MINISTRY OF EDUCATION AND TRAINING
THAI NGUYEN UNIVERSITY

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ORGANNIZING ACTIVITY PROBLEM - BASED LEARNING IN TEACHING ECOLOGY AT THE DEPARTMENT OF BIOLOGY, UNIVERSITY OF EDUCATION

Speciality: Theory and Methodology of Teaching Biology

Code: 62.14.01.11

SUMMARY OF DOCTORAL DISSERTATION OF EDUCATIONAL SCIENCE

THAI NGUYEN - 2015

The work was completed at:
COLLEGE OF EDUCATION - THAI NGUYEN UNIVERSITY

Supervisor: Assor.Prof. Nguyen Phuc Chinh, Ph.D

Reviewer 1: .....

Reviewer 2: .....

Reviewer 3: .....

The dissertation will be defended at College of Education
Thai Nguyen University

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INTRODUCTION

1. Reasons for choosing themes

* Derived from education reform tasks

The resolutions, ordinances and decisions of Communist Party, State and Government are determined fundamental and comprehensive educational innovation, including innovation of teaching method what are took following the trend approached "Student-centered pedagogy" in our country.

The University of Education is implementing training tasks staff eligible morals, professional and professional qualifications that meet the requirements development of society. They should be models for innovation of teaching methods. However, they have a major challenge is the huge amount of information, limited classroom time, the subject teachers not paid attention to innovative teaching methods to model for students.

* Derived from the characteristics of Problem - Based Learning

Problem-Based Learning (PBL) is a teaching method that empower students to conduct research, integrating theory and practice, apply knowledge and skills to develop workable solutions to the identified problems (Savery JR, 2006). Applying PBL in teaching at the university will overcome the situation that society criticize them of away from reality.

* Derived from the characteristics of the Ecological subject

Ecology is the science that studies the relationship between living organisms and between organisms with their environment. Ecological knowledge is the basis to solve many problems related to human life. So when ecological teaching may apply PBL to improve efficiency, forming problem-solving capacity for students.

From the above reasons, we choose research topic: "***Organnizing activity Problem - Based Learning in teaching Ecology at the department of Biology, University of Education***".

2. The purpose of research

2.1. Overall objective: The organization PBL in Ecological teaching at Biological Department, University of Education to improve the efficiency Ecological teaching, meets innovation of general education.

2.2. Specific objectives: (i) Indentified the problems in Ecology program at the Department of Biology, University of Education. (ii) Proposed organizational processes of PBL in Ecological teaching at the Biological Department, University of Education.

3. Research task: 1/ Research theoretical basis of PBL. 2/ The actual investigate of PBL in teaching at the University of Education. 3/ Analysis content of Ecological program at Department of Biology, University of Education, to identify learning problems. 4/ Building and applying organizational processes of PBL in Ecological teaching. 5/ Pedagogical experiment to evaluate the effectiveness of the plans that the thesis proposed.

4. Subjects study: PBL in teaching Ecology at the University of Education and teaching process at the Department of Biology, University of Education.

5. The hypothesis: If problems and PBL organizational processes be determined logically, the students will form PBL learning skills and outcomes of Ecological learning at the Biological Department, University of Education are improve.

6. Research methods

6.1. Theoretical research method: Look at the related text and documents.

6.2. Pedagogical investigation method: Investigation of PBL manipulate reality in teaching at the University of Education for practical basis of the thesis.

6.3. Expert method: Consult contributions by experts on PBL organizational processes, about the problems of Ecology teaching, on the principles, techniques PBL organization, on conducting pedagogic experimental organization to complete the thesis.

6.4. Pedagogical experimental methods: Organization of pedagogical experiment in the Biological Department at University of Pedagogy - TNU to verify scientific hypotheses of the thesis.

6.5. Methods of mathematical statistics: Statistics, describe and analyze the results of the obtained investigation and experiment.

7. Contributes of thesis: The thesis is the systematic works on theoretical basis and assess the current status of PBL, on problems and on PBL organizational processes; - The thesis has clarified the role of PBL in biological teacher training, meeting the requirements of innovation oriented strengthen the capacity for pedagogical students.

8. Structure of thesis: The thesis has 141 pages (including references) is divided into sections, chapters: Introduction 5 pages; Chapter 1: Rationale and practice of PBL 39 pages; Chapter 2: Organization of PBL activities in Ecology teaching at the University of Education 60 pages; Chapter 3: Pedagogical experimention 24 pages; Conclusions and recommendation 2 pages; The published research works related to the thesis 1 page; References 10 pages. The thesis has 29 tables, 17 image and refer 111 documents (50 Vietnamese documents, 60 English documents, 1 French document).

Chapter 1
THEORETICAL AND PRACTICE BASES OF PROBLEM - BASED LEARNING

1.1. Concept of Problem-Based Learning

1.1.1. Some basic terminologies

The terminologies as problem posing instruction, problem solving instruction, problem posing and solving instruction, Problem-Based Learning are different ways to call the same connotations that orientated problems to students, may pose problems and engage in problem solving, from which acquired knowledge, develop thinking and positive attitudes toward learning. However, they have different historical approaches, each way emphasize any stages of the process of detecting problems, solve the problem, the conclusion. In this thesis, we use the term Problem-Based Learning (PBL).

