

Interactive Panel “Newline Trutouch” Usage for Increasing the Efficiency of Training Future Bachelors in State Border Security

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Abstract - The article deals with the effectiveness of the experimental academic program on the discipline “Border Guard Service”, which is a part of the military special disciplines block, aimed at forming sustainable knowledge, skills and abilities of higher education students at the Bohdan Khmelnytskyi National Academy of the State Border Guard Service of Ukraine using an interactive panel “Newline TruTouch”. Among the advantages of this panel are: the ability to model and animate various processes and phenomena; visualization and interactivity; saving time; convenience, etc. It was concluded that following firmware was quite effective: IdeaMax firmware (allow to use the display as a whiteboard, and also to run an electronic whiteboard for writing), Whiteboard (give the ability to insert images, video files, tables, etc.), Multi-Touch technology (to recognize up to 20 touch points on the display simultaneously), Google Earth application (to share experiences, instruct cadets before their leaving for internships and perform tasks as part of the Reserve of the Head of Service and other tasks) etc. It was defined that lessons, which were conducted according to the experimental program, helped to improve the quality and success of cadets training, to master military-applied skills, to develop professional competences, that in general provided the formation of future specialists readiness to fulfill the tasks of the professional activity.

Keywords-- military special disciplines, border guard service, interactive panel, future bachelors in state border security, cadets training.

INTRODUCTION

Modern professional activity of the State Border Guard Service of Ukraine (SBGSU) servicemen is carried out in extreme conditions with a high degree of responsibility for insuring the protection of the sovereignty and territorial integrity of Ukraine at the state border [1; 2; 3; 4; 5; 6; 7]. Conditions of operational and service activities require border guards to have the appropriate knowledge, skills and abilities to perform assigned tasks, as well as to possess professional competences [8; 9].

According to a number of authors [10; 11; 12; 13], the main professional competences of future border guard officers include those that determine their ability to organize service and serve in border details, as well as to organize operational and service activities of border protection unit and to manage the actions of the unit's forces and means in different conditions of the situation. Studies of many scientists [14; 15; 16; 17; 18], decisively state that the formation of professional competences of high level is contributed by the quality of lessons, the use of modern information and communication technologies (ICT) in the learning process and implementation of the best European and international standards for training personnel to a rapidly changing operating environment. Therefore, the use of modern technologies in the training of border guards is one of the main tasks nowadays.

The analysis of literature sources [19; 20; 21; 22; 23; 24] proves that modern ICTs are quite productive when they are used during lessons, and allow to intensify the cognitive activity of students, and contribute to the effectiveness of teachers' activity and students' one.

MATERIALS AND METHODS

The aim of the research is to study the effectiveness of the experimental academic program on the example of military special discipline "Border Guard Service" regarding the formation of professional competences and learning outcomes of future bachelors in state border security, which are necessary for professional activities, using an interactive panel "Newline TruTouch".

In order to test the effectiveness of the experimental academic program (EAP) on the discipline "Border Guard Service", a pedagogical experiment was conducted at the Bohdan Khmelnytskyi National Academy of the State Border Guard Service of Ukraine (NASBGSU) in the 8th semester for cadets of the 4th year of study of the State Border Security Faculty. 49 male cadets took part in the experiment. The experimental group (EG) included cadets who were trained according to the EAP ($n = 24$), and the control group (CG) included cadets who were trained according to the current educational program ($n = 25$). The number of classroom hours for lessons according to the curriculum of the discipline was the same in the EG and the CG.

At the beginning and at the end of the experiment, the indicators of quality and success of training of cadets in the EG and the CG were checked. Verification of indicators of quality and success of training was carried out by means of current control for the purpose of establishment and estimation of level of understanding and mastering of separate elements of knowledge, abilities and skills by cadets during all kinds of academic studies, independent work and an estimation of quality of individual tasks performance as well as for the purpose of assessment of cadets' learning outcomes on the discipline "Border Guard Service".

Methods of checking the quality and success of training of future bachelors in state border security include: written test of knowledge, oral one, conversation, solving practical problems, solving hypothetical situations introduced into an exercise, working out official documents, working in small groups, exam.

Research methods: theoretical analysis and generalization of scientific and methodical literature, pedagogical observation, pedagogical experiment.

