, KhonKean University (Inprasitha,2017)  This study is a the qualitative case study that emphasized on protocol analysis and analytical description.

Collecting the data from two learning units: Positive and Negative number and Algebraic Expressions in Grade 7th mathematics Contents , by using video recorder, audio tape recorder, images recorder and field note, and analyzed by using lesson study’ protocol in the first step of lesson Study which is 'Collaborative design a research lesson' or Plan step (Inprasitha,2011).

A researcher collected the data by using video recorder, audio tape recorder, images recorder and field note in the first step of Lesson Study which is 'Collaborative design a research lesson' or Plan step of Lesson Study (Plan , Do ,See) (Inprasitha,2011). By focusing Lesson Study team's discussion about mathematical knowledge to design lesson plans on first two units of Grade 7th mathematics Contents which are Positive and Negative number and Algebraic Expressions.

The results of this study showed that mathematical Structures like mathematical knowledge in form of key words, which is lesson Study team help together to design lesson plan. For example in the last lesson Plan of Positive and Negative number, which is in the topic of Mixed calculations. Before designing this Lesson Plan, students have to know addition, subtraction, multiplication and division first, and then they can do it step by step like Algorithm. So, Lesson Study team have to know about Mathematical Structures to be algorithm of learning. Lesson Study gave a chance to teachers in Lesson Study team to share their knowledge and adding perspective to look at mathematical knowledge like a structure, that is mathematical Structures which help designing lesson plan better.
The Workbook of Technological Knowledge for Strengthening Natural Science Teacher Competencies

Evi Suryawati Syafei, Riau University
Dea D. Dewita, Riau University

Technological Pedagogical and Content Knowledge (TPACK) is a conceptual framework that shows the relationship between three kinds of knowledge. Needed by the teacher or prospective teacher including technological knowledge, pedagogical knowledge, and content knowledge. The objective of this study was to develop a workbook of Technological Knowledge (TK) for Strengthening Natural Science Teacher Competencies. The workbook was developed from essential indicator of Teacher Competency Test. Design, develop, simulation and validation of workbook by internal validator conducted at the Laboratory of Biology Education FKIP University of Riau. External validation by experts, pilot test and user response of the workbook in Pekanbaru Natural Science Teacher Forum. Workbooks validated on four aspects of the Technological Knowledge include format, content, illustrations and language. Validated workbook will be disseminate after revised. The workbook can be used as a learning resource by the teachers to improve technology competencies and teaching and learning process.

Keywords: Natural Science Teacher, Technological Knowledge, workbook
An Exploration of Approach for Collaboratively Plans with Lesson Study Team in Student Interns Practicum

Weerasuk Kanauan, Khon Kaen University
Maitree Inprasitha, Khon Kaen University
Narumon Changsri, Khon Kaen University

Initial teacher preparation program has closely link and has a great impact for quality of teacher (Inprasitha, 2013; Sowder, 2007). Inprasitha (2010) proposed the framework for teacher education program of Mathematics Education, Khon Kaen University which immediately linked between pre-service and in-service teacher program by Lesson Study (Inprasitha, 2015). In last year of Mathematics Education program, student interns teaching practices with lesson study incorporating open approach at schools project of the students' mathematical higher thinking development project in northeastern of Thailand, consist of lesson study team in weekly cycle (Changsri, 2012, Thinwiangthong, 2012).

The context of study was student interns' practicum at Ubonratchathani province based on project school. There were 6 schools and 6 lesson study teams. The purpose of this study was to explore the differences in approach for collaboratively plan with lesson study teams. Target groups were 13 student-interns from Mathematics Education program, Khon Kaen University. The data collected by participant observation, group and individual interviewing. Data were collected 3 months and analyzed by content analysis and grouping the practice for improving lesson plans through the umbrella of Lesson Study based on Inprasitha (2010).

The results of the study were as follows: there were several approaches for collaboratively plan. Participants for collaboratively plan the lesson can be classified into 3 sessions. 1) Student intern collaboratively plan with mentor teacher, 2) Student intern collaboratively plan with student interns as peers same school, 3) Student intern collaboratively plan with student interns from other schools and 4) They joined to plan the lesson at the faculty with peers and lecturers as adviser. They collaborative analysis mathematics textbook in order to identify aim of lesson and anticipate students' ideas and students' difficulty. They compared students' ideas crossed school with peer through social media such as Facebook and Skype. The mentor teachers provide information about how students' response to problem situation.
Comparison of Specific Content Knowledge of Students in Physical Education Teacher Education Program

Han Joo Lee, Yonsei University
Sas-Byul Moon, Yonsei University
Su-Ruyn Ryu, Yonsei University

1. Background/Purpose
Rink (2014) and Ward (2013) stated that content development is a critical skill for physical educators. Further Ward et al (2017) extended the conceptual understanding of content development by integrating pedagogical content knowledge (PCK), and they argued that content knowledge is related to PCK. Content knowledge can be categorized into common content knowledge (CCK) focused on rules, etiquette, technique and tactics; specialized content knowledge (SCK) concerned with an understanding of the students’ errors in performance. Although Ward, Lehwald, Lee (2015) introduced an assessment tool for measuring SCK of teachers using content map validity of content map to measure content knowledge has not been examined extensively. Thus, the purpose of this was to determine the extent to which the content map and the can discriminate between different levels of SCK. More specifically this study investigated the content development in three groups differentiated by content expertise, advanced experience and experience. Research questions were: (1) Is SCK differentiated by groups? (2) How does SCK appear in different formulae of content development variables?