The different definitions of PBL mentioned teaching that directed at learners, suggest the relationship to the curriculum, the skills. By studying the different views of PBL, we determined: “Problem-Based Learning belongs student-centered teaching model, based on the use of reality problems as a starting point for the acquisitions and integrate new knowledges, develop problem-solving skills”.

1.1.2. The problem - success factors of problem-based learning

1.1.2.1. Concept of the problem: The problem is the basic structure unit and an important factor in the success of PBL. The problem is a natural phenomenon or an event/situation was, is or will take place in reality and contains things that be explained.

1.1.2.2. The role of the problem in PBL: - The problem is engine, context and situation that learners occupy knowledge in the course contents; - The posed problem may stimulating effect the cognitive performance and social activities of the learners.

1.1.2.3. The criteria of a problem: A good problem (according to B. Duch) has to participate in the interests of learners, encourage students to explore and understand deeper the concept was introduced. - Question in the problem should be openness, not limited to a correct answer, but it is connected with the previously learned knowledge. - The problem has base from learning content. - The problem related to reality. - Problem help develop thinking skills at a high level. - The problem attract the attention and interest of the learner; - The problem encourages collaboration to solve issues.

1.1.2.4. The types of problems

a. Well-structured problem: Well-structured problem are those in which constraints are clearly defined, the correct answer, the only correct solution. These problems usually stem from the events what were arranged in advance, were happened and had resulted, had the solution, are presented as a duty to remember and be organized, introduced by teachers, in the order had been instructed, for example, solving for X in an algebraic equation or the arithmetic (like 2 + 2 = 4), and calculating the trajectory of the rocket’s flight. The type of this problem is usually used in the traditional teaching methods.

b. Ill-structured problem: Ill-structured problem are the problems when making seems unclear and there is no the only answer, for example, redesigning a work process, creating a new marketing strategy, ... The type of this problem stems from the real -life situation, when its solving will appear many different solutions. Among many solutions are in place, any solution has most clear arguments will be accepted. These issues help the learners' aware of the problem naturally, without coercion, not common path, but learners are expressed their personal opinions, discuss together to devise the best solutions for problems solving. The type of this problem is towards the use in the PBL.

1.2. The scientific basis of study under question

1.2.1. Basis philosophy*:* Based on the Socratic method, PBL attention to target people who learn to solve the problem and become autonomous learners; Marxist philosophy towards PBL determine the advantages, the principle of using practical problems as the starting point for the acquisition and integration of new knowledge; philosophical conception of John Dewey on oriented classroom helps PBL define the goals of awareness, skills and attitudes.

1.2.2. Basis psychology*:* cognitive conception of J.Piaget, L. Vygotsky and J. Bruner provide theoretical basis for PBL.

1.2.3. Basis theoretical teaching*:* PBL meet student-centered teaching model, appropriate with the view of construct theory, learners have similar roles behavior of scientists.

1.3. Overview of the PBL application

1.3.1. The situation PBL research and application in the world

PBL different levels ideology be matched quite soon, at many countries, in many areas. PBL studied and widely applied in the Americas, Europe, spread to many universities in Australia, Asia (Japan, Korea, ...) and many developing countries in Southeast Asia (Singapore, Malaysia, ...). The applied research indicate the characteristics of PBL, the organizational processes, making the problem and how to use the consistent with conditions of the training institution, shows PBL is effective to learners perceived knowledge, practice the necessary skills and appropriate behavior.

1.3.2. The situation PBL research and application in Vietnam

In Vietnam, there have been many theoretical and empirical studies of posing instruction, problem solving instruction, PBL. The studies, the application happened a long time but mainly in schools. The PBL applying studies in particular fields in University of Education, in which Ecological teaching must theorical and practice studies.

1.4. Characteristics of PBL

1.4.1. The nature of PBL: PBL introduce learners accurate and complete information about the authentic and meaningful situations, that be basis for students' study and exchange, students learn the content, problem solving skills, social skills, independent learning skills, learned behavior of adults (Richard I. Arends, 2009).

1.4.2. Basic characteristics of PBL: The studies on PBL are defining characteristics: 1/ Problem is the central element of teaching activities; 2/ The learner is the center of the teaching process, self-inquiry identified sources of information to help solve the problem; 3/ Working in small groups is a core activity; 4/ Teachers are coaches, guidance or helper; 5/ Integrated specific knowledge; 6/ Relationship with the outside environment.

1.4.3. Advantages and disadvantages of PBL

1.4.3.1. Advantages of PBL: PBL has been proven be an effective teaching strategies for a variety of learning (Cheung, 2011), especially for XXI century learners, emphasizing student-centered learning: - Promoting positive, active of learners; - Learner practice the necessary skills, participate in identifying learning objectives and planning to explore, discover; - Learner access to early practical issues, connected with background experiences; - Construction a broad and flexible knowledge base, - Require teachers constantly rising, teachers can incorporate many forms teaching in a lesson with many technical measures to make comfortable, fun, friendly and open atmosphere.

1.4.3.2. Disadvantages of PBL: - Do not give the same results for all subjects; - Difficult to apply for large classes; - Requiring teachers have qualified organizations, counselors, referees and deal with the types of people learning style, requires professional behavior of the

PBL group members; - Students can not do exactly what the teacher wants; - Students can not afford to explore all requirements of the lesson; - Teachers have difficulty choosing appropriate problem and take time to plan and implement PBL teaching.

