Developing the Method of Teaching Project Design :

A Case Study of 3rd Year Students, The Faculty of Architecture, Silpakorn University

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1.0 Objective

In architectural education, an important component of a bachelor degree is the study of architectural project design. This component of the course plays an integral part in the development of an architect's creativity in the design process. With the continual changes in the various styles of design used in architecture, a student in the field may find it difficult to

develop their own ideas. Guided or 'dictated' by their teacher's opinions, the student's own interpretation the different concepts of architectural professional knowledge and practice in design becomes very confusing.

The main objective of this paper is to identify the problem or problems that limit the student's creative thinking. This will be undertaken as collaborative action research project between the teacher, his students and architect graduates who act as assistant teachers. The development of a new method of teaching in architectural project design was used as a method for addressing the identified issues relating to the problem of student's limited creative thinking. The main principles of cooperative learning will be used as a model for this change.

Problem based learning will be introduced, as a way of integrating the practical and theoretical components needed by the students in architectural project design. The integration of problem based learning is aimed at stimulating the students' need to know. This will give more meaning to their studies and allow them to relate work done in the studio to real life situations.

By using action research, the action group, through observation and interview, will plan, measure and evaluate the implemented changes, based on specific evidence accumulated at each particular action step.

2.0 Preamble

This action research project describes changes in the method of teaching project design to third-year architect students at Silpakorn University. Traditionally the teaching process in architectural design has been teacher dominated. This usually involves the teacher critiquing students work individually allowing little thought or input from students. The process of learning is usually passive and tends to limit the student's own ideas or thoughts.

Our objective was to change the method of instruction from a teacher-centered process to that of a student-centered process by using the fundamental principles of cooperative learning. Cooperative learning is therefore based on a student-centered approach to the teaching and learning process. It gives students an opportunity to discuss their thoughts and ideas with other students in the class, creating a more conducive environment for them to develop greater creativity in project conceptualization and design.

As the teacher, I worked closely with my students in all stages of implementing the new changes. This included the initial reflection stage (reconnaissance) and in the perspective planning stage, which was based on the first action steps we were to carry out. The implementation and evaluation of subsequent steps that followed were also done collectively. The opinions of two architectural graduates, who act as assistant teachers to recent graduates in my private design studio, were also used in the initial planning phase.

3.0 Reconnaissance: Statement of the Issue in the Context of the Thematic Concern

Traditionally, teaching and learning in Thailand has been a teacher dominated process operating within a rigid structure offering little or no flexibility. The learning process is one that is passive and tends to be boring to both students and teachers.

Recently the National Education Act B.E. 2542 (1999) has served as a master legislation on education reform in Thailand. One of the major objectives of the reform is being the development of a 'learner-centered, teaching-learning process'. The 'teaching-learning process' is aimed at enabling learners to develop themselves at their own pace and to the best of their ability.

The current rote system will therefore be abandoned in favor of this analytical learning structure. This initiative by the government, which will involve many teachers to undergo intensive re-training, is seen as important in the context of our research. It is hoped that it may be used as a starting point for future educational planning objectives currently being promoted by the Thai educational sector for the betterment of students and teachers alike.

The current method of teaching architectural project design to third year architect students at Silpakorn University is very much based on a teacher-centered approach. The process of learning by students is best described as being mostly a passive exercise. This allows students very little if any input into the process of teaching and learning. As a visiting lecturer and teacher of this component of the course since 1984, I believe that the current teaching process in project design limits the student's ability to think creatively.

In the studio, students have little opportunity to express and share ideas about their work with the teacher and other students in the class. The relationship and role of student and teacher are clearly defined, with input of ideas and solutions coming mainly from the teacher. If the learning process could be based on a student-centered approach, this would allow greater input and thought from the students. Perhaps students will then have a greater opportunity to think 'outside the square' and be able to develop greater creativity with the help of input from other students and guidance from their teacher.

There was an expressed interest by the students and teacher to improve the system in a way that would allow students to have a greater input of how the course was conducted and structured. Experience as a student of architecture in Paris, gave me the initial idea of introducing a system in project design that would allow greater input and information sharing between students. As a student, my experiences were comparably different to those of my students. With a setting similar to that of a 'round table', students openly discussed their ideas with others in the class. These discussions were guided and supported by the teacher, who would promote discussion and provide opportunities for reflection. Cooperative learning was seen as an alternative and improvement to the current teacher-centered approach.

