THE METHOD OF ORGANIZING INDEPENDENT EDUCATION USING COMPASS 3D SOFTWARE IN EDUCATIONAL PROCESS

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Abstract

The article is designed to develop methods of using engineering graphics software in the organization of Independent Education of students of professional educational institutions. This article focuses on developing their knowledge related to the field through systematic modeling of engineering independently using Compass 3D software.

An important component of the formation of the competence of the use of electronic resources is the ability of students to develop skills in the use of software products in their professional activities. Therefore, in an integrated learning environment, using Compass 3D software is the development of the skills of independently performing the in engineering by students.

Keywords: *Compass 3D software, empirical research, virtual learning environment, integration, intensiveness*

Introduction

Currently, the process of vocational education, based on innovative engineering programs, is a very important factor in the life of mankind. The use of e-learning in the educational process increases the quality of education and ensures that it becomes better (Olga V. Januschik, 2015). Therefore, in various conflicting situations in the socio – economic aspects of human life, professional knowledge and skills play a key role in making key decisive decisions. Because the rigidity, stuttering and priority requirements imposed on engineering structures have solutions that conflict with economic requirements.

The reason for this conflict is that the economic requirement implies a reduction in costs if more materials are required to meet the following requirements. Professional knowledge of the field is provided by specialists with skills, brought to compromise solutions at the intersection of these conflicting requirements. The main task of the Professional education process is the training of specialists with professional knowledge, skills, as well as their ability to apply modern information technologies in the process of education and production. According to the World Bank's "study for all" data, investment in education will contribute to the development of knowledge and skills of the world population (BEHERA, 2013).

In most of the countries of the world, various obstacles are now emerging in the development of the professional education process. Therefore, this process is to contribute to become a competitive specialist in practice, considering that certain knowledge of students in the field of innovative engineering and information technology as well as their personal qualities is an educational environment focused on development. This integrated learning environment shows that the information being studied by the students correlates with their future scientific activities in the field of technology and construction and their prospects in the society, as well as an indicator of the need to train a competitive person in the process of obtaining quality education. Therefore, at the present time, due to the rise in the popularity of professional education in our country, there is a rapid development of the educational environment, which contributes to the success of their chosen professions and the independent study of electronic resources in the modern innovative educational environment.

In addition to the informatization of the educational process, the main task of innovative education is reflected in the formation of special compensations aimed at the ability to apply professional knowledge, skills in students and the development of their skills in the future professional activity. We must first of all rely on the fact that we cannot introduce a new type of education into practice, that is, without a clear understanding of the processes of its effective use in the electronic environment to listeners and readers. If this process is used purposefully, it can improve the quality of the training process (Luiz Miguel Renda dos Santos, 2015).

Statement of problem:

The aim of the study is to contribute to the research activities on the development of motivation in students in the process of implementing independent education into practice using virtual innovative engineering programs in the process of professional education. The solution to the existing problem in the field of research is to carry out the tasks related to engineering in the Compass 3D program, as well as to develop strategic directions in the

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organization of Independent Education of students of professional educational institutions through it, and thereby improve the effectiveness of the educational process using pedagogical information technologies with the help of

The objectives of the study is to analyze the existing problems in the independent learning process with a comparative comparison of the effectiveness of the research work using Compass 3D software as well as to solve the existing problems. The scientific novelty of the study is that it is determined by the empirical research framework in which the study is oriented towards practice. An important aspect of the study is the increasing social and economic importance of the educational process in the quality of Strategic Education, together with the establishment of a digital learning environment in the development of the individual, society and the state (Rao, 2019). Training of specialists, the level of development of educational – methodical and material – technical base of education is considered important in improving the quality of Education, which increases the efficiency and professional intensity of knowledge of students (Dzhumaevich, 2020).

Life is an unstoppable process towards technology and an electronic government that has all the different components. Electronic education helps elevate the nation and develop the country (Mazen Ismaeel Ghareb, 2015). The problem facing this study is to develop knowledge, skills so that students of professional educational institutions can conduct research in a virtual learning environment using Compass 3D software to perform engineering related tasks in the process of organizing Independent Education.

Research methodology

To organize an independent education requires a certain profession or field of activity, as well as the ability to do this. Through self – education by an individual, he can freely choose the available resources and at any time have the opportunity to use the goals, tools, content (Daniyarovna, 2022).

Scientific innovation in accordance with the development of the individual, society and the state, the social and economic importance of education as a strategic resource is determined by the direction in which the empirical study is put into practice (Fernando Moreira, 2016).

In the process of organizing independent education in Professional educational institutions with the introduction of pedagogical and information technologies, we analyzed the effectiveness of students ' acquisition of knowledge with the help of theoretical and empirical research.