1.4.4. The PBL organizing process

Most models applied PBL at the universities in the world are introducing the 7-step process, emphasizing the centered role of student, students are proactive in the steps, are work with issues in small groups, the teacher is a facilitator, a guide. Some other guidelines described PBL cycle (Hmelo Silver, 2004), or introduce process in 4 phases, each phase with corresponding steps (Nguyen Van Khoi et al, 2010).

1.5. Investigate the actual of Problem-Based Learning apply in teaching at the University of Education

1.5.1. The purpose, object, content and methods of investigation

- Purpose of the investigation: Find out the actual of PBL in teaching in University of Education to determine the factual basis of the thesis; - Objects of investigation: Teachers with experience teaching from 5 years and students is studying 2nd year or more; - Contents of investigation: Investigation on the teaching methods using of teachers; the actual use of PBL; Investigating students' ability to recognize the teaching methods and forms of learning; effective learning factors,techniques.

- Methods of investigation: Mainly used questionnaire, the questions are designed on paper and it was sent directly to teachers and students. The questionnaire included questions on closed, open, many alternatives, with understandable, clear, logical and objectivity content. Combined with exchange survey, chat with teachers, students, observing Ecological teaching activities at the Department of Biology, Hanoi and Thainguyen University of Education.

The survey was conducted in the academic year 2013 - 2014, collected 150 votes of teachers, 185 votes of students that were learning 2^{nd} year, 3^{rd} year.

1.5.2. The results of investigation

Through research the teachers' teaching and students' learning situation, is presented from table 1.1 to 1.10, found that: (i) In the teaching process, teachers have used many types of different teaching methods , but mainly were presentation, conversation, practice, group activities, styled informed knowledge; (ii) In the using process of teaching methods types, teachers often apply traditional engineering models, not to promote the positive, the initiative of students. (iii) When teachers design learning activities, they have performed relatively complete activities that mandatory requirements and strictly adhere to the preparatory work of teaching but research to the needs, possibilities , interest of students has not been paid adequate attention. (iv) The concept of PBL and positive activities in PBL has not been fully and accurately awareness; (v) The types learning of students were diversity, due to the characteristics of each specialized and awareness of students and the learning styles were often required by teachers, students are not really receptive and creative their learning types. Many students depend on teachers, lazy train, study, explore, discover, while presenting the report, many students from limited capital, low self-esteem about yourself. Application of PBL in teaching will help overcome these shortcomings.

Chapter 2

ORGANNIZING ACTIVITY PROBLEM-BASED LEARNING IN TEACHING ECOLOGY AT UNIVERSITY OF EDUCATION

2.1. Ecological program in training Bachelor of Biological Pedagogy

Find out program of Ecological subject in the training program Bachelor of Biological Pedagogy at the Faculty of Biology, University of Education in Hanoi, Hanoi 2, Vinh, Thainguyen, we found, those programs were mentioned content that include the relationship between organisms and organisms, between organisms with its environment and the significance of the interactions with the development process of biota. The relationships between organisms exist in the relationship structure and organization of different levels, from individuals, populations, communities and to the ecosystem.

They refer to the major ecological regions on the earth, related to climatic features, make up the specific habitat. They mentioned the application of Ecological knowledge rational exploitation natural resources and environmental protection.

For details, has some differences between the programs, but not significantly. However, the distribution of the teaching duration of the programs were different: Ecology Theory programs at Biological Department in Hanoi University of Education was 2 credits, in Hanoi 2 Pedagogical University was 1.5 credits , and in Thainguyen University of Education was 1 credit. These were some of the unfavorable when conducting pedagogical experiment.

2.2. Problems in Ecological Teaching

2.2.1. Some problems in Ecological teaching

- Issue 1. The Indochinese tiger (Panthera tigris corbetti) is a native species of Vietnam. The experts estimate that, at present, in Vietnam, there are about 30 natural tigers, mainly distributed in the central region and the Northwest. In 2010, Vietnam has lost the last rhinoceros and many scientists believe that the next animal that is capable of high extinction is the tiger. However, as of May 11/2014, 174 tigers are kept in captivity, including 121 individuals are being caging at 10 farms and the private zooand the rest owned by the zoo , the rescue center of the State. Activity illegal tiger trade in Vietnam is growing. Please comment on the habitat of tigers in Vietnam. Why are tigers in Vietnam being in danger of extinction? How do the illegal trafficking of tigers stop?

When students solve problem, they get the knowledge of local species, endangered species, habitat characteristics and ecological factors related to the life of the organism, the impact of humans on animal life. Simultaneously, students increased understanding of the caging and trading problems of rare animals, thus forming a positive attitude to the care and protection of rare animal species.

- Issue 2. A few recent years, the home elephants in DakLak consecutive dead, from hundreds individuals, now only 43 individuals, most over age 35 and they are nearly no longer fertility. Since the beginning of year to May 2015, there were 5 home elephants and 1 elephant forest death, on 7th May, a elephant house (43 year

old), that despite undergoing treatment and rehabilitation goods in 1 month, but did not escape death. What are the causes and risk reduction the number of elephants in Dak Lak? Please propose measures to conserve elephants and other rare animals.

To solve the problem, students should analyze the basic characteristics of the population, the relationship between the population of organisms with their environment, attention to economic, culture, life... of DakLak and geographical area of the conservation area of rare animal species.