3.1 Development of the Thematic Concern

Students of the project design course were interviewed in order to gain a deeper understanding of the issues relating to the limited development of their creative thinking. This was seen as problematic for the further development of students in their professional practice. Two graduates from my private studio were also interviewed. We as a group felt it was important to have some

input from 'outsiders', for our initial planning. The issue of the thematic concern can be explained by looking at the comments from interviews conducted prior to the initial planning phase.

The concerns of the action group, composed of the author, his students and graduate architects were similar. The underlying problem or area of concern was based around the students having limited input in determining the teaching process in the class that would allow them to be more creative in the design studio. The main areas of concern voiced by the action group were:

1. The educational process is teacher-centered; and
2. The course is based on individual study.

The current setting of the project design course will also be outlined to give a broader understanding of the educational processes we are looking to change and improve.

4.0 The Current Setting

The faculty of architecture at Silpakorn University has been established for more than forty years. It is composed of three hundred and fifty (350) students, who are enrolled at the bachelor degree level. This program is separated into a five-year academic term, with a practical component at each year of study. This involves students undertaking a six to eight week class in architectural project design.

Normally, there are four teachers per class who teach architectural project design. Each teacher is responsible for a group of twelve to thirteen students. The course is divided into four different design projects including:

1) Kindergarten school;
2) Office (medium size);
3) Hospital; and
4) Commercial complex (i.e. shopping center).

Teachers are responsible for organizing each program and evaluating their work individually with each student. The projects on line start from a kindergarten project and then to a medium size office, hospital and commercial complex. The course is structured in this way to give the students experience in designing a range of different projects, each with different design components. Sometimes the second project may be changed to group housing.

At the beginning of the course, the teacher gives all of the students a "program" or a set of design specifications and a graphic description of the site on which the project is to be built. The setting is that of an actual studio in which each of the twelve students arranges their own drawing tables, papers, books, pictures, and models. This is the space in which students spend most of their working lives. They are mostly occupied in private, parallel pursuit of the common design task.

During each project, a student under the supervision of a teacher develops their individual project. This involves the students developing their 'own' version of the design, recording their results in preliminary sketches, working drawings, and models. The communication between the teacher and student consists mainly of suggestions by the teacher in relation to what they should be doing in order to successfully complete their assigned task. Often, the advice given to the students is based on the teacher's own perceptions and ideas.

On completion of their work, a presentation is made in front of a jury of teachers. This presentation involves the students giving an oral explanation of their work, so the teachers can critique the project and give a grade for their work.

In this particular research project, I have drawn on a specific example of third-year students undertaking the design of a kindergarten under my supervision. The actual processes will be explained. This will be done in a series of steps to give the reader an understanding of what is involved in the design of a specific project.

Each student will receive a program from their teacher, which outlines the procedures they must follow in relation to the development of the kindergarten project. Students must start to work individually in order to develop specific concepts relating to each step of the conceptualization and design stages of their project. These processes are summarized below on a weekly basis:

5.0 Kindergarten Project Design

➢ Week 1

- The student must present their analysis of the site zoning diagram and schematic design; and

- The teacher will usually tells them to change the approach because it is not correct to the law and tells them to clarify zoning of administration and classroom space.

➢ Week 2

- Students will present a plan, based on the comments of the teacher from the

first step; and

- The teacher will make necessary corrections and discuss these individually with each student.

➢ Week 3

- Students must develop their projects to more detail with plan, facades, sections and a conceptual model.

➢ Week 4

- Students will present their project to a jury comprising of the four teachers for a critical evaluation of the work completed thus far.

➢ Week 5

- Students must bring back their revised projects, based on comments made previously by the jury for further review.

➢ Week 6

- Students finalize their projects, again based on the further revision to prepare a good presentation.

➢ Week 7

- The students present the completed project to the jury for the final result.

Creative thinking is one of the major things that an architect must possess in their professional life. In order to develop this creativity, we must start doing so in project design.

6.0 Opinions of Graduate Architects and Students

The opinions of the students in our research group were used as a basis for initial planning. Interviews of my students were conducted to gain an understanding of their opinions relating to the development of creative thinking. The opinions of two architectural graduates were also used in the analysis. The graduates work as assistant teachers in my private studio. It was felt that their opinions were important to have an 'outsiders' point of view to gain a greater understanding of issues relating to the development of creativity and their implications on future professional practice in architecture.

