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Formation of Professional Imagination in the Process of Implementation of Technical Disciplines with the Aid of Modern Information Technologies

Lyudmila BOROVYK[1], Lyudmila MATOKHNIUK[2], Kateryna DEMYANYUK[3], Victoriya Shevchuk[4], Svitlana PIDHAICHUK[5], Oleksandr DANYLENKO[6], Anatolii Halimov[7], Ihor BLOSHCHYNSKYI[8]

[1] Doctor of pedagogical sciences, associate professor, Chair of general science and engineering disciplines department, National Academy of State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, blv_nadpsu@ukr.net, orcid.org/0000-0003-2949-2187

[2] Doctor of psychological sciences, associate professor, Head of the Department of Psychology, Municipal Higher Education Institution "Vinnytsia Academy of Continuing Education", Vinnytsia, Ukraine, lyda1974@gmail.com, orcid.org/0000-0002-6316-2352

[3] Candidate of psychological sciences,

Abstract: The article describes the peculiarities of the use of information technology in teaching the discipline "Descriptive geometry, engineering and computer graphics". SolidWorks in combination with traditional teaching methods was used to develop professional imagination as a necessary intellectual quality of bachelors of the specialty "Road Transport", at the stage of improving the professional and moral and psychological support of the activity of the personnel of the State Border Guard Service of Ukraine (SBGSU). The work combines drawing work on a drawing sheet with the use of information technologies and retains active cadet intervention in the process of creating volumetric images directly in a graphic editor. The paper demonstrates the peculiarities of the cadets' acquisition of practical skills in creating volumetric models with SolidWorks tools and the development of detail drawings. The main criteria for the selection of individual tasks are substantiated: complex nature and clearly expressed geometric orientation. The objects selected for imaginary transformations were simple geometric shapes and volumetric bodies. On the basis of the developed psychological tests the influence of the means of performing technical tasks with the use of a graphic editor on the formation and development of the professional imagination of cadets is determined. The use of SolidWorks Graphic Editor has fostered professional imagination, spatial and logical thinking, and has developed a desire for technical and professional activity which provided the opportunity to perform various technical tasks quickly and professionally and to increase the country's defense capability.

Keywords: *professional imagination; engineers; Information Technology; Computer Engineering; graphic editor of SolidWorks.*

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associate professor, Senior Lecturer of general and engineering disciplines department, National Academy of State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, kozubkd@gmail.com, orcid.org/0000-0002-6566-0435
[4] Candidate of pedagogical sciences, associate professor, Senior Lecturer of general and engineering disciplines department, National Academy of State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, vikashevchuk71@gmail.com, orcid.org/0000-0002-0436-1183
[5] Candidate of technical sciences, associate professor of the department of general scientific and engineering disciplines, National Academy of State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, svitlankayar@gmail.com, orcid.org/0000-0002-9868-6447
[6] Candidate of pedagogical sciences, Head of the Department of Navigation, Danube Institute of the National University "Odessa Maritime Academy", Ukraine, obdan@i.ua, orcid.org/0000-0002-5283-3368
[7] Doctor of pedagogical sciences, professor, Senior Research Fellow, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, galimov-a@ukr.net, orcid.org/0000-0002-4348-4995
[8] Doctor of pedagogical sciences, professor, Head of the English translation department, Faculty of foreign languages and humanities, National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi, Khmelnytskyi, Ukraine, i.bloshch@gmail.com, orcid.org/0000-0003-1925-9621

1. Introduction

Formulation of the problem. The organization of computer-aided training in the teaching of subjects of technical direction of the speciality "Road Transport" influences the increase of efficiency of mastering of knowledge by cadets, promotes the development of spatial imagination, the formation of technical thinking, the prompt fulfillment of technical tasks.

Nowadays, one of the urgent problems of psychological and pedagogical research is the determination of the developing potential of educational disciplines, the search and introduction of modern forms and methods of teaching, in which considerable attention is paid to the formation of psychological processes, in particular, professional imagination as a necessary intellectual quality in the stage of professional and moral improvement, psychological support for the activities of the future frontier officer. Particularly relevant is the issue of preparing bachelors of the specialty "Road Transport" at a higher military educational institution, namely the National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi (NASBGSU) as future defenders of the state border.

The purpose of studying the discipline "Descriptive Geometry, Engineering and Computer Graphics" is to provide knowledge and skills of the State Border Service of Ukraine personnel, that are based on the development of technical thinking, the acquisition of strong theoretical knowledge of the basics of graphical construction of models and engineering objects and basic rules of execution and reading of drawings, graphical models of geometric figures which will be required for engineers to present technical thought through the drawing, as well as to understand the drawing of the principle of electrical circuits or devices.