2. Method
A total of 53 (M=42, F=11) students participated in this study. The participants were classified into three groups: The first group consisted of Elite soccer players (N=18). The second group consisted of PE majors who were considered competent and are playing at intramural soccer league (N=18). The third group consisted of students who have taken soccer class (N=17). Participants were asked to complete a content map (i.e., list the skills and tactics from the initial tack to more complex tasks horizontally, list and sequence of the instructional tasks vertically, use arrows to show progression of the tasks, etc.) of soccer. The content map measure 7 variables (i.e., Informing task(I), Extension task(E), Extension-applying task(EA), Refining task(R), Refining-applying task(RA), Applying nongame task(AN), & Applying task-game(AG).

3. Analysis/Results
Descriptive statistic and One-Way ANOVA analysis was used to analyze the differences among group's means of content development variables. Results of the study showed that elite and intramural soccer players scored higher than class takers in terms of E, EA, R and RA. However, there were no significant differences between elite and intramural players group in the scores of the E, EA, R and RA. The second group showed highest scores in EA and RA.
4. Conclusions

This study showed that content map discriminated the SCK of expert groups (e.g., elite and intramural soccer players) from the less experience group of students (e.g., soccer class takers) in PETE program. The expert groups demonstrated more organized content map and thus scored higher in extension and refining categories in content development. Measuring SCK and concurrent validity was discussed in relation to content map scores and instructional tasks.
The Use of Lesson Study in Teacher Mentoring Activities at Teacher Working Group in Aceh Jaya District, Aceh, Indonesia

Mukhlis Mukhlis, University of Syiah Kuala, Banda Aceh

This article, 'The Use of Lesson Study in Teacher Mentoring Activities at Teacher Working Group in Aceh Jaya District, Aceh, Indonesia' focused on how to use lesson study in mentoring the teachers through activities in teacher working group (KKG), a structural professional organization established by teachers in a region or cluster of schools as a medium for exchanging experiences to improve teachers' ability and improve learning quality. This program implemented at Aceh Jaya District, Aceh, 1-6 September 2016. The participants in this mentoring activity were the primary school teachers in Aceh Jaya District. Number of participants was 47 primary teachers, 10 district facilitators of Aceh Jaya District and 1 collaborator from LPTK lecturers.

The use of lesson study in teachers mentoring activities of at the Aceh Jaya District KKG had a positive impact on improving the personal competence of primary teachers in Aceh Jaya District. The pattern of implementing mentoring with a lesson study approach that is divided into planning, implementation and reflection stages has helped teachers not only in understanding the characteristic of knowledge, skill and character to be taught to students, but also assisting them in designing more systematic learning steps, preparing student workbooks with focus on the competencies to be trained, preparing simple learning media that students can easily understand, and helping them design more authentic evaluation tools.

What still needs to be strengthened in the future is the emphasis on the use of learning methods that are more challenging students to work more leverage in groups both inside and outside off the classroom. The use of cooperative learning models, worksheets and more creative learning resources will help teachers realize that.

Key Word: lesson study, teachers mentoring activities, Aceh Jaya District, Aceh, Indonesia
Lesson Study-Learning Community for Prospective Biology Teachers in Coordination System Material

Eko Susetyarini, *University of Muhammadiyah Malang*

Sri Wahyuni, *University of Muhammadiyah Malang*

Nur Widodo, *University of Muhammadiyah Malang*

Iin Hindun, *University of Muhammadiyah Malang*

Exposing prospective teachers with various experiences in conducting instructional activities based on Lesson Study is expected to equip them with necessary professional, pedagogic, social, personality, innovative, critical thinking, collaborative, and communicative competences. This current study aimed at describing the implementation of Lesson Study-Learning Community for prospective Biology teachers attending Biology Instructional Management Program course, particularly for teaching Coordination System material. This current study was conducted by employing descriptive design. The subjects were sixth semester students of Biology Education department of University of Muhammadiyah Malang, in total of 25 students, divided into 5 groups. Every student in a group, in turn, became a model teacher, student, and observer. They implemented Lesson Study-Learning Community by following Plan, Do, and See stages.

During Plan stage, the prospective Biology teachers, in groups, made chapter design and lesson design outside the class hours. During Do stage, they were conducting instructional activities and the observers observed the 50-minute instructional session. During See stage, there was a reflection between the model teacher and observers. The data were analyzed descriptively and qualitatively. It has been shown that 80% students were satisfied with their role of being model teachers, observers, and students in Lesson Study.

The model teachers implemented collaborative strategy when making chapter design and lesson design, particularly for teaching Coordination System material, with their peers in groups. The model teachers implemented problem-solving method upon their teaching practice. The observers observed any activities occurring in the class. The model teacher and observers reflected on their class session. Lesson Study ' Learning Community in Biology Instructional Management Program course has equipped the students as the prospective Biology teachers with necessary teaching experiences before conducting teaching internship in schools.

Key words: Lesson study-learning community, prospective Biology teacher, coordination system
Assistant Program for Prospective Teachers by Implementing Lesson Study in Biology Instruction on Natural Colorings

Sri Wahyuni, *University of Muhammadiyah Malang*
Eko Susetyarini, *University of Muhammadiyah Malang*
Nur Widodo, *University of Muhammadiyah Malang*
Elfi Anis Saati, *University of Muhammadiyah Malang*

This current study aimed at describing the competence of prospective Biology teachers in designing Biology instructional activities by utilizing the results of research on natural colorings in soybean extract drink. This current study was conducted by means of Lesson Study. The chosen material was digestion and additive substance for food/drink. The results of research to incorporate upon teaching were the combination of dragon fruit peel/skin and teak wood leaves as the natural colorings, rich of antioxidant, added to soybean extract drink.

