MINISTRY OF EDUCATION AND TRAINING
HANOI NATIONAL UNIVERSITY OF EDUCATION

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DESIGN GEOMETRICAL PROBLEMS ASSOCIATED TO PRACTICE IN TEACHING GEOMETRY AT HIGH SCHOOL

Major: Theory and method of teaching mathematics
Classification**:** **62 14 01 11**

SUMMARY OF DISSERTATION OF EDUCATION SCIENCE

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At ..... on .....

INTRODUCTION

1. Problem formulation

+ Significance of mathematics in the general education program: In the general education program, most countries in the world attach significance to mathematics. Mathematics is considered as the core foundation course and a compulsory subject at all levels of education. National Council of Teachers of Mathematics USA (NCTM, 2000) said: mathematics programs from kindergarten to grade 12 allow all students to: analyze the characteristics and properties of two- and three-dimensional geometric figures and develop mathematical theories about geometric relationships; locate the figures and describe spatial relationships; solve problems using visual, spatial arguments and geometric modeling. Geometry and spatial sense is the basic component of learning mathematics. They provide a way to interpret and reflect on the physical environment and they can serve as a tool for research on other topics in mathematics and sciences.

+ Development of learners capacity: In math teaching goals, most countries in the world have focused on the development of learners' capacity, especially the capacity of thinking, problem-solving capacity. Therefore, the need to strengthen the ability to apply mathematical knowledge and skills in real life, through the resolution of situations that arise in life.

+ The role of geometry: No one does not acknowledge the role of practice for the development of science in general, in particular for math. Geometry is used in many industries, such as mechanic, carpentry, architecture, construction business, painting, etc.

+ State of the art: There have been several studies on the practical problems, that solve interdisciplinary and practical problems, develop the ability to apply mathematics in fact, improve the capacity to apply

mathematics into practice, teaching mathematics in connection with reality in schools, colleges and universities. But there has not been any research on methods of design geometric problems associated with the realites in teaching geometry at the high school.

With the above reasons, the selected theme is: *Design geometric problems associated with realities in teaching geometry at high schools.*

2. Research purposes

The aim of the thesis is, that proposes methods to helps teachers design the geometrical problem associated with practical to use them in teaching process geometry, contribute to improving the quality of teaching geometry at high schools.

3. Scientific hypothesis

Applying the methods presented in the dissertation, teachers can design geometric problems associated with the realities and then use them in the process of teaching geometry at high schools. Students will see more clearly the significance and practical value of the geometry at school, contributing to improving the quality of teaching geometry at high schools.

4. Research Tasks

The thesis should answer the following research questions

(1) Why geometry problems associated with realities should be designed and used in teaching geometry at high schools?

(2) How are the design and use of the geometry problems associated with realities in teaching geometry at high schools today?

(3) How are the methods to design and use of the geometry problems associated with realities in teaching geometry at high schools?

(4) Could the proposed methods to design and use of the geometry problems associated with realities in teaching geometry at high schools be feasible and effective or not?

5. Subject, scope and object of study

+ Subject of study is the process of teaching geometry at high schools.

+ Scope of the study: the geometric problems associated with realities in mathematics program at high schools.

+ Object of the study are objectives, content of mathematics program at high schools.

6. Research methodology

The methods primarily used in the thesis are:

+ Academic research method (for questions 1 and question 3)

+ Investigation and observe method (for question 2 and question 4)

+ Pedagogical experiment method (for question 4)

7. New contributions of the thesis

+ In theory:

- Review the design and use of Geometric questions associated with reality in teaching Geometry in high schools from theory system and home and overseas offensed works; Point out opportunities, ways of designing practical Math questions, enhance the application of practical Math questions and utilize them in teaching Geometry in high schools.

- Methods to design and use geometric problems associated with realities in teaching geometry at high schools have been proposed.

+ In practice:

- Assess partly the current situation of the design and use of geometric problems associated with realities in teaching geometry at high schools.

- Methods to design and uses of geometric problems associated with realities make students more interested in learning geometry, see more clearly the practical value of geometry knowledge. This can contribute to improving the quality of teaching geometry and developing thinking, personality of students at high schools.

8. The protected issues

- The situation in some high schools now shows that the design of geometric problems associated with realities in teaching geometry at high schools is still very difficult and insufficient.

- Methods to design and uses of geometric problems associated with realities in teaching geometry at high schools is feasible and effective. This can contribute to improving the quality of teaching geometry at high schools.

9. Thesis structure

Besides the introduction, conclusion and recommendations, the thesis consists of three chapters:

Chapter 1. Theoretical and practical foundation

Chapter 2. Methods to design and use geometric problems associated with realities in teaching geometry at high schools.

