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Designing Competency-Oriented Questions in the Subject "Optics" For Physics Pedagogical Students In Can THO University

Tran Thi Kiem Thu
Department of Physics, School of Education, Can Tho University.

Abstract: *The quality of teaching for physics pedagogical students does not depend on the knowledge that students acquire, but on the competence to apply that knowledge in real life and career. The article presents the content of the course-oriented questionnaire "Optics". This is also one of the teaching methods to develop learners' competence, thereby improving competence professionaland applying knowledge to the life of physics pedagogical students.*

Keywords: *Competence, questions, physics pedagogical students, optics*

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I. Introduction

Today, pedagogical students in general and physics pedagogical students in particular must face many challenges because the requirements for professional competence are increasingly changing, for example, they must have the skills and knowledge to implement the new general education program in 2018. Students who study in the traditional way will face obstacles and are unlikely to meet the conditions at high school after graduation. Therefore, university lecturers need to identify and choose appropriate measures to foster the competence of pedagogical students in a practical and effective way, including the use of competency-oriented questionnaires, this gives physics pedagogical students the opportunity to learn and practice through the mobilization of personal knowledge and the use of learning skills such as information technology, self-study, group discussion. Students can implement teaching in the direction of a competency approach for students, they can form professional competencies in other words this is develop knowledge and skills to carry out teaching according to the new general educational curriculum.

Asking questions is an important activity in teaching because it helps learners think [1]. Paul and Elder say that "Thinking is not motivated by answers but by questions; in fact, every field of mind is born of a cluster of questions [2].We have talked a lot about changing teaching methods, but an effective means used in teaching, especially in active teaching methods, has not been properly mentioned: Questions and problems using questions in the teaching process [3].There are 4 types of questions [4]. Asking questions can be used to test knowledge of the past, with questions that require factual answers by asking who, what, where and when. The design also aims to stimulate the learners' thinking.

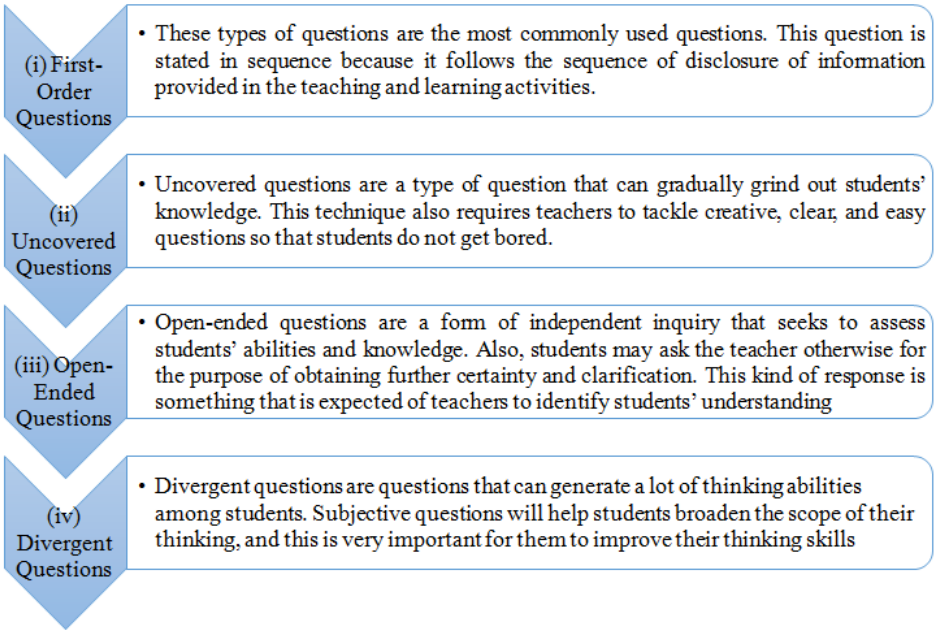

Figure 1: Four types of questions in teaching [4]

II. Content

2.1 Definition of competence

Roegiers X. defines competence as "Ability is the integration of skills that naturally act on the contents of a given type of situation in order to solve the problems posed by these situations" [5, p. 91].

According to Weinert F., "Competence is the sum of acquired or acquired skills as well as the learner's willingness to solve problems that arise and to act responsibly and critically to come to the solution" [6]. Pham Xuan Que proposes specific competencies includingfive skills that learners must acquire after completing an integrated topic: skills to approach problems from different opinions, skills to identify problems to be solved, analytical skills, synthesis and critical thinking. Additionally, there are specific groups of competencies for Physics including competencies related to Physics knowledge, Cognitive Physics, Communication in Physics and Evaluation [8].