Qualitative designed was employed in this current study. Students of Biology Department, Faculty of Teacher Training and Education, University of Muhammadiyah Malang who were in their sixth semester and attending Microteaching course were recruited as the subjects of this study. Assistance program was covering the following materials (1) designing instructional activities, (2) teaching, and (3) reflection. The qualitative data were in the forms of the results of instructional design/planning, implementation, evaluation, and reflection by the students. The data were analyzed descriptively.

This current study has resulted in the followings (1) the prospective Biology teachers were capable of designing the instructional activities shown by their making chapter design and lesson design, (2) they could implement and evaluate their teaching of natural colorings in soybean extract drink, and (3) they could reflect their instructional activities through Plan, Do, and See stages of Lesson Study.

It has been concluded that the competence of prospective Biology teachers in designing Biology instructional activities has been improved through the implementation of Lesson Study in Assistance Program by utilizing the results of relevant research.

Key words: assistance program, Lesson study, research-based instruction
Development of Teacher Training Method by Immediate Sharing of Teachers' Recorded View in Practical Lessons

Shiho Furuta, Nara University of Education
Takehiro Furuta, Nara University of Education
Hiroyuki Yoshikawa, Nara’s Women’s University Secondary School

The purpose of this study is to determine the effectiveness of a teacher training method using information from teacher's view captured by wearable camera. The method is originated especially to help pre-service and novice teachers without long experience design practical lessons quite similar to workshops and create materials used in these classes. This paper makes the interim report of the study.

In teaching practices or teacher training programs of Japan, teachers are usually observed by other teachers (observers) or recorded by handy-camera from the back of the classroom, which makes it difficult for observers to know in detail what instructions teachers give to their students while walking around the classroom.

We came up with a hypothesis that the process where teachers see students reacting and responding, then accordingly change teaching styles or go for more suitable techniques to achieve the goals fixed in their lesson plan can be analyzed by tracing their recorded view along with their remarks.

To test this, a wearable camera worn by a teacher was connected with a tablet PC of an observer via Wi-Fi, and thus the observer came not only to grasp the atmosphere of the entire classroom but to monitor how the teacher went forward.

In this test, the observer obtained the materials and lesson plan from the class teacher beforehand to modify them while monitoring the class.

As a result of monitoring a veteran teacher with 25 years of teaching experience in technical arts, the observer could also identify the student's various learning problems and straighten out the matter at the same time when the in-service teacher judge it necessary.

It can be said that this method is effective for observing teachers to think about re-designing the lessons or modifying the materials in real time when in-service teachers are dealing with the situation.

Furthermore, feedbacks from observing teachers could also be helpful for further improvement of lessons designed by veteran teachers.

The possibility of the observation by more than one observer at the same time will be considered after this test.
The Implementation of Lesson Study on Animalia Material for Prospective Biology Teachers

Roimil Latifa, University of Muhammadiyah Malang
Eko Susetyarini, University of Muhammadiyah Malang
Lala Yulian Permana, University of Muhammadiyah Malang

The common problem encountered among prospective teachers is their lack of readiness to seek and dig out information regarding instructional materials. This current study aimed at describing the implementation of Lesson Study for prospective Biology teachers, particularly on preparing for teaching Animalia materials. Qualitative design was employed in this current study. Sixth semester students of Biology Education department were recruited as the subjects. There were in total 25 students (prospective Biology teachers) divided into 5 groups. Every student in a group, in turn, became an observer, student, and model teacher. They implemented Lesson Study by following Plan, Do, and See stages. During Plan stage, the model teacher designed a Lesson Plan. During Do stage, the model teacher conducted instructional activities based on the designed Lesson Plan. During See stage, there was a reflection to examine and analyze the instructional activities so as to find out the weaknesses to improve further. This current study has revealed that more than 90% of prospective Biology teachers have shown the followings: (1) their improved competence to design instructional activities, particularly in making Chapter design and Lesson design; (2) their ability to conduct instructional activities, specifically on Animalia materials; and (3) their ability to do a reflection on their instructional activities. It is concluded that Lesson Study has equipped the students as the prospective Biology teachers with the competence to design and conduct their instructional activities in class.

Key words: Lesson Study, Animalia, Prospective Biology Teachers
An Exploring Teachers’ Mathematical Knowledge for Teaching Fractions

Chompoo Lunsak, Khon Kaen University
Maitree Inprasitha, Khon Kaen University
Narumon Changsri, Khon Kaen University

Teachers' mathematical knowledge for teaching is important to improve teaching and learning mathematics (Ball et al., 2008). Particularly, teachers' knowledge of fractions is important because fractions are notoriously difficult to learn and teach (Newton, 2008). Iwasaki et al. (2005) founded Thai teacher believed that teaching fractions was easy and student learned fractions easily. Student just followed the teacher and practiced with exercises, but student achievement was very low. Khon Kaen University, Center for Research in Mathematics Education has implemented Lesson Study and the Open Approach in schools aimed to developing Thai mathematics teaching profession based on Lesson Study (Inprasitha, 2015).

This study aimed to explore teachers' mathematical knowledge for teaching fraction. Data collected from 175 mathematics teachers from project schools. These project schools participated in long term professional Development by using Lesson Study and Open Approach based on Inprasitha (2011). This study was the first phase of project. A translated and adapted version of mathematical knowledge for teaching about fractions test was used to gather data on teachers' mathematical knowledge for teaching about fractions. There were 14 items include 6 multiple choices and 8 comprehension tests. Data were analyzed by using basic statistics.