Chapter 3. Pedagogical experiment.

Chapter 1

THEORETICAL AND PRACTICAL FOUNDATION

1.1. An overview of relevant researchs

1.1.1. The abroad researchs

From the last decades of the sixteenth century, Francis Bacon (1561-1626), or even earlier, had used "natural method" of teaching: Teaching starts with situations in everyday life. Since 1990, at the University of Arizona (USA) there is a program "After school" for students who work on projects connected Science - Technology - Engineering - Math (STEM). They will discuss and resolve issues related to the school and their residential areas, after hours at school. Recent 30 years, researchers from the Institute Freudenthal in Netherlands has been developed curriculum and teaching methods math called "Realistic Mathematics Education - RME) based on the notion that math is a human activity and students need to "reinvent" math themselves or mathematically think in

class (Van den Heuvel-Panhuizen, 2003). The theoretical approach developed in the Netherlands has been adapted in a number of other countries including the US and the UK (see eg Romberg, 2001). Following this direction, PhD thesis of Nguyen Thanh Thuy (2005) at the University of Amsterdam Netherlands studied and propose ways to help vietnamese pedagogical students apply theoretical framework and practical education of math in the situation in Vietnam; In a report on Trends in International Mathematics and Science Study (TIMSS), the Australian Council for Educational Research (ACER) counted set up contained a reallife connection or set up used mathematical language or symbols only, in a mathematic book as follows:

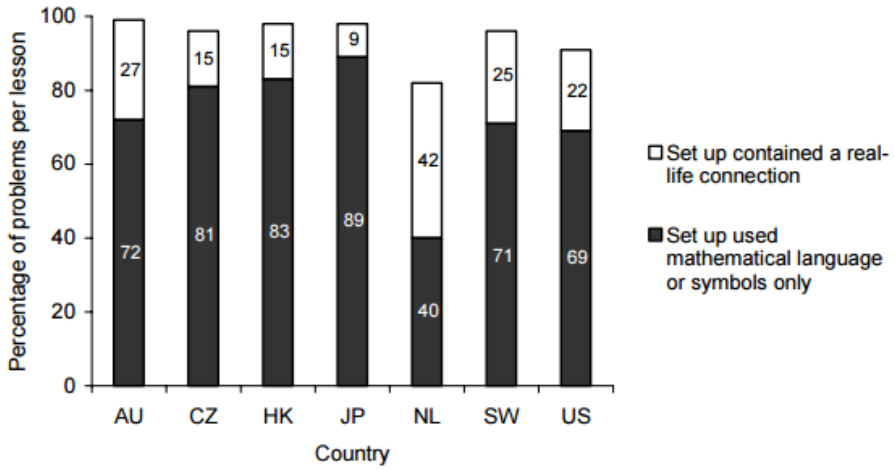


Figure 7

According to the above table, in Australia (AU), around 27% of problems in mathematical lessons have been established using connect with real life, that is greater than that in Japan (JP, 9%). However, the percentage of mathematical problems has been established using the mathematical symbols or sign language in Japan is 89%, which is larger than that in Australia (72%). Netherlands (NL) has a minimum rate (40%) compared to other countries of the mathematical problems which are set using mathematical symbols or sign language and has the highest percentage (42%) of the mathematical problem establishing a connection

with the real world than Australia, Czech Republic (CZ), Hong Kong (HK), Japan, Switzerland (SW) and the United States (US).

It specially needs to mention to Programme for International Student Assessment (PISA) and High School Mathematical Contest in Modeling (HiMCM) in the United States, from the final years of the twentieth century until recent years.

However, in many countries, "it remains a significant gap between research on mathematical modeling and the development of mathematical education".

All the above-mentioned research results directed at applied mathematics capabilities to solve the problems arising from the practice, especially mathematical modeling capabilities of practical situations. But we have not found any work that mentions the method to design geometric problems associated with realities?

1.1.2. The domestic researchs

In mathematic textbooks and workbooks in primary or secondary schools, there are many practical simulation problems. There have been a number of studies dealt with separately to the problems with the actual content. Such as the work of Pham Phu (1998), Nguyen Ngoc Anh (1999), Bui Huy Ngoc (2003). Particularly for teaching probability - statistics in universities and colleges in the direction associated with realities, professional practices, we can see the works of: Tran Duc Chien (2007), Ta Huu Hieu (2010), Tran Thi Hoang Yen (2012), Phan Thi Tinh (2012), Nguyen Thi Thu Ha (2015). In some other works, the authors also introduced the practical events, phenomena related to ordinary mathematical knowledge. For example, the work of Phan Anh (2012), Nguyen Dang Minh Phuc (2013). Bui Van Nghi (2009, 2011, 2013) were interested in the use of means in practice that support for teaching geometry, help students explore some space goemetry knowledge and be interest in connection math with practice, explain

some practical phenomena based on knowledge of the program "Sphere, cylinder, cone" in Geometry 12.