Empirical research is a phrase from the development of necessary practical proposals, recommendations on the basis of the analysis, generalization of empirical data obtained on social life phenomena and processes on a practical basis with new programs and methods.

On the basis of preliminary analyzes conducted on the object of empirical research, a program of analysis of the existing problem is developed. The scientific program is the first necessary document of any practical, theoretical research. The program is aimed at investigating the existing scientific hepateses on the object of the study, as well as the scientific hepateses on the study, the main tasks of which are performed and the statement of the methodological basis of the study is an expression.

There are general requirements of any empirical research program, which include the identification of the main objectives and objectives of the study; the development of the current hypothesis; the use of computer techniques in the application development process, etc.

The subject of the study is one of the major issues of the existing problem. In the same problematic case, there may be several directions that will be the subject of research on a single object of empirical research. In other words, when the subject of the study is formed, scientific hepateses are formed on the ways of solving the existing problem, at the same time, the methods and forms of conducting the research are described.

The object of the study is to understand the social phenomenon, processes and structures oriented to the field. Any research object will have a structural property, mainly a limit of time, space and quantitative measurement. At the theoretical and methodological level of the empirical research program, the choice of the research object is important.

An important aspect of the methodical part of the program structure is the structure of empirical research, the justification of technical processes and techniques.

The structure of the study is a set of private methods, from which it is used for the purpose of gathering and systematizing empirical materials.

Research technique-refers to the unity of specific techniques and expresses the productive and in place use of this or that method.

In the process of conducting practical research, preliminary empirical data are collected using specific research techniques, which include the following research techniques:

Survey method – the convenience of this method is manifested in the fact that the observation and experiment techniques of the study can only be used by teachers in the educational process, while the survey method can also involve short-term trained assistants in conducting the study and with their help cover a large amount of respondents.

The method of observation – only if it provides information about the events that are happening in the current period, the method of the survey directly refers to the respondent, allowing him to get detailed information about the

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actions he has done in the past period and what he is doing now, about his plans for the future. A distinctive advantage of using this method is that to a certain extent the researcher will be independent of the object from which he is conducting the research and will not be subject to it. It has its own scientific value with its object and viability in the scientific data obtained by the method of observation.

Empirical research method is the means of obtaining information and data about an object, processing them in the primary way. Empirical data and facts are then introduced into the theoretical research framework.

The explanation of the data and that enters into the framework of theoretical research leads to thinking,the development of law or principle, technological invention.

Observation as a method of empirical research:

Conversation-method through dialogue-this will serve to strengthen the knowledge of students on the basis of the task given by question-answer;

Presentation is a method that allows students to determine the level of speech and professional knowledge;

Statistics-the processing of analyzed data is the achievement of reliable accurate results using mathematical analysis techniques to prove.

Instrumentation Procedure for data Collection

The scientific novelty of the results is that in order to increase the effectiveness of the independent educational process of students of professional educational institutions, we conducted experimental research at Boysun District 1 Vocational School of Surkhandarya region as an example. In the course of the study, 32 respondents were included in the experimental group and 30 students in the control group. On the basis of empirical studies conducted with the aim of increasing the effectiveness of the independent educational process of students of Professional educational institutions, we defined the following tasks: methodically – purposefully (goals, tasks, approaches, principles); accurately – technologically (stages, content, forms, methods, technologies, tools, pedagogical conditions); efficiency (components, levels, norms and indicators). In order to introduce experimental research into practice, the procedure for participation in the experiment was considered and discussed at the meeting of the first – stage students of Boysun district vocational school No. 1 and teachers of the Department of General – Military Sciences of Termez engineering and Technology Institute. The procedure for discussion, the results of the proposals and decisions given were noted at the meeting (Note No. 12 of March 2022).

Materials and methods

As a result of our research, we organized an 8 – hour training course for students studying at Boysun District 1 Vocational School of Surkhandarya region with the aim of using the Compass 3D program and developing the skills and skills to apply it in an independent educational process. In order to determine the degree of mastering of the students from the Compass 3D program, we analyzed the process of performing their tasks in accordance with the program and showing it through the presentation on the basis of the following formula:

GIWE= (ACR + ARA + AR)/100

ACR–average current rating (the sum of the Daily grades/days of training). These evaluations are the evaluations that students have completed by conducting various surveys in order to determine the degree of mastering of the subject in the process of training;

ARA–the average rating allocated for the independent performance of the task. Average rating, which is allocated depending on the level of performance of the given tasks by the students;

AR the average rating allocated to shed light on the final independently executed project through presentation. An assessment that is reserved for students to defend their given duties through presentation.

