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Original article

Impact of threats from the use of modern information technologies on university students' learning outcomes. Part II

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ABSTRACT

The second part of the publication discusses the results of practical research on the impact of threats to the use of modern information technologies and independent Internet-based acquisition of knowledge on the results of students' learning outcomes. It presents the course of empirical research with the methods and tools used. The summary presents the conclusions that arose during and after the research. Attention was drawn to the broad spectrum, which so far has not been covered by civilian students of the hierarchical university. The negative impact of threats on unaware users of modern information technologies is highlighted and described.

KEYWORDS

modern information technologies, Internet, communication, threats

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Introduction

The impact of the risks associated with the application of modern technologies on the students' learning outcomes in a hierarchical university has not, to date, been the subject of broader research deliberations. Moreover, in the authors' opinion, this issue has not been an area of detailed scientific exploration. Therefore, it has become justified to take up this subject and present the results obtained both from the analysis of respondents' opinions and during direct observations. The first part of the study addresses the theoretical layer of the undertaken area of consideration [1]. The empirical research highlighted in this publication will complement the whole and allow obtaining a full picture of the research results related to the dangers arising from the use of modern information technologies and self-acquiring knowledge based on global network resources, which may affect the results of student education [2]. It is also worth noting that the everyday use of modern technological solutions is somewhat related to the possibilities of exchanging information directed to young people, who naturally follow the trends in the development of modern technology, both related to devices and software with increasingly sophisticated functions dedicated to interpersonal

communication, on an ongoing basis. Given the above, one of the consequences of technological progress is the possibility of using them to disseminate education and knowledge [3; 4]. Hence, it has become crucial to determine the general nature of threats during the use of modern technologies and their impact on the increase or decrease in the knowledge level obtained through them. Their generation was the basis for further work aimed at answering the question contained in the main research problem: *what is the impact of threats from the use of modern information technologies on the university students' learning outcomes?*

The course of the research process required the use of various research methods [5], including empirical ones, whose results are presented in this work.

The course of empirical research

In the first part of the study, the authors emphasized that opinions and judgments were examined using a questionnaire survey to obtain objective results. It was anonymously completed by civilian students of the Military University of the Land Forces of the faculties of National Security and Security Engineering in 2019, thus before the COVID-19 pandemic and the spread of remote learning. A total of 62 respondents answered the questions contained in the survey: 21 students of second-cycle studies (master's degree, 2nd year of study) and 41 students of first-cycle studies (2nd to 4th year, undergraduate and engineering studies). According to the authors' estimates, the above constitutes about 50% of the total number of civilian students of the Faculty of Security Studies. Therefore, the authors considered them to be credible. The adopted restriction was the fact that the opinion survey deliberately omitted civilian students of the 1st year of study of the two afore-mentioned faculties, who had not yet had experience with the use of modern information technologies at the university. Besides, one of the significant limitations of the surveys was that military students, who are candidates for professional soldiers, were not included in the survey, which is regulated by separate regulations on military service. Below are presented the research results collected from answers given to 17 successively discussed questions included in the questionnaire and the conclusions of the Authors' Team.

Question 1. Gender:

a) Male; b) Female.

The entire survey was attended by 62 respondents: 33 women and 29 men (Figure 1a). The percentage of people surveyed is shown in Figure 1b.

The results obtained from the answers given indicate that women slightly prevailed in the group surveyed with the questionnaire sheets, and it was they who constituted a larger number of civilian students in the previously indicated fields of study of the Faculty of Security Studies.

Question 2. Age:

a) up to 25; b) 26-35; c) 36-45; d) 46-55; e) 56 and more.

The respondents' age and their percentage share are shown in Figure 2a-b.

The data obtained clearly indicate that more than 98% of students are young people up to the age of 25, although there is one person over that age.

Question 3. How often do you use access to new technologies? Please provide one answer:

a) rarely; b) every second day; c) every day.

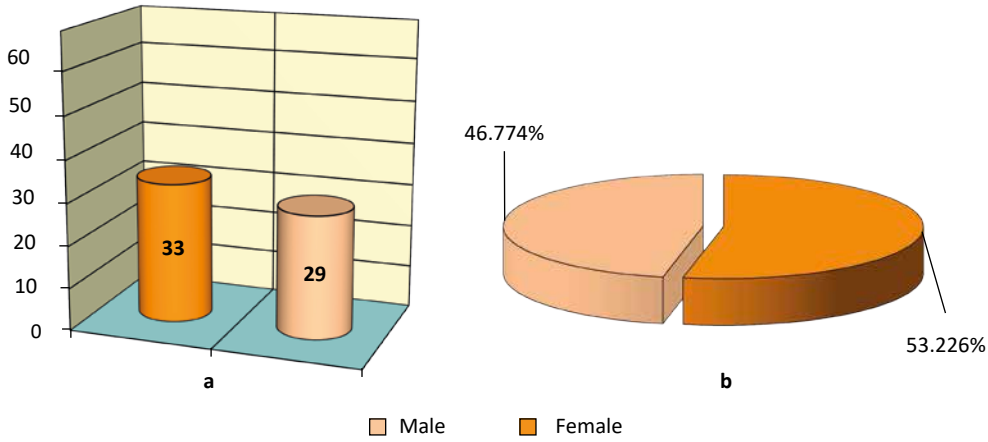

Fig. 1. Quantitative value (a) and percentage value (b) of answers to question 1: Gender
Source: Own study.