The research with the participation of cadets was conducted in compliance with all relevant national regulations and institutional policy (Order of the Head of the SGBSU "On Approval of the Regulations on the Organization of Scientific, Scientific and Technical Activities in the State Border Guard Service of Ukraine" adopted on June 13, 2012, № 440). Informed agreements were obtained from all people who participated in this study.

RESULTS AND DISCUSSION

Scientific progress in the technical equipment of the educational process over the past few decades has significantly transformed modern approaches to teaching. The introduction of ICT in the educational process is facilitated by the emergence of new interactive equipment in educational institutions: multimedia boards, projectors, tablets, set-top boxes, etc. [25]. Different types of interactive equipment greatly facilitate the learning process and provide new opportunities for teaching and learning [26].

Among the variety of technical teaching aids, it is worth to single out the interactive panel which is one of the latest modern digital devices used in higher education. The interactive panel is a device that combines the functionality of a projector, whiteboard, computer, tablet and TV in a heavy-duty shockproof housing [27]. This is a modern device that demonstrates the possibilities of technical progress of the new generation. It combines a significant number of functions and new educational technologies in the teaching of academic disciplines.

Numerous studies have shown that interactive panels have a number of significant benefits for use in education. Researchers [28] emphasize that interactive panels improve the quality of learning and make lessons enjoyable, motivating and interesting. According to their research, the success of students in the digital learning classroom, when an interactive panel is being used, is higher than of students in the traditional classroom. Among the advantages of such devices are: the ability to model and animate various processes and phenomena; visualization and interactivity; saving time; convenience, etc. The use of interactive panels was proved to increase students' motivation and success and facilitate understanding of learning content [21]. The interactive panel is more advantageous in terms of visual learning. The educational software and online resource development are necessary and important for increasing students' attention in the classroom [18; 25]. Due to its characteristics, the interactive panel is considered to be a learning tool with many pedagogical and didactic opportunities. Its use can promote more interactive classroom practice, collaboration and knowledge sharing.

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Regarding the studied literature and taking into account the results of our research, we have developed and substantiated an experimental academic program on the discipline “Border Guard Service” using an interactive panel and its capabilities. Let us consider the features of its application in the EG.

We used the IdeaMax firmware, which allows us to use the display as a whiteboard, and also allows us to run an electronic whiteboard for writing [28]. In the CG the teacher wrote with chalk on a regular “blackboard”. After the free space ran out, he deleted the records. In contrast to the EG, the teacher opened a new “window” of the “Whiteboard” on the interactive panel and continued recording. You can record with a standard set of colors or choose a color from the palette. In addition, it is possible to choose the thickness of the marker. Researchers [26] have shown that this tool provides feedback to the audience, creates a sense of personal touch and support, and provides the right pace of learning.

The ability to insert images, video files, tables, etc. is one of the functions of the “Whiteboard”. Researchers [29] point out that the advantage of such a demonstration is: a single source, no distribution costs, wide and flexible access to content. The multisensory screen allows you to perform any actions with these files: zoom (zoom in or out), move them to a convenient side of the screen, change color, copy, and so on. For example, to explain how to draw up a border protection plan, the instructor uploaded an appropriate form, made notes on it that would be useful to cadet, saved it if necessary or sent it to the cadet, who is connected to the panel by wireless communication. It should be noted that the device allows you to transmit and display images from mobile devices (up to 6 devices at a time). Not only those who are present but also remote participants can demonstrate the data.

Also, the possibilities of the “White Board” concerning the usage of a set of standard geometric shapes (circle, oval, rectangle, triangle, star) as well as a straight line and a line with an arrow were used. This set was used to create symbols using standard modular blocks, which are used for the design of graphic operational and service (combat) documents in the SBGSU and other law enforcement agencies. Amplifiers, modifiers and symbols can be drawn with a help of stylus, which can display information more accurately and efficiently. Taking into consideration that one of the requirements for the application of symbols is to reduce the clutter of circuit patterns, maps, multichromatic and monochromatic electronic systems, it is possible to ‘group’ the developed symbol or composition of signs, and further reduce their size, rotate, move, copy, insert into the desired “window” of “Whiteboard”, etc.

An important element is the use of different colors depending on the affiliation of the symbol, in accordance with the operational requirements, equipment, configuration and viewing conditions.

To ensure the optimal contrast between the symbol and the background of the board, the teacher could change the color contrast, the background color of the whiteboard, fill in the inner area of the sign, etc. It helped to display and assimilate the information displayed on the screen better.