A cadet who has successfully completed this course should: know theoretical foundations of graphic image construction; basic rules for the execution and reading of technical drawings, the requirements of standards for the execution of graphic, text documents; be able to use the knowledge of a unified system of design documentation (with the help of drawing equipment and skills to perform work drawings and sketches), to apply the methods of graphics in studying the structure and operation of the mechanisms of samples of combat vehicles and technical means of border protection, use SolidWorks Graphic Editor to create drawings and volumetric models of mechanisms. That is why it is very necessary for cadets to apply knowledge of a unified system of design documentation, skills in

SolidWorks Graphic Editor in order to create work drawings, sketches of parts, and read assembly drawings of units of military vehicles, military weapons, automotive equipment and devices.

2. General Background of Research

Analysis of recent research and publications. Qualitative higher technical education in modern conditions of development of technology can not be imagined without the full use of modern computer-aided design systems, the introduction of which is a continuous process from the implementation of elementary tasks, the construction of simple geometric objects to the creation of parts and units of machines, the study of their motion, the prediction of failures and making decisions to eliminate them. The experience of Khmelnitsky National University on the use of computer aided design systems (CAD) in the preparation of mechanical engineers is used in the work. At first it was a 2D drawing (AutoCAD, Compass), and later it was 3D modeling (SolidWorks, Autodesk Inventor, T-Flex). The results of the work on the introduction of end-to-end computer training are presented in the works of university professors (Harzhevsky, 2012; 2014; Silin & Harzhevsky, 2010; Kinitsky et al., 2013; Kinitsky et al., 2014) and in a number of basic researches (Harzhevsky, 2016; Kharzhevskyi, 2015). Engineering tasks of applied character with practical application were performed by the teachers of NASBGSU (Demyanyuk et al., 2016).

Such scholar as I. Bloshchynskyi revealed the significance of informational and communication technologies usage during professional training of future border guard officers who study on specialty «State border security and protection» according to the first (bachelor) level of training of higher education for passing state examinations (Bloshchynskyi, 2017). Some details on these issues, can be also found in the works of M. Karpushyna, I. Bloshchynskyi, V. Zheliaskov, V. Chymshyr, O. Kolmykova, & O. Tymofieieva (2019), dealing with the enhancement of Ukrainian future border guard officers training and using some computer programs to intensify the learning process of these military specialists at NASBGSU of different specialties (Bloshchynskyi, 2017).

Researchers Melnychuk, Rebukha, Zavgorodnia and Bloshchynskyi revealed organization of distance learning and usage of modern informational technologies of students on "Nursing" specialty (2018). Other scholars, namely I. Bloshchynskyi, O. Halus, I. Pochekalin, and D. Taushan described the use of electronic educational and methodological software

packages for improving the preparation of the cadets of NASBGSU for final examinations (2018).

The professional training of military specialists in engineering specialities should be balanced, skillfully and carefully worked out at all stages of cognition, should take into account the peculiarities of their training, so there is a special attention of Ukrainian military psychologists to the process of professional training of future officers. These aspects were reflected in the work of L. Matokhnyuk (2007).

Implementation of European border guards' Common Educational Standards in Ukraine: comparative analysis was revealed in the work of (Balendr et al., 2019). Other scholars presented Ukrainian border guards interoperability assessment in the framework of common European border guard standards implementation (Balendr et al., 2019). The place of imagination in teaching is considered in the research of L. Borovik and K. Demyanyuk (2016). Aspects of the formation of psychological processes, in particular the professional imagination, are reflected in the works of (Maksimenko, 2004; Ivanchenko & Zaika, 2017). The types, techniques, functions, stages of the imagination development are considered in the work of V. Romanets (2000).

Summarizing the results of scientific research in the writings of psychologist (Maksimenko, 2004), it can be argued that imagination is the ability of the individual to: a) generalize images; b) arbitrary manipulation of images (association between objects - association, separation - dissociation); c) transformation of images (comparison, dismemberment, creation of new ones); d) flexibility in the application of existing generalizations.

Aspects of teacher dimensions in technical higher education conducted on engineering students studying at University Politehnica of Bucharest and University Politehnica of Timişoara were revealed in the article of Dragomir, G.-M., Todorescu, L.-L., & Greculescu, A. This study surveyed students' opinions regarding the teacher-student relationship, teacher's role as an evaluator, professional expertise, education in general, personality traits, teachers' roles and managerial skills (2019).