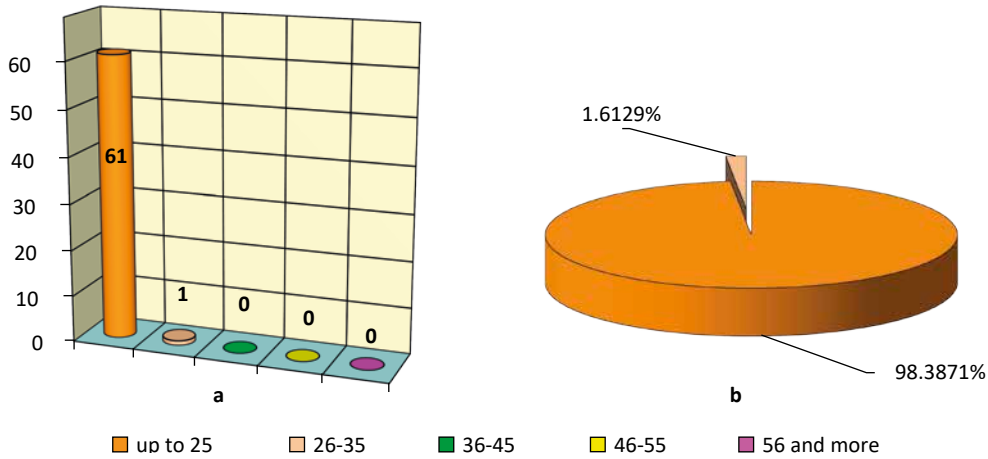

Fig. 2. Quantitative value (a) and percentage value (b) of answers to question 2: Age
Source: Own study.

The results of the surveys for question 3 are shown in Figure 3a (quantitative value) and Figure 3b (percentage value). The main conclusion is that more than 95% of young people use access to new information technologies every day. For them, this is part of a generally accepted standard of operation related to the widespread use of modern ICT infrastructure and the use of data transmission via the global Internet.

Question 4. How much time do you spend using new technologies? Please provide one answer:

a) up to 2 hours; b) up to 3 hours; c) up to 4 hours; d) up to 5 hours; e) more than 5 hours.

The answers to Question 4 are presented in Figure 4a (quantitative value) and Figure 4b (percentage value).

The analysis of the data in Figures 4a and 4b shows that 87% of students spend more than two hours a day browsing the Internet, of which as many as 41% use the global network for

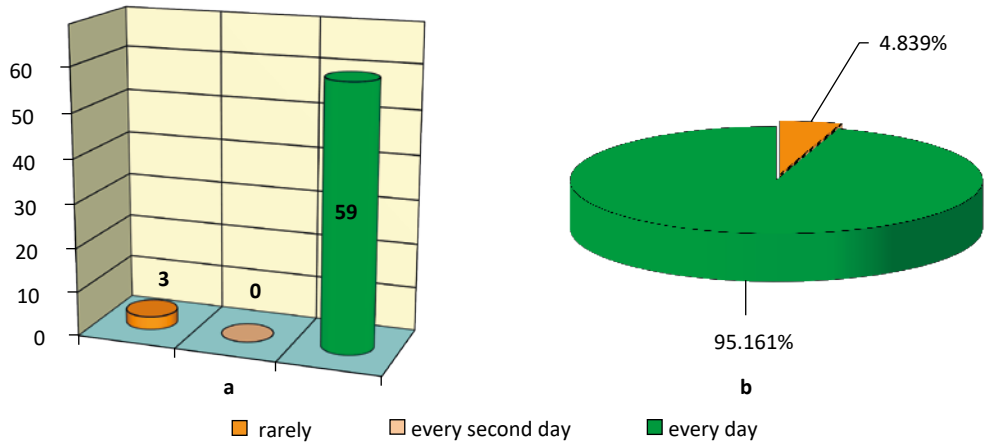

Fig. 3. Quantitative value (a) and percentage value (b) of answers to question 3: How often do you use access to new technologies? Please indicate one answer
Source: Own study.

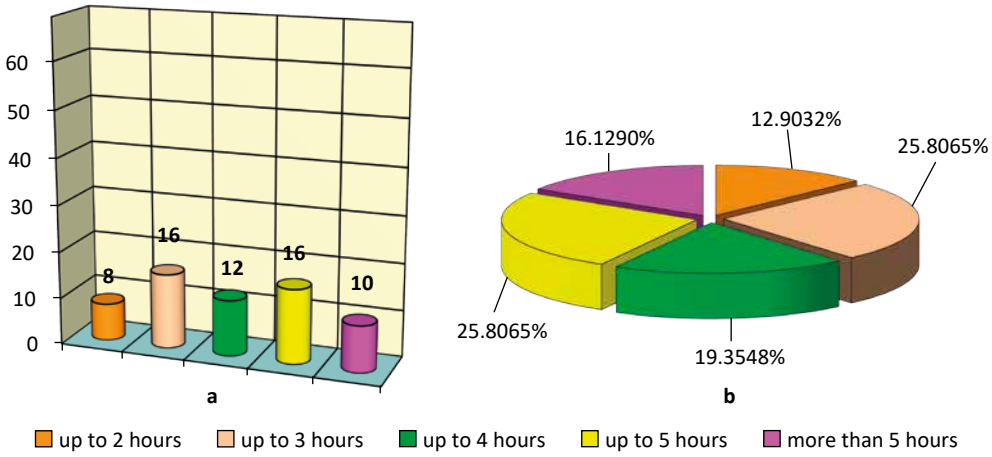

Fig. 4. Quantitative value (a) and percentage value (b) of answers to question 4: How much time do you spend using new technologies? Please indicate one answer
Source: Own study.

more than four hours a day, and more than 16% of them for more than five hours. The authors are convinced that the above is not only due to students' involvement in learning and broadening their personal interests, but also to their existence in social media or the search for entertainment.

Question 5. Having access to the Internet, multimedia platforms, and other technologies, do you enrich your knowledge in the field of study? Please provide one answer:

a) yes; b) no; c) no opinion.

The answers obtained to question 5 are presented in Figure 5a (quantitative value) and Figure 5b (percentage value of people broadening their knowledge).

More than 4/5 of the civilian AWL students declare that having access to the Internet, multimedia platforms, and other technologies, they enrich their knowledge in the field of study.