The interviews were conducted as a group, with questions designed to stimulate discussion in relation to our initial concerns relating to creative thinking. The questions asked were as follows:

- What do you think about the current method of teaching project design?

- Why do you think the current system limits your creative thinking?

- What are your opinions on how to improve the method of teaching?

6.1 Graduate's Opinions (assistant teachers)

What do you think about the current method of teaching project design?

- The method of teaching now is already good even though students have only one teacher to develop their projects, because the teacher changes for each project; and

- Each teacher has a different area of expertise, so students can have a different perspective from the different teachers. Some ideas of the teachers they may agree with, others possibly not. The students must try to understand people who have different opinions to those of their own.

Why do you think the current system limits your creative thinking?

- Project design concentrates only on the function of the building and lacks focus and discussion relating to creativity; and

- The current system limits creative thinking because it is still heavily based on individual study.

What are your opinions on how to improve the method of teaching?

- The teacher must try to understand the student's ideas and try to guide them to develop their creativity. This can be done by using a team of teachers or advisors who specialize in other related branches such as engineering, economics, the arts etc. to help them develop their project;

- Propose an opportunity for students to select their own teacher or even the project to develop;

- The jury judging the projects should be open to more public opinion;

- Teachers must be flexible and guide students by posing questions that lead

to further discussions, allowing them to think for themselves;

- Teachers must also be more sensitive and supportive towards students. For example, rejecting a student's proposal without an adequate explanation. Instead of saying "no, that will not work", the teachers should give an explanation by using a relevant example such as a case study; and

- The administrators of the course should categorize the teachers in different academic years, relating to the atmosphere and knowledge of the students and according to the direction of education.

6.2 Student's Opinions

What do you think about the current method of teaching project design?

- To follow the advice of the teacher is realistic, to follow personal development is sometimes utopia;

- For project design, we only talk about I.Q., but we tend to forget the social aspects that govern our feelings, creativity etc.; and

- The system is good, but the problem is based on the quality of the teacher.

Why do you think the current system limits your creative thinking?

- Developing creative thinking by only following the opinions of our teachers is similar to following exact needs of a client. It limits our opinion in the design

process and can block creative thinking;

- To follow the comments of the teacher doesn't allow students an opportunity to propose their own ideas;

- The final result given by the jury should be based only on the completed project. The current assessment process takes into account the various stages of the project. This makes the program too restrictive and doesn't give the student much flexibility in the design process;

- All teachers must not impose their personal ideas on the student's project design;

- The teacher plays a very important role in the operative thinking of the students;

- Teachers should not be able to give marks without the input of the jury;

- Teachers critique only the function of the building and forget other important issues relating to the concept, facade design and creativity;

- The timing of each project is too short in order for students to develop a good project and should be extended; and

- The teacher is a "dictator".

What are your opinions on how to improve the method of teaching?

- The students should only be under supervision of a teacher, not be dictated to by the teacher. This would allowing them greater choice in the decision making process;

- It will be good if students can propose the topic of the project by themselves under supervision of the teacher;

- The teachers must only guide the students instead of dominating their creative thinking;

- Teachers must listen to students and try to understand them more;

- Teachers must show some interest in the student's project during the final assessment by the jury. They shouldn't walk in and out all the time;

- Students want to choose a teacher for their projects freely;

- Teachers must be friendly and flexible; and

- Teachers must propose several guidelines for students, so they can have more freedom of choice.

7.0 Initial Review

The ideas of the discussion group were evaluated as a basis for further planning. Based on reviewing the current teaching methods in project design at Silpakorn University and interviews of both current students and architectural graduates (assistant teachers), some common concerns were identified.

Students felt that they had little opportunity to express and share their ideas about their project with their teachers. They felt that in most cases their teachers acted as "dictators", who imposed their own ideas and perceptions on the students, giving them very little opportunity to use their own

creativity. If students were given opportunities to share their ideas amongst themselves and the teacher, with some guidance, then perhaps they might be more inclined to think 'outside the square' and develop greater creativity.

Concerns voiced by graduate architects, who acted as assistant teachers, voiced similar concerns to those of the students. Their perceptions about some issues did vary in certain situations. They did feel however the development of creativity did have an impact on the professional practice of architecture. As assistant teachers, they felt that they had some role to play in the student's development of creative thinking.

