

Critical thinking as an information security factor in the modern world

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Abstract. Access to information in today's world is unprecedentedly easy thanks to the Internet and social media. However, this also creates information overload and the threat of disinformation. Critical thinking is becoming a key skill for sifting reliable information from fakes and manipulations, which makes this topic relevant. The research aims to determine the role of critical thinking in ensuring the information security of the population in the modern world. The study used the methods of analysis, systematisation, synthesis, and generalisation. The study confirmed that critical thinking is an important factor in the field of information security of the population, and also examined the main aspects of critical thinking and its components, including analysis of information sources, fact-checking, contextual understanding, bias research, formulation of critical questions and self-assessment. The study also thoroughly analyses the key aspects of critical thinking skills and considers the concept of Team-Based Learning (TBL), which is an active approach to education aimed at stimulating students' critical thinking and engaging them in an active learning process. The results of the study highlight the peculiarities and importance of developing critical thinking skills in the Ukrainian population, especially in the context of the ongoing war with Russia, as the war manifests itself not only on the military front but also in the information space, and therefore the development of critical thinking becomes an important element in protecting national interests and information security. The results of the study can be used by researchers to develop specific recommendations and strategies to increase the level of critical thinking among the population and improve information security

Keywords: personality; reflection; development; individual and mass consciousness; cybercrime

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Introduction

In today's information space, there are threats of cyber-crime, including fraud, phishing, and other types of attacks. Critical thinking helps to identify and prevent such threats. More and more attention is devoted not only to the study of facts but also to the development of critical thinking in the educational process, so studying this issue helps the younger generation prepare for the challenges they face in the modern information world. Modern society is characterised by the consumption of a large amount of information that comes to people every day. The ability to effectively process this information and determine its veracity is becoming an important issue today.

Ukrainian scientists M.A. Rozhilo *et al.* (2021) emphasise the importance of developing critical thinking as a key component of development. They note that critical thinking skills are essential for responsible and rational perception of information in an era of increased spread of fake news and manipulation. They argue that fostering critical thinking in the educational process and the education of society as a whole is an integral element of modern education. It is worthwhile to study in more detail the aspects of fostering critical thinking skills among the Ukrainian population.

The section highlights the current state of the problem under study at the global level, analyses the latest research and publications (7-10 works of other researchers) with links to scientific publications over the past 3-5 years. The relevance, purpose, objectives and the novelty of the study are substantiated. References to literature must be submitted in round brackets, example: "L. Wales (2022) mentioned...". One citation should not include more than 3 sources.

According to O.H. Rybchuk (2023), the history of the development of the concept of "critical thinking" covers more than 2500 years and is the subject of research in various sciences, such as logic, philosophy, pedagogy, and psychology. The scholar notes that during different historical periods, scientists have made a significant contribution to the development of the concept of critical thinking. The researcher emphasises that philosophers from different eras, from antiquity to modernity, have improved their views and interacted with each other, developed, supplemented, and sometimes contradicted the ideas of other philosophers, using critical thinking as a tool of analysis. Therefore, based on the above, it is necessary to study in more detail the features of critical thinking in the modern information society.

N.J. Alsaleh (2020) emphasises the importance of integrating critical thinking into curricula and teaching methods at all levels of the educational process. The scientist recognises that this orientation should become an integral part of learning so that students develop these skills in a quality and systematic way. In addition, the researcher draws attention to the technological aspect of critical thinking education and points to the need to introduce digital innovations in this area, as the use of modern technologies, interactive platforms, online resources, and other digital tools can improve the effectiveness of critical thinking education and provide a more interactive and dynamic form of education. It is important to consider this aspect in more detail, as the introduction of technological innovations in education can significantly expand the opportunities for young people to develop critical thinking and prepare for the modern challenges of the information society.