*The above-mentioned works are either general researchs on elementary and general mathematic applications in practices; or application study of subjects Calculus, Probability, Arithmetic and Algebra in practice; or application of mathematics for teaching at high schools. There has been yet no works which depthly study about the relationship between geometry at high schools with realities***.**

1.2. The key terms in the thesis

+ ***Problem:*** A problem includes the question or ask for someone's actions, to find answers, to satisfy that requirement, in a given condition; a problem can be an issue, a situation that requires the implementation must figure out how to solve the issue or situation.

+ ***Reality***: According to dictionary definition: "The reality is the overall general what exists, that is taking place in nature and society, in terms of relations to human life"; "*Practices* are human activities, primarily production workers, in order to create the conditions necessary for the survival of the society (in general)."

+ ***Problems associated with the reality***: A problem in association with the reality (also known as practical problem or problem with practical content) is that it contain assumptions or conclusions concerning the reality. A An artificial practical problem (also called practical problem) is the problem based on assumptions about a situation / issue that may occur in reality.

1.3. Why should teaching geometry be linked to realities?

1.3.1. Teaching geometry should be linked to the history of formation and development of geometry.

Mathemetician Henri Poincaré (1899) said: The task of educators is to create conditions for the perception of the child to experience all of what their ancestors experienced. The experience has to proceed quickly

through certain stages, but absolutely not miss even one. With that perspective, the history of science is a guide for us.

The process of formation and development history of the geometry is always connected with reality.

1.3.2. "Study attached to reality" under the principle of "Unity between theory and practice" - one of the fundmental principles of education.

1.3.3. Applying mathematics to solve practical problems is an essential competence of learners.

1.4. Practical investigations

1.4.1. Regarding problems related to practices in geometry textbooks and workbooks: Geometry textbooks before amending the consolidated (1987) has led to the problems related to practice, mainly collected from old math problems. In the current textbook (used from 2002 to the present), the authors showed many drawings, pictures, historical stories related to the lesson content, in order to support the teacher to suggest the problem, motivation and interest in learning for students. According to our statistics, in advanced geometry textbooks 10, there are 19 figures and 4 readings, class 11 with 8 figures and 2 further readings, class 12 with 7 figures and 1 reading. In addition to the drawings, images associated with the practice to illustrate the lesson content and the further readings/“you may not know”, in geometry textbooks and workbooks 10 there are 19 problems and in geometry textbooks and workbooks 10 there are 3 problems, which associated with the practice. Most of them are the problem only with practical elements, there are few real problems in practice. Particularly, in geometry textbooks and workbooks 12, there is no problem associated with the practice. This shows that it is neccesary to supplement the practical problems associated with the textbook, exercise book in high schools.

1.4.2. Practical investigation about concerns of teachers and students to the relationship between geometry and realities in geometry teaching process: We have designed and synthesized survey comments from 50 teachers and 300 students (the actual number is greater than 50 and 300, but we rounded for ease of calculating statistics) of the high schools follows: high school Cau Giay District, Hanoi; High School in Vinh Bao, Hai Phong; High School Gia Loc, Hai Duong; High School in Van Lam, Hung Yen; High School in Phu Yen, Son La; Hiep Binh High School in Thu Duc District, Ho Chi Minh City. To facilitate teachers and students in answering the questions, the questionnaire we had the hint about the relationship between high school and practice geometry.

Some conclusions: Most of the surveyed teachers were aware of the importance of realities and the need to bring more the practical problems in the process of teaching geometry at high school; In fact, very little practical applications of the knowledge of geometry at high school can be found; Most of the students want the teachers to add practical mathematic problems to see more clearly the meaning of the learned knowledge.

1.5. Summary of chapter 1

+ The results of historical research shows that arise in the course of development, math always connected with reality. However, the geometrical problem is practical problem really only a very modest amount. We just saw (not much) the like practical problem of geometry (as the old chinese math).

+ In the country there have been some studies mention the problems with the actual content. Some authors have put into the event, the actual phenomena related to mathematical common knowledge; or interest in the use of means in practical support for teaching geometry, help students explore some of spatial geometrical knowledge. Some works have studied the most common application of elementary math, math common in

practice; or use the assigned study subjects Calculus, Probability, Algebra and Algebra into practice.

