UDC 378

BUILDING SOME METHODS FOR ENHANCING CAPACITY OF FIGURING OUT AND EXPLORING THE PROBLEMS OF THERMODYNAMICS TASKS

N. D. Tran

Lecturer,
Military Technical Officer,
Nghe, Vietnam

Abstract. It can be said that capacity to detect and solve the problem plays an important role in teaching the cadets in military schools. The general theory about using the problem-solving methods as well as the suggestions about how to teach cadets in learning General Physics to solve thermodynamics tasks are provided in this article.
Keywords: thermodynamics; problematic situation.

Introduction

With respect to solve difficult tasks efficiently, it can be interpreted as students can not only base on the background understanding not only the professional knowledge. That is to say, the students need to study and explore the problems. Task often contains the problems which need solving; however, these solving problems are unknown, they can bring the students new things that must be explored in creative activities rather than merely recalling activities. "Problem-solving situation" is one thing in which participants face to face the difficulties. In order to solve the problems, students should be aware of them and have potential abilities. In a broader sense, authenticity underpinning the notion of problem-solving tasks is also incorporated into opening new knowledge horizon as well as building active learning attitude for the cadets. Thanks to this, the students can give many good ideas and suggestions for General Physics in class time. This article mentions the "problematic situation" term (related to "students in challenge situation") that indicates the students' mental state when they have to face the problem which needs addressing, they make demands with unknown knowledge, but the good way to solve the problem is not often provided, the students have to self study and explore them.

Types of problematic situations

When the trainees are engaged in active challenges, they will know inadequate knowledge. Thanks to this, the belief of their wrong understanding is broken. Students will be in the following circumstances:

- Choice Scenario: The cadets are in a mood of deliberation, thinking when choosing the most appropriate answer under certain conditions to carry out the problem-solving tasks (the learners need to choose the operating model).
- Unexpected situation: The cadets have a mood of surprise, when facing the problem-solving tasks and will not understand why need something new to carry out the tasks (the learners need building new model).
- Situation with many challenges: The cadets will be in a confused mood, when they don't know how to solve the difficulties feel disappointed (the learners need building new model).
- Inappropriate situation: The cadets will be in an anxiety and suspicion when facing the problems contrary to common circumstance, or the problems with identified results, so it is necessary to have more appropriate reasons (the learners need to have more appropriate model).
- Judgment Scenarios: The cadets feel so confused, when they don't know how to choose the best way to solve the task be-

cause there are too many options. The learners should check and validate the models mentioned.

- Opposition Scenario: The learners are in strong conflict when making a seemingly logical explanation but this explanation derives from low opinions based on unjustified reasons. Therefore, the learners need to ignore bad ideas to finish problem-solving assignments.

The process of finding out and solving problems, the learners can build the deep knowledge of General Physics. The application of knowledge during the process of scientific cognition to instructing problem-solving tasks requires teaching the whole new knowledge as well as organizing effective learning situations. Therein, to be appropriate to new specific knowledge in class time, a situation called "fundamental problem situation" is expected. Because this situation is not only considered the efficient way to urge the students in learning but also it orients the thinking of the subject, in order to stimulate the learners to finding out new thing throughout addressing the underlying situation which can be a continuous process from one situation to another. This is not merely a repetition of the old knowledge as well as not only the re-thinking. This drives from not merely a repetition of the old knowledge as well as not only the re-thinking. In the process of acquiring and practicing, the need to explained physical phenomena is shown up by the invariant correlations between reasonable data which is observable and measurable. Then, finding out the answer to the questions of the quality or the relation to reality that we can guess about their existence which will be the following notes: coming from a feasible experiment allows collecting the necessary information, performing experiments to collect sensory data directly and then by combining inductive and inductive activities to make conclusions.

From the above analysis of the formation of the system of physical knowledge, it is possible to generalize the phases of the process of problem solving, constructing some new physical knowledge with the following scheme: pointing out problems → guessing → making solution and exploit to the problem-solving tasks.

Some methods to develop capacity of solving and exploring the problems of thermodynamics tasks

Method 1: Exploiting and using educational equipments as well as applying traditional methods with modern methods effectively are to create many opportunities for the students to improve their capacity to find out and solve problems.

Method 2: Organize and guide students' learning activities to approach scientific research methods.

- Guide and organize the participants to take part in the pattern (according to Angorit) or the orientation question system.
- Urge the students on physical cognitive methods; practice frequently their thinking activities (logical thinking and dialectical thinking).
- Guide students to self-study to formulate the concepts of physics and construct the laws of the paths that form the law (direct observation, empirical generalization). Thanks to this, the students can improve physical cognitive methods; practice their thinking activities (logical thinking and dialectical thinking).
- Improve the terms of physics, using the knowledge of mathematics in Physics so that the learners can figure out the problems in the process of acquiring new knowledge and apply the knowledge to solve problems in the other technical fields.