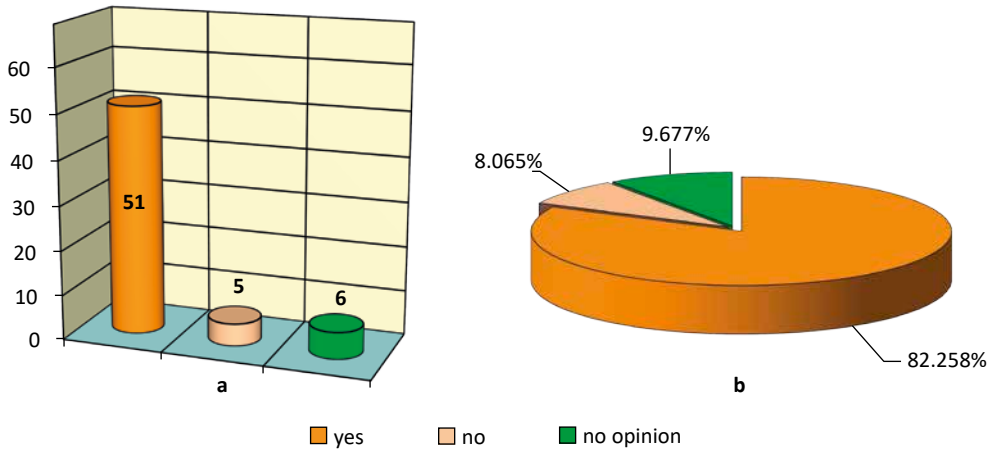

Fig. 5. Quantitative value (a) and percentage value (b) of answers to question 5: Having access to the Internet, multimedia platforms and other technologies, do you enrich your knowledge in the field of study? Please provide one answer
Source: Own study.

Therefore, it can be assumed that they constitute an essential source of knowledge in the various subjects covered by the study curriculum.

Question 6. Do you think that universities should allow greater access to modern technologies when accounting for teaching rigors? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to question 6 are presented in Figure 6a (quantitative value) and Figure 6b (percentage of answers provided). The analysis of the results obtained leads unequivocally to the conclusion that the students would like more freedom to access digitized sources of information while accounting for the didactic rigor. As many as 56 respondents were in favor,

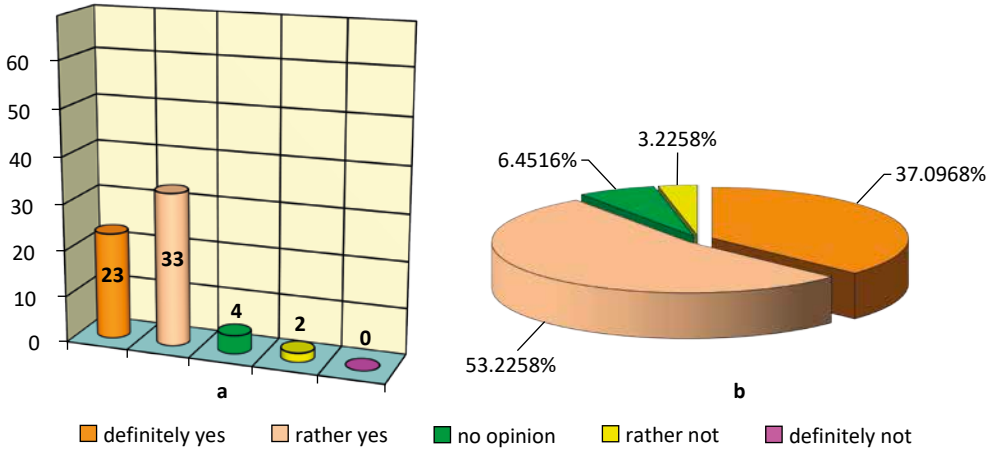

Fig. 6. Quantitative value (a) and percentage value (b) of answers to question 6: Do you think that universities should allow greater access to modern technologies when accounting for teaching rigors? Please provide one answer
Source: Own study.

which is over 90% of them. In the authors' opinion, such convenience is a negation of the idea of studying as a form of independent acquisition of knowledge and then accounting for it reliably following the criteria specified for a given subject. As a consequence of introducing such a solution, a situation could arise in which a graduate of a given specialization in the field of study would not have a fundamental knowledge resource, which in the long term could lead to the collapse of the education system. It results from the widespread students' conviction about trouble-free access to knowledge sources via the Internet.

Question 7. Having access to modern technologies, have you ever used scientific aids (e.g., electronic versions of learning materials) during various forms of course completion? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers obtained in the survey to question 7 are presented in Figure 7a (quantitative value) and Figure 7b (percentage of answers given).

During various forms of course completion in the field of study, access to modern technologies and the use of scientific aids (e.g., electronic versions of learning materials) is used at the level of 90%. It indicates the need for the lecturers to change their approach to that issue and consider evaluating the progress made by students in a form that allows for an objective assessment of their knowledge, skills, and competences.

Question 8. How do you assess the safety of the technologies used? Please provide one answer.

a) very high; b) high; c) average; d) low; e) very low.

The answers to question 8 are presented in Figure 8a (quantitative value) and Figure 8b (percentage of answers given).

Respondents rate the safety of the technologies they use and those made available to them highly, but none of the surveyed indicated a "very high" rating for its safety. Among the answers, there are also those that show low or very low safety in the use of new technologies.

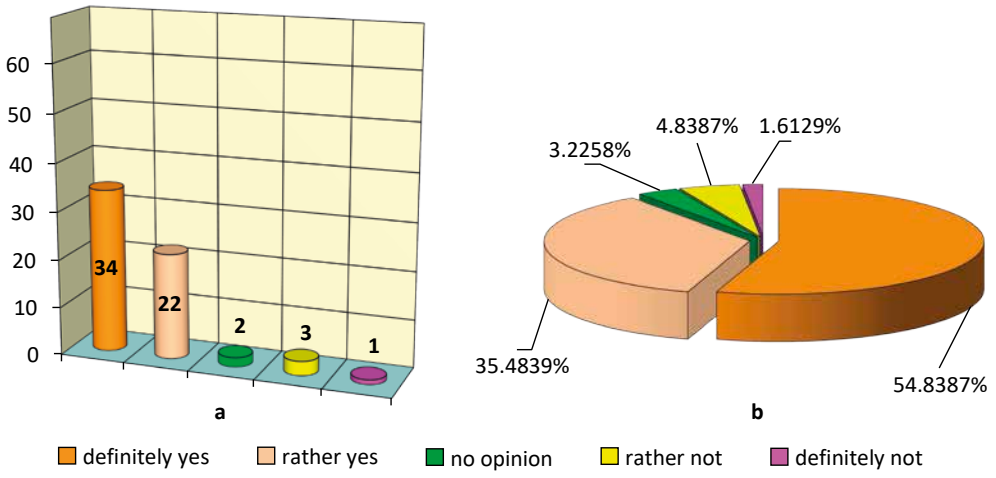

Fig. 7. Quantitative value (a) and percentage value (b) of answers to question 7: Having access to modern technologies, have you ever used scientific aids (e.g. electronic versions of learning materials) during various forms of course completion? Please provide one answer
Source: Own study.