+ Overseas, some universities have programs and projects connected math with life. The students will discuss and solve issues related to residential schools and their clusters. There are a number of PhD thesis was concerned about how to connect math with reality or everyday life. Research teaching and learning through the mathematical model and applications has grown quite strongly in recent decades.

+ However, the current situation survey on teaching geometry linked with practices with a modest sample of 50 teachers and 300 students in some high schools showed that: Most teachers are asked via questionnaire are aware the importance of practice and the need to strengthen the practical problems in the teaching geometry process subjects at high schools; but can only find very little practical application of the geometrical knowledge at high schools. To the students: Most students have teachers who wish to add to the practical problem of students see more clearly the meaning of the knowledge learned.

Based on theoretical overview and works that have been published related to the teaching geometrical problems associated with the practices, along with the current status survey results, we are confident on the theoretical and practical basis of our research problems. At the same time, we expect to contribute to the scientific and practical significance in the next chapter.

Chapter 2
METHODS TO DESIGN AND USE GEOMETRIC PROBLEMS ASSOCIATED WITH REALITIES IN TEACHING GEOMETRY AT HIGH SCHOOL

We are oriented to the study and proposal of methods to design and use geometric problems associated with realities in teaching geometry at the high school as follows:

Orientation 1: The problem of giving content to serve general education, in accordance with the requirements of fundamental innovation Vietnam comprehensive education in the current period [3]: The contents of general education told ensure streamlining, modern, practical, practice, apply knowledge into practice [4].

Orientation 2: Measures to help develop educational programs: "Adjustments and supplements, updates, refresh all or some elements of education, ensures the development and stability relative of education had, in order to make the implementation of targeted programs of education set out to achieve the best efficiency, consistent with the characteristics and needs of social development and the development of fish student workers"[3].

Orientation 3: Each measures to orient high school mathematics teachers can design some of the problems to be used in the teaching process. Specifically as follows: There are ways to design problems geometry students help explore, discover and explore the knowledge of lessons, support for student access concept, theorem (measure 1); There are ways to design problems geometry students help find the meaning, the practical value of knowledge geometry (measures 2, measure 3); There are ways to design problems students help deepen and expand knowledge (measures 3, measure 4); There are methods to design the problem to assess the capacity of understanding mathematics, into practical use of students (measure 4); There are ways to design problems helps students

practice geometry, consolidate knowledge and skills through calculating the quantity geometry (measure 5).Requirements: Each measure must be stated clearly: The purpose of the measure; Pursuant to the measures; How to implement the measures and the use of problems in teaching designed geometry at high schools.

Orientation 4: The problem must be designed to fit the qualifications, capabilities and knowledge.

With difficult problems, need grading operations, motivations (beginning, intermediate, end) to help students overcome the difficulties and obstacles in the process of problem solving.

2.1. Method 1. Design the problem of geometric knowledge discovery based on teaching facilities made from simple materials in practice

2.1.1. Purpose of the method: This method help teachers design the problem or situation to explore the knowledge or study of geometry based on the teaching facilities made from simple materials available in practice.

2.1.2. Base of the method: Based on the laws of cognitive activities; Based on the concept "What is effective teaching?"; Based on the meaning and effect of the teaching facilities; Based on the meaning and effect of the discovery teaching methods in mathematics.

2.1.3. Implementing methods and using the designed problem

We propose the implementation process of this method as follows:

Step 1 (prepare): Base on the content of the lesson, teachers design the detection problem to discovery geometry knowledge for students (through questions, activities, learning patterns ...) and design means made from simple materials in fact to support students to solve problems, prepare the answers and operating results.

Step 2 (implementation): Teachers organize and manage the classroom; students discover knowledge and record operating results.

Step 3 (discussion of the whole class): Teachers organize that students exchange and discuss results of solving with the whole class.

Example 2.1.1. Design problems learn about the conic (Geometry 10)

Could use a funnel cone glass or hard plastic molds used for making hats with modeling clay blocks (usually used as toys for children), then use a knife to cut blocks of this land, have shaped profiles different conic.

