Methods of developing exercises in teaching Statistics Probability through examples

Cao Hữu Hòa

ThS. Trường Đại học Trà Vinh

Abstract: *Develop a new Probability Problem (PP) from the original PP. The new PP is formed based on the choice of content and form in different appropriate directions. From there, we can clearly understand the meaning of developing new PPs for learners such as: fostering the capability to mobilize knowledge; creating logical thinking about analytical ability; the ability to return strangeness to familiarity; ability to think independently to detect and solve problems, etc.*

Key words: *Statistic; problem, new problem, analysis, synthesis, generalization, analogy.*

1. Introduction

Statistics Probability is the science of measuring the possible possibilities of phenomena in life. From there, it helps us make decisions to solve problems in a reasonable way the lowest risk. Exploiting the PP solved in the documents to develop into new PPs in order to foster learner's ability to mobilize knowledge and the ability to associate with familiarity; creating logical thinking about analytical ability and independent thinking capacity to detect and solve problems. When learners are able to understand PP in various aspects, they will have a more general view of them. By analogy, they know how to create new PPs. Thanks to that, it contributes to developing in them the ability to self- study, self-research and bring their thinking ability to a new level. In particular, it gives them the capacity to detect problems and the ways to solve them. In [1], these competencies were emphasized in the Vietnam - Denmark International Conference on Mathematics Education in the Direction of Competency Approach held at the Vietnam Institute of Educational Sciences in 2014.

2. Content

2.1. Research methodology

Theoretical research on guiding methods to propose new PPs develop-ment methods, refer to related published articles and research topics.

Research the content of PPs and reference materials for Probability - Statistics at Universities that the author collected from websites.

2.2. The study

2.2.1. Concept of developing new PPs

New PP development is understood to come from a PP in the learned materials. Based on the application of teaching thinking with existing knowledge, people propose new directions, through the following activities: analysis, synthesis, comparison, similarity, generalization that they can predict similar PPs, general PPs or PPs contrary to the original PPs. If they are verified correctly, they are PPs developed from the original PPs.

2.2.2. Directions for introducing new PP development methods

In [2], Professor, Dr. Dao Tam, Master. Lam Van Hieu, the theoretical foundation for teaching innovation in the current period is given. Learners are given opportunities to practice activities to foster the following abilities:

- Problem detection capacity and problem - solving techniques through analysis, comparison and generalization activities to develop new PP,

- The capacity to exploit open PPs through the analysis of intermediate relationships in PP,

- Communication capacity to expand the ability to develop new PPs on the basis of using open PPs through coordinated activities to jointly detect and solve problems of new PP

2.2.3. New PP development methods

+ *Method 1*: Transform PPs in learned documents into open PPs for learners to survey and discover new knowledge.

- *Meaning of the method:* when learners work with open PP, they encounter the obstacle of not knowing how to apply existing knowledge and experience to solve problems. From there, there are activities to clarify attributes in the new PP that require them to have judgmental thinking, experiment, and find

solutions. It is this that will enhance their problem detection practice.

- *How to do it:* We can elucidate this method through examples

Example 1: Original PP in [3] is given by C. H. Hoa: There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 90%, the second doctor correctly is 70%. Calculate the probability has *a doctor* accurately diagnose the disease.

PP1.1. There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 90%, the second doctor correctly is 70%. Calculate the probability have *two doctors* accurately diagnose the disease

PP1.2a. There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 90%, the second doctor correctly is 70%. Calculate the probability that *the patient will be diagnosed* correctly.

PP1.2b. There are two doctors diagnosing the same patient. The likelihood of correct diagnosis of the first doctor is 90%, the second doctor is 70%. Calculate the probability of having *at least one doctor* make an accurate diagnosis?

+ *Method 2*: Create opportunities for learners to generalize the PPs they have learned to create new PPs.

- *Meaning of the method:* Exploit the relationship between common and private problems. A particular problem can be contained in many different general problems and vice versa. Therefore, we can start from surveying many specific cases to generalize into general PP. However, in [2], Professor, Ph.D. Dao Tam, Master. Lam Van Hieu show that the generalization of PPs and the creation of new PPs are more general, people seek to prove them in generalized cases and then specialize. When learners practice developing new PP in this way, lecturers can train them in the ability to analyze, compare, synthesize, generalize, etc. Thus, teachers have indirectly trained them in logical thinking, dialectical thinking and creative thinking.