Given that the assessment is based on a 100-point system, the total sum to achieve the results obtained at GIWE is divided into 100.

According to the results obtained on the UMP, according to the evaluation indicator: if the high rating is from 2,7 to 3, if the average rating is from 2,2 to 2,6, if the unsatisfactory rating is from 1,8 to 2,1, and if the lower is considered unsatisfactory.

Currently, one of the main requirements in engineering is the use of modern engineering graphics software. Therefore, in the process of our research, let's look at the performance of the given task using the Compass 3D software. This program is widely used in the educational process of higher education institutions, we conducted educational training sessions for students on the use of Compass 3D program for a wide application of this engineering graphic program even in the educational process of professional educational institutions.

In particular, depending on the direction of specialization, the various disciplines taught for them can also be applied in computer science, engineering graphics, computer design and other sciences. In order to learn Compass 3D software, students will first be required to have the skills to create 3D-sized models. But even if there are no such skills, then with the help of this program there will be no serious obstacles to the work of 3D design. Because engineering graphics software has a standard graphical usage interface that is integrated with many Windows, which

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significantly reduces the time it takes to master the program and is thus an easy–to–use engineering graphics software (Víctor Revilla–Cuesta, 2020).

Compass 3D software–this is a program that develops creativity and the ability to perform mathematical analysis. Therefore, students will be required to have theoretical knowledge on the basis of training sessions on working with this program and apply it in practice. To this end, with the help of the Compass 3D program, we can define the following functions for independent educational tasks:

– Create visual of the voltage under the influence of different quantities of forces;

– Demonstrate the benefits of using Compass 3D software to optimize assigned tasks;

– To check the reliability of the results obtained using analytical calculation techniques.

As an example, we will consider the performance of the task on the topic" calculation of the aggregation unit of the Lemex detail to consistency". According to him, we will consider the selection of materials for the Lemex detail and the detail of the fastening plank with the help of a bolt to it and the calculation of its deformation by tension (compression, bending and silencing) under the influence of various forces in the assembly unit. The result of the analytical calculation of the task is the diagrams of voltage and deformation of the lemex detail assembly unit.

Successful performance of these tasks shows that the student is well acquainted with the methodology. When determining various Power Factors, using static analysis, the strength of the detail is checked (Y. Sugimoto, 2016).

The support for the static analysis module allows you to calculate the Lemex detail under the influence of the constant forces and the state of tension and deformation in its assembly unit, and together with this, the lemex detail under the design and the strength of its assembly unit, determine the dangerous parts in relation to the allowable voltages and enter the APM FEM analysis the process is easy to use for designers, and instead of prototypes, there is an opportunity to analyze the project by reducing material costs by generalizing it in computer programs. The additional section of APM FEM analysis is combined with Compass 3D software, which performs static frequency, bending and thermal analysisillarni and let's start it as follows:

1. Enable Compass 3D software

2. In 3D model mode, we build a three-dimensional space model of the Lemex detail and its assembly unit through the application "Sborka", it is convenient to use it, since the objects under consideration are considered to have a simple configurationFigure 1.

