METHODOLOGY OF DEVELOPING CREATIVE COMPETENCE IN STUDENTS WITH PROBLEMATIC EDUCATION

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ABSTRACT

It is known that problem solving has a great importance in the study of specific sciences such as Mathematics, mechanics, and Physics. Therefore, while teaching young people to problem-solving, it is possible to cultivate and develop creative thinking in them. The following article deals with the problems and opportunities for the development of creative competence in students through the solution of non-standard problems.

Keywords: Problematic education, problematic tasks, creative competence.

INTRODUCTION, LITERATURE REVIEW AND DISCUSSION

Today, when radical reforms are being carried out in the field of education, the demand for the form and content of education has completely changed. It is also a requirement of the time to develop methods of developing creative competence in the teaching process. A distinctive feature of the development of students' creative competence like other skills develops during the period of activity. So, the main task of the teacher in solving this problem is to look for forms, methods and means of organizing the creative activity of students in the process of teaching Mathematics.

Nurturing creative competence in a person is based on the development of independent thinking. This can be done in the following areas: scientific generalization-induction; ability to apply scientific results to specific problems - deduction; and finally to be able to feel the contradictions between scientific generalizations and processes occurring in nature [1].

Experiences have shown that students have more opportunities to develop independent thinking and, consequently, to develop creative competence by solving problems in Mathematics and Physics. The following article discusses a very interesting task given in Olympiads. Students love such issues, they do not have a clear solution, in other words, these issues are not solved using formulas and therefore become a source of lively discussion. Students' creative competence is further developed by non-standard questions and specific issues. We present below some of the specific issues used to develop students 'creative competence in optimization methods classes [2]

1-problematic task. A rabbit Қ, (1-figure) Oz^1z^2 the beginning of coordinate is $(0,0)$ from z^1 to the arrow $\varphi, -\frac{\pi}{2} < \varphi < \frac{\pi}{2}$ at an angle the unit moves rapidly with unit speed. A fox T, in the same space Oz^1 arrow $z_0^1 > 0$ point is in $(z_0^1, 0)$. Maximal speed equals to 1. Can the fox reach the rabbit?

Solution. According to the task of the problem Қ point $\dot{x} = u$, $\|u\| = 1$; Қ point is moving with legitimacy $\dot{y} = \upsilon$, $\upsilon = \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix}$. As you see Қ -rabbit's movement equation is completely obvious: $\dot{y} = \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix}$, $y(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix}$.

Solving this differential equation under the given initial condition, we obtain:

$$y(t) = y(0) + \int_0^t \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix} d\tau = \begin{pmatrix} t\cos\varphi \\ t\sin\varphi \end{pmatrix}.$$

Now we show you if T-fox $u = \begin{pmatrix} -\cos\varphi \\ \sin\varphi \end{pmatrix}$ moves faster can reach the rabbit. To do this, we solve the following differential equation under the given initial condition.

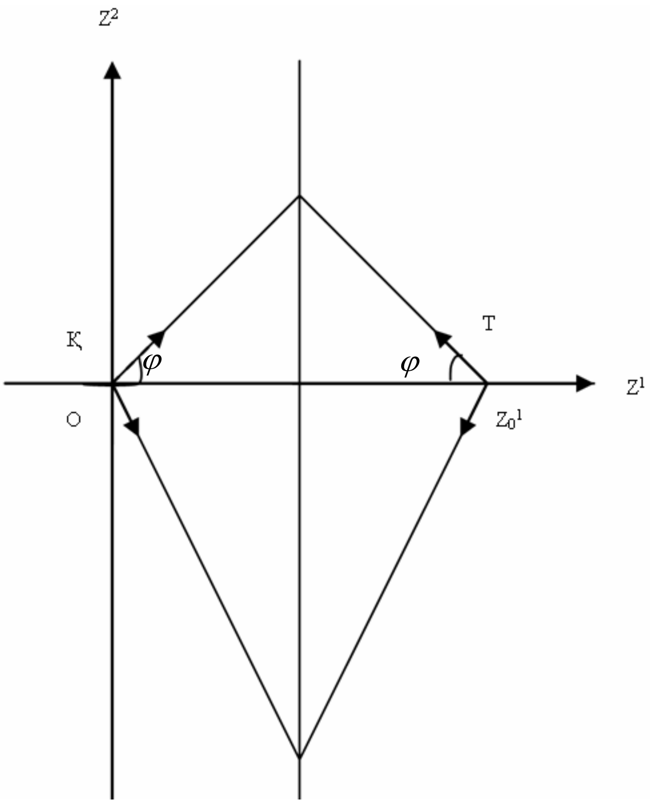

Figure 1.