Both students and assistant teachers saw creativity, as an essential attribute that an architect must possess in order to develop in the professional context.

8.0 Action Research

8.1 Plan

After our initial analysis, there were a number of things relating to the teaching process that we as a group felt had to be changed to address the issue of improving creative thinking in the design studio. The plan was to introduce a student-centered process of teaching and promote group development.

To improve creative thinking of the students, the system must be flexible. The teacher must be friendly and guide the students by posing ideas and questions to promote discussion. They should not dominate their ideas and thoughts so students can have courage to think for themselves. Students must work together in a group so they can exchange their ideas.

The teacher must be willing to listen to the opinions of the students and try to understand them more.

Our action was to be achieved by using a cooperative learning method to develop an atmosphere and a system of study that would promote student creative thinking. The changes incorporate the opinions of the action group as well as encompassing the main concepts underlying the processes of cooperative learning. The actions and observations of our plan have been outlined on a week to week basis.

8.2 Action and Observation

Our plans were put into action with the twelve students in my project design class, undertaking the kindergarten project. As the author, I am referred to as the 'teacher' in the following discussions:

➤ Week 1

- A group meeting was scheduled to explain the methods of cooperative learning;

- Emphasis was placed on the need for the students to work together as a group and share ideas and help each other;

- The idea of sharing was encouraged not only between the teacher, but between the students themselves; and

- After each step, the students were asked to evaluate as a group.

The teacher promoted discussion between the group about the various aspects of a kindergarten and ideas about the site

location. Questions were posed to promote discussion and information sharing. The intention of the teacher was to build a classroom climate of trust. This was done to find cooperative ways for students to acquire and analyze information relating to the course content. Some of the student's responses are summarized below:

What is kindergarten ?

- A second home for children;
- A jail; and
- A place for children.

How is a kindergarten used in relation to its' function?

- Administration;
- Classrooms;
- Teacher's room;
- Service; and
- Play ground.

What are some concepts we must look at in relation to site analysis?

- Location;
- Size;
- Environment; and
- Orientation;

What aspects to we have to consider in relation to approaches?

- Main entrance;
- Sub-entrance; and
- Regulations.

What are the different zones of each activity?

- Active zones; and

- Passive zones.

What are some issues of circulation that we must consider?

- Roadway;
- Walkway;
- Public;
- Private;
- Service; and
- Axis.

What should the size of the different function areas in our comparative study be in relation to area occupied and the percentage of area occupied?

- Total Function Area _____ m² 100 %
- Administration Area _____ m² ____ %
- Classroom Area _____ m² ____
- Teachers Room _____ m² ____ %
- Etc…

The group questioned and answered by discussing between themselves, with the guidance of the teacher. The students plan to present the models of their concept by using all the information gathered in the class discussion. Some students proposed to the group that more information is needed from the library, while others propose to search the Internet. The group agrees to make copies of all the information they will collect and distribute it to all members in the group.

➢ **Week 2**

- Students share the ideas for conceptual design by using mass model instead of presenting individual plans; and

- They critique each others work and

and make suggestions about some of the problems they have encountered. Some of the questions discussed by the group were:

- How should we plan the various approaches?
- What is the expression of form?
- Where is the zoning of each of the activities?
- Why?

By using a mass model for their presentation, the students seem to enjoy developing ideas. This method gives the students more flexibility, as they can change their ideas by cutting and replacing the model. They all participate and help each other with constructive ideas to evaluate each other's work.

It seems that there are three or four similar conceptual ideas among the group. The teacher divides the students into four groups that will work together on similar ideas. Although they will be doing their individual projects, the groups that share similar ideas will work as a team to help and support each other.

➢ **Week 3**

- A group of guest advisors composed of architects, structural and systems engineers, economist and artists participate with the students to share their ideas and guide them according to the concepts developed by the students;

- The student's models are used to show their function and form inside; and

- Some issues are raised for discussion between the students who share ideas

about the following questions posed by the guests.

- What is the type of the structure that will be used?
- How can you increase energy efficiency on your project?
- Why choose these colors?
- How can you express the symbolism of your project?
- How will the building maintenance be done?

The students consult the advisors about their own project, as well as the other students and their teacher. Information is shared between the group and evaluations are made collectively.

It's really important for a student architect to realize that when you're just beginning to get together a conceptual design for your building, you need to talk to various experts such as the structural engineer and the services engineer.