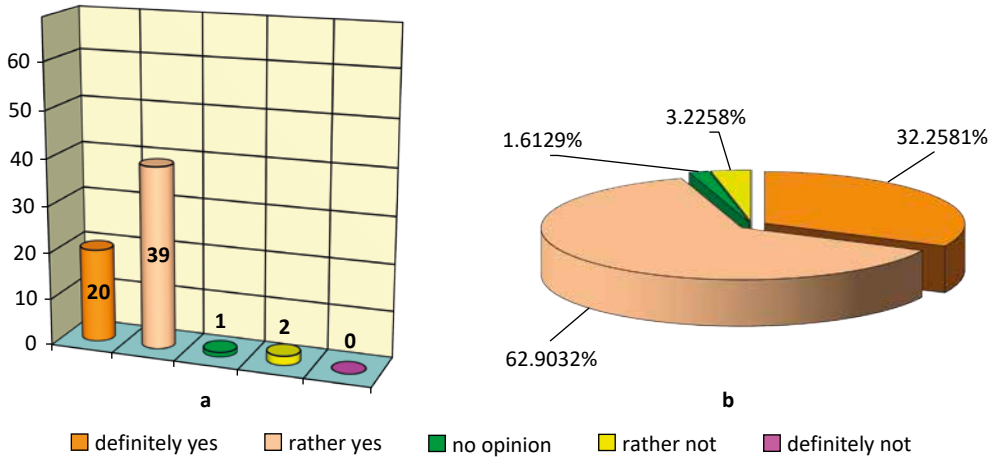

Fig. 8. Quantitative value (a) and percentage value (b) of answers to question 8: How do you assess the safety of the technologies used? Please provide one answer
Source: Own study.

That may indicate a slow increase in awareness of possible threats and a lack of ability to comprehensively secure the device and operating system with access to the global computer network.

Question 9. Are you aware of the basic threats from the modern technologies used? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to question 9 are depicted in Figure 9a (quantitative value) and Figure 9b (percentage of answers provided).

According to the authors, the answers obtained in the conducted survey should inspire optimism resulting from the fact that students are aware of the fundamental threats from the

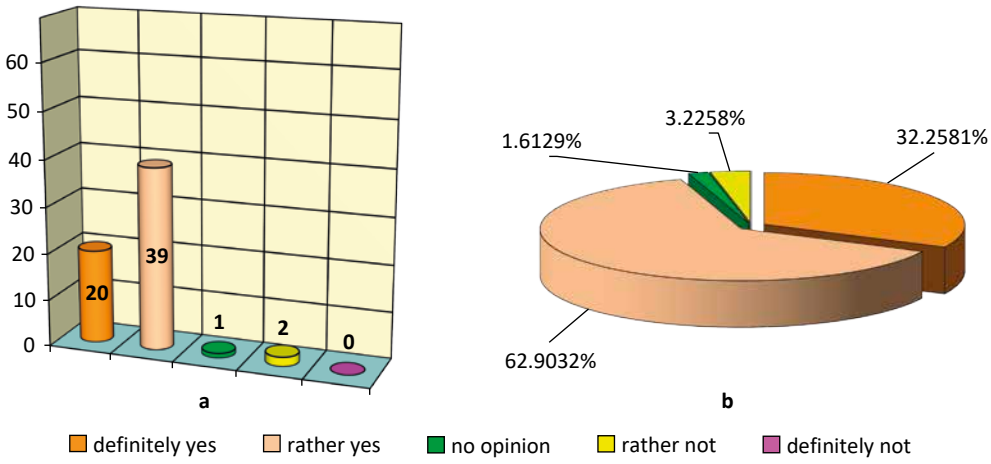

Fig. 9. Quantitative value (a) and percentage value (b) of answers to question 9: Are you aware of the basic threats from the modern technologies used? Please provide one answer
Source: Own study.

use of modern technologies. The above also stems from the introduction of the subject of information and communication security into study programs. On the other hand, young people are reluctant to admit that they have unsystematic knowledge in this area.

Question 10. In your opinion, is all the information necessary for a positive accounting of courses in a given field of study available through multimedia platforms? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to the question 10 are presented in Figure 10a (quantitative value) and Figure 10b (percentage of answers provided).

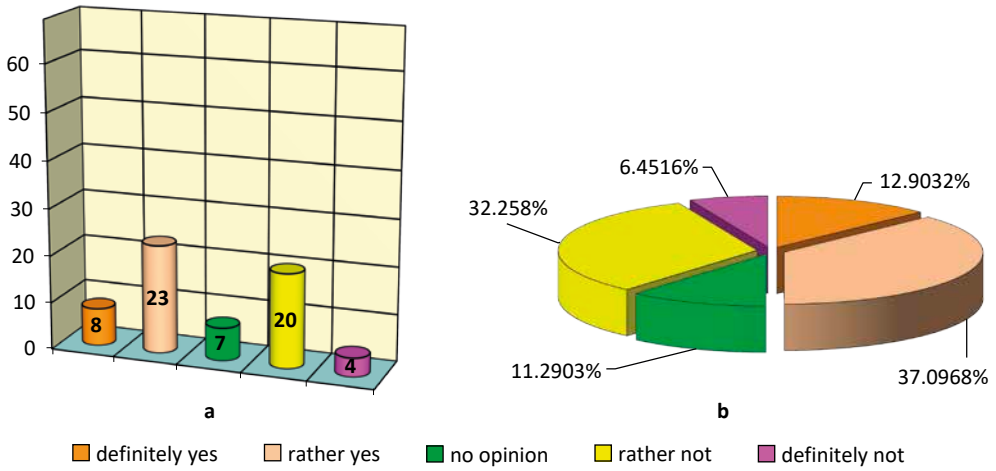

Fig. 10. Quantitative value (a) and percentage value (b) of answers to question 10: In your opinion, is all the information necessary for a positive accounting of courses in a given field of study available through multimedia platforms? Please provide one answer
Source: Own study.