A. Competency-oriented questions

Practical studies on questions in teaching draw out the shortcomings of the traditional question as follows [8]:

Table 1: Comparison of traditional questions and competency-oriented questions

Traditional question	Competency-oriented questions
Little change in the construction of exercises, usually closed questions.	Use a combination of different types of questions based on a new problem
Lack of applied reference, transferring learned to unknown problems as well as real life situations.	Learning content is situational, contextual and practical. Learners are determined
Too little frequent review and neglect of the connection between the known and the new	Through questions from lecturers, students have the opportunity to apply a combination of learned and new knowledge to solve real-world problems.

III. Findings

3.1 Building capacity development-oriented questions for physics pedagogical students in the section "Optics"

Competency-oriented questionnaires consist of multiple questions, designed to help students learn about a certain topic. The following example on the subject "Solar energy and spectrum"

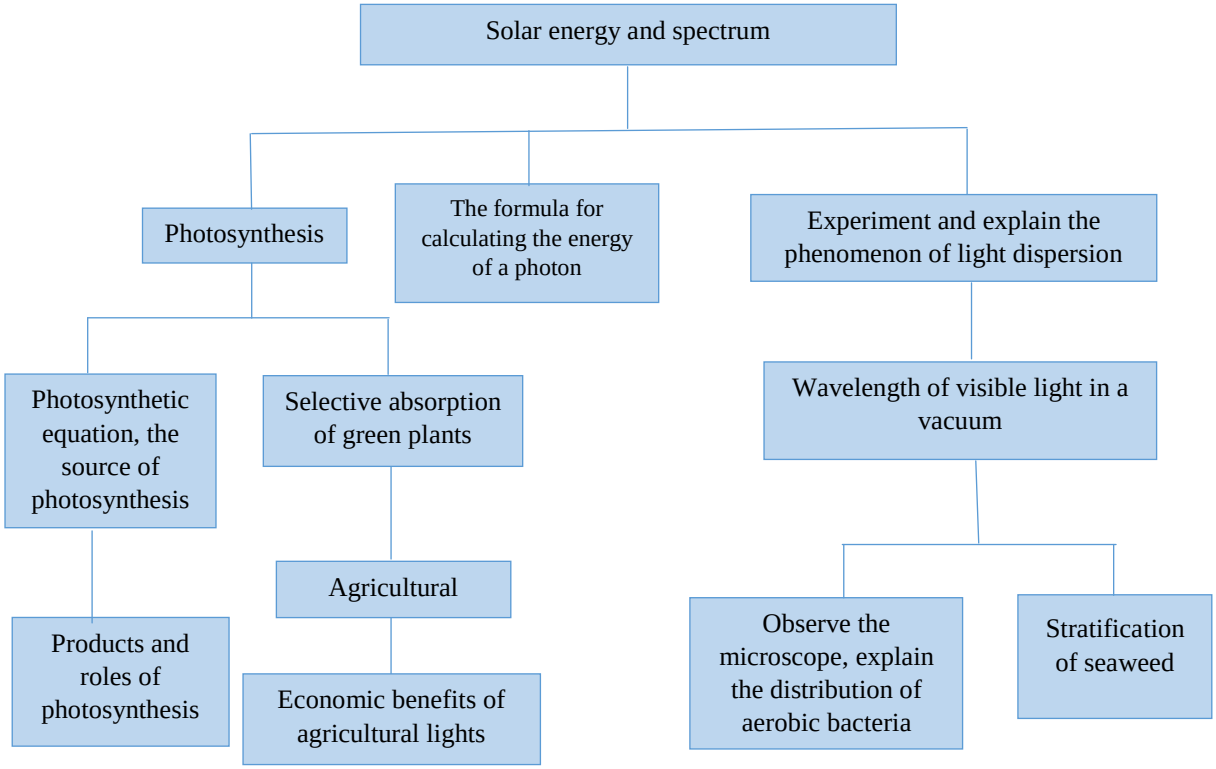

Figure 2: Knowledge tree of course-oriented questions "Optics"

We design according to 3 types of questions from simple to complex: Knowledge-consolidation questions, questions to expand knowledge, knowledge application question.

A. Knowledge-consolidation questions: This question is mainly intended to recall previously learned knowledge and is effective for students to apply old knowledge to answer new questions. For example:

Question 1.1
What is a continuous spectrum? Name two sources that emit a continuous spectrum?