The study result revealed as follows: 1) 46.14 percent of teachers justify Pedagogical Content Knowledge (PCK) in anticipation of students' idea both of correct and misconceptions ideas about the meaning of fractions and comparing fractions, selecting examples to take students deeper into mathematical content or selecting appropriate representations to illustrate the content about ordering fractions, comparing fractions and relationship between fractions and decimals, teachers understand about the sequence of teaching in each content, teachers know a topic being taught to topics from prior or in the future about operations of fraction. 2) 41.84 percent of teachers justify Mathematical Subject Matter Knowledge (SMK) on solving and calculate an answer correctly, using mathematical signs and symbols correctly, definition or specific mathematical explanations about the fractions system and operations of fraction.

Keyword(s): Mathematical Knowledge for Teaching, Lesson Study and Open Approach

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References


How Preservice Teachers Use Assessment Questions In Mathematics Classroom Using Lesson Study and Open Approach

Sudarat Phiangnoy, Theerakarnbanhong School
Jensamut Saengpun, Chiang Mai University
Pisittha Kachi, Chiang Mai University

Classroom assessment is a systematic collection of information about students' abilities, characteristics, skills, understanding and knowledge developed, administered and scored by a teacher for the purpose of evaluation (Frey, 2014). Assessment can be done before, during and after instruction. Information gathered during assessment can be used by teachers to improve instruction or to summarize students' achievement and monitor their learning (Cornelia, 2015). The purpose of this study was to analyze using assessment questions of pre-service teachers who taught in teaching practicum program in schools using lesson study and open approach. Target group was lesson study team in grade 1 at Chumchon Banbuakkrognoi school. Lesson study team composed of the pre-service teachers, teachers and observers. A research instruments were lesson plans, research note, observation note, video recorder and students' works. Data were analyzed by content analysis. The result showed that assessment questions are used to assess students' mathematical thinking in mathematics classroom through 4 steps in open approach: Posing Open 'ended Problem step; pre-service teachers used assessment questions for assess understanding students' problem situations. Student' self learning step; pre-service teachers used assessment questions for observing how students solve the problems by using worksheets. They realized the important topic from assessment questions and used Assessment eye for assess students' mathematical thinking followed assessment questions in each lesson plan. Whole class discussion and comparison step; pre-service teachers used assessment questions for create questions In which type of questions focus on students' reasoning. So the often words were why? how? because? This case, questions will be used with Just-in-time Assessment. Pre-service teachers assessed students' mathematical thinking by students' presentation of ideas, question posing and answering the questions. Summarization through connecting students' mathematical ideas emerged in the classroom step; pre-service teachers used assessment questions for students' summarize how to solve the problem or students' analysis and decision on the best solution. The questions for summarization are created and defined in lesson plan that questions will be used with Just-in-time Assessment. Pre-service teachers assess by using students' answer for adjusting the teaching in next classes continuously.

Keyword(s): Classroom assessment, Assessment questions , Lesson Study, Open Approach


The Character Development of Professional Teacher Candidate through Lesson Study Based Learning Study

Poncojari Wahyono, Muhammadiyah University of Malang

The development of character values within the national education system is a strategic step to foster a noble value in learners. One of the keys to success of these efforts is teachers interaction of learning with students. Teachers who are able to demonstrate professional values have an important role in order to foster positive characters in students such as honesty, creativity, communicative, and self-evaluation. The implementation of this lesson study involves sixth semester students taking advanced genetics courses. The plan, do and see stages are implemented by involving all groups in each class. Implementation of learning using lesson study as a learning community able to develop the character's values to the students by 11.69% for creativity, communicative of 11.33%, honesty of 4.55%, and self-evaluation of 8.71%.
Model of Lesson Study and Open Approach in Healthy School

Suttharat Boonlerts, Suratthani Rajabhat University

This study was aimed to describe model of lesson study and open approach in healthy school of Thailand. Research participants consisted of teachers and director from one primary school, four persons in total, two student teachers majoring in mathematics, and three professionals. Data were collected by field recording and interview. After that, data were analyzed as content analysis and validated by researcher triangulation.

The results found that;

School represented some integrations of healthy school concept by using contemplative education, which constituted of community establishment and community's lifestyle, using positive psychology, conducting activity through contemplative education, together with open approach in mathematics instruction as core subject and utilizing lesson study in the stages of research lesson design and of collaboration to observe research lesson. While the stage of collaboration to discuss and reflect lesson outcomes, it was used with PLC (Professional Learning Community) of school.

Reference

The Reconciliation between Critical Pedagogy and the Intellectual Freedom: A Case Study of Cowhey's Classroom

Kazuki Uematsu, The University of Tokyo

The purpose of this study is to consider Jacob W. Neumann's ideas on reconciliation between critical pedagogy, the theory and practice toward changing the social reality, and students' intellectual freedom within the context of teacher's curriculum development. We explore this question using the case study of Mary Cowhey's practice in classrooms.

Critical pedagogy is a series of educational studies that, along with neo-Marxism, has mainly been advanced in the United States. Its focus is on power relationships and inequality concerning formal education. Two scholars, Michael W. Apple and Henry A. Giroux, lead Critical pedagogy in U.S. While Apple has analyzed the reality of schooling within the political, economic, and social contexts, Giroux has developed his own pedagogy, called "border pedagogy," to describe the cultural politics of resistance toward democratic society. Giroux's border pedagogy is greatly influenced by Paulo Freire, a Brazilian educator. Freire is famous for the idea of "banking education" and has argues that education is political and cannot be neutral. Giroux (2005) has also admitted the influence of the Freire's practice and theory on his work.