Such scholars as E. Ganea and V. Bodrug-Lungu (2018) focus on inequality in vocational/ technical education by eliminating gender bias. They emphasized the subject of gender-related inequalities in vocational/technical education and how these are influenced by social norms and gender bias. They also discuss the role played by vocational schools as "fuels" for the labor market, develop gender-sensitive competences of teachers in secondary vocational/technical education, eliminate gender bias in the education and teaching process, create a gender-

sensitive environment in vocational/technical schools in Moldova (Ganea & Bodrug-Lungu, 2018).

Another scientists, M. Rodriguez Peralta, J. Nambo de Los Santos and J. Rodriguez Buendia (2018) described socioformation and the formative evaluation in engineering. There investigation describes the effect of implementing a checklist as a medium so that the student acquires knowledge and gives feedback on the process of teaching and learning, promoting the integral formation. It was based on the action investigation, with students of the Career of Engineering on Communications and Electronics of Instituto Politécnico Nacional in Mexico (Rodriguez Peralta et. al., 2018).

In addition, in the process of forming the imagination, it is important to take into account the individual-psychological characteristics of the cadet's personality, in particular the developed observation, which involves activity of attention, productivity of thinking; as well as the perception, that is, the correct spatial location of the object (Ivanchenko & Zaika, 2017; Demyanyuk, 2006). It is also established that the imagination of the border guard cadet is formed in the process of solving their technical tasks in stages, in particular, these are the following stages: a period of intellectual and creative readiness; awareness of the need; the origin of the idea - the formulation of the problem; search for a solution; choice of principle of action; transformation of the principle into a scheme; technical design and presentation of the final result (Borovik & Demeniuk, 2016; Demyanyuk, 2006). The quality of solving the problem contributes to the growth of technical interests related to the emotional and volitional parties: the cadet feels pleasure from the correct completion of the task, it increases its efficiency and productivity; develops aspirations and desires for technical and professional activity. However, the issues of practical recommendations on the application of the new scientific results obtained have not been sufficiently addressed to date.

3. Methodology of Research

The objective of this article *is* to perform a comparative analysis of the levels of development of professional imagination in two cadets' groups of engineers in studying the discipline "Descriptive geometry, engineering and computer graphics" using the SolidWorks engineering program with elements of 3-D modeling and traditional form of drawing on plane.

The experiment hypothesis is that usage of the capabilities of SolidWorks 3D graphics will facilitate the cadets' professional imagination,

namely the ability to perceive images holistically, combine model images, the ability to isolate and synthesize object images, to analyze images. In addition, the electronic environment will provide the formation of characteristics such as aptitude for experimentation, flexibility, connectivity, structural, cognitive activity, independence, increasing interest in the discipline being studied.

To confirm the hypothesis of the experiment, the following methods were used: observation, analysis of the results of control work, analysis of oral and graphical reports, analysis of characteristic errors made by the two groups. Besides, during the experiment, in order to objectively determine the level of professional imagination, the following methods were used, namely:

1. Analysis of current written and oral answers of cadets to the generalization of images of technical, spatial imagination in solving technical problems of the first, second and third type, solution.

2. Observation of cadets' activities at lectures and practical classes in order to identify their spatial, technical imagination.

3. Questionnaire of cadets in order to find out their personal assessment of the level of development of their own spatial imagination, its role in professional activities, etc.

4. Carrying out diagnostic tests, sections and statistical processing of results.

The National Academy of the State Border Guard Service of Ukraine named after Bohdan Khmelnytskyi was the experimental base. The study was conducted using psychological tests for 1st year cadets who studied the discipline of "Descriptive Geometry, Engineering and Computer Graphics" using SolidWorks Graphics Editor and for second year cadets who performed graphic work using traditional imaging techniques. The sample consisted of a total of 30 first year and second year cadets of the Faculty of Engineering. We got the informed consent from the participants of the study. On the basis of the analysis of testing, the assessment of the professional imagination of future border guard officers of the direction of training "Road Transport" in the framework of the pre-experiment design was carried out.

According to the results of the pilot study, two groups were selected among the cadets of NASBGSU in the specialties "Road Transport" and "Telecommunications and Radio Engineering". The groups were randomly selected from the cadets available at the Faculty of Engineering without taking into account their success and technical training Each group studied under different conditions. In one group of the specialty "Telecommunications and Radio Engineering" the educational process was carried out according to the newly developed technology with the use of

Solid Works software, in the other group of students majoring in "Road Transport" the traditional training system was used.