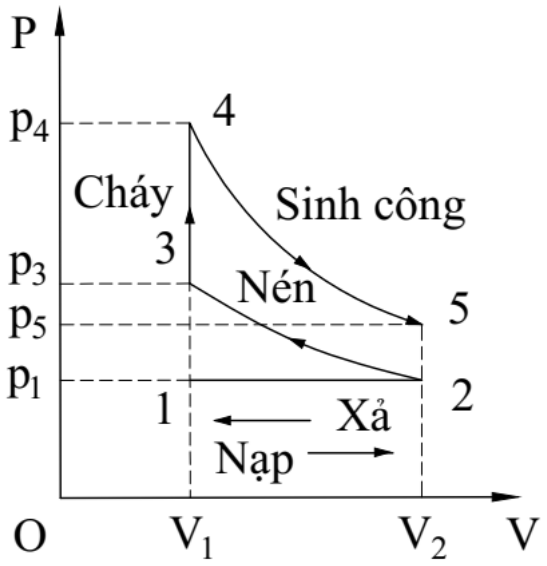
Method 3: Create a positive learning environment for learners during training. Thus, the military school is considered as a learner-centered learning environment which can improve multi-sensory stimulation (audiovisual); orientation of multi-dimensional development (method, cognitive thinking); collaboration, interaction with each other in search of information exchange, information pro-

cessing, information application. The learners can learn new knowledge based on creative thinking by making decisions.

Method 4: Instruct students find out on their own mistakes and correct mistakes, make self-assessment and evaluation of learning outcomes in the research process. Promote the positive and self-control learning styles of students in the study of General Physics as well as in scientific research.

Applying effective methods to the contents of teaching thermodynamics in General Physics.

Nowadays, internal combustion engine operating Nikolaus Otto cycle commonly used in military vehicles of the military technical officer is 4-stroke petrol engines.



1 Nạp = Intake, 2 Nén = Compression, 3 Nổ, Cháy = Power, 4 Xả = Exhaust.

5 Sinh công = work

Thermal-boost coefficients: Hệ số tăng áp khi nhận nhiệt

Compressibility factor: Hệ số nén

Performance: Hiệu suất

For example:

Question: In the ideal Otto cycle, determination of parameters at steps 1, 2, 3, 4; Heat gets Q1 and cycle efficiency. Why are there so many research topics that transform engines in older military vehicles at school from petrol to diesel in the current trend?

Step 1: Problematic analysis (finding out problem, expression of problem)

+ The cadets understand what the problem-solving task is. Which form belongs to? What the cues are given and how to solve the problem.

Step 2: The solution to problem-solving task (identifying the steps and knowledge to solve the problem in the above article).

Step 3: Logical argument (or choosing the correct answer and giving explanation for the problem)

Step 4: Evaluation of the solution (giving the comments on the problem-solving task, presenting some other suggestions of solving the task).

Step 5: Application for new situations in the calculation of Diesel engine performance

Teachers may instruct their cadets to the approach to problem-solving task in the following form:

1. This is a technical mathematical problem of internal combustion engine running on the Otto cycle.

2. To solve the problem mentioned in this topic is to calculate thermology and engine performance. Thus, we need to find the state parameters at the points.

Point 1: $p_1 = 1atm; T_1 = 373K; V_1 = \frac{m}{\mu p_1} RT = 1,06m^3$

Point 2: $V_2 = \frac{V_1}{\varepsilon} = 0,76m^3; T_2 = T_1 \left(\frac{V_1}{V_2} \right)^{\gamma - 1} = 765K$

$p_2 = \frac{m}{\mu V_2} RT_2 = 12,3atm$

Point 3: $V_3 = V_2 = 0,176m^3; p_3 = p_2 \lambda = 19,7atm$

$T_3 = T_2 \lambda = 1225K$

Point 4: $V_4 = V_1 = 1,06m^3; T_4 = 1225 \left(\frac{1}{6} \right)^{0,4} = 600K$

$p_4 = 1,61atm$

Received Heat: $Q_1 = \frac{m}{\mu} C_V \ T_3 - T_2 \ = 2,5 \ p_3 V_2 - p_2 V_3 \ = 328kJ$

Performance: $\eta = 1 - \frac{1}{\varepsilon^{\gamma - 1}} = 0,511 = 51,1\%$

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