Despite Apple and Giroux's influence, Neumann (2009) has pointed out that, while critical pedagogy's proponents consistently utilize the language of freedom, democracy, and emancipation, too often the methods of enacting critical pedagogy found in the literature eschew democratic, student-centered engagement for a form of prescribed analysis of issues of the teacher's choosing. He also notes "the rhetoric of freedom followed by a too frequent practice of scripted control" (p. 125). If all education is political and cannot be neutral, he argues, then it is necessary to reconcile between critical pedagogy and students' intellectual freedom in classrooms, so that students learn to think and act democratically by thinking and acting democratically.

Neumann (2013) refers to some classroom practices as the alternative approaches to critical pedagogy. They are practical, take into account teachers' knowledge and beliefs, and fit into teachers' already crowded work lives. One of these is Cowhey (2006)'s classroom practice. She, too, was greatly influenced by Freire, but her practice was different from the typical ones of critical pedagogy. This study explores the above question of reconciliation by analyzing Cowhey's classroom practice. As a result, it shows how her practice included Freire's key concepts, dialogue and generative themes, and that there are multiple goals for students rooted in their own experiences and interests.
Development of STEAM Curriculum based on Rural Culture -- A Case Study of Chinese Schools

Junjie Zhang, Zhejiang University

STEAM curriculum is a sort of comprehensive curriculum integrating science, technology, engineering, arts and mathematics. The emergence of STEAM curriculum is one of the latest achievements of curriculum development and reform all over the world, since it emphasizes the application and innovation of science and technology, and highlights the cultivation of both pioneering spirit and practical ability. Scholars have researched and discussed on STEAM curriculum theories, such as its concept, development, organization, activity design, assessment, and so on. In the meanwhile, lots of countries have carried out STEAM curriculum practice, they have developed project-based STEAM curriculum like 3D printing and Scratch programming while there were also cases that add contents of arts curriculum to technology and engineering disciplines. In China, STEAM curriculum has also got more and more attention in K-12 education and schools in developed areas have built innovation workshops to encourage students to participate in STEAM curriculum in their club time. Ministry of Education of the People's Republic of China enacted <Science Curriculum Standards of Primary School Education> in 2017 which stipulated that science classes should be offered in the first grade. That also promoted the innovation in science curriculum, therefore more and more teachers and education researchers put their eyes in STEAM curriculum.

But now, in the practice of STEAM curriculum in China, there are problems such as the lack of curriculum teaching resources, the lack of discipline integration, the lack of laboratory construction standards and implementation plan, the lack of professional teachers and so on. Schools in rural areas in China which can’t afford advanced educational facilities face big challenges particularly

Considering the significance and complexity of the research on the practice of STEAM curriculum, this poster elaborates the representative cases of some schools in rural areas in China about how to develop STEAM curriculum based on traditional local culture. Rural culture in China includes farming culture, folk customs, traditional techniques, and so on. All of them provide rich resources for STEAM curriculum design and development. In 2016, I joined in a volunteer teaching program which aimed to improve the teaching of rural schools. I advised local teachers to introduce STEAM concept into science courses and we decided to develop STEAM curriculum according to local conditions. We inspired students to mash various vegetables for the paints and make use of them to create paintings. According to this project, students were able to understand how to extract natural pigments in ancient. What’s more, students built close connection between arts and science. Another case is about production of diabolos (which called ‘kongzhu’ in Chinese) in primary schools. It integrated three disciplines including arts, technology and physical education to help children make their own toys. In the process of our exploration, students are expected to master the properties of various materials and realize scientific principles about playing diabolo. Questionnaire survey, focus group interview and participant observation are employed to research feedback from students and local teachers. Overall, students took a positive view of the course.
In spite of financial difficulties, schools in rural areas in China still try their best to bridge the gap between local culture and STEAM curriculum. And this kind of curriculum development pattern involves with students, teachers, folk craftsmen, farmers, educational researchers and so on. In the end, this paper put forward the possibility of further research on the practice of STEAM curriculum based on rural culture. Also, it should be further considered in curriculum integration, resource development and teacher training.
Developing Health-Education Curricula Based on the 1970s-1980s Practice Records of Yogo-Teacher Sakaguchi Setsuko

Rie Arima, The University of Tokyo

Concern over the educational role of the Yogo-Teacher has been growing in the field of school health services for the last several years. However, it has not been reported the educational characteristics and practices of Yogo-Teacher. The purpose of this study is to clarify the process of developing health-education curricula based on the practice records of a famous Yogo-Teacher, Sakaguchi Setsuko (1930' 015), who influenced many other Yogo-Teachers. She recorded children's mental and physical difficulties, used these records to identify the problems in their educational environment, and then created original curricula to address those problems.

First, the study briefly discusses Yogo-Teachers most of whom are female and work full-time in Japanese schools, usually one or two to each school. They are often compared to school nurses in other countries, but Yogo-Teachers are teachers. According to a historical study by Sugiura (1985), Yogo-Teachers date from the Meiji era, in which they were like school nurses, combatting contagious diseases. In 1941, during World War II, the Japan National School Order established the position of Yogo-Kundo (teacher), and most school nurses became Yogo-Kundo at that time. Although in 1947 their role was renamed to Yogo-Teacher, their main work was still to address urgent nursing and public-health problems, including controlling contagious diseases. However, improvements in hygiene reduced the need for school nursing after about 1965, and Yogo-Teachers lost their reason for being.

Sakaguchi, then a Yogo-Teacher in an elementary school in Nagano Prefecture, released her practice records to other Yogo-Teachers, mainly in Nagano, proposing educational practice as a new role for Yogo-Teachers. She conducted health education, not only in classroom lessons but also in daily life. She always saw things from the children's point of view. For instance, her records include notes on communication with a child who had had a brain infarction and had difficulty exercising. His remark that he didn’t want to eat in the classroom because he ate so slowly reminded her of the need for support of such children. She decided to develop a curriculum on brain infarction with the help of teachers and parents. The poster presents additional examples. Sakaguchi's practice marks the point at which Yogo-Teachers began to play an educational role.