- Issue 3: Eucalyptus trees has replaced almost the entire vegetation of mountainous ecosystems in Huu Lung. Imprints of primeval forests with large reserves of valuable wood such, now only have a few decades old cap ironwood that be retained by few families. According to the village elders, former villagers still live with the forest, is protected by the forest until natural forests have been cleared. So whether do renewable natural forest? Please predict the next trend toward change in Huu Lung forest. what does studies on means?

Through this issue, students identify: The relevant concept (biomes, the basic characteristics of biomes - species composition and structure, characteristic species, common species; relationship between species in plant communities; ecological succession). Causes and consequences of problems.

- Issue 4: Rainforests are among the ecosystems on land with the highest output contributed the bulk of the real primary quantity planet. Let's prove it. Whats is factors limiting primary productivity of the ecosystem?

This problem requires identifying ecosystems. Based on the metabolic activity of living source in the ecosystem to determine the primary production of ecosystems.

- Issue 5. Environmental Protection in Singapore: Pulau Semakau Landfill is the first famous artificial landfill island in the world. Thanks to this system, from 16,000 tons of garbage each day, after incineration, Singapore must just over 10% landfill of there garbage. In particular, the heat generated during incineration is used to run generators supply enough 3% of the total electricity demand of Singapore. Singapore retained the green environment with severe

penalties through the sense of embarrassment in public to remind people not to litter. How do we have the attitude to trash?

This issue note to environmental pollution, requires identifying the pollutants, environmental pollution situation, measures that we used to limit environmental pollution.

2.2.2. The present levels of the problem*:* 1/ The applying exercise, 2/ The actually story is based on exercises, 3/ The real problem. In it, the 3rd levels is the highest levels and it is targeting of PBL. At this level, when students learn, solve problems, they will develop higher-order thinking skills such as analysis, synthesis and evaluation through discovery, research and resolve problem activities.

2.2.3. Methods, techniques, measures to determine problems

2.2.3.1. Methods, techniques to determine problem (Figure 2.1)

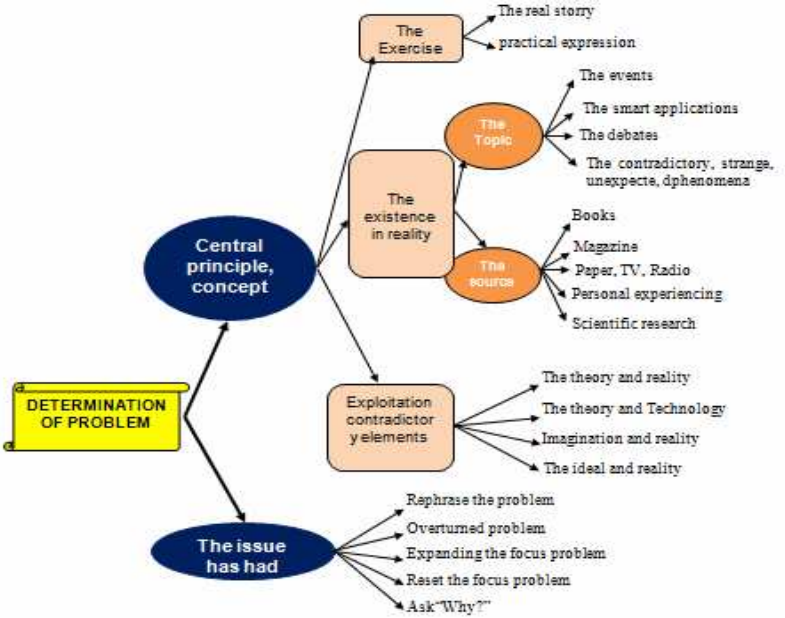

Figure 2.1. Methods and techniques to determine problems

We can identify the problems based on the central principles and concepts to building problems, or seek the existence of problems in

reality, or exploiting the contradictory elements; It is also possible from the already problem, redefine the problem by rephrasing problems, or overturned problem or expanded focus, or to reset the focus, or ask "Why?".

2.2.3.2. Measures to determine the problem: - From prior knowledge, leading to the problem; - From an old problem, apply the same switch to new problems; - Since the problem situation in life, build a problem; - Exploiting the contradiction between the phenomenon of life with scientific knowledge to detect new problems; - Changed some parts of the problem has to lead to new problems; - Use inductively from the specific knowledge to lead to problems; - From the experiments, comment the results and conclusions, raised the issue.

2.3.2. The Problem-Based Learning organizational process in teaching Ecology

Based on the teaching principles, based on guidelines processes and to meet the requirements of education reform, the thesis proposed PBL organizational processes (Figure 2.5).

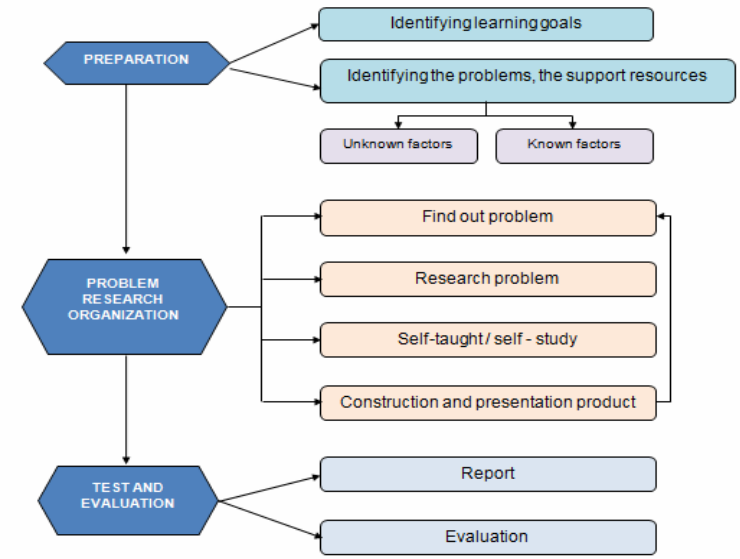

Figure 2.5. Diagram PBL organizational processes

2.3.3. Applying PBL organizational processes in teaching Ecology

The application teaching process is based on the basis: - activity positions in teaching; - Ladders classified awareness of Benjamin S. Bloom' learning field; - Capacity; - Build educational goals; - The different approaches related to the logical sequence of scientific research.