To remind the cadets of the training material, which was considered during previous training session, the relationship between lessons, topics, sections of the discipline “Border guard service”, the function of saving records on the “Whiteboard” and sending training material to separate users was applied. The technology of the device allows to make up to 20 pages of “Whiteboard” at the same time, 8 of these are displayed on the panel. The combination of mobile technology, wireless networks and e-learning technologies provides a wide range of educational opportunities [30].

The capabilities of the Android operating system were used to view the images and explain the order of actions of border details on the circuit pattern to the cadets. Based on the developments of scientists [28] this technique “visualizes” the action, which has a positive effect on the general learning outcome [31]. Images, if necessary, can be scaled (enlarged or reduced), the necessary comments and notes can be made on top of digital content, which is displayed (Fig. 1). At any time, it is possible to return to the function “Whiteboard”, without losing the marks made on the image.



FIGURE.1 THE EXAMPLE OF USING COMMENTS AND NOTES WHEN VIEWING IMAGES

Similarly, this feature was used when watching educational videos: the instructor made the necessary notes on the screen, drew the attention of cadets to the most important things, the group discussed the actions of border guards etc. This technology is quite useful because the group and the instructor share their attention on the screen, which contributes to the discussion, diversification of activities. The instructor's attention is focused on the reactions of cadets, which is an important motivating factor.

Thus, feedback was provided as an important mechanism that can increase learning efficiency. During the lessons on discipline “Border Guard Service” with the cadets of the EG using the capabilities of the interactive panel, the results of the work of individual cadets and teams were displayed in order to discuss their work. Taking into consideration pedagogical practice, cadets make typical mistakes that need to be brought to the attention of the whole study group in order to take them into account and prevent in future.

In this case instructors used the capabilities of the Windows operating system. The results of practical work of several cadets or teams were displayed on the screen using a scanner or video camera simultaneously. Concerning the approaches to group learning, collective performance of tasks in the classroom provides the formation of the following skills: interpersonal communication, leadership, conflict resolution, project management.

Also, the function of simultaneous lighting of several windows was used when there was a need to demonstrate several documents, which should be worked out sequentially, one after another. For example, the border protection plan is worked out by the head of the section of border guard service inspectors on the basis of his decision for the day – the screen simultaneously illuminates the decision and the border protection plan. The distribution of the time of the section of border guard service inspectors per day is worked out on the basis of the border protection plan – the screen simultaneously covers the state border protection plan and the distribution of time per day, etc. According to scientists [28], the display of ready-made documents significantly saves time, especially when solving the problem.

Cadets could graphically display the drawn up plan of border protection on the scheme of a section of border guard unit. Taking advantage of this opportunity made it possible for future border guard officers to create strong causal links between the material studied earlier and the material studied today. Teachers presented their knowledge as problematic, that is open to numerous interpretations. It promotes the creation of causal relationships and stimulated the motivation of the person for further intellectual development, helped to create an environment for discussion of ideas, analysis of their content [19; 26; 29]. The advantage of the interactive panel is that the data on the display was presented not only by the cadets who visited the lesson, but also by distant participants, such as those who are on a business trip.

Multi-Touch technology recognizes up to 20 touch points on the display simultaneously. These capabilities were used to plot the situation by several cadets at the same time to save study time. In fact, the number of cadets who can work on the interactive panel at the same time is limited only by the size of the display. However, in this case there is one limitation: all persons must simultaneously make notes or marks in one colour.

Despite this fact, the ability to work on the interactive panel of several cadets at the same time is an unconditional advantage of this device. Scientists proved [27] that working in a team, a person achieves more than he would if he works alone. Also, the level of self-confidence and teamwork skills are being developed.

To train cadets to put tasks for subordinates, to give an order on protecting the state border, to inquire a local resident, to check a border team, etc., we used the opportunity of recording the cadet's actions with a video camera, playing this record later, discussing the behavior, gestures, business language of the student, whether he keeps standards of border guard service culture, etc. According to scientists [26], it facilitates the exchange of information between sources of knowledge (teachers) and recipients (cadets). Thus, the cadet had the opportunity to see himself “objectively” and draw his own conclusions about his own positive actions or shortcomings. If class time was limited, video files with the cadets' work were stored on a USB drive or sent to their e-mail boxes. Later, in times for self-training or at any other time free from classes, future professionals could watch videos and self-assess their own actions or the actions of colleagues.