Example 2.1.2. Design problem about revolution Hypeboloit (Geometry 12)

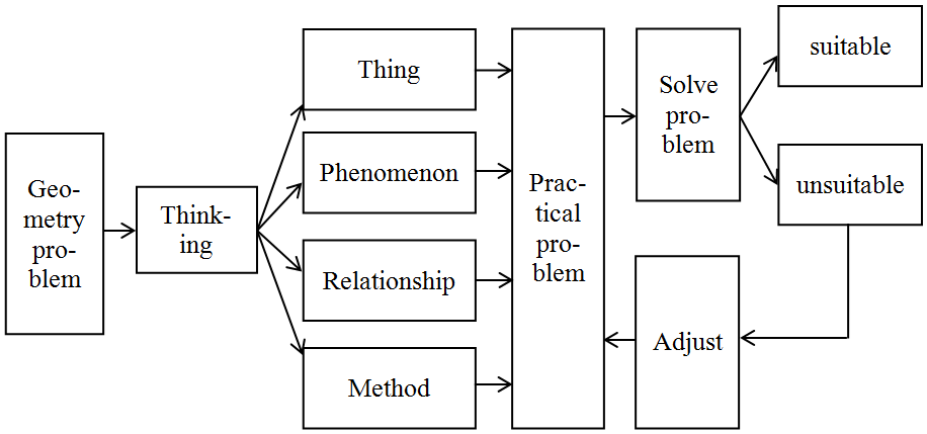
2.2. Method 2. Relating pure geometry problem to a practical situation to design problem associated with reality

2.2.1. Purpose of the method: The method aims to create practical problems associated with the problem of pure geometry through thinking.

2.2.2. Base of the method: Based on the role of thinking; Based on the role of pedagogic metabolization; Based on the results.

2.2.3. Implementing methods and using the designed problem

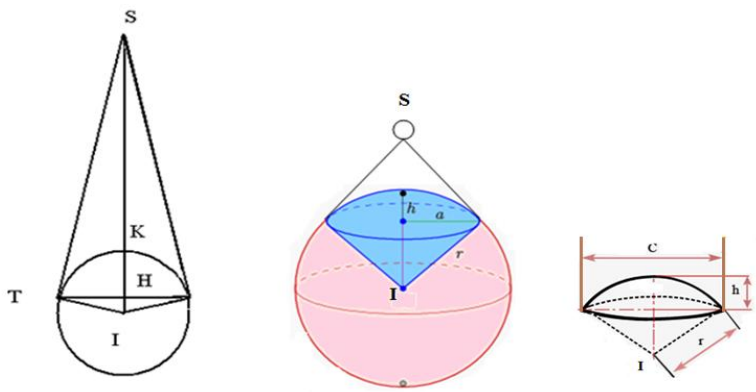
We propose the implementation process of this method as follows:



In this process: Starting from a problem (pure mathematics) we can relate to an object, or a phenomenon, a relationship in fact, a solution that can transform from the pure mathematic problem into practical ones. For example, a square can relate to a square-shaped objects, such as floor tiles; an ellipse may relate to the orbit of a planet in the solar system; two crossed lines may relate to a highway and a high street; from the calculation of a triangle edge, knowing the other two sides and the angle opposite to it, we can think to calculate the distance between two points that are not directly measurable.

Example 2.2.1. Design problems of the vision of a meteorological satellite, related to the problem of sphere tangent (Geometry 12)

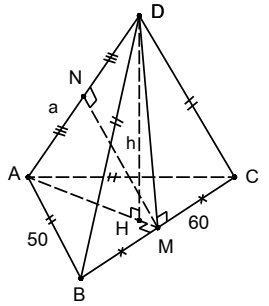
Geostationary meteorological satellites circling the earth above the equator at an altitude of about 35,880 km (22,300 miles). Calculating the area of the bridge can be seen from satellites, said that the demand side is a pompoms an area calculated by the formula $S = 2\pi rh$ r is the radius of the Earth ($r \approx 6371$ km) and h is height pompoms.



Example 2.2.2. Design problem of ballooning, related from the problem of the pyramid (Geometry 12): A big balloon D attached recording device observing a fairground, which is tied with rope to three points A, B, C on the ground, AB = AC = 50 m, BC = 60 m. Assuming that the wires are stretched, the string length is: BD = DC = 50 m, AD = a (m)

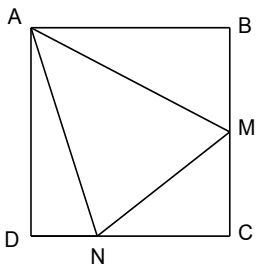
a) When a = 60 m, find the distance from balloon D to the ground.

b) How much should the length a be, so that the balloon is 20 meters above the ground?



Example 2.2.3. Design problem of determining the size bricks flowers, reminiscent of the problem of determining the square (Geometry 10): Since the problem of determining a central square to hear a point M of a side of the square, a point N over a third of the adjacent edge and said a line through points N may pass through a square top, we can set out a practical situation as follows.