The offered complex of psychological and pedagogical means of forming the imagination in cadets helps to overcome emotional tension in solving complex technical problems, to create positive motives and emotions of success, to realize the need to exert volitional efforts for overcoming difficulties in image manipulation.

Considering the complexity of the development of experimental research tasks and the use of modern methods of their application, reducing the time for examination, the need to maintain the objectivity of the assessment, it can be argued that today the proper level of training cadets can only be done using computer technology.

The use of computer technology in education makes various changes in the development of the personality, which belong to both cognitive and emotional-motivational processes, they affect the character of the person, with an emphasis on enhancing the cognitive motivation of students when working with a computer (Silin & Harzhevsky, 2010). The use of computer engineering technologies in training contributes to increasing the share of independent learning activity and activation of students, "the formation of the learner's personality through the development of his ability to learn, self-study, self-education, self-actualization, self-realization" (Harzhevsky, 2014; Kinitsky et al., 2013).

In psychological research, it is emphasized that ICTs influence the formation of theoretical, creative and modular-reflective thinking of the trainees, that computer visualization of educational information has a significant influence on the formation of the imagination, which is central to imaginative thinking, and the imagery of presenting certain phenomena and processes in the memory of the learner enriches the perception of educational material, promotes his scientific understanding.

4. Results of Research

Computer graphics cover all types and forms of rendering images, both on the monitor screen and on external media (paper, film, etc.).

Computer graphics are used to visualize data in various fields of human activity.

There are three areas of computational graphics:

- pattern recognition;
- transformation of images;
- visualization of images.

By "image" is meant not only a graphical representation of a subject, but also its description in any language, such as mathematical.

Pattern recognition is a method and means of classifying and identifying objects. As a rule, the input is an image and the output a description in a particular language. An example is optical text recognition. Typically, image encoding is accompanied by the loss of some information.

Image conversion is a method and means of changing one look from one image to another. However, the recognition and visualization operations are not performed.

Image visualization is a method and means of graphical interpretation of numerical relations. This includes animation, 3D modeling, and more.

The correlation between these computer graphics directions is shown in Figure 1.

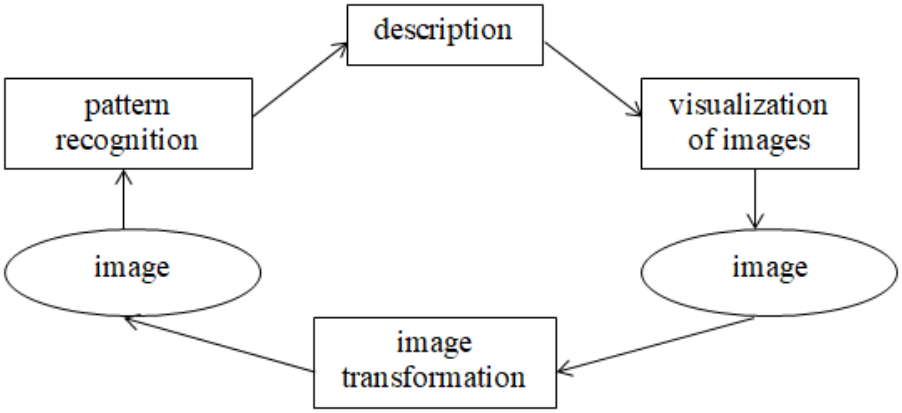


Fig. 1. Directions of computational graphics
Source: Authors' own conception

In general, the application of SolidWorks, which uses the ability to transform three-dimensional graphics in the study of technical disciplines, creates a cadets' imagination, namely the ability to perceive the image in a holistic way, in the imagination to combine model images, the ability to select and generalize images of objects, to analyze the image. In addition, the electronic environment is able to form such characteristics as the propensity for experimentation, flexibility, connectivity, promotes the development of cognitive activity, independence, increasing interest in the discipline under study.

However, working with a finished software product does not always realize the evolving functions of learning, and self-programming requires certain skills and knowledge of the programming language.

The methods of depicting spatial objects on a plane, adopted in descriptive geometry, are used not only in technical drawing, but also in other general technical and special disciplines when solving military-engineering problems by graphical method.

Knowledge of the course "Descriptive Geometry, Engineering and Computer Graphics" underlies such general education, engineering and military disciplines as theoretical mechanics, material resistance, machine parts, repair and operation of automotive technology, topography, border security and engineering.