With the help of a microphone and a video, video conferences were created, in particular with cadets who left for internships in the units of state border protection, with graduates of the NASBGSU with the purpose of experience exchange, etc. Such a discussion supports the next stage of the educational process - reflective learning, through which you can assess the results of the educational process.

Google applications, including Google Earth application, were used during the Border Guard Service classes. According to scientists (Allen, 1998), the Internet has much greater potential in the learning process than it has while executing its usual function - the transmission of information. It offers educators a new environment for teaching learning material in new and exciting ways of learning that are an alternative to traditional teaching methods. Internet access and the ability to work with information and applications are a significant advantage for both students and teachers [21; 22]. With the help of Google Earth, the teacher demonstrated on the display different sections of the state border (mountainous, sea, river, plain, etc.), border crossing points, controlled border areas, the area of joint forces operation in the East of our country, etc. The image was displayed in both 2d format and 3d one. The aerial and satellite images offered by Google Earth are of very high quality, so you can recognize the state border line, the line of border engineering structures, the location of border units and border crossing points, belt and front roads, access routes to the state border and other detailed information that is necessary for lessons on “Border Guard Service” (Fig. 2). This approach allows users to “immerse themselves” in a virtual environment and experience real-world phenomena [25].

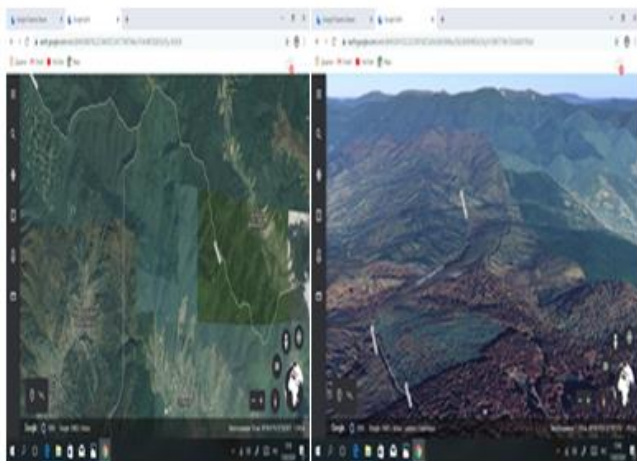


FIGURE.2: THE DIFFERENCES IN THE DISPLAYING OF THE MOUNTAINOUS AND FORESTED SECTION OF THE STATE BORDER IN 2D FORMAT AND 3D ONE

Pictures can be enlarged or reduced, depending on the purpose and tasks set by the teacher during the lesson. In addition, directly on the picture, if necessary, you can draw up the situation with the help of marker, similar to the “Whiteboard”. It is useful for analyzing the tactics of offenders and the actions of forces and means of border guard units and detachments.

Using the interactive panel and Google Earth application, everyone had the opportunity to “visit” any section of the border, assess the physical and geographical features of the area, draw conclusions concerning the tactics of offenders and opportunities of using his forces and means. With the help of photos published by users, you can see with your own eyes the nominal border signs, feel the diversity of the natural landscape of the border, look at the realities of the border guard service in different regions of the country (Fig. 3).

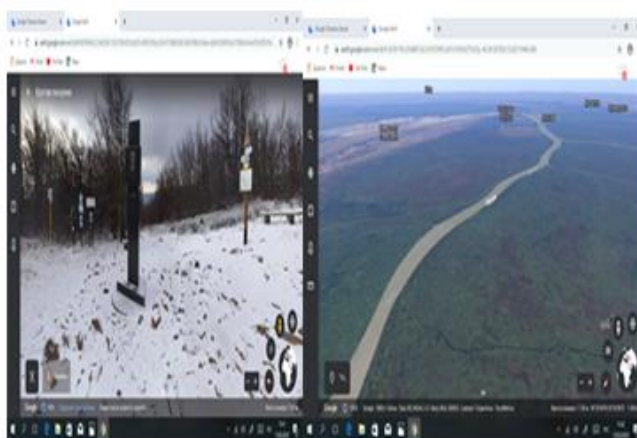


FIGURE.3: DEMONSTRATION OF A PANORAMIC IMAGE OF THE NOMINAL BORDER SIGN “KREMENETS” AND THE RIVER SECTION OF THE STATE BORDER

In order to acquire and improve the professional competencies of future border guard officers, the field center for the educational process provision (FCEPP) of the NASBGSU is actively used. It is there that most of the practical classes of the military and border guard disciplines are held. The interactive panel and Google Earth application were used before the complex practical classes at the FCEPP of the NASBGSU. In the classroom, cadets were trained to organize and carry out professional activities on various positions, from junior border guard inspector to head of the border unit. Later, during field classes at this field center, cadets learned to apply the acquired knowledge and skills in practice directly on the ground. Imitation of aspects of real situations in a virtual environment allows cadets to apply theory in practice [32].