$$\dot{x} = \begin{pmatrix} -\cos\varphi \\ \sin\varphi \end{pmatrix}, x(0) = \begin{pmatrix} z_0^1 \\ 0 \end{pmatrix}.$$

In fact, solving the equation, we get:

$$x(t) = x(0) + \int_0^t \begin{pmatrix} -\cos\varphi \\ \sin\varphi \end{pmatrix} d\tau = \begin{pmatrix} z_0^1 \\ 0 \end{pmatrix} + \begin{pmatrix} -t\cos\varphi \\ t\sin\varphi \end{pmatrix} = \begin{pmatrix} z_0^1 - t\cos\varphi \\ t\sin\varphi \end{pmatrix}$$

Now we do the changing of z(t)=y(t)-x(t). As we have understood if, z (t) and any t=T(z_0)>0 is equal to zero a fox can reach the rabbit:

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$z(t) = y(t) - x(t) = \begin{pmatrix} t\cos\varphi \\ t\sin\varphi \end{pmatrix} - \begin{pmatrix} z_0^1 - t\cos\varphi \\ t\sin\varphi \end{pmatrix} = \begin{pmatrix} 2t\cos\varphi - z_0^1 \\ 0 \end{pmatrix}$, From this in order to be z(t)=0 to be $2t\cos\varphi - z_0^1 = 0$. By solving the equation we get $t = \dfrac{z_0^1}{2\cos\varphi}$.

T(z_0)= $\dfrac{z_0^1}{2\cos\varphi} > 0$, because according to the task of the problem $z_0^1 > 0$,

$-\dfrac{\pi}{2} < \varphi < \dfrac{\pi}{2}$ and so, $\cos\varphi > 0$. So if a fox moves with a recommended speed $u = \begin{pmatrix} -\cos\varphi \\ \sin\varphi \end{pmatrix}$, at $T(z_0) = \dfrac{z_0^1}{2\cos\varphi}$ time it can reach the rabbit.

1-problematic task. If the first task is fulfilled φ , $\dfrac{\pi}{2} < \varphi < \dfrac{3\pi}{2}$ and satisfied in(Figure 2), can a fox reach the rabbit ?

Solution .Now if Қ- rabbit $\upsilon = \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix}$ moves with the following speed, T-fox $u = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$ speed, any chose of θ , doesn't help to reach the rabbit and we prove it. Really the equation of rabbit motion

$$\dot{y} = \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix}, \quad y(0) = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \text{ we solve,}$$

$$y(t) = y(0) + \int_0^t \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix} d\tau = \begin{pmatrix} t\cos\varphi \\ t\sin\varphi \end{pmatrix} \text{ we get .}$$

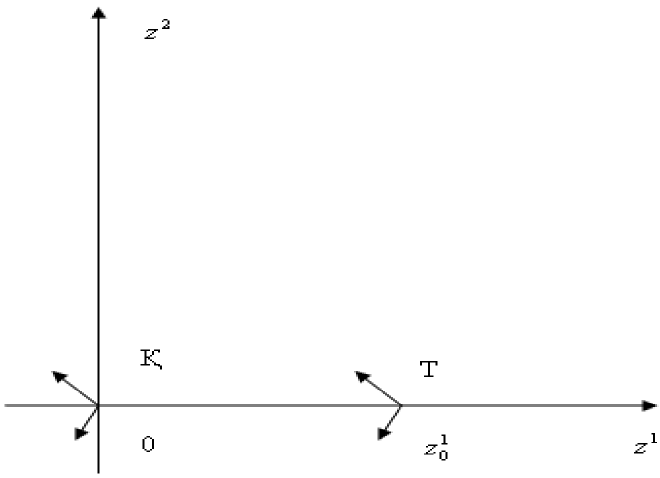

Figure - 2

We solve the same fox motion equation $\dot{x} = \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}$, $x(0) = \begin{pmatrix} z_0^1 \\ 0 \end{pmatrix}$, we get $x(t) = \begin{pmatrix} z_0^1 \\ 0 \end{pmatrix} + \begin{pmatrix} t\cos\theta \\ t\sin\theta \end{pmatrix} = \begin{pmatrix} z_0^1 + t\cos\theta \\ t\sin\theta \end{pmatrix}$.