Example applying PBL organizational processes in teaching Organisms in their environment theme:

a. Preparation: The teacher determined learning goals, problem and resources:

* Target of teaching:

+ Knowledge: - Analysis of the impact of ecological factors on the life of the organism, and the organism's adaptation to ecological these factors; - Distinguish environment and habitat. Name the and outlined the characteristics of some biota; - Proof of human activities affect animal life.

+ Skills: - Train skills to work in teams, search and process the information, identify targets, detect and solve problem, self-learning, thinking, use some learning tool skills; - Identify some skills used in study subject knowledge as observation, experiment.

+ Attitude: - Recognizing the relationship between Ecologist with some other sciences; - Applying the knowledge Ecology to explain natural phenomena related to the living environment of the organism; - Forming be positive learning, initiative, optimism attitude.

* Define the problem: ***The migration of salmon***: Pacific Salmon are born in fresh water, rivers upstream, then migrate to the ocean, they grow in the sea from 1 to 4 years to adulthood. Then the salmon migrate thousands of miles across the ocean to the river to spawn. Upon arrival in the estuary, they gathered in the brackish water and wait for the tides bring them back up the river. The journey up the river could take several months. So do not eat salmon in fresh water, they lost 40% of body weight at the time of spawning and fertilization of eggs. The upstream migration of spawning only happens once in the lifetime of most of salmon, each lay out thousands of eggs, then the mother fish often die. Why are there differences in the habitat of salmon and salmon eggs?

- Question orientation: From the living environment and the ecological factors affect the life of salmon and trout adaptation to ecological factors, be generalized knowledge about environment, habitat, ecological factors, the influence of ecological factors to biological and adaptation of organisms to ecological factors. How do humans have affected the lives of creatures?

* Resources: Documents on Ecology (lectures, textbooks, books), documents, web pages about the geographic characteristics of the environment, the story about the biological behavior of the species squeeze; Teachers and students prepare teaching materials (computers, projectors, side table, A_0, A_4, markers, crayons, ...).

b. Problem research organization: Teachers grouping, communication problem, specified time, support for the group, to the students. Students follow these steps, the following activities:

**** Step 1. Find out problem*** (maybe done in one class period)

+ *Interpretation new term*: Leader: read problem and outlined the new terminology. Instructors recording secretary. Terms may group stated many new terms, general leader, under the guidance of teachers, summarizes the new terminology: - Name, habitat characteristics; biological characteristics, classification; - Contrary to spawning rivers; - The stage in the life of salmon; - Salmon Habitat; - Ecological factors affect the life of salmon

+ *Identifying problem*: The members raised questions about the phenomenon to explain, describe the relationship. For example:

The phenomenon, problem should resolve	**Question**
Influence of ecological factors on living organisms and the adaptation of organisms.	1 / Which do ecological factors affect to creature's life? How do organisms reacted to that effect? 2 / What do man had measures not to cause adverse effects on biological life?

**** Step 2: Research problem*** (maybe done in one class period)

**** Step 2: Research problem*** (maybe done in one class period)

+ *Analysis of problem*: Leader organize discussions, members were presented the answers, on the knowledge found, the group chief general comments, the secretary recorded, possibly in the form of application problem tree diagram or the thinking. Example of problem tree:

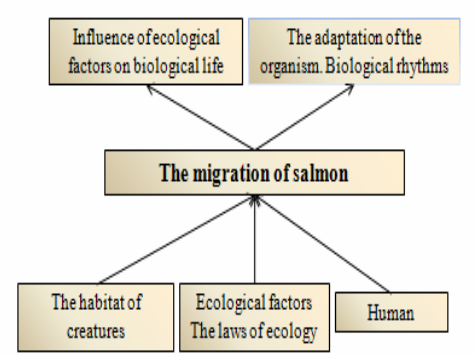

Figure 2.6. The diagram the problem tree illustrates analyze problems in teaching organisms in their environment

+ *Identify the knowledge that need to solve problems, lists the unknown knowledge*: Group discussed and agreed with the knowledge necessary to learn: - The concept of the environment, the type of environment the of organisms . - The concept of ecological factors, types of ecological factors. - Some a fundamental law of ecology. - Influence of ecological factors on organisms and their adaptations (the light, temperature, water, soil, air). - The concept of biological rhythm, the kind of biological rhythms.

The teacher may suggest groups some issues to explore knowledge that related to topic, encourage students to identify problems. Example: "Now, in the winter, we still have dragon fruit to eat. Please explain why and how do farmers harvested debenture dragon? ", ...