To improve the practical skills of cadets on the eve of field classes a real picture of the FCEPP was highlighted on the display of the interactive panel in Google Earth application, and due to it a visual idea of the conditions under which they had to work in the future was created. The resolution of the display allowed to orientate clearly on the place of the beginning of the lesson, to appoint landmarks and routes of movement, to define the places of hypothetical situations introduced into an exercise, the points of gathering, etc. This feature is especially useful for organizing different types of combat.

With the help of Google Earth application, the instructor explained using a real photo the peculiarities of professional activity on demarcation line, passage of persons and vehicles through entry-exit checkpoints (EECP), actions of interacting bodies and units, etc. The resolution of Google-images allows to distinguish the fortification equipment of the EECP, as well as the artillery shell craters. Google Earth application was also used to share experiences, instruct cadets before their leaving for internships and perform tasks as part of the Reserve of the Head of Service and other tasks.

The effectiveness of the EAP on the discipline “Border Guard Service” using an interactive panel was proved by the fact that during the exam cadets mainly demonstrated the proper level of knowledge of the theoretical material on regulations, which are applied by the head of border guard unit, skills in organization of operational and service activities of border guard unit and in managing them in different situations, the ability to explain their actions as a leader in a particular service situation. Special attention was paid to the level of professional competences of future bachelors in state border security, which was reflected in the general learning outcomes of the discipline.

All cadets demonstrated a sufficient level of knowledge of border terminology during reports and additions. The reports in solving situational tasks were quite complete, the cadets proved that they have a sufficient level of knowledge, skills and abilities concerning themes that were studied. Most of the cadets quickly orientated themselves in the operational situation and made appropriate decisions on the state border protection.

Comparing the dynamics of success and quality of knowledge of the cadets in the EG before and after the implementation of the EAP using an interactive panel, we can state significant changes. In particular, the EG cadets managed to achieve much better results than the CG cadets. Namely, the quality of cadets' knowledge of the EG increased by 20.07% (Table 1). The average score in the EG cadets became 4.24 and it was also higher (0.36).

TABLE 1.
DYNAMICS OF SUCCESS AND QUALITY OF KNOWLEDGE OF CADETS OF THE EG AND OF THE CG DURING PEDAGOGICAL EXPERIMENT

Success and quality of cadets according to the results of the summative assessment	EG (n=24)			CG (n=25)		
	The beginning	The end	Changes	The beginning	The end	Changes
«excellent» (A)	4	7	+3	3	4	+1
«good» (B)	7	8	+1	8	8	-
«good» (C)	6	7	+1	6	7	+1
«satisfactory» (D)	5	2	-3	7	5	-2
«satisfactory» (E)	2	-	-2	1	1	-
success	100%	100%	-	100%	100%	-
quality	70.83%	90.9%	+20.07%	68%	76%	+8%
average score	3.88	4.24	+0.36	3.80	4.00	+0.2

CONCLUSIONS

The results of the pedagogical experiment demonstrated that conducting lessons for cadets of the 4th year of study according to the developed experimental academic program on the discipline helped to improve the quality and success of training, master military-applied skills, form professional competences, which generally ensured the readiness of future bachelors in state border security to fulfil the tasks of the professional activity.

The implementation of an interactive panel “Newline TruTouch” in the process of teaching military-special disciplines to cadets allows to increase the effectiveness of educational and cognitive activities and create interactive cooperation of participants in the educational process, expands and deepens the professional competences of modern border guards.

The study proves the need to change the current academic programs of military-special disciplines taking into account the implementation of modern ICT for the future bachelors' training specializing in state border security, the experience in operational and service activities of state border protection units and detachments and the requirements for future military-professional (combat) activities of specialists for the needs of border guard agency of Ukraine.

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Conflict of interest

Authors have declared that no competing interest exists.

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