In order to improve the perception of the material as well as to improve the professional level, for the formation of high-staff cadets, special attention is paid to the integrity of the course, which is ensured by the consistency of the presentation of the material and the interconnection of different sections, their combination with elements of computer graphics.

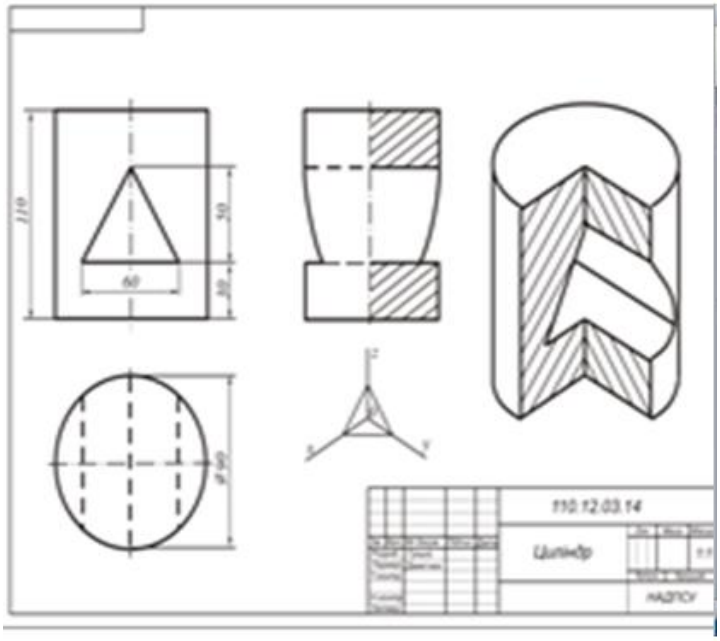
Thus, we are tasked with combining graphic work on a drawing sheet with the use of computer technologies and maintaining active cadet intervention in the process of creating volumetric images directly in a graphic editor. The Solid Works program was used to accomplish this task.

One of the first lessons in the Solid Works graphic editor was a class on Projection Drawing: Building a Line of Intersection of Rotation Surfaces with Polyhedra, which is a transition from the sections of descriptive geometry to the basics of machine drawing. This work was performed by cadets during a classroom training in drawing class using drawing geometry techniques. The next step was to work in a computer class with the use of a graphic editor, which allowed to demonstrate the formation of lines of intersection of objects in space. On the basis of the created model, the cadets formed a working drawing of the detail, taking into account the rules of creation of projection types, sections and drawing of sizes.

The lesson was based on a presentation of work in Solid Works using animation effects. This made it possible to organize the work of cadets for solving geometric problems by a formal-logical method (based on imaginary constructions). To visualize a future model of a given figure on the computer screen, we illustrated all stages of its creation.

It should be noted that the main criterion for the selection of individual tasks was their complex nature. Another criterion for selecting tasks is a pronounced geometric orientation. Because we were guided by the purpose of our research - the development of professional imagination in

border cadets in the course of their general technical training, so the objects we chose for imaginary transformations were simple geometric figures and volumetric bodies. One such task is shown in Figure 2.



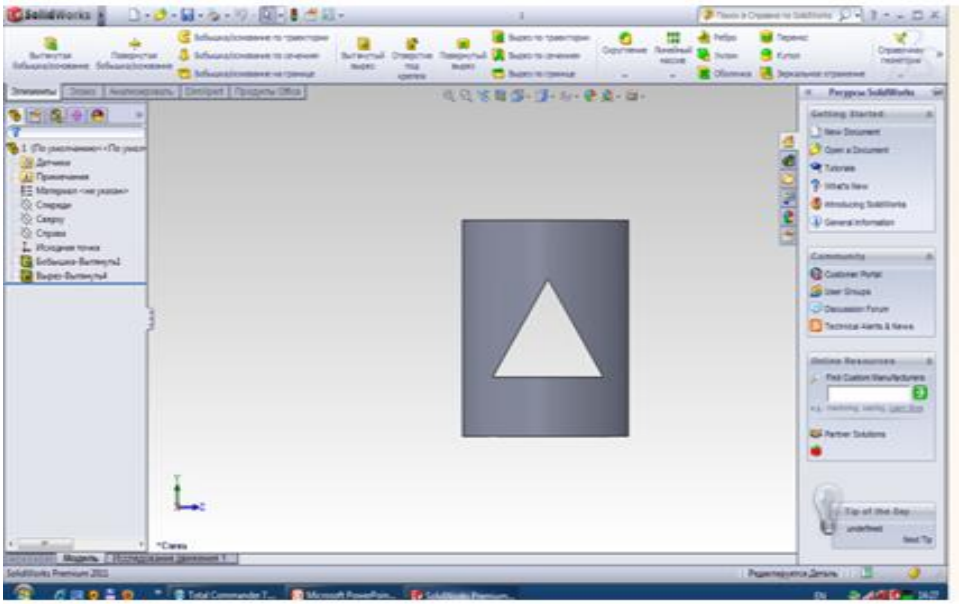


Fig. 2. Model and drawings of the cylinder
Source: Authors' own conception *(screenshots of the author's smartphone)*