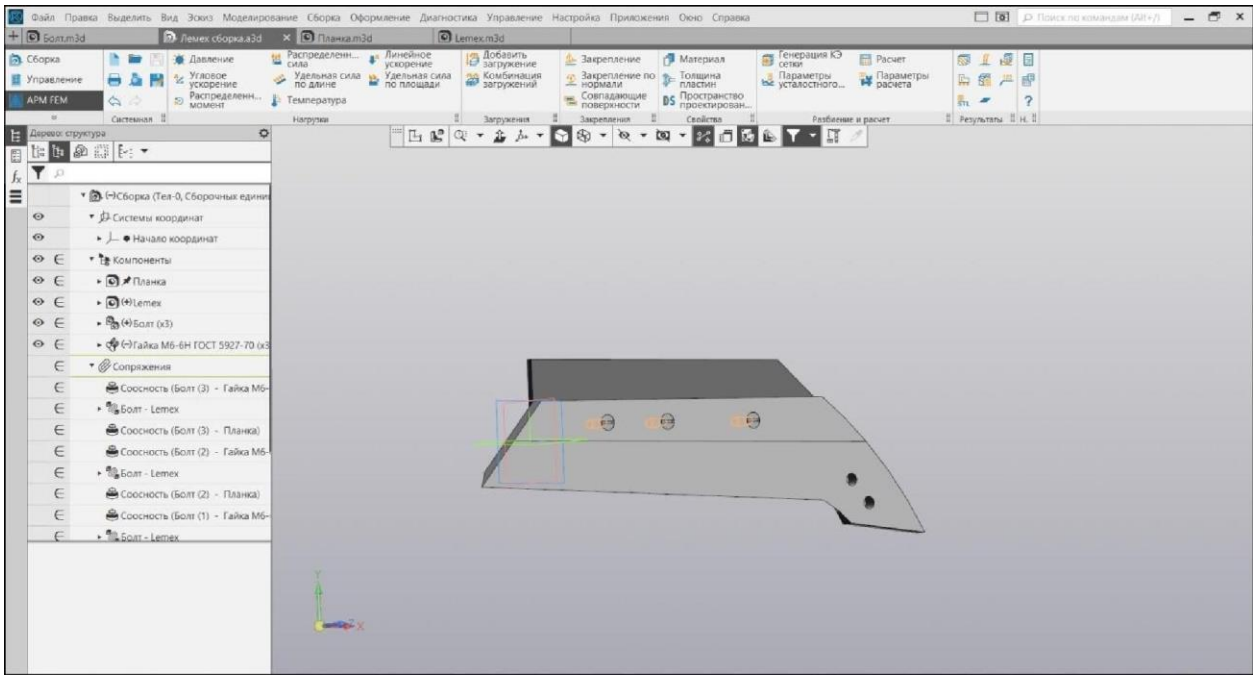

Figure 1:Lemex detail and three-dimensional model of its assembly unit

3. The next step is to select the material from the library of the section “Upravlenie” Compass 3D. There is a wide range of different materials that the program offers, among which we select the material according to the design details assembly unit. The details we are designing the folding unit choose steel alloy materials. Taking into account the high durability, plasticity and adhesive properties for heavily loaded variable parts of the working bodies of the soil processing machines, as a result of heat treatment of the surface layer of samples from 65G steel studied in the experiment, the most effective combinations are increased the hardness using a temperature plasma at a temperature of 300o C (Alimnazarov J., 2020). G in branded Steels (0,90-1,20% Cr, 1,20-1,60% W, 0,80 – 1,10% Mn) has the

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highest tolerability, when refined, it is also deformed and applied for the preparation of large and long Siders for processing soft material (Alimnazarov Alim S. Y., 2021).The characteristics of the materials selected for the assembly unit are given in Tables 1, 2, 3, 4.

Table 1: Lemex detail material parameters

Material	**Type**
Constantvoltage [MPa]	810
Normalvoltagemodule [MPa]	205000
Coefficient	0,3
Density [kg / m^3]	7810
Temperature coefficient of linear kengayishningishning	0,000012
Consistencyincompression [MPa]	410
Stretchendurancelimit [MPa]	209
Torsionendurancelimit [MPa]	139

Table 2:Plank detail material parameters

Material	**Type**
Constantvoltage [MPa]	560
Normalvoltagemodule [MPa]	210000
Coefficient	0,3
Density [kg / m^3]	7810
Temperature coefficient of linear	0,000013
Consistencyincompression [MPa]	600
Stretchendurancelimit [MPa]	294
Torsionendurancelimit [MPa]	150

Table 3: Bolt detail material parameters

Material	**Type**
Constantvoltage [MPa]	235
Normalvoltagemodule [MPa]	200000
Coefficient	0,3
Density [kg / m^3]	7800
Temperature coefficient of linear	0,000012
Consistencyincompression [MPa]	410
Stretchendurancelimit [MPa]	209
Torsionendurancelimit [MPa]	139

Table 4:Material loading information

Name	**Loading parameters**
DistributedPower [N/m]	:X = 0; Y = -300; Z = 0 : 300 N
Distributed Power [N/m]	X = 0; Y = 200; Z = 0: 200 N

4. By generalizing the sample from the additional section of the APM FEM analysis, we determine the change in the mechanical properties of the sample in terms of the directions of the forces acting on it in different quantities 2, 3 – pictures and 5 – table.

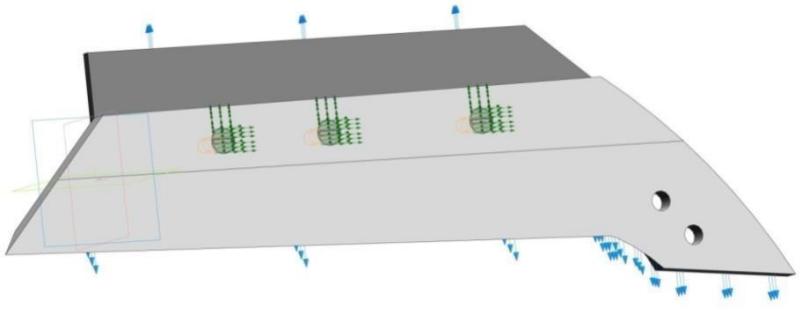

Figure 2:Change of mechanical properties of the sample in terms of directions of forces acting in different quantities