Now we see the similarities with task 1 $z(t) = y(t) - x(t) = -\begin{pmatrix} z_0^1 + t\cos\theta \\ t\sin\theta \end{pmatrix} + \begin{pmatrix} t\cos\varphi \\ t\sin\varphi \end{pmatrix}$.

The both sides of this equation $p = \begin{pmatrix} \cos\varphi \\ \sin\varphi \end{pmatrix}$ we multiply the scalar by the unit vector, in other words we see $z(t)$ to p we look at the projection of the axis directed along,

$$(z(t), p) = (y(t) - x(t), p) = -z_0^1 \cos\varphi - (t\cos\theta\cos\varphi + t\sin\theta\sin\varphi) + t = -z_0^1\cos\varphi - t\cos(\theta - \varphi) + t =$$
$$= -z_0^1 \cos\varphi + t(1 - \cos(\theta - \varphi)) > 0.$$

Because, $z_0^{'} > 0$, $\frac{\pi}{2} < \varphi < \frac{3\pi}{2}$ is $\cos\varphi < 0$, so $-z_0\cos\varphi > 0$; t Time, $1 - \cos(\theta - \varphi \geq 0$ of them we get $(z(t), P) > 0$, here $z(t)$ non of t>0 doesn't convert to zero, So, a fox can't reach the rabbit.

3-problematic task. A rabbit is moving in a flatland $\dot{y} = \upsilon,\ \|\upsilon\| \leq 1;\ \ y(0) = y_0$, and a fox is moving with $\dot{x} = u,\ \|u\| \leq k;\ \ k > 1,\ \ x(0) = x_0$ legitimacy. Here $\upsilon = \upsilon(t)$ is rabbits movement speed (control), $u = u(t)$ a fox's movement speed (control), and $\|z\| = \sqrt{(z,z)}$ is that, (z,z) – scalar multiplication. If $y_0 - x_0 \neq 0$, at the same time the speed *t* is obvious to the fox, limited $t = T(x_0, y_0)$ can a fox catch the rabbit?

Solution. Lets say $\upsilon = \upsilon(t)$ of a rabbit $\|\upsilon\| \leq 1$ is a voluntary control that satisfies the condition. In that case the fox with $u(t) = \upsilon(t) + (k-1)\frac{y_0 - x_0}{\|y_0 - x_0\|}$ control is able to catch the rabbit, now lets prove it. Here really we get $z(t) = y(t) - x(t)$ by changing:

$$\dot{z} = -u + \upsilon \quad ; \quad \dot{z} = z_0 - (k-1)\frac{z_0}{\|z_0\|} \quad , \quad z(0) = y(0) - x(0) \quad ;$$

$$z(t) = z(0) - \int_0^t (k-1)\frac{z_0}{\|z_0\|}d\tau = z_0 - (k-1)\frac{z_0}{\|z_0\|}t = \frac{z_0}{\|z_0\|}(\|z_0\| - (k-1)t) = 0.$$

Here we get $\|z_0\| - (k-1)t = 0,\ \|z_0\| = (k-1)t,\ \ t = \frac{\|z_0\|}{k-1}$

$$t = T(x_0, y_0) = T(z_0)\frac{\|z_0\|}{k-1} > 0 \ .$$

So, no matter how the rabbit chooses its management, the fox with a control $u(t) = \upsilon(t) + (k-1)\frac{y_0 - x_0}{\|y_0 - x_0\|}$ at $t = T(z_0)$ time can catch the rabbit.

These examples show that students 'creative competence is only activated when they face some intellectual challenge, but the solution to that challenge must be within their intellectual capacity. L.S. Vygotsky noted the importance of developing a learning strategy for the intellectual development of students and said: "Teaching is good only if it goes ahead of development. In this way, it revives and invigorates a number of tasks that are in the process of maturation, close to the zone of development. " [3] Therefore, the preparatory stage is very important in problem-based education. The questions and answers at this stage or the mistakes made in assimilating the given information characterize not only their lack of knowledge, skills and competencies in this area, but also their capabilities, i.e. developmental area, and allow the teacher to identify a number of problems within students 'intellectual capacity. There is a wide range of literature on the analysis of errors and the development of school education strategies in the pedagogy of a number of foreign countries [4].

It is also important to identify creatively gifted students and solve problems on this topic selected from the course of differential equations in the development of their creative activity. At the same time, solving and analyzing these types of issues allows students to develop and nurture creative competence.

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