In an archaeological phase, people discovered the bricks crumble flowers. The archaeologists predict that these are the debris of bricks decorated flower, square shape, with each other; each side of the square are the borders that align with different colors and each corner has a small decorative flowers. In the piece of rubble, there is also a piece of the border, there are still a few pieces on each border point. Is it possible to determine the magnitude of the bricks that (length side of the square), from the debris looking for in the following cases, or not?



a) Knowing two points on one side of the square and a point on the opposite edge.

b) Knowing two points on one side of the square and an adjacent point on the other side.

c) Knowing three points on three different sides of the square.

d) Know the four points on four different sides of the square.

2.3. Method 3. Selection of practical problems which can be explained by common mathematical knowledge or solve by means of a mathematical model for designing problem system

2.3.1. Purpose of the method: Design a problem or problem system to explain an issue in practice and help students see the meaning of the common knowledge and can use mathematical models to solve a problem.

2.3.2. Base of the method: Based on the goal of teaching mathematics; Based on the meaning and process of mathematical model; Based on the purpose of similar activities.

2.3.3. Implementing methods and using the designed problem

Teachers first choice practical situations which have been introduced in textbooks, in the references and figure out how to explain to the practical situations. Then they have to design problems or system of problems in the learning patterns, help students gradually explain practical situations. Or they can organize discussions, cooperative learning, large assignments, seminars and projects in practical situations to deepen and expand the knowledge of geometry in high school.

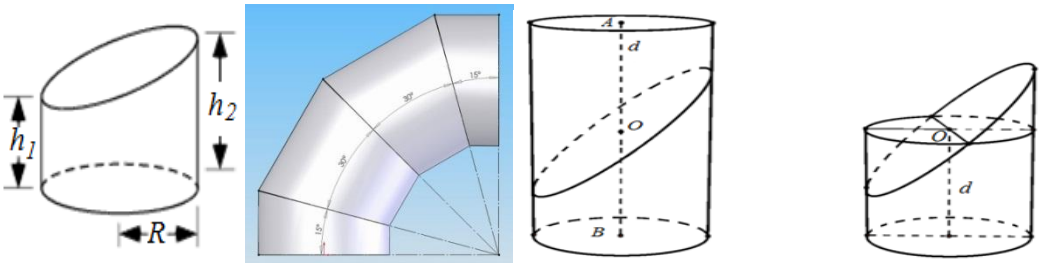
Example 2.3.1. Design problems of the cylinder volume fraction of revolution is cut by a plane oblique to the axis (the angle between the straight lines and sharp corners plane) and the surrounding area of that section (Geometry 12).

Practical situations are set as follows: In an industrial park it is arranged a gas pipeline system serving the air conditioner. Placed along the walls are flat circular cylindrical tube connecting the corners xoay. At transplant some people are cut beveled cylinder. The question is how to calculate the volume and surface pulse quanhcua air duct system should look like?

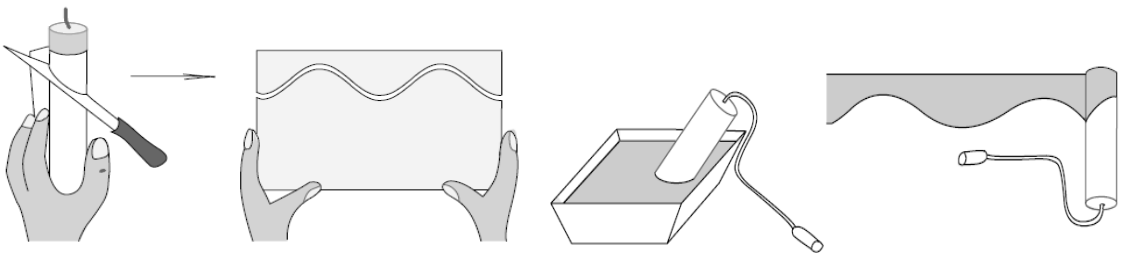
The mathematical problem is following:

For a cylinder of revolution (T) and a plane surface (P) cut all the way to its birth. Calculate the volume of the cylinder section located between a bottom surface of the cylinder and that intersection and the area of development of the form; Knowing that the radius of its base by R and the distance between the center and bottom center of the cross section (T) to cut by (P) by d. (Figure 33)

To help students solve the problem on, we can set up the system suggest the following questions: (1) When the plane (P) parallel to the bottom of the image forming cylindrical shape is what? The volume of the building blocks of how calculated? (2) When the plane (P) cut oblique to the axis of the cylinder, can change shape to form the first case or not? How change?



Example 2.3.2. Design developed the problem of road intersection of a cylindrical surface and a flat surface with the axis of the cylinder creates a sharp corner (Geometry 12): Practical situations are set as follows: Wrap a piece of paper around a cylindrical candle and cut it obliquely by a knife, we get an elliptical cross section and a wavy curve if cover up that piece of paper on a plane. What is that curve?