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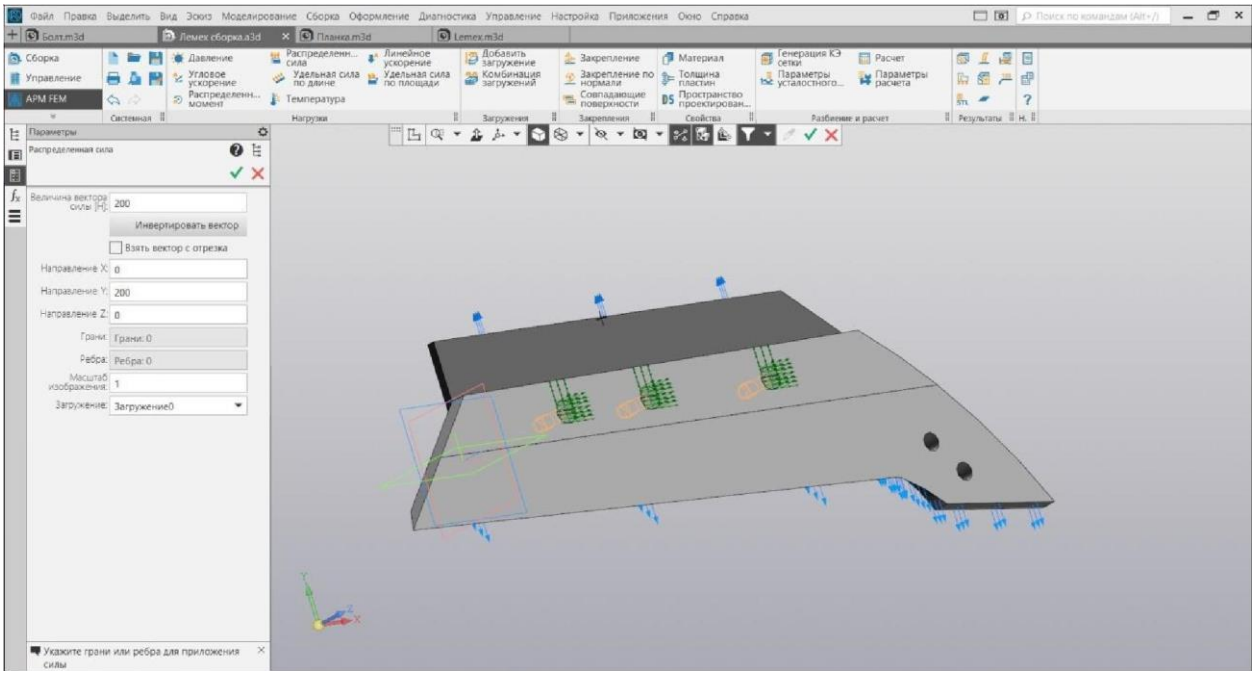
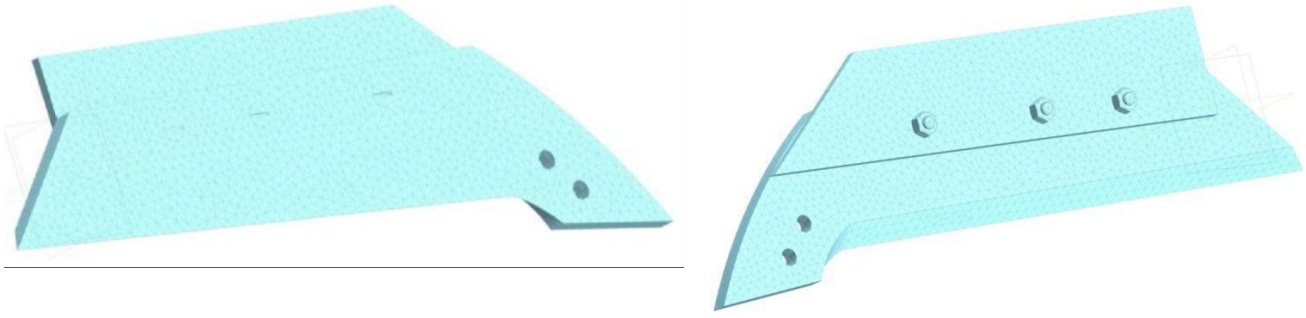


Figure 3:Determine the direction and values of the forces acting on different quantities

5. Comparison of parameters and results in the network of finite elements



a) b)

Figure 4: set of restricted elements.