So far, we have identified three characteristics of her practice. First, she developed original curricula from the needs of actual children instead of simply applying the public curriculum. Second, she was able to identify children's educational needs by recording changes in the children. Third, she expanded her records of communication with children into developing health-education curricula.

In conclusion, the practices created by Sakaguchi can bring about mutually respectful relationships between students and teachers. The most important goal of health education is not to possess expert knowledge, but to produce understanding relationships that nurture other people as well as oneself.
Teachers' Learning through Implementing Mathematics Textbook with Lesson Study and Open Approach: Teachers' Knowledge for Teaching in First Grade Mathematics

Chanika Senawongsa, Khon Kaen University
Maitree Inprasitha, Khon Kaen University
Narumon Changsri, Khon Kaen University

Before entering the 21st Century, most of teachers' learning in Thailand depends upon professional development by disseminating information to teachers by various kinds of short course training (Inprasitha, 2015). In 2002, Center for Research in Mathematics Education Faculty of Education, Khon Kaen University started to conduct Lesson Study and Open Approach in the project for teacher professional development to elementary schools (Inprasitha, 2005). At early stage of this project, Japanese Mathematics Textbook (Thai version) is the main focus of three steps of Lesson Study process. Murata et al. (2004) suggested three specific areas that develop and interact through the Lesson study process to support teacher learning. Furthermore, according to Stein, Remillard, & Smith (2007), this point to how teachers learn through implementing textbook. One among there is improving of teachers' knowledge. Teachers' knowledge about subject matter (content knowledge), pedagogy, and learners may influence teachers' response to textbook including how they use and what they learn from them (Collopy, 2003).

This study was aimed to investigate teachers' knowledge for teaching in first grade mathematics. The participants in this study were 4 teachers who use the textbook in the classroom using Lesson Study and Open Approach. The data were collected from a first grade mathematics lesson that the teachers and Lesson Study team collaboratively interprets problem situation, sequence of teaching, and anticipates students' ideas appeared in the textbook (Inprasitha, 2015). While teaching through 4 steps of open approach, students' ideas have been observed and later discussed. And the data were analysed based on Collopy's framework and Inprasitha's framework.

The results show that the textbook can be effective professional development tool because 1) teachers learned mathematics content 2) they learned how to teach the content and sequence of teaching and 3) they learned students' ideas and how to manage it during designing the lessons; teaching the lessons; and reflecting the lessons through implementing mathematics textbook together.
Improving Mathematics Communication Skills through Cooperative Learning In Matrix Algebra

Siti Inganah, University of Muhammadiyah Malang

This research aims to improve students' mathematical-communication skills through cooperative learning in the matrix algebra course. Qualitative approach and exploratory type are employed in Lesson Study activity. The subjects in this research are students who took in matrix algebra course. Lesson Study activity is conducted in some stages, which are Plan, Do, and See in four cycles. The data are collected by doing some observation and recording on field activities. The results show that through cooperative learning method, the students' mathematical communication skills in both written and oral are increasing. The students' ability to read and write symbols correctly are increasing. Students become more active in discussions, interact with their friends in groups, ask each other with some questions, share ideas, and pour the ideas in to some writing.

Keywords: matrix, mathematics communication, cooperative learning
How to Teach Learning Strategies to the Biology Pre-Service Teacher?

Endang Susantini, Universitas Negeri Surabaya
Sifak Indana, Universitas Negeri Surabaya
Isnawati Isnawati, Universitas Negeri Surabaya

Learning strategies are cognitive strategies that used by the students to solve the learning problems. The learning strategies are include: simple repetition, complex repetition, elaboration, organization, and metacognition. Teaching Learning Strategies (LS) does not require any specific time. Lecturers or teachers can teach LS while teaching learning material. Pre-service teachers should have LS, so that they can teach the learning strategies to their students. One way to teach LS is by using metacognitive strategies. The steps of metacognitive strategies applied in this research are the students were asked to write down their prior knowledge, and then write down the knowledge that has been acquired, after that the students will compared their prior knowledge with the knowledge that already gained, and the final step is the students assess their own concept understanding. There are three purposes of this research: (1) to explore the metacognitive skills of Biology pre-service teachers during LS by using metacognitive strategies, (2) measure the development of learning strategies that use by the pre-service teachers before and after the learning in using metacognitive strategies, (3) describe the response of pre-service teachers after the learning. The research samples were 25 pre-service biology teachers from biology education program of Universitas Negeri Surabaya in the 4th semester. The implementation of metacognitive strategies was conducted in three sessions, those are: namely theoretical study of LS, modeling LS on the topic of ecosystem, and workshop on preparing LS-oriented Biology learning material. The research was design by using one group pre-post test design. The data of metacognitive skills were analyzed by calculating the mean score of the students' skills in determining the levels of confidence, comparing concepts, and determining scores. The data of the increase in students' LS knowledge were analyzed by using n-gain score, while the data of students' responses were analyzed by using descriptive qualitative. The research results shows that (1) the students' metacognitive skills increased from 3.1 to 3.3 out of 4 scale (2) the students' LS knowledge gaining is also increased, from 45.40 to 81.04 (3) the responses of pre-service teachers revealed that they obtained many benefits from the metacognitive strategy learning, such as, it helps to find the important concepts, assess their own concept of understanding, and practice the honesty. The conclusion of this research is that metacognitive strategy can be used to teach learning models or methods as well as to develop students' metacognitive skills. Student who have gained knowledge of learning strategies can choose the best learning strategy in which appropriate to the material that being learned.
Lesson Study and Open Approach: A Case Study of 1st Grade Classroom, Khon Kaen University Demonstration School (International Division)