2.4. Method 4: Exploit the potential Geometric knowledge in real shapes, blocks and modern architecture to design Math questions or Math question system on Geometric comprehension.

Steps of the implement the are as follows:

+ *Step 1:* The teacher must discover the geometry knowledge hidden in the modern architecture. For this it is neccessary to ask questions, issues of observing the structure as follows:

- Structures close to which spatial shape learnt in geometry in high school?
- Which straight lines, planes, surfaces are hidden in the architecture?
- Which problem of quantity (distance, angle magnitude, area, volume) can be set off from the architecture?
- How connections, parallel relationship, perpendicular relationship ... can be exploited in the architecture?

+ *Step 2:* Teachers should set up a suitable system of questions, problems, arranged in a logical order so that the resolution of the previous problem may suggest to solve the problem later, support students solve problems.

+ *Step 3:* Teachers organize students to discuss, cooperate to learn, or do the assignments, organize seminars, project execution .... Then, students will see the meaning of the content of math learned in high school, feel that lessons could really be interesting and attractive.

Example 2.4.1. Design a problem by observing the modern architecture (Geometry 12)

Questions

(1) What is general shape of the structures in the above picture? (2) Is it possible to use straight steel rods, straight concrete columns to form the frame structure of the building or not?

To get the answers, let's study the system of problems related to these structures, which is set out as follows:

Problem 1. Given a cylinder has a rotating shaft $O_1O_2 = l$, the bottom circle is (O_1, R) and (O_2, R) (Figure 42, 43, 44). The segment AB has a constant length k, moves on two circles: A moves on the circle (O_1, R) and B moves on the circle (O_2, R). Prove that each point M of the segment AB moves on a fixed circle.

Problem 2. Given a cylinder has a rotating shaft $O_1O_2 = l$, the bottom circle is (O_1, R) and (O_2, R) (Figure 45). The segment AB has a constant length k, moves on two circles: A moves on the circle (O_1, R) and B moves on the circle (O_2, R). Call O is the midpoint of O_1O_2, E is the midpoint of AB and D is the midpoint of BC. A fixed point M on section AB, F is the projection of M on ED. Find relation between length of MF and OF with R, l, k.

Problem 3. Prove that the (H) by AB during rotation around the axis (O_1O_2) is the hypeboloit.

2.5. Method 5. Based on figures, blocks or situations in practice, introduce appropriate elements to design the problem to calculate the quantities of length, area, angle and volume of figures, blocks learnt in geometry program at high school

Chapter 3
PEDAGOGICAL EXPERIMENT

3.1. Purpose and organization of pedagogical experiment

3.1.1. Purpose and hypothesis of pedagogical experiment

+ Purpose: Pedagogic experiments assess the feasibility and effectiveness of the methods designing geometry problem associated with the practice and using them in teaching geometry at high schools.

+ Hypothesis:

Hypothesis 1: The measures designed geometrical problems associated with the practice as suggested in Chapter 2 thesis will be high school mathematics teacher support and in which they can design some real geometrical problems associated with practical to use them in teaching geometry at high schools.

Hypothesis 2: If using the geometrical problem associated with design practice has been in teaching geometry the pedagogic experiments class will more interested in learning and applying the knowledge to practices will be better than corresponding control class.

3.1.2. Organization of pedagogical experiment

Activities of pedagogical experiment:

Activity 1: Meet and exchange on the measures in Chapter 2 thesis with 50 teachers of Mathematics Mathematics six groups of six high schools (as described in Section 1.4.2) to ask for comments, reviews price for the proposed measures and ask them to apply measures designed some geometrical problems associated with the practice.

Activity 2: Conduct training four empirical information office pedagogical terms (including two more and two more theoretical

exercises) are warranted to evaluate the feasibility and effectiveness of using the designed geometrical problems associated with the practice.

Time for pedagogical experiment: 1st: From October 12 to November 2, 2013, at the school: High school Cau Giay District, Hanoi; High School in Vinh Bao, Hai Phong; High School Gia Loc, Hai Duong.Lan 2: From October 9 to November 5, 2014, at the school: High school Phu Yen, Son La; High School in Van Lam, Hung Yen; Hiep Binh High School, District Thu Duc, Ho Chi Minh City.

3.2. Lesson plans for pedagogical experiment

We design leeson plan for 4 hour about cylinderical surface (including 2 theoretic and 2 exercise) by intensifying relation between lesson and practice.