The surface of rotation is a cylinder with a through hole in the form of a triangular prism. The proposed task develops the ability to quickly identify the most characteristic features of the object (the most characteristic, meaningful to the imagination - unlike essential, important for thinking) and to find other objects that have both similar and not similar properties while holding in mind several objects at once. These operations form the basis of combining, which is one of the main techniques of the imagination.

Building a line of intersection of surfaces and determining the visibility of points shapes the ability to imagine and predict options for the further development of the situation and provides specific means of comprehensively predicting the possible results of action, which is a prerequisite for making the right decisions.

Thus, the primary purpose of initial computer graphics lessons was to acquire cadets' practical skills in starting and tweaking SolidWorks Graphics Editor, conducting research on SolidWorks tools, creating bulk models and drawing parts. The offered individual tasks allow to develop in cadets the following skills:

- view the imaginary object from different centers of design, keep in mind all the spatial and metric relations in the subject;
- to represent a spatial object, to carry out the ideas of the combination of several bodies, to capture the peculiarities of the location of their elements;
- to imagine in the imagination the synthesis of individual elements into a coherent image;
- perform image transformation;
- perform generalization of images;
- operate images, have imagination flexibility.

During the development of the following lessons with the use of a graphic editor, the ultimate goal of studying the discipline "Descriptive geometry, engineering and computer graphics" was set: the development of design documentation for the manufacture and repair of components of special machinery.

The initial stage of designing models of assembly units was the development of components of units of nature, and the creation of their models in a graphical editor, which allowed to analyze complex geometric shapes of technical details, gave the opportunity to gain practical experience and contributed to the further development of the professional imagination of cadets-border guards (Fig. 3).

Fig. 3. Creating a model node from nature
Source: Authors' own conception *(screenshots of the author's smartphone)*

Creating a model of an individually assigned assembly unit and developing a computer variant of the assembly drawing (Fig. 4) is based on the ability to read assembly drawings of units of military and special equipment units, which requires cadets to generalize professional images and operate them. This task forms in them the ability to operate freely with the features of objects, changing them at their discretion, in order to create fundamentally new images, and this ability is an integral part of the ability to professional activity.

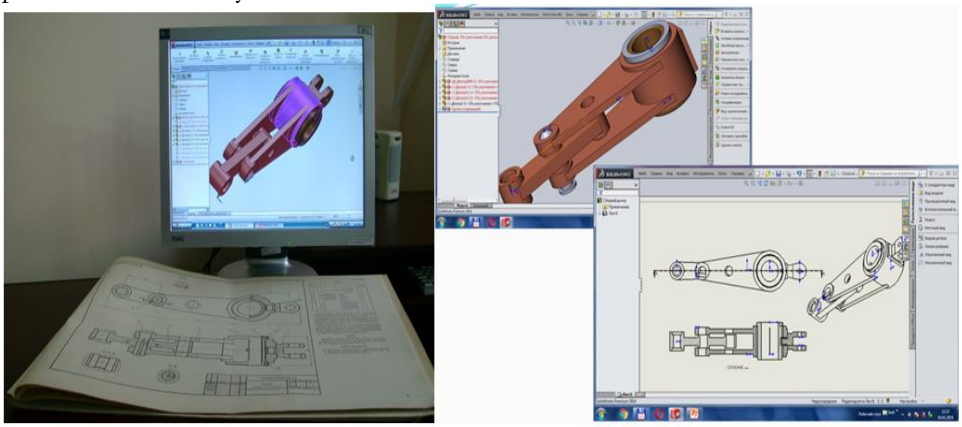


Fig. 4. Creating a model and drawing the assembly unit
Source: Authors' own conception *(screenshots of the author's smartphone)*

Solving the task forms such qualities of professional imagination as its freedom, relaxation, ability to boldly move to new objects and situations. This allows cadets to react in the future, while creating unexpected, unpredictable turns, but clearly strive for the end goal, constantly holding its causes and comparing with it every step of the imagination.