- *How to do it:*

Step 1: Analyze and solve PP

Step 2: Choosing the PP generalization method creates a more general PP. After solving PP, we transform PP by setting more general requirements and the

solution method is still based on the knowledge of the original PP.

Step 3: Set to PP, inspect and adjust (if necessary)

From the original PP Example 1, we can further exploit the hypothesis to use the Bayer's consequence formula.

At that time, we will have the following new PPs:

PP1.3. There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 90%, the second doctor correctly is 70%. If there is a doctor diagnoses the correct disease, what is the probability that Doctor I (or doctor II) diagnoses the correct disease?

Step 1: Analyze and solve PP

Analysis: Two doctors diagnosed the same a patient, so we have two independent events. What if a doctor diagnoses the correct disease? Doctor I "or" doctor II, so these two events are "conflict". Find the probability "private"- doctor I (or doctor II) in the "common"- both doctors. So, we have to use Bayer's consequent probability formula.

Solution: Let A be the event of a person diagnosing the correct disease

Let A_1 and A_2 be the events, respectively, the doctor I and II diagnose the correct disease, Inferred:

$$p(A) = p(\overline{A_1})p(A_2) + p(A_1)p(\overline{A_2}) = 0,34$$

Step 2: You should ask first: Calculate the probability of a doctor diagnosing the correct disease? (general issue). In particular cases: If there is a doctor diagnoses the correct disease, what is the probability that Doctor I (or Doctor II) diagnoses the correct disease?

Step 3: Set to PP, inspect and adjust.

At that time, we will have the following new PP:

PP1.4. There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 80%, the second doctor correctly is 70%. Calculate the probability have *a doctor* accurately diagnose the disease?

PP1.5. There are two doctors diagnosing the same patient. The likelihood of diagnosing the first doctor correctly is 80%, the second doctor correctly is 70%. If there is *a doctor* diagnoses the correct disease, what is the probability that Doctor I (or Doctor II) diagnoses the correct disease?

+ *Method 3*: Development of new PP using analogy.

- *Meaning of the method:* In [2], Professor, Ph.D. Dao Tam and Master. Lam Van Hieu show that

content and form are dialectically unified with each other. It may be the same content, but in the development process it is expressed in many different forms and vice versa. Setting up PP in this form is a very effective measure for learners to solve PP of the same type, improve math solving skills, develop the ability to detect and solve problems; Forge analytical thinking, algorithmic thinking and creative thinking.

- *How to do it:*

Step 1: The problem analysis must find and synthesize the given facts and conditions to guide the solution. After analysis, we will solve PP.

Step 2: We can change PP in the following directions: change given figures; change objects; change relationships in PP; change by increasing or

decreasing the number of objects; Changing new PPs is more difficult.

Step 3: Set to PP, inspect and adjust (if necessary)

At that time, we will have the following new PPs:

PP1.6. Analogization for **PP1.1**. The probability of correct diagnosis of the disease independently by three doctors is $p_1 = 0,8$, respectively; $p_2 = 0,75$ and $p_3 = 0,7$, what is the probability of *a doctor* correct diagnosis of the disease?

PP1.7. Analogization for **PP1.6**. The probability of correct diagnosis of the disease independently by three doctors is $p_1 = 0,8$, respectively; $p_2 = 0,75$ and $p_3 = 0,7$, what is the probability of *two doctors* correct diagnosis of the disease?

PP1.8. Analogization for **PP1.4** in life: There are two doctors diagnosing the same patient. The chance of properly diagnosing Mr.I's disease is about 80%, Mr.II's is about 75%. At that time, if there is a man who diagnoses the correct disease, which man do you think is more talented?

PP1.9. Similarization for **PP1.6.** Three doctors diagnosed the same patient. Each person's ability to properly diagnose the disease is: 80%, 75% and 70% respectively. At that time, if there is a doctor who diseases the correct disease, which one do you think is the most talented?

3. Conclusions

Instructing learners to exploit the solved PP to develop into a new PP requires them to have the capacity to mobilize learned knowledge, detect and solve problems as well as apply basic thinking operations such as analysis, synthesis, comparison, specialization, analogization, generalization.

When lear-ners know how to understand at PP from many different aspects, they will develop analytical thinking, logical thinking and especially creative thinking. To do this well, lecturers need to use PP teaching methods from the perspective of knowledge creation; Focus on exploiting open PP and especially focus on using open problems for learners to communicate and interact in the process of exploring and solving problems; chain the knowledge they have learned so they can mobilize better when necessary; Encourage self-study with goals appropriate to the target audience.

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