According to the authors, the respondents' answers in the proportions of 31 notes (almost 51%) in favor of 24 (38%) of negative opinions allow to think that the students can obtain the necessary information for positive accounting of subjects through multimedia platforms. The respondents who marked "no opinion" (7 people – almost 11%) probably rarely use this form of acquiring knowledge or are unable to give an answer.

Question 11. Do you take e-learning classes? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to question 11 are presented in Figure 11a (quantitative value) and Figure 11b (percentage of answers provided).

As many as 29 respondents (46.77%) indicate that they regularly use e-learning classes, while at the same time almost the same number of people, representing 45.1% of the respondents, do not see such a need. The authors are convinced that the results obtained from questions 10 and 11 are inconsistent for young people, who declare that they are supporters of new technologies, and, on the other hand, are reluctant to use them to expand their knowledge.

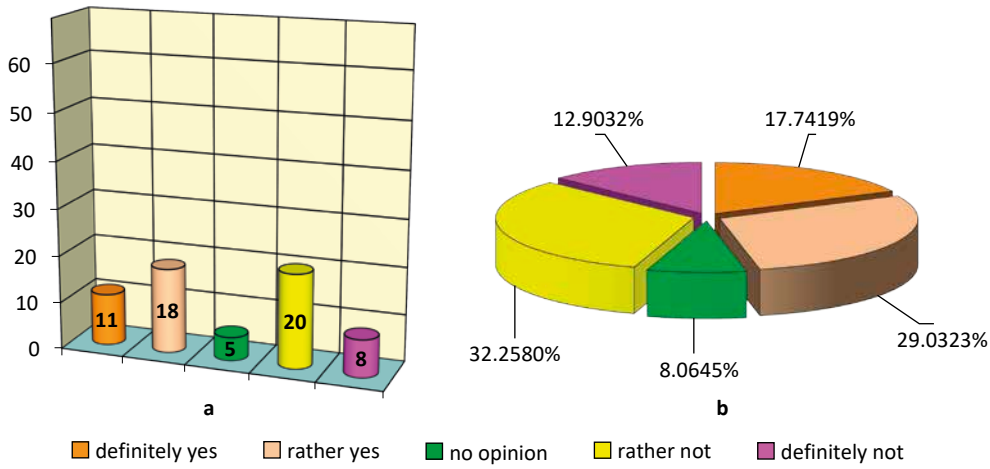

Fig. 11. Quantitative value (a) and percentage value (b) of answers to question 11: Do you take e-learning classes? Please provide one answer
Source: Own study.

Question 12. How do you assess your learning progress (acquired knowledge) through the possibility of using and accessing modern forms of transfer? Please provide one answer:

a) very large; b) large; c) average; d) small; e) very small.

The answers to Question 12 are shown in Figure 12a (quantitative value) and Figure 12b (percentage of answers provided).

The results obtained from the answers to question 12 unequivocally indicate contradictions with the answers given to earlier questions 10-11. None of the respondents marked the answers "small" and "very small", making it clear that modern forms of education are conducive to obtaining positive marks.

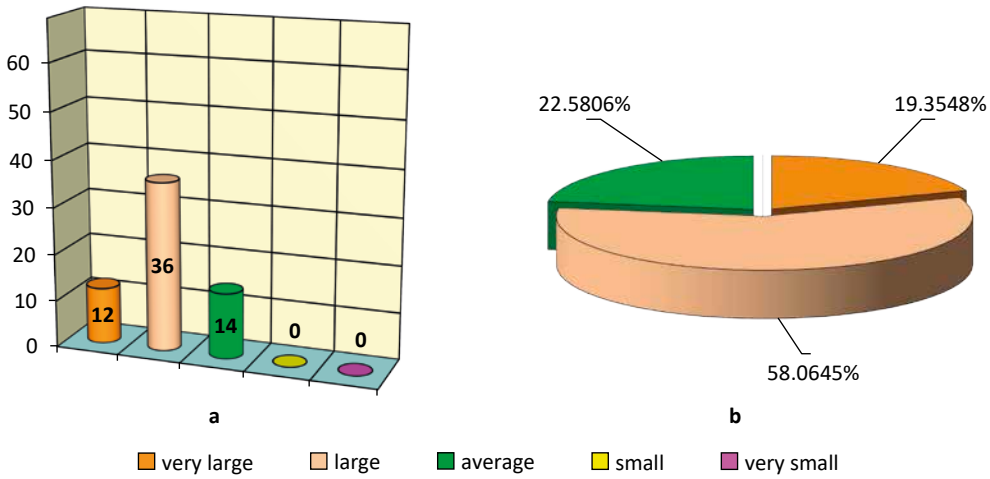

Fig. 12. Quantitative value (a) and percentage value (b) of answers to question 12: How do you assess your learning progress (acquired knowledge) through the possibility of using and accessing modern forms of transfer? Please provide one answer
Source: Own study.

Question 13. Do you think that the lack of access to modern technologies may have a negative impact on your learning outcomes? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to question 13 are presented in Figure 13a (quantitative value) and Figure 13b (percentage of answers).

73% of the respondents clearly indicated ("rather yes" and "definitely yes" answers) that the lack of access to modern technologies may have a negative impact on their learning outcomes. In view of the above, the possibility of accessing the Internet via mobile telephony or a computer network, and thus to knowledge in the areas of their cognitive interest, significantly impacts the amount of information collected and processed by them, and therefore may be a factor determining the positive account for teaching requirements.