The students can then understand how the content fits into the context and how it relates to other things. And that's the way they learn. This way of presenting information as problem based learning is much more motivating for students and they will tend to learn a great deal more using this approach.

➤ Week 4

- The students presented their projects in front of the jury (four teachers).

- This is the first phase of the evaluation process and includes students from other project design groups;

- Students and teachers share the ideas of other groups;

- Their discussions are guided by the different teachers, giving the students a chance to have opinions of teachers other than their own;

- The teacher makes some constructive notes that the students may use; and

- These notes will be presented to the teacher's group in the studio.

➤ Week 5

- The teacher and students in the action group discuss and reflect the opinions of the other teachers in the jury. By following the notes and opinions of their own teams and those of the group collectively, the new information will also be used by individuals to further improve their projects. This will help them to have a good final presentation.

➤ Week 6

- Most of the problems that students encountered have been resolved through vigorous discussions between their individual groups and the all of the group together; and

- All the students in the teacher's action group are ready to present their projects to the jury for the final evaluation phase, after finalizing ideas gathered from previous week's discussions.

➤ Week 7

- The teacher's students are very satisfied with their final result and believe that they have been fairly successful in achieving their planned objectives;

- After the jury evaluated the students, they were interviewed as a group to evaluate their opinions of the new approach to the teaching process in project design; and

- The opinions of the students were summarized by their teacher and will be evaluated to determine the outcomes of the new process of teaching.

8.3 Reflect

• **Student's Opinions**

The interviews were conducted as a group, with questions aimed to make some evaluations of student's opinions relating to the new changes that have been implemented. Questions relating to the students opinions about their teacher were conducted by our 'outsiders', in order to be objective. The following questions were asked:

• **What do you think about cooperative learning?**

- It allows students can share more ideas amongst themselves by open discussion and can evaluate the project together. This helped with coming up with new ideas and made our work enjoyable;

- By having the input of other students, our minds were open to more ideas, allowing us to think more creatively; and

- Working in groups with similar ideas was very helpful and made developing ideas easier with the increased input from not only our groups, but the ideas of the other groups who participated in

the discussions.

By using a model as a tool to develop the project, it seems that student's work on three-dimensional space instead of using a two- dimensional plan or diagram. Using a two-dimensional approach can often be boring to the students as they can readily relate to three-dimensional models as in the real world. This seems to stimulate the student's thoughts and makes learning a more enjoyable process.

• **What do you think about problem based learning?**

- By having information from experts in other disciplines, it allows us to have a better idea of how things are done in real life situations. For example during the conceptual stage of project development, talking to the structural engineer we have a much greater understanding about the types of structures that can be designed for our project;

- With additional information, we are able to have a greater insight into what is and what isn't possible to design for our kindergarten project; and

- This then can enable us to use this information to further develop the design with our teacher.

Having a group of guest advisors from different disciplines sharing their ideas with the students, allowed students to obtain specialized advise that may not always be available from their teacher. It will also allow them find additional information that they need for other aspects of their project

such as air-conditioning, interior design etc.

Understanding how the content fits into the context and how it relates to other things students will tend to learn much more than by just studying theory. Presenting information in this way is much more motivating for students.

By the time the students have completed their project design course, they'll have a very good knowledge of kindergarten buildings and their construction as well as the various issues relating to property development, profitability, the environment etc. Each of these is a subject area in itself. Over a small period of time, the students have gone from knowing nothing about these subjects to knowing quite a lot. The students will have taken a great step forward intellectually, technically and professionally. This type of learning is very practical and has all the real issues to do with being an architect.

- **What do you think about your teacher?**

- The teacher was very gentle in his approach. He acted only as a guide and didn't try to dominate our opinions with his own ideas or thoughts; and

- At first we felt strange that the teacher was asking us questions and making us think more critically about what we were doing, but as time went on we became more comfortable with talking openly about our ideas.

Being a student-centered method of teaching and learning, students are given more of an opportunity to actively participate in how the course is conducted. By allowing the students to play a role in

selecting their teachers, the teachers must adapt themselves to participate with the students. This will give them an opportunity to interact with the students more closely on a different level than before.

Generally the results from the observations and interviews have shown us that the students enjoy working in the studio more by using the cooperative learning process. They can work as a group and help each other under the supervision of a teacher who is more sensitive to the needs of the students.