Question 1.2
Suggest an experiment to obtain an image of a continuous spectrum.
a) Tools
b) How to proceed
c) Results obtained and interpretation

Question 1.3
Write an expression for the energy of a photon

Question 1.4
Fluorescent light is produced by which of the following rays?
A. Gamma rays B. X-rays
C. Ultraviolet rays D. Infrared rays

Question 1.5
The compound used to cover the light bulb is a compound of which chemical element?
A. Silicon B. Phosphorus C. Copper D. Silver

B. Questions to expand knowledge: This question has integrated content, students need to apply knowledge of many different sciences to answer, but they are related in terms of content because are designed according to topics, questions related to practice, stimulate students' interest in learning.

For example:When observing LEDs used as artificial light for sprouting plants, one can see that the light is red

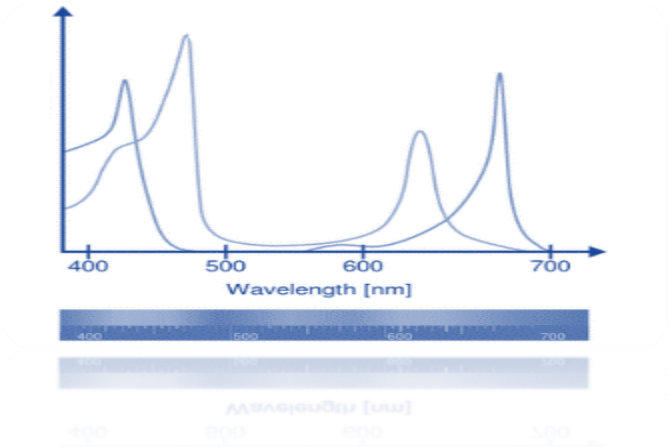

Figure 3. Graph depicting the absorption of green plants

Figure 4. Planting trees using lights

Question 2.1 In which ray region does photosynthesis occur most?
Question 2.2 Explain how to use artificial light to illuminate sprouts.
Question 2.3 Evaluate the use and benefits of the method of using artificial light in crop farms?
Question 2.4 Name some external factors that affect photosynthesis.

C. Knowledge application question: This question is a question built to apply consolidated knowledge and expanded knowledge, contributing to deepening knowledge for students.

For example

Question 3.1 When shining sunlight through a prism on a long filament of algae in a solution with aerobic bacteria (bacteria that grow well in an oxygenated environment), observed under a microscope, it was found that a. Bacteria are concentrated at the ends of the algae. Please explain this phenomenon. b. Is the number of bacteria concentrated at the two ends of the algae the same? Why?
Question 3.2 During photosynthesis, specific chlorophyll molecules absorb red light photons at 700 nm. Know that it takes a minimum of 48 photons to synthesize one molecule of glucose. Calculate the photon energy required to synthesize one molecule of glucose.
Question 3.3 Shines a narrow beam of light consisting of a mixture of four monochromatic colors, inclined at an angle to the surface of the water. Arrange in ascending order of depth penetration of red, blue, yellow, orange rays. The explanation for this arrangement?
Question 3.4 In the great sea there are algae - strange, beautiful plants. Knowing that the algae closest to the surface of the water has the highest chlorophyll content, the easiest to absorb light, so it can absorb the longest wavelength and vice versa. Marine algae have many different colors: green algae, blue algae, red algae, yellow algae. Arrange the order in which you can encounter algae from the surface of the sea to the

bottom of the deep sea. Explain why this is arranged.

Some competencies of physics pedagogical students are fostered through competency-oriented questions
- Integrated knowledge: Physics pedagogical students are trained in interdisciplinary and interdisciplinary knowledge such as Biology and Chemistry.
- Logical thinking competence: Students are trained to solve quantitative or qualitative exercises in competency-oriented questionnaires.
- Self-study capacity: Some of the problems in the set of oriented questions are associated with practice. To solve them, students have to search for other documents.
- Competence in using information technology: Searching documents, drawing student graphs need to use a search engine from the internet, in addition to the textbooks and materials provided by the lecturer or specialized books.
- The competence to evaluate the advantages and disadvantages: draw life skills for yourself, lessons learned, mental training attitude of self-control, self-responsibility and morality.
- Competence to communicate and cooperate: Perform exercises that students need to exchange with other students in the class, in groups or even students in majors such as Biology and Chemistry.
- Experimental competence: Experiments such as using a microscope, adjusting the focus to observe aerobic bacteria are one of the skills to use current tools for students to learn knowledge from set of questions, both helping them to be able to operate equipment to help students become competent.

IV. Conclusion

Teaching according to competency approach using competency-oriented questionnaires brings many benefits to learners, such as developing thinking competence, group discussion,
integrated knowledge, and knowledge application to solve problems associated with practice, besides, overcoming limitations when learning only with traditional exercises. Learners' knowledge increases rapidly, forming competence to meet the requirements and purposes of the training program for physics teachers.

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