Alisa Moonsri, Khonkaen University
Khemthong Kotmoraka, Khonkaen University
Narumon Changsri, Khonkaen University
Maitree Inprasitha, Khonkaen University

Mathematics classroom that using lesson study and open approach was a collaboration between teachers. This way was the professional development in classroom level. Teachers participated in a well-organized process. Lesson Study provided an opportunity for teachers to clearly understand about teaching and learning in a classroom. They discussed about planning a lesson, implementing and observing a lesson, and reflecting about the classroom. The observation helped teachers to realize about what was a good teaching that supported students' learning (Inprasitha, 2006).

The study examines process the Lesson Study and Open Approach in 1st grade classroom, Khon Kaen University Demonstration School (International Division). The target group included in-service teacher, internship students in Mathematics Education Program, researcher, and research assistant from Center for Research in Mathematics Education, Faculty of Education.

The data were collected by video-tape recording of first grade classroom. The internship students, teachers and researcher collaboratively designed research lesson (plan), observed research lesson (do), and reflected on teaching practice (see) (Inprasitha, 2010).

The research findings found that Phase 1: Collaboratively design research lesson, teachers, observers, and researcher planned the research lesson together every day after observed and reflected about the previous mathematics classroom. In addition, this research lesson followed the steps of open approach including 1) Posing open-ended 2) Students' self-learning 3) Whole class discussion and comparison 4) Summing-up by connecting students emergent mathematical ideas. Phase 2: Collaboratively observing the research lesson, teacher taught the research lesson followed four steps of open approach. Phase 3: Collaboratively reflection on teaching practice. The reflection was on every day after the teacher taught mathematics lesson. The reflection aimed to learn what emerged in the classroom and how to improve for planning the lesson in the next research lesson.

Keyword(s): Lesson Study, open approach

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Developing Teacher-Scholar Partnerships in Early Years Education Lesson Studies: The Historical Legacy of Voluntary Research Groups in Japan

Sachiko Asai, Tokyo University

1. Subject of Report
This presentation reports on the historical development of teacher-scholar partnerships in Japanese voluntary research associations. Some early childhood education and care (ECEC) teachers have traditionally engaged in practical research on ECEC with scholars. Among these groups, the voluntary research association Hoiku Mondai Kenkyukai (Homonken: Society for Research on the Problems of ECEC) has been one of the central organizations.

This presentation aims to explain the difference in the concept of teacher-scholar partnership between the first Homonken (1936' 943) and the second Homonken (1953'). Both concepts are significant for this field.

2. The First Homonken
Homonken was established in 1936 by scholars of psychology, psychiatry, pedagogy and related disciplines, along with ECEC teachers. They researched the practical problems of ECEC in hopes of discovering solutions. Mantaro Kido, a psychologist and educational reformer who established foundations for educational science, played a leading role. In 1943, however, the first Homonken disbanded during the fighting and aftermath of World War II.

The first Homonken was the first association to organize comprehensive research on children by teachers and scholars. Kido conceptualized the association's teacher-scholar partnership as follows:
- ECEC problems are discovered by ECEC teachers.
- ECEC teachers seek solutions to ECEC problems.
- ECEC teachers collaborate with scholars to build a theoretical foundation for these solutions.

Kido sought to solve the problems of children's development by grasping their social and cultural development through the cooperation of teachers and scholars.

3. The Second Homonken
In 1953, ECEC teachers and researchers reestablished Homonken. ECEC teachers wanted a place where they could conduct practical research, and Takashi Inui, a psychologist and disciple of Kido, supported them. Teachers and researchers in the second Homonken have examined ECEC problems, and remain active today. Their ideas have been influential in Japanese ECEC.

Reflecting that participants in the first Homonken conducted "scholar-centered enlightening activities," participants in the second Homonken have tried to share their roles and collaborate on research. Inui conceptualized the teacher-scholar partnership of the association as follows:
x Do not put the present child in the frame of the developmental stage of an infant, as occurs in conventional psychology.

x Based on the results of collaborative research between scholars and practitioners, we can create a future development process for children.

Inui tried to create a process for children's social development through collaborative researches.

4. Conclusion

In the first Homonken, participants established frameworks for ECEC case studies. They understood children's developmental problems in a social and cultural context through a style of teacher-scholar partnership.

By contrast, the second Homonken has made it possible to pioneer the developmental theory of social constructivism.
Extending Mathematical Ideas of 5th Grade Students in Classroom Using Lesson Study and Open Approach

Kanyarat Phiasuwan, Khon Kaen University
Auijit Pattanajak, Khon Kaen University

The purpose of this research is to analyze the extending student's mathematical ideas in the classroom which utilizes the Lesson Study and the Open Approach (Inprasitha, 2011). This study was the qualitative research method that emphasized on analytic description and protocol analysis. The target group was the sixth grade students in the first semester of the academic year 2016 at the Chum Chon Kuddon Wittayakom School where is located in Kalasin province. This school has been subjected to the project for professional development of mathematics teachers through Lesson Study and Open Approach which is implemented by the center for research in mathematics education, Faculty of Education, Khon Kaen University. The instruments used in data analysis were divided into 3 parts: protocols (by using a tape recorder, video camera and field note), students' work from activities and interviews.