Group observations showed that most students were involved in the various aspects of the class activities and tasks in their groups. Student enthusiasm seemed to be greater in a new studio setting that was more relaxed and open.

A method of monitoring the individual student's displays of feelings, interests interaction, learning etc. could be used to further assess the outcomes of cooperative learning in a more systematic way. This data could be used to record students' individual command of cognitive knowledge and skills such as communication and cooperative social skills, problem solving skills and their success in working independently within the framework of their respective group. A formal observation sheet could be developed to describe and record this data.

The project design program must be more flexible. A greater selection of the types of projects the students can chose from should be increased from four to six projects. The number of projects that the students have to complete should at the same time be reduced so they can have more time to develop their ideas. Increasing the number of choices in projects for the students to select from can also allow them to change

projects if they feel that they don't like what they are working on.

Using information from experts that is delivered in a practical form must be balanced with adequate theory. Problem based learning is a dialectical approach to the learning process that allows students to relate theory in the context of real life situations. Delivering large amounts of theory may not always be interesting to the students. Finding the right balance between theory and practice is important in giving students greater meaning to their studies. It is important that the course structure is planned to accommodate the student's perceived need for information rather than having a series of lectures delivered by a related expert when the students do not require the information.

To make the process more successful, the teachers in the class must try to understand and try to develop in the same direction of the students. By introducing cooperative learning to other students who are studying project design, a greater number of participants will also have an increased opportunity to share ideas from each other. The faculty, in implementing these changes across the board may encounter difficulties. Issues such as further training for teachers, developing a good system of management that is related to the needs of the students and the quality of education, as a whole must be critically examined.

9.0   Conclusion

To develop the method of teaching project design as a student-centered approach for the third-year students in architecture at Silpakorn University, we must offer an alternative to enlarge the student's creative thinking in their fields.

The four steps of action research: plan, act, observe and reflect were used to implement, measure and evaluate this alternative process.

Evaluations of the new method of teaching a small group of third-year architectural students undertaking project design were seen as being educationally positive in nature. By working as a group the students can learn as group and help each other by sharing their information and thoughts. This allows them to have more ideas to support their creative thinking as well as improving their interpersonal and other social skills.

Based on the results of the first cycle of action research, it appears that to fully evaluate the effectiveness of the implemented changes, they must also be introduced to the students second, third and fourth projects. The final results of the student's projects must be evaluated and analyzed against other control groups using the current teacher-centered approach in teaching the project design course. Analyzing the results of student's marks in past academic years could also be done to validate the success of the changes relating to the student's creative thinking. Students' project design results from other schools of architecture in Thailand may even be used in further evaluations. If this work was to continue, a series of action research cycles will have to be implemented.

If consideration is made to further extend the new method of teaching project design in other classes, other wider issues must be considered such as the structure of Silpakorn University as an educational institute and how it fits into the educational, economic and social structure of the country.

10.0 References

1. Barbara, B. Meyer., and Carol, P. Etheridge. (1997). "Improving student interest in the Spanish 1 classroom through democratic teaching'. University of Memphis, USA.

2. Commissioned Report No. 24 (1994). 'Workplace learning in the professional development of teachers". National Board of Employment, Education and Training. Canberra: Australian Government Publishing Service.

3. Day, C. et al. (1999). "Educational action research". Oxford: Triangle Journal Ltd.

4. Expedition of discovery: Architectural education at Newcastle – L Johnston in Ballantyne, R, Bain, J and Packer, J (1997)

5. Joyce, B., and Weil, M. (1996). "Models of teaching". A Simon and Schuster Company, Needham Heights, Mass.

6. Kemmis, S., and McTaggart, R. (1990), "The action research planner'. 3rd ed. Victoria: Brown Prior Anderson.

7. Lang, H (1995) Cooperative Learning in "Teaching Strategies and Methods for Student-Centered Instruction" Heather McWhinney: Canada ch 15

8. Office of the National Education Commission, "National Education Act of B.E.2542 (1999)", Thailand, 1999.

9. Oxford Analytica Briefs, "Bureaucrats Threaten Long-Overdue Education Reforms", November 1, 2000.

10. Schon, D. (1983). "The reflective practitioner". Basic Books Inc. USA.

11. Strauss, A., and Corbin, J. (1996). "Basic of qualitative research". London: Sage.