+ *Identify learning objectives*: unified group stated learning objectives: - List the types of habitats of organisms and ecological factors group. - Analyze the content, meaning and examples for each basic ecological rules. - Light, temperature, water, soil, air meant for the living organism? Plants, animals affected by these factors and we react to adapt to factors like? Cites examples. - The behavior of the salmon migration Is biological rhythms? What are biological rhythms? The biological rhythms type and significance of biological rhythms?

**** Step 3: Self-learn/ self-study*** (done at home): Every individual carefully selected sources; Active, initiative learning; Learn more resources; Try to summarize the information learned in his way; Read on and learn according to the learning objectives; Write cite the source of information; Notes the topic, the main content carefully.

**** Step 4. Verify the ideas, theories, presentation of products*** (maybe done in one class period): On the basis of the individual presenting the results of his study, the leader summarizes and concludes , the secretary of the group record the results by the joint report, can be presented as follows:

REPORT ON RESULT PROBLEM SOLVING OF THE GROUP

Members of the group: Learning goals:

Knowledge: Presented under the logical framework (Table 2.4)

Table 2.4. The logical framework illustrates solve problems report "Organisms in their environment"

The problem	The phenomenon needs to solve	The content
The migration of salmon	Related Knowledge: 1. Environmental and ecological factors	- Define:
		- The format:
	2. The laws of ecology. The impact of people	- The content:
		- Example:
		- Application:
	3. Biological rhythms	- Define:
		- The format:
		- Meaning:
	Basic knowledge: 1. Effect of ecological factors to organisms - Effects of the light, temperature, water, earth, air	- Role:
		- Affect the Plant:
		- Affect the Animal:
	2. Adaptation of organisms - For the light, temperature, water, soil, air:	- Plant:
		- Animal:

Integrated Knowledge: Knowledge of morphology, anatomy, physiology of the organism; knowledge of evolution (adaptation of organisms), the knowledge of physics, chemistry (chemical properties, properties of water, temperature, the light, air, ..); Geographical knowledge (the geographical distribution of organisms), ...

c. Test, evaluation

**** Step 1: Report***: leader elected representatives presented the group's report. The other group added other ideas with groups presented. Teachers commented, drawing experience solve problems activities of the group. Each member can write the report on the results of the group' activity.

The teacher assigned homework: Solve problems: Kangaroo has long been viewed as representing the unique beauty of Australia. If you have the opportunity to travel Australia, whether you miss the opportunity to see firsthand and take beautiful photos with Kangaroo're walking on grass? Why do Kangaroo only found in Australia, in nature?

Students based on how teamwork to solve problems in the classroom and solve problems that teachers assign at home. The articles returned to the teacher at the next session; Teachers ask students to design issues to teach Organisms in their environment.

**** Step 2. Test and evaluation***: teachers assess teamwork results and assess each student through the implementation of homework knowledge (terminology, knowledge concerning the environmental organisms habitat), skills (skills to collect documents, presenting articles clearly stating sufficient basic knowledge do not, analytical skills, general knowledge through the tabulator, diagrams and skills to detect problems), attitude (exercise seriously have not, stating personal opinions not, not timely submission).

2.4. The necessary skills are formed in PBL

In the thesis, some of the necessary skills are presented and analyzed: detecting problems, solve problems, thinking skills (systems thinking, higher-order thinking), teamwork skill, mapping thinking using skill, problem tree skill, "logical framework" using skill.

Chapter 3
PEDAGOGICAL EXPERIMENT

3.1. Pedagogical experimental purposes: Verify scientific hypothesis of the thesis, demonstrate the feasibility and efficiency of PBL organizational processes in teaching ecology at the Department of Biology, University of Education.

3.2. Experimental Content: Pedagogical experiments were conducted in Ecological theory teaching, include the topic of teaching Ecology.

3.3. Experimental Methods

3.3.1. Select pedagogical experiment objects: Because the delivery time and students study the subjects in the Department of Biology of some Pedagogical University is different, pedagogical experiment be limited in the Department of Biology at University of Education - TNU. The results can be applied appropriately designed to apply to teach in other educational institutions.

The teacher that teachs experiment meets the standard of university training; The students participated in pedagogical experiment belong 45, 46 courses. Survey Experiments (SE) were conducted on 45 courses, Implications Experiments (IE) for 46 courses. When conducting IE, divided into 2 groups: the experimental group (EG) - 137 students and controlled group (CG) - 136 students.

3.3.2. Experimental conducting: Stage 1: SE, explore the students' possibility awareness about the ecological knowledge at the end of the course is 2 weeks (Test No. 1), which seek to apply PBL organizational processes; * Stage 2: IE, performed teaching process by presentations method in CG and by PBL in EG. At the end of the experimental, test the number 2. After 2 weeks, perform the experimental following test to test reliability students' cognitive capacity. With EG, after each topic of study, students were asked to perform solve problems exercises. Teachers marking and evaluation PBL skills of the students.

3.3.3. Reviewed empirical results: - Qualitative assessment through observation, commented on the spirit, the attitude of teamwork, how to collect documents and information search, approach and solve

problems, how to discussion, how present the tests; - Quantitative assessment through test point EG and after the experiment (AE), through the reporting exercise. The content, the level should measure knowledge, skills and attitudes are presented in Table 3.1, Table 3.2.

3.3.4. Handling, analyze experimental results: The experimental results were processed and analyzed using the mathematical statistical parameters by software Microsoft Excel and is concretized through the quantitative data on the table, figure; through qualitative evaluation, review.