Table 5: comparison of parameters and results

Name	**Result**
Itemtype	10
Maximum side length of the element [mm]	5
Maximum thickening coefficient on the surface	1
Coefficientofvolumedistribution	1,5
Limitednumberofelements	12901
Numberofnodes	26166

6. Static calculation results 6, 7-tables.Table 6:Inertial characteristics of the model

Name	**Result**
Modelmass [kg]	1.333325
ModelweightCenter [m]	(0.123408; 0.002176; 0.006464)
Inertial moments relative to the center of mass of the model [kg*m^2]	(0.000627; 0.00854; 0.009138)
Reaction moment relative to the center of mass [N*m]	(-1.353334; 0.002172; 3.017054)
The general reaction of the bases [N]	(0.004575; 99.984558; 0.015149)
AbsolutereactionPrice [N]	99.984559
Absolute torque value [N*m]	3.30668

Table 7:Static calculation results

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Name	**Type**	**Minimum value**	**Maximum value**
Equivalent voltage according to Mizesu	SVM [MPa]	0.010854	15.510269
General linear wiper	USUM [mm]	0	0,002981
Reserve coefficient		10	10

7. Results of the calculation of Priority 5, 6, 7, 8, 9, 10 – figure and 8, 9-tables.

Table 8: priority calculation results

N	Reserve coefficient in loss of priority
1	0,000305

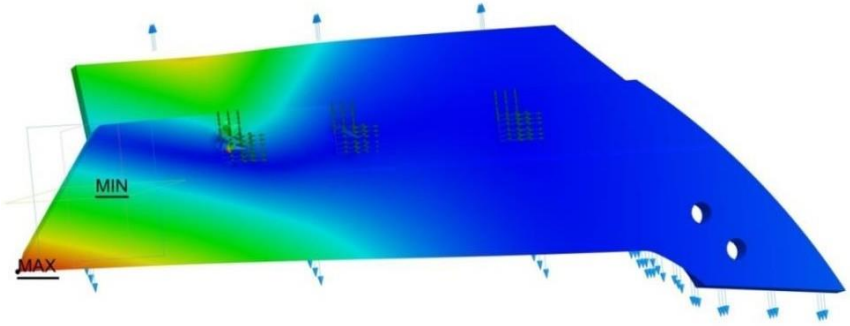

Figure 5:The form in the loss of the first priority

Table 9:Results of the calculation of the private frequency

N	**Chastota [rad/sek]**	**Chastota [Hz]**
1	3929.104425	625.336391
2	8989.189676	1430.673971
3	13475.676472	2144.720522
4	15841.613672	2521.271123
5	17580.910211	2798.088764

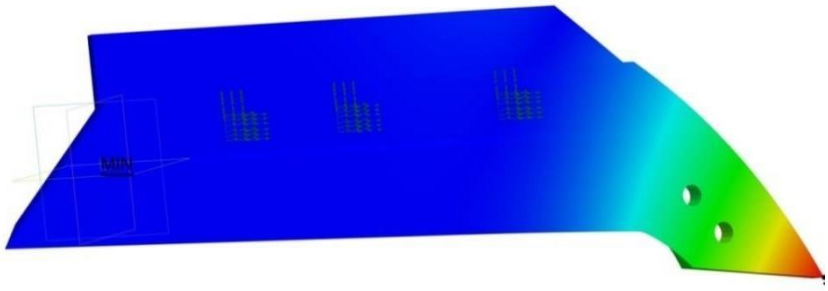

Figure 6:First private swing form

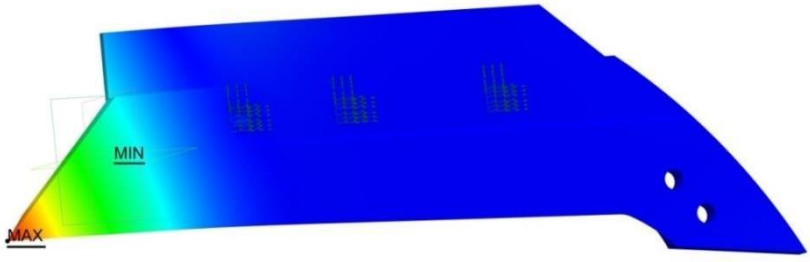

Figure 7:Second private swing form

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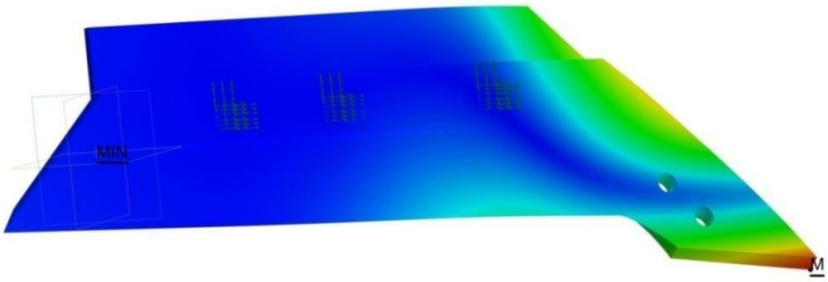