In order to compare the levels of professional imagination development in two groups of cadets, the difference between them was the execution of graphic works using information technologies and using graphic methods of image construction (respectively I and II groups), a test was carried out consisting of a number of technical tasks, which described in (Demyanyuk, 2007). The results of the tasks are shown in Table 1 and Figure 5.

Table 1. The results of the performance of technical tasks in psychological tests for the reproduction of the image of a lacked detail by the first and second cadet groups

Group / task number	Tasks completed (%)						
	1	**2**	**3**	**4**	**5**	**6**	**7**
1	93,33	73,33	80,00	66,67	73,33	60,00	60,00
2	66,67	60,00	46,67	40,00	33,33	53,33	40,00

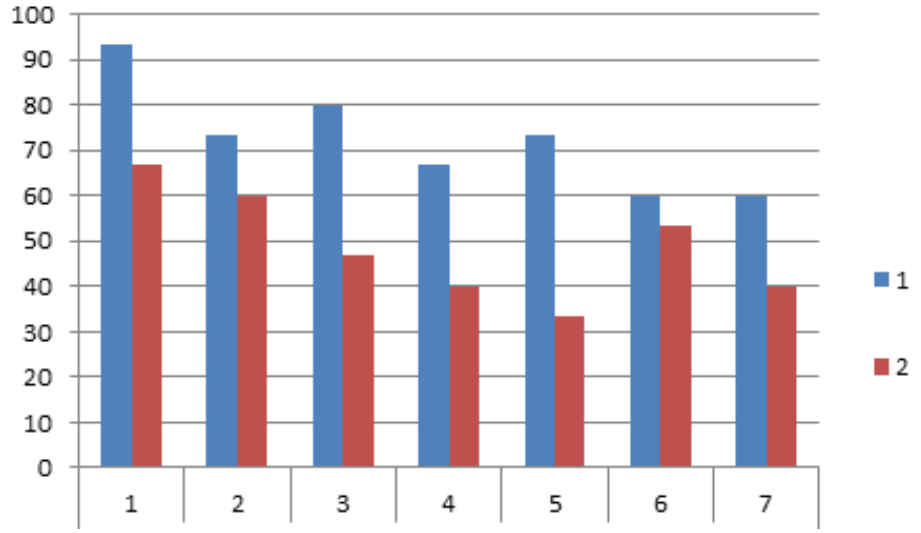


Fig. 5. The results of the performance of the technical tasks for the reproduction of the missing image of the first and second cadet groups
Source: Authors' own conception

Analyzing the cadets' answers and the errors of the first and second groups, it was found that the cadets, in the process of perception, had differently memorized the exhibited form. Some of them grabbed the cutout image whole without breaking it down into separate elements. The result was a coherent image of a given shape, which, with varying degrees of ease and precision, was transformed into the image of the object you were looking for. We were convinced of this by studying the graphical constructions of the subjects.

Cadets could not always explain why they chose this object and not another object. But they easily depicted the complete and basically correct contour of the given shape and, thus, even before the practical test (that is, before testing on a real model) proved the correctness of the image. The performed works indicate that the investigated formed an integral image of a given shape, taking into account all the elements of the cut. The right choice of the right figure gives us good reason to claim that in such investigated and transformed image had a holistic form. The cadets of the second group correctly exposed each element of the profile at the exposure of the given shape, but did not bring the perceived parts to create a coherent image. As a result, the image of the desired part in them was formed fragmentarily.

Therefore, the cadets of the second group, when performing tasks, usually made mistakes related to the selection of figures that look like a detail that exactly matches the concave shape.

Some cadets of the second group relied on a detailed perception when performing tasks. As a result, the image of the desired part was formed incomplete and inaccurate, which led to the wrong choice of figure. The choice of the figures of the cadets of the first group, who admitted similar tasks by the nature of the error, was justified as well. This indicates the typical negative impact of detailed perception on the success of tasks that require the reproduction of a holistic image of the imagination.

The answers and qualitative analysis of the errors of the cadets of the second group shows that in the reproduction of the image of the desired detail, many of them relied on another type of perception, which we called "impulse". The essence of this peculiarity of perception lies in the fact that the cadet during the exposure of the concave shape quickly displayed some one characteristic element of the profile of the hole and tried to find the desired detail behind it.