3.3. Assessment the results of pedagogical experiment

3.3.1. Assessment results 1

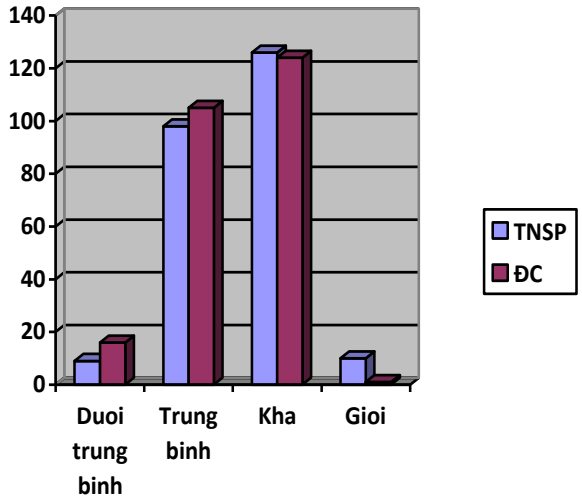
Statistical results consultation results from the 50 teachers on measures design geometrical problems associated with the practical shows: Measures 2, 3, 4 are most of the teachers said that quite new or very new (90%); In that measures 1 and 2 were more than half (50% - 54%) of teachers said that quite feasible; also measures 3 and 4 with 40% of teachers said that less feasible; Some teachers rated "fairly effective" accounted for between 40% and above, "very effective" accounted for between 16% and 24%.

All teachers surveyed (100%) were given at least one geometrical problem associated with the practic. However there are some teachers give all quite similar format. Specially 2/50 teachers offer 4 problems.

3.3.2. Assessment results 2

3.3.2.1. Quantitative assessment through exams

The chart compares the test results after the experiment of the two class



TNSP: pedagogical experiment; ĐC: control ; Duoi trung binh: Substandard, Trung binh: Standard, Kha: Good, Gioi: Very good.

Statistical hypothesis testing: Hypothesis H_0: $\overline{X}_{TN} = \overline{X}_{DC}$. Test results in the pedagogical experimental and control classes are random and not true. For H_1 theory: $\overline{X}_{TN} > \overline{X}_{DC}$. Test results in the pedagogical experimental class higher than that in control class is true. Choose the level of significance $\alpha = 0,05$, the hypothesis H_0 is rejected and H_1 hypothesis therefore can be accepted. Thus $\overline{X}_{TN} > \overline{X}_{DC}$ is true, not random. It means that the teaching method proposed in the thesis is actually more effective than conventional teaching methods.

3.3.2.2. Qualitative evaluation through questionnaires

3.4. Conclusion Chapter 3

Pedagogical experimental results proved the feasibility and effectiveness of measures designed geometrical problems associated with the practice already recommended in Chapter 2; Scientific theories in the thesis is acceptable.

CONCLUSION AND RECOMMENDATION

Conclusion

Today most countries in the world have focused on capacity development objectives for learners, especially thinking capacity, the capacity to solve the problem. Therefore, in teaching mathematics in general, geometry particular, need to enhance their ability to apply their mathematical knowledge and skills into practice through solving situations that arise in life: the capacity to model practical situations assumptions or real-life situations. Teachers need to help students develop the skills that they will use everyday to solve problems, and should help students feel that math is useful and meaningful, to help them believe that they can understand and apply math. However, practice shows that many teachers of mathematics has not paid adequate attention to those tasks, mainly interested in the concept, the pure mathematical clause and the only theoretical problem, make the math becomes boring, not attract students.

Research from works published abroad, we saw a number of countries already have programs, projects, exams connection math with life, such as Programme for International Student Assessment (PISA) and High School Mathematical Contest in Modeling (HiMCM) in the past two decades. In our country, some studies have put into these events, in fact phenomena related to common mathematical knowledge; or interest in the use of means in practical support for teaching geometry, help students explore some of spatial geometrical knowledge.

To contribute to developing the school program, serving educational objectives, we study and propose measures designed geometrical problems associated with practical use in teaching geometry in high school. We hope that our measures may help high school teacher to design geometrical problems associated with practices, contribute to the content of school

education, in accordance with the requirements of fundamental innovation throughout Vietnam comprehensive education in the current period.

We propose five measures designed goemetrical problems associated with the practice and use them in teaching geometry at high schools. Pedagogical experimental results at 6 high schools from many different regions somewhat have demonstrated the feasibility and effectiveness of the proposed methods.

Recommendation

Design geometrical problems associated with the practical in teaching geometry at high schools is very difficult and shortcoming, so that it is necessary to encourage, guide and implement further methods to design and use problems associated with the practice.

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