Figure 8:Third private swing form

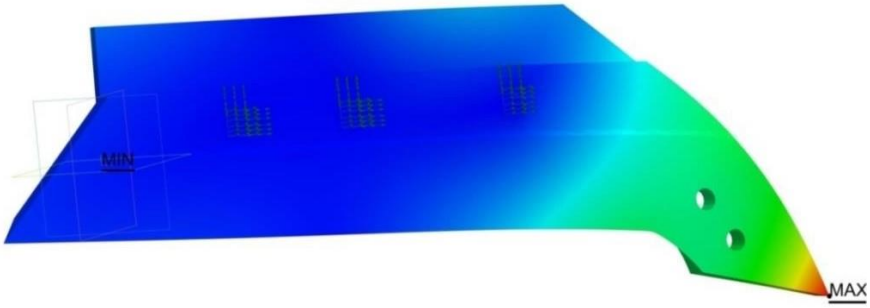

Figure 9:Fourth private swing form

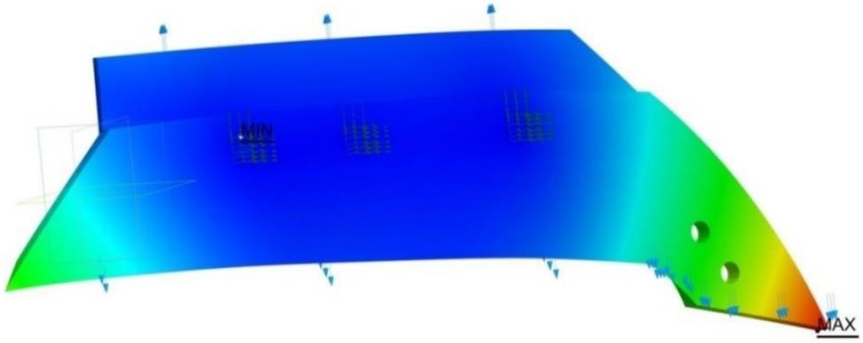

Figure 10:Fifth private swing form

Results

Due to the fact that currently a lot of attention is paid to professional educational activities in our country, it is aimed at contributing to research activities through the development of support in students in the process of performing tasks and practicing using virtual innovative engineering programs in the organization of Independent Education in these educational institutions. The solution to the existing problem on the basis of research is the development of strategic directions in the organization of Independent Education of students of professional educational institutions in the process of performing engineering-related tasks in the Compass 3D program, through which the educational process using pedagogical and Information Technologies is improved with the help of engineering graphics programs. Therefore, in this process, we have organized 8-hour training sessions for the students in order to make the design processes more understandable to the students of educational institutions using engineering graphics programs and to create convenience in the process of mastering the students in order to evaluate the effectiveness of the tasks and research work with the help of the Compass

The most ambiguous and at the same time practical significance in the study are the categories of methods (objectives, content, tools to be used, forms of organization and results) that perform the function of complex, multifaceted and qualitative education of didactics associated with education (Yan Dong, 2019). The process of research was based on the following: methodical-goal (goal, tasks, approaches, principles); content – technological (stages, content, forms, methods, technologies, tools, pedagogical conditions); efficiency–depending on the degree of practical performance of the task in terms of evaluation (components, levels, norms and indicators). The students achieved the development of skills of effective use of practical applications in the use of technical means of storing, processing the results obtained by the Compass 3D program.

In the process of our research, we analyzed the results of the quality indicators of the training sessions conducted by the teacher with the help of the Compass 3D program for the students and compared the independent