Analysis of verbal and graphical reports shows that the cause of the errors is largely hidden in the impulsive perception of the cadet, which is why the image created for the desired part had a similarity to the cut in only one, the most characteristic element. However, relying only on certain

features of the part did not ensure the success of the task, since all the parts from which the desired one had a degree of similarity to the given cut. Therefore, in order to accomplish the task, it was necessary to create an accurate image of the cutout and to match it to the figures.

Errors in performing these experimental tasks also occurred in the first group that performed graphical tasks using a graphical editor. However, the observations and analysis of the reports in this group show that the causes of the errors are different in nature from those of the second group.

So, we see that although the both study groups made mistakes in performing tasks, their nature and causes do not coincide. Analysis of oral and graphical reports showed that the first group when performing tasks relied on a holistic perception of a given form with the inclusion of both characteristic performances and openings, and transitions. However, due to the excessive reduction of the time of consideration of the given form or insufficient attention in the individual cadets of this group, the formed image of adequate detail proved to be unstable or inaccurate, which led to errors in the task. It is no coincidence that most of the mistakes of the first group cadets are related to the selection of figures that look very adequate. We are also convinced by the fact that with increasing exposure time of a given shape, such errors were not repeated. The causes of the errors of the second group, are mainly in the detail and impulsivity of perception, resulting in the image of the desired detail in them formed with the predominant selection of only certain elements of the concave shape. If among the additional details were not similar to the one sought in the most different variant, then one could perform the task based on only these characteristic features. This indicates the stability of the features of perception that appeared when creating the image of the item you were looking for.

Analysis of the nature of errors, as well as the reports of cadets shows that the causes of errors in the performance of these tasks depends not only on individual differences in perception, but also on the features of image transformation.

Some cadets only saw a false answer as a result of their practical work. Other cadets of the study groups made similar mistakes, although they could not always depict the contour of the concave shape. They also explained their image by the similarity of the profile picture of the selected part with the image of a given hole. This indicates the identity of the causes of this type of error in all subjects.

Psychological analysis of the materials obtained as a result of these experiments shows that the success of creative, professional tasks that require the manifestation of spatial, technical, professional imagination, also

depends on the relationship of logical and imaginative components in the mental activity of the individual. The main cause of these errors lies in the attempt to complete the task only in a logical way, without imagining the details. However, the characterization of speeches and transitions is not always comprehensible, since for all features in the expression configuration it is impossible to find exact verbal equivalents.

Thus, it becomes apparent that the holistic type of perception has a positive effect on the creation of an accurate image of the imagination.

The use of SolidWorks Graphics Editor enables you to perform a number of tasks for various technical tasks. We have used only the graphic part of the program, and its further use for studying other technical disciplines is an extremely promising area.

Knowledge and ability to use the tools of the graphic program SolidWorks not only develops spatial and logical thinking while solving scientific, engineering and military-topographic problems, but also allows you to perform design work at a high professional level, with greater accuracy, with much less labor, which in the complex leads to a reduction of time for accomplishing tasks. As experience has shown, organizing computer-aided engineering classes has the effect of improving the efficiency of the knowledge of border guard cadets, contributes to the development of professional imagination and the formation of technical thinking. It should also be noted that further development requires the creation of rational domestic teaching programs on the basis of multimedia equipment, as well as their introduction into the educational process of the NASBGSU.

5. Conclusions

The following results were obtained on the basis of the analysis of the developing potential of educational disciplines, search and introduction of modern forms and methods of teaching, in which considerable attention is paid to the formation of psychological processes of research.

Combining graphic work on the drawing sheet with the use of computer technology and retaining the active intervention of the cadet in the process of creating voluminous images directly in the graphic editor contributes to the formation of professional imagination as a necessary intellectual quality at the stage of improving the professional and moral and psychological support of the future border guards. It helps to get cadets hands-on skills in building bulk models with SolidWorks tools, and developing part drawings.

The ways to achieve the ultimate goal of studying the discipline are the development of design documentation for the manufacture and repair of units of special equipment. The main criteria for the selection of individual tasks are substantiated: complex nature; clearly expressed geometric orientation. The objects selected for imaginary transformations were simple geometric shapes and volumetric bodies.

On the basis of the developed psychological tests the influence of the means of performing technical tasks with the use of a graphic editor on the formation and development of the professional imagination of cadets is determined. The use of SolidWorks Graphic Editor promoted spatial and logical thinking, developed a desire for technical and professional activity, allows to perform design work at a high professional level, with greater precision, with much less labor costs and in a complex leads to reduced time to complete tasks and increase defense capabilities of the state.

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