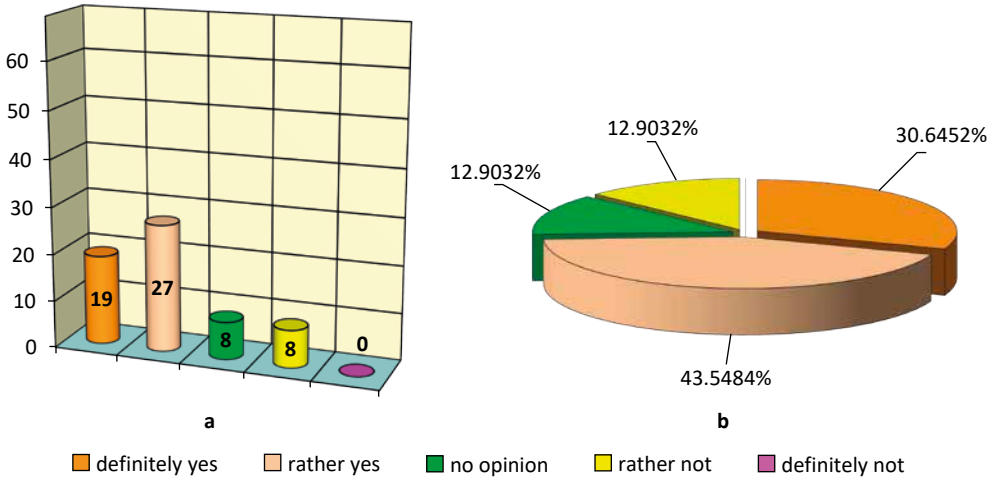

Fig. 13. Quantitative value (a) and percentage value (b) of answers to question 13: Do you think that the lack of access to modern technologies may have a negative impact on your learning outcomes? Please provide one answer
Source: Own study.

Question 14. How often do you use the university library (reading room)? Please provide one answer:

a) when I have to – no necessary data on the Internet; b) once a month; c) once a week; d) every second day; e) every day.

The answers to Question 14 are presented in Figure 14a (quantitative value) and Figure 14b (percentage of answers given).

The main conclusion of the research results gathered after receiving data from the respondents is a worrying trend of exclusive use of netographic sources and websites to obtain information necessary for positive accounting of individual subjects related to the specialization and field of study. People who use books in the library permanently constitute a significant minority. The authors believe that the above also reflects the widespread use of multimedia platforms for acquiring knowledge. Therefore, another question arises as to whether students verify the information obtained in this way since various examples indicate that the Internet contains unreliable data, which is increasingly often provided by incompetent people. Today,

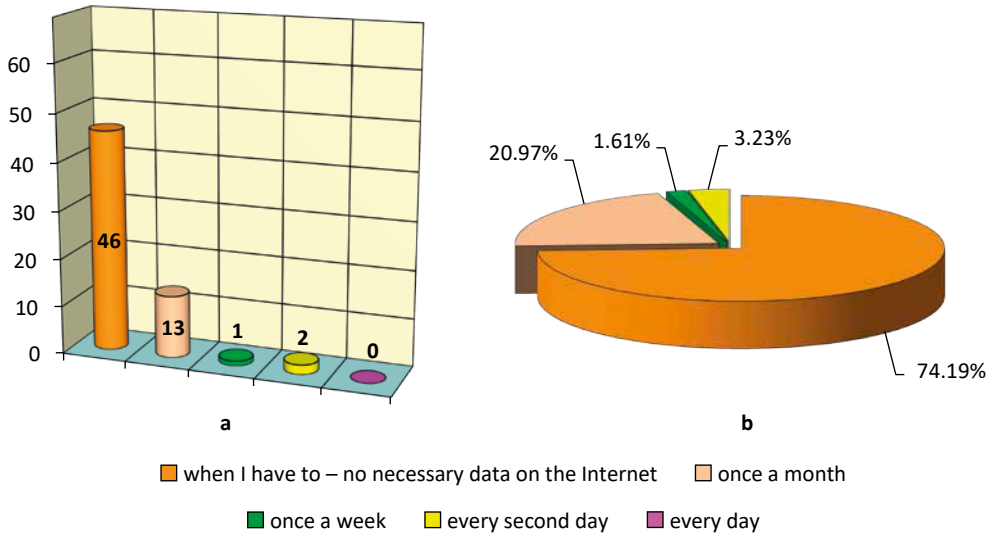

Fig. 14. Quantitative value (a) and percentage value (b) of answers to question 14: How often do you use the university library (reading room)? Please provide one answer
Source: Own study.

everyone can try their hand at being an expert in a given field, which is not always supported by knowledge useful in studies.

Question 15. What do you think are the most effective methods and forms of enriching students' knowledge? Please provide one answer:

a) notes from classes and active participation in them; b) notes from classes and Internet access; c) a combination of the above.

The answers to question 15 are presented in Figure 15a (quantitative value) and Figure 15b (percentage of answers given).

Direct observation makes it possible to conclude that the most straightforward form of collecting various types of data concerning a given subject is to obtain a lecture or teaching materials in digital form directly from the lecturer. That is indeed convenient, but on one condition that students respect copyright and that the lectures and other data made available to them are not transferred to Internet platforms for distribution without their creator's consent.

Question 16: Can you use netography and the database of legal acts available on the global network? Please provide one answer:

a) definitely yes; b) rather yes; c) no opinion; d) rather not; e) definitely not.

The answers to question 16 are presented in Figure 16a (quantitative value) and Figure 16b (percentage of answers).

It can be concluded from students' answers to question 16 that as many as 79% of the respondents assess their ability to use electronic sources at a high level. Unfortunately, it is not confirmed by the authors' observations, which is closely linked to the requirement to indicate who is their author and to make notes. It is closely linked to the requirement to indicate who is the author of the information and provide footnotes. Such a situation occurs when someone illegally attributes someone's achievements to themselves with the conviction that since certain information is on the Internet, it is possible to use it without stating who its author is.