As the results of this research, showed that lesson study teams worked to create a lesson plan together. In each lesson plan, lesson study teams analyze the ideas of each subject, to find the way to create a problematic situation that would be used in an open approach. In the classroom using lesson study and open approach students solved the mathematical problems by themselves and that make various mathematical ideas. When students exchanged their ideas with each other they communicate ideas too. Consequently, the ideas was extended. That is students found relation and connection between each ideas. Students found rule formula, definitions, how to solve problems to be generalization and can be extended to connect to each topic which is the higher order thinking.

Keywords: Lesson Study, Open Approach, Extending Mathematical Ideas
The purpose of this research was 1) to study the reading and writing ability of Grade 1 students at Pattaya City School 7 (Ban Nong Phang Khae) after using Management Processing with Professional Learning Community and Reflection, and 2) to study the reading and writing ability of disability students from Grade 2 to Grade 9 after using Management Process with Professional Learning Community and Reflection. The target group was 174 Students in Grade and 46 disability students in reading and writing from Grade 2 to Grade 9. Professional Learning Community was composed of the school director, deputy school director of academic affairs, head of academic affairs, head of Thai language department, Thai language teachers, heads of class level, Classroom teachers, volunteer teachers and parents. Management Process with Professional Learning Community and Reflection was comprised of 4 stages 1) analyzing problems and reflection stage 2) doing and reflection stage 3) checking and reflection stage and 4) revising and reflection stage. The experimental instruments used were 1) manuals of the Management Process with Professional Learning Community and Reflection, and 2) teacher manuals based on the four-step skills pattern. The research instruments were reading and writing ability assessment forms and reflecting forms. The result data were analyzed for mean, percentage and qualitative data analysis.

The findings of the study are as follows:

1. The assessment result showed that Grade 1 students could improve their reading and writing ability to very good level after using Management Process with Professional Learning Community and Reflection. When discriminated from the indicators, the result showed that the students can read phoneme segmentation, tone, words, phrases and messages, and they could perform handwriting at very good level whereas the others ability indicators results were at good level.

2. The assessment result show that disability Grade 2 to Grade 9 students could improve their reading and writing ability to very good level after using Management Process with Professional Learning Community and Reflection. When discriminated from the indicators, the result showed that the students could read phoneme segmentation, tone, words and phrases, and they could take dictation at very good level whereas the others ability indicators results were at good level.

The Reflection result of Management Process with Professional Learning Community and Reflection to teaching based on the four-step skills pattern showed that the students felt happy to read and write. Moreover, high reading ability students could peer-tutor their friends. The volunteer teacher was satisfied with the results and applying the reflection results to the next instruction. Parents have satisfy for the result, and cooperated with the school to teach their children to read and write at home.
Lesson Study on Using TAD as a Pre-Writing Tool to Develop Ideas

Soo Yin Chia, North Vista Primary School
Dashni Ravindran, Si Ling Primary School

To address a common complaint amongst primary school students in Singapore that they lacked details in their writing, Steve Peha's (2014) ideas development strategy, Transition-Action-Details (TAD) was taught to two classes of students of the same level in two different schools. The results and observation in this study showed encouraging results not only in the students' ability to develop ideas before writing but also in a more positive attitude towards writing.

This Lesson Study project was undertaken by two teachers from two different primary schools as a collaborative effort to help their students generate and develop details for writing at the pre-writing stage. The teachers, together with two knowledgeable others from the English Language Institute of Singapore (ELIS), collaboratively planned lessons to introduce and teach TAD to students in one school. After the complete lesson enactment in the first school, the team reflected on the impact of the lessons and refined the process.

The second enactment was carried out by the teacher in the second school.

Using a pre-intervention composition writing as a baseline standard, these students were taught to use TAD to develop ideas for writing. During lesson enactment, scaffolding was provided in the form of teacher modelling and explicit instruction. Several cycles of this took place to allow the students to develop a comfort level to use TAD before writing their compositions. Students reported feeling more empowered to write better and found that writing could be ‘fun’.

Findings from students' and teachers' reflections, together with TAD charts produced by the students during lesson enactment and the students' writing at the end of the inquiry process that showed an increase in relevant and well-developed ideas in the students' writing will be presented. The study has implications on the classroom practice of teaching writing and developing students' competency in writing and enjoyment of writing.
Improving Prospective Teachers' Competence to Plan and Teach thoughtfully and Collaboratively in Comparative Chinese and American Cultural Contexts

Yali Zhao, Georgia State University
Dehua Liu, Hunan Normal University

Lesson Study (LS) is an effective way for teacher professional development in Japanese schools, especially in the area of math and science education, and has gained much attention in Asia and North America since late 1990s. In China, lesson study, more commonly in the name of public teaching demonstration or action education, is widely encouraged and implemented in Chinese schools to help young and novice teachers develop instructional skills and competence thanks to China's new curriculum reform which emphasizes on improving teacher quality, students' academic performance, creativity and problem-solving skills, as well as similar cultural and educational system as in Japan: centralized curriculum, collectivism, and open-mindedness to critique. This is in stark contrast with the American schools where localized school curriculum, teacher isolation, and individual effectiveness seem to dominate. A considerable amount of research has been conducted to examine the effectiveness of lesson studies, however, most of the research focused on math or science in-service teachers. More research on prospective teachers and in social education arena is needed to help us better understand the complexity and the benefits of using lesson study to help prospective teachers to develop collaborative and reflective skills, build up meaningful content knowledge and more effective instructional strategies.

This comparative case study aims to examine how lesson study could be implemented similarly and differently with prospective teachers in Chinese and American cultural and educational contexts in the process of identifying lesson topics or issues, learning objectives, accommodation of student needs, collecting and preparing teaching materials, designing activities, teaching, debriefing, and refining the lesson.