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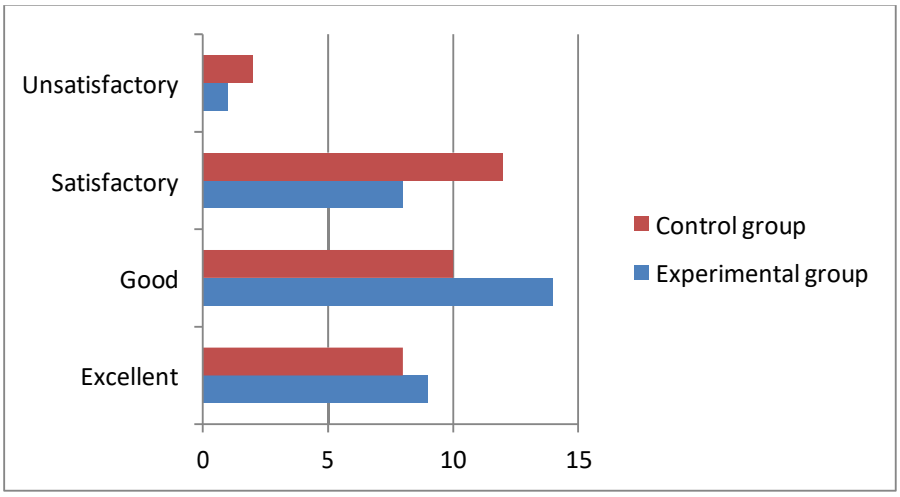
performance of the students of the experimental and control group studying at Boysun district vocational school No. 1.

According to him, the average current rating (daily marks/sum of days of training), allocated for independent performance of the task in the form of a presentation of the tasks performed by the experimental and control group of students using the Compass 3D program, is the average rating (average rating, which is allocated depending on the level of independent performance of the tasks, the average assessment (assessment allocated to protect students ' given duties through presentation)allocated to enlighten the final independent completed project through presentation was summarized and expressed as follows:

Total cost = (daily cost/sum of days of training) + (average cost divided by the level of independent performance of the given tasks by the students) + (average cost divided by the 100 divided by the number of hours the students will be protected by the presentation of the given tasks.

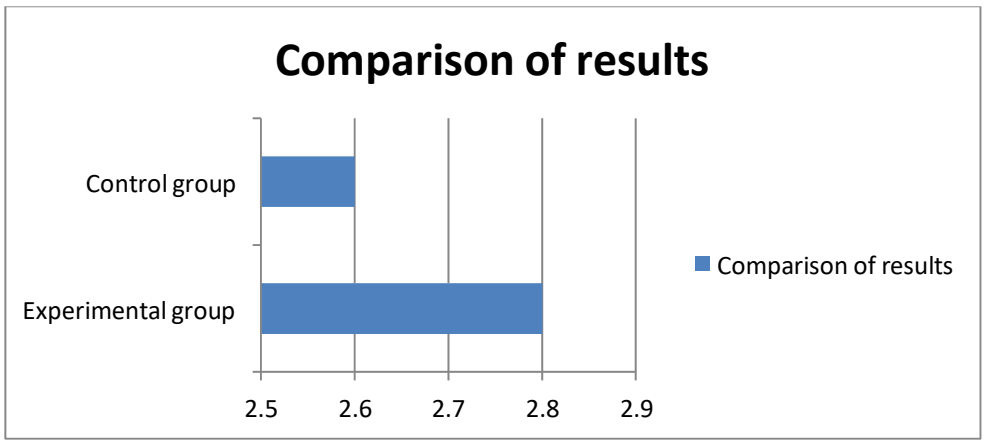
According to the results of the experiment and control group Students, the results of their mastering were compared, the results of the research experimental group showed an effective result compared to the results of the use of the Compass 3D program in the organization of independent training in relation to the results of the control group and were described by the following diagram 1 .



1 – diagram. Indicators of mastering

Discussion

The educational needs for students are diverse, and they include pedagogical technologies, models, strategies, methodologies and updated technological paradigms, imagination of future education, its application in the current education. In particular, in the process of establishing an independent education of students using engineering graphics programs, the average in the experimental group on GIWE reached 2,8. In the control group, however, showed an average of 2.6 results on GIWE 2–diagram.



2 – diagram. Comparison of results

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Conclusion

In the new professional educational institutions, many changes were made due to the content, number and quality of education, the reform of educational programs, technologies. And the implementation of these tasks will ensure a positive solution to the issues of development of the economy, reduction of poverty, finding a worthy place in the life of young people, as a result of which the issues of increasing the welfare of our people will be solved. In this process, cooperation relations between professional educational institutions and higher education institutions have been systematically established and the objectives and priorities of modern professional education system restoration, the new mission of the sphere have been defined. At present, the teachers of the Department of Applied Sciences of the Termez engineering and Technology Institute organized training sessions for students studying at Boysun district 1st vocational school with the help of practical engineering graphics programs of agricultural techniques and their equipment. In the process of educational training, the indicators of Mastering by students were analyzed on the basis of empirical studies. Using Compass 3D software for the experimental and control groups in the research processes, their mastering indicators were compared, and as a result of the use of practical programs, positive results were obtained in the course of lessons and independent education.

Conflicts of Interest

The authors declare no conflict of interest.

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