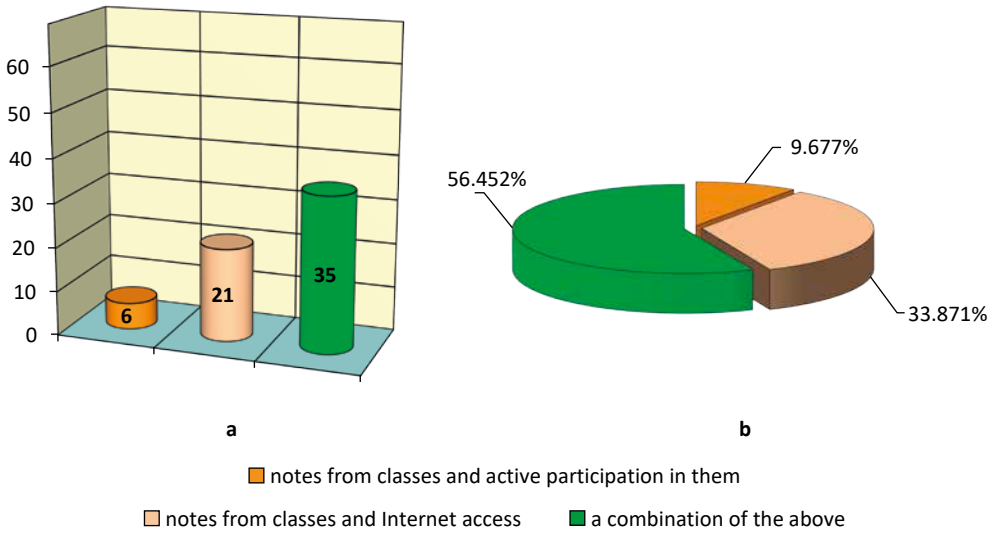

Fig. 15. Quantitative value (a) and percentage value (b) of answers to question 15: What do you think are the most effective methods and forms of enriching students' knowledge? Please provide one answer

Source: Own study.

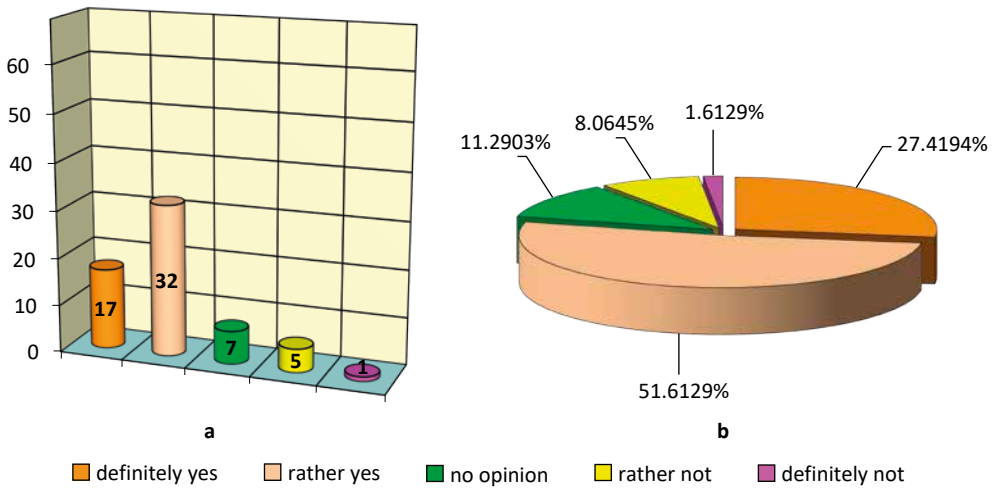

Fig. 16. Quantitative value (a) and percentage value (b) of answers to question 16: Can you use netography and the database of legal acts available on the global network? Please provide one answer

Source: Own study.

Question 17. How do you assess the correctness of the implementation of procedures for the protection of intellectual property at the university (e.g., anti-plagiarism)? Please provide one answer:

a) very good; b) good; c) average; d) bad; e) very bad.

The answers obtained from the survey to question 17 are presented in Figure 17a (quantitative value) and Figure 17b (percentage of answers given).

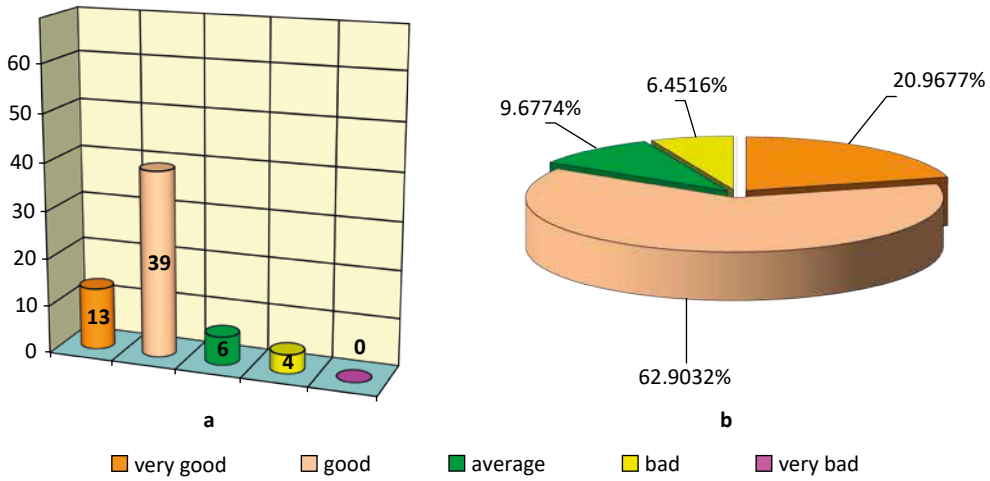

Fig. 17. Quantitative value (a) and percentage value (b) of answers to question 17: How do you assess the correctness of the implementation of procedures for the protection of intellectual property at the university (e.g., anti-plagiarism)? Please provide one answer
Source: Own study.

The authors believe that students should have regular training and be aware that the unauthorized use of someone else's scientific output constitutes a violation of copyright and is illegal. The answers given by respondents indicate that students know the consequences of such behavior. There is training in the protection of intellectual property. Promoters of qualification papers also make efforts to ensure that there is no situation where a bachelor's, engineer's or master's thesis is excluded by the Uniform Anti-Plagiarism System. Unfortunately, there are instances of this being ignored. The same is true of materials obtained from lecturers, which are later passed on without the creators' knowledge and consent.