3.4. Experimental results and discussion

3.4.1. Results of quantitative analysis

3.4.1.1. The results of analysis tests

Analysis of the SE and IE's test results, through Tables 3.3, 3.4, 3.5; Figure 3.1 and 3.2 show that test scores of EG higher than the survey group and the CG; Analysis the IE's test results of the EG controlled through the tables and figures.

Table 3.6. The frequency IE's test results (f%)

Plan \ x_i	1	2	3	4	5	6	7	8	9	n	$\overline{X}$	s^2
EG	0,0	0,0	0,0	3,7	12,5	45,6	23,5	11,0	3,7	136	6,4	1,158
CG	0,0	2,2	8,0	13,1	44,5	21,9	10,2	0,0	0,0	137	5,1	1,282

The data in Table 3.6, Figure 3.3 shows the EG's average point value is higher than CG's ones, variance of EG is lower than CG, so test scores of EG is concentrate than. From Mode value or less, the frequency of the CG is higher than the EG, also from value Mode and older, the frequency of EG is higher than CG. Such test results of EG is higher than the CG.

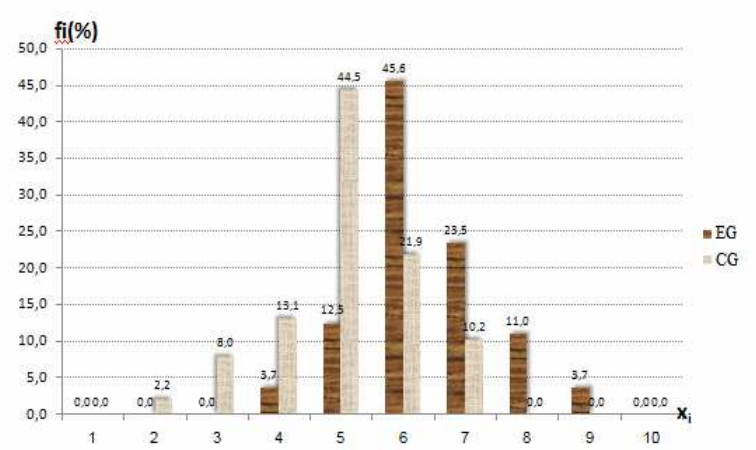

Figure 3.3. Chart of IE's test results frequency

To confirm the test scores results in EG and CG, we compare the average value and variance analysis, shown in Table 3.8, 3.9. The hypothesis H_0: "There are no differences between academic results of EG and CG" and "At IE, using PBL and other teaching methods are impact similar to students' test scores results in EG and CG".

Table 3.8. Inspection $\overline{X}$ test scores impact experiment

U-Test: Two Sample for Means	IG	EG
Mean ($\overline{X}_{TN}$ và $\overline{X}_{ĐC}$)	5.1	6.4
Known Variance	1.282	1.158
Observations	137	136
Hypothesized Mean Difference	0	
z (z =U)	-8.48	
P(Z<=z) one-tail	0.20	
z Critical one-tail	1.64	
P(Z<=z) two-tail	0.40	
z Critical two-tail	1.96	

Table 3.8 shows that: $\overline{X}$ EG > $\overline{X}$ CG, the absolute value of U = 8.48 > 1.96, so the hypothesis H_0 is rejected, the probability (P) = 1.64 > 0.05, the difference is significant statistically with 95% confidence.

Table 3.9. Analysis of test scores variance in impact experiment

Anova: Single Factor						
SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
IC	137	694	5,1	1,282		
EC	136	866	6,4	1,158		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	$F_A = S_a^2 / S_n^2$	*F_A (P-value)*	*F crit*
Between Groups	115,69	1	115,7	95	2E-19	3,876
Within Groups	330,03	271	1,218			
Total	445,71	272				

In Table 3.9, the general (Summary) said the number of tests (Count), total points (Sum), the average score (Average) and variance (Variance). Table analysis of variance (ANOVA) said the number of FA = 95 > F crit = 3,876, so H_A hypothesis is rejected, that is the different teaching methods affect academic results of students.

The AE results in EG and CG were analyzed through Tables 3.10 on frequency of test scores, Figure 3.5 on the chart of frequency, Table 3.11 on moving convergence frequency, Figure 3.6 graph the frequency of moving convergence frequency are seing the results of the EG test scores are higher than CG. To confirm, we tabulated Table 3.12 to inspection average values and Table 3.13 to analysis of variance, showed the difference in mean values and variances are significant statistically with 95% confidence. This suggests that cognitive capacity reliability about knowledge and skills of students in EG are higher than CG.

3.4.1.1. Result analysis the reports

Table 3.14 provides information about frequency students perform PBL skills are increased through the report for each study topic:

Table 3.14. Frequency of students performing PBL skills (%)

Skills \ Topic	1	2	3	4	5
Explain new terminology	46,0	53,3	56,9	61,3	67,9
Identify problems (raise questions)	42,3	49,6	53,3	57,7	64,2
Identify related knowledge	59,9	67,2	70,8	75,2	81,8
Identify knowledge need to address	58,4	65,7	69,3	73,7	80,3
Identify learning objectives	67,9	70,1	73,0	77,4	83,9
Collect, cites document	47,4	54,7	58,4	62,8	69,3
Identify integration knowledge	41,6	48,9	52,6	56,9	64,2
Mapping problem tree (or mind map)	69,3	71,5	75,2	79,6	86,1
Making logical framework	60,6	67,9	71,5	75,9	82,5
Detecting and creating problems	45,3	52,6	62,2	60,6	70,1

At Table 3.15 and Figure 3.7 shows the frequency of the report point in EG: range of score in the reports increased from 5 to 9, the score's frequency through the themes, Mode and the average score value increased through the the report in the topic of teaching Ecology.