Conclusion

In effect of the work carried out and the achievement of the objective set, it has become possible to respond to the main research problem. The choice and application of the research methods presented in a nutshell were determined by the nature of the phenomena under consideration, forcing them to be conducted in most cases based on hypothetical assumptions. However, it may be assumed that their application made it possible to guarantee the reliability of the research conducted and obtain reliable final data.

The obtained results and conclusions from research deliberations can (and should) be used both practically and theoretically. Concerning the former, they boil down to teaching the rational use of modern information technologies during the educational process, pointing out the dangers arising from their use, and shaping the ability to verify primary sources of knowledge coming from the Internet. The above increasingly often provides a foundation for students who do not use traditional forms of acquiring it, such as studying borrowed books or working independently in a given university reading room.

The theoretical dimension provided in Part I of the publication will boil down to the application of the obtained research results contained in this study during the implementation of didactic (training) projects with students of subsequent years of study. Moreover, the

research conducted and the conclusions drawn from it will constitute the content of lectures delivered during symposia and scientific conferences. According to the authors, they may be applied as review and didactic materials in solving other research problems, especially to verifying the effectiveness of higher education methods.

The research conducted by the authors in 2019 before the SARS-CoV-2 pandemic on the impact of threats from the use of modern information technologies on the university students' learning outcomes allows the following conclusions, which are a summary of the research results to date, to be presented:

1. It is likely that traditional forms of knowledge transfer will slowly become forgotten in favor of lectures and exercises carried out with the use of modern technologies, e.g., with the use of simulation systems, artificial intelligence, virtual environment, and broader use of platforms for remote learning (e-learning).
2. Every effort should be made to ensure that students can make proper use of digital resources and electronic sources, each time indicating the source of data, information, and messages used by them in their qualification work. The ability to select them is also crucial as it may impact grades in subjects during the accounting of individual semesters during studies (questions 5 and 6).
3. Access to modern technologies and solutions within ICT creates the conviction that there is, and will continue to be, undisturbed data transmission, which will allow any information to be obtained without any problems during study. Such a conviction causes disregard for the existing methods and ways of students' gaining knowledge independently. It was also considered inappropriate to support the accounting of the lecturers' requirements through correspondence from electronic notes, technical novelties, and the Internet. Every academic lecturer should react to that (question 7).
4. While executing the research, it was noted that the respondents are inconsistent in their answers, and some of them are mutually exclusive or suggest that the respondents are reluctant to admit to attempts to facilitate their credit and exams in selected subjects. That is indicated by questions 10-12. On the other hand, it cannot be ruled out that some lecturers do not pay attention to whether the student uses Internet access during the exam or credit.
5. The authors would like to stress that for young people, the possibility of using modern technologies (question 3) and a large amount of time spent in the digital world (question 4) is the norm of everyday life and their answers only confirm this.
6. Currently, students are focused on classes conducted interactively, using the latest multimedia to attract attention and interest the recipient (question 5). The perception of knowledge is essentially based on the sense of sight.
7. The safety of the technologies used was positively assessed (question 8), as was the knowledge of threats in the aspect of modern technologies applied (question 9). There-fore, it can be hoped that their users are aware of various types of dangers.
8. The negative impact of lack of access to modern technologies on scientific results (question 13) was indicated by as many as 46 respondents (73%). Such a result allows the possibility of accessing knowledge in individual subjects of study via the Internet, has a significant influence on the quantity and quality of information collected and processed by the students. Unfortunately, those who base their knowledge exclusively on Internet sources often do not meet the didactic requirements.

9. The research results obtained from the authors' observation and the respondents' answers (question 14) lead to the conclusion that the traditional use of sources of knowledge collected in the form of books in the library and the possibility of using the reading room does not arouse wider interest among students. Nowadays, they are focused on the electronic presentation of didactic materials from lecturers, which are required during classes and exams in subjects and specializations.
10. The respondents' answers to question 16 suggest that they have a basic knowledge of the use of electronic sources and the database of legal acts available in the global network.
11. Students highly evaluate the correctness of the implementation of procedures in the field of intellectual property protection at the university (question 17). The answer to the content of question 17 conflicts with the direct observations made by the authors and examples of students' actions since they are not always entirely aware of the consequences of an attempt to misappropriate someone's text posted on the web or scientific output.

Summarizing the research outcomes presented, the authors are aware that it has not been possible to exhaust the subject matter of the deliberations. It seems appropriate to continue or resume the research in the near or far future. The problems raised in the work are only a prelude to further research conducted in the broadly understood security sciences related to new information technologies, which is reflected in focus on one university. It is worth noting that there is no reference to other military universities in the Polish Armed Forces because they are not generally available even if they have been carried out. Therefore, the research only covered the civilian AWL students.

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Conflict of interests

All authors declared no conflict of interests.

Author contributions

All authors contributed to the interpretation of results and writing of the paper. All authors read and approved the final manuscript.

Ethical statement

The research complies with all national and international ethical requirements.

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Biographical note

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Wpływ zagrożeń wynikających z użytkowania nowoczesnych technologii informacyjnych na wyniki kształcenia studentów w uczelni wyższej. Część II

STRESZCZENIE Druga część publikacji omawia wyniki badań praktycznych w zakresie oddziaływania zagrożeń stosowania nowoczesnych technologii informacyjnych oraz samodzielnego zdobywania wiedzy w oparciu o sieć Internet na wyniki kształcenia studentów. Zaprezentowano w nim przebieg badań empirycznych wraz zastosowanymi metodami oraz narzędziami. W podsumowaniu przedstawiono wnioski powstałe w tracie oraz po zakończeniu obszaru badawczego. Zwrócono uwagę na jego szerokie spektrum, którym dotychczas nie byli objęci studenci cywilni zhierarchizowanej uczelni wyższej. Podkreślono oraz opisano negatywny wpływ zagrożeń na nieświadomych użytkowników nowoczesnych technologii informacyjnych.

SŁOWA KLUCZOWE nowoczesne technologie informacyjne, Internet, komunikacja, zagrożenia

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