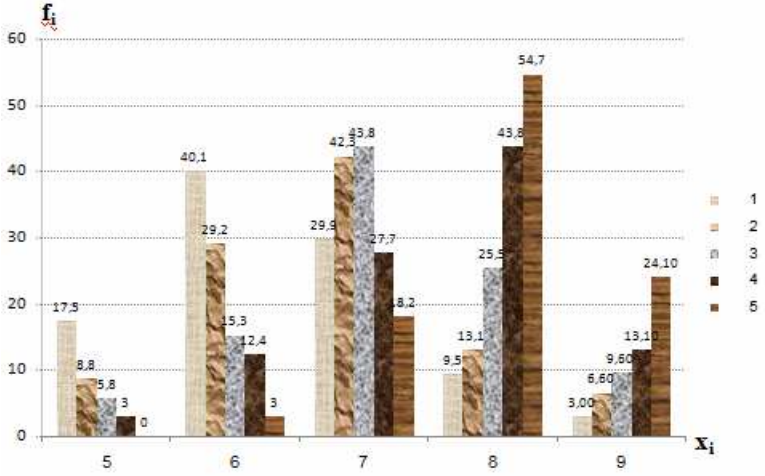

Figure 3.7. Chart of IE's test results frequency in the reports

3.4.2. Results of qualitative analysis

Through observation of teaching activity before IE, during IE, through tracking reports, presentation of tests and discussions with teachers, students, we determine, using PBL in teaching Biology Ecology is having a positive effect, raising interest in learning, practicing basic skills, built up students' extensive, flexible knowledge base and responsive asked to assess regularly in the credit system learning process.

CONCLUSIONS AND RECOMMENDATIONS

1. CONCLUSIONS

1.1. The PBL term has the connotation with problem posing instruction, problem solving instruction and some other teaching methods but the approach is different. PBL belongs student-centered teaching model, based on the use of practical problems as the starting point for the acquisition and integration of new knowledge, develop problem-solving skills.

Success factors of PBL is problem. The problem is a natural phenomenon or an event/situation has been and probably will happen in reality and contains things to be explained. The problem is distinguished two kinds: Ill-structured problem and Well-structured problem. PBL towards Ill-structured problem. The nature of PBL is to introduce students practical problems, as a basis for research and exchange of students, through which students learn academic content, problem solving skills, social skills, independent learning skills, behavior of adults.

1.2. Assessment of the status applied PBL at University of Education and observed Ecological teaching activities, the PBL approach in Ecological teaching at the University of Education was identified urgent and necessary, contributing to the renewal of education, training the Bachelors who have sufficient knowledge and skills to meet the requirements of society.

1.3. The problems in Ecological Teaching is determined include (i) Organisms in their environment, (ii) population Ecology, (iii) communities Ecology, (iv) Ecosystem, (v) The natural resources and environment. These problems can be used in the process of teaching new knowledge or used to review, practice knowledge, skills or test and evaluation.

1.4. The process of PBL organizing in teaching Ecology is built consists of 3 stages: (1) Preparation, (2) Organize the research of problem, (3) Test and evaluation. In each stage divided into steps with specific activities of teachers corresponding to the activities of students, including student activities are account for a large proportion. PBL organizational processes ensures the basis for an operational perspective in teaching, the taxonomy of awareness, capacity, the building educational objectives, the access to the logical sequence of scientific research.

1.5. The pedagogical experimental results the initial confirmed using problems and PBL organizational processes in Ecological teaching have improving effects the efficiency of teaching and practicing the skills of students at Department of Biology, University of Education.

2. RECOMMENDATIONS

2.1. Expand pedagogical experiment about PBL organizational processes in teaching other subjects at the Department of Biology, University of Education and at the universities in our country.

2.2. Bring contents of PBL into a teaching thematic in Biological teaching method modules at the University of Education and in regular retraining plan for Biological teachers in schools, in order to improve the professional capacity of Biological teacher, thereby improving the quality of teaching biology.

2.3. Continue to evaluate the effectiveness of PBL on students that has been engaged experimental and in more detail study on training PBL skills to students.

PUBLISHED WORKS RELATED TO THE DISSERTATION

1. **Nguyễn Phúc Chỉnh, Nguyễn Thị Hằng** (2013), "Some general issues on problem-based learning", *Journal of Education*, 309(1), pp. 32-33.
2. **Nguyễn Thị Hằng** (2013), "Scientific basis of problem-based learning", *Journal of Education*, special number in August, pp. 40-41.
3. **Nguyễn Thị Hằng** (2014), "Activities of the lecturers and students in problem-based learnign", *Journal of Education*, special number in July, pp. 120-121.
4. **Nguyễn Thị Hằng** (2014), "Method of determining the problems in problem-based learning", *Journal of Science and Technology*, *TNU*, 126(12), pp. 159-164.
5. **Nguyễn Thị Hằng** (2014), "Application problem-based learning process in teaching Ecology", *Journal of Science and Technology*, *TNU*, 129(15), pp. 165-171.