N.V. Dehriarova *et al.* (2022) are convinced that critical thinking is a key skill in modern society. The researchers believe that this skill is developed through systematic and continuous work in secondary schools and, later, in higher education institutions or during self-education. The researchers point out that teachers/educators and parents should share the responsibility for developing critical thinking in young people. The researchers emphasise that this process should be organic and purposeful in educational institutions of different levels, as the work of pupils and students must be meaningful, as this is the key to ensuring that any attempts to influence the opinion of an established personality will not be successful. According to the researchers, the teacher/lecturer should understand the appropriateness of using critical thinking development methods and avoid their excessive use, which can lead to the opposite effect. It is worth studying this issue in more detail within the framework of information security of the population.

N.N.S.P. Verawati *et al.* (2021) note that it is important to consider the cognitive criterion as a key aspect in the formation of critical thinking, as it helps not only to understand the structure of critical thinking but also to identify possible ways of its practical use. Considering the cognitive criterion as an important element of education, scientists believe that it is possible to prepare the younger generation for a more responsible and informed perception of information in the modern world. In the context of information security, this is even more important, so it is necessary to study this aspect in more detail.

H.V. Belenka (2020) notes that interactive teaching methods play a key role in the development of students' critical thinking, as they promote active participation of young people in the learning process and encourage them to analyse, discuss and critically evaluate information. The scientist emphasises that interactive methods create unique opportunities for students to express their thoughts, argue their views and communicate with fellow students, which contributes to the development of critical thinking, as students learn to analyse different points of view and understand the arguments of others. It is worth exploring the specifics of critical thinking development methods in more detail.

The research aims to reveal and define the key function, in particular the role, of critical thinking in shaping the security of the population in the modern global information context.

Materials and methods

A wide range of general scientific theoretical research methods were used to study critical thinking as a factor of information security of the population in the modern world. Analysis, systematisation, synthesis, and generalisation were employed. The analytical method was used to identify the key aspects of the concept of "critical thinking". The analytical method was used to study the main definitions, elements, and development of this concept. Based on this method of research, it was possible to identify the main aspects of critical thinking and its elements, including the study of information sources, fact-checking, understanding the context, researching bias, asking critical questions and self-criticism. This method of research allowed us to consider and analyse in detail the key aspects of critical thinking and identify their importance in the information processing process.

The systematisation method was also employed to study the features of critical thinking. This method was used to review and organise the key aspects of this skill, in particular the concept of Team-Based Learning (TBL), which is an active approach to education aimed at stimulating students' critical thinking and engaging them in an active learning process. The synthesis method was used to integrate and combine different aspects of the concept of critical thinking into one coherent concept. This method was used to systematise and summarise the various aspects and components of critical thinking, creating a theoretical framework for a deeper understanding of this concept. The use of the synthesis method allowed us to combine different aspects of critical thinking, which made it possible to consider this process from different perspectives and consider various factors that influence its development and use. The synthesis method resulted in a comprehensive concept of critical thinking that includes elements such as analysing sources of information, fact-checking, contextual understanding, asking critical questions and self-assessment.

The generalisation method was used to conclude based on the information collected and processed. This method was used to summarise the findings of the study of critical thinking and its importance in modern society. Using the method of generalisation, this research article analysed the peculiarities and importance of teaching critical thinking skills to the Ukrainian population, especially in the context of the ongoing war with Russia, not only on the frontline but also in the information field. This method allowed us to determine how patriotic education affects the development of critical thinking in modern Ukraine. Also, using the method of generalisation, the peculiarities of this issue in the context of internally displaced persons were identified. This method helped to emphasise the importance of developing critical thinking among the Ukrainian population, especially in times of war and information manipulation.

The above-mentioned scientific methods helped to study and analyse the concept of "critical thinking", its features and components, as well as to highlight the main aspects of the use of critical thinking in the modern information society, in particular through the prism of the hybrid war that is ongoing in Ukraine and requires relevant knowledge, skills and abilities of critical thinking.

Results

Modern life in the information society is characterised by extreme complexity and rapid changes in many areas. Every day, the population of Ukraine is bombarded with a huge flow of information that affects individuals and mass consciousness. This is a result of the work of modern media, which delivers information extremely quickly and mobilised. Sometimes even faster than people can absorb and assemble this information into a single picture of the world. In addition, the general public is also faced with the information war waged by Russia, which is trying to provoke discord within Ukrainian society. Therefore, the development of critical thinking skills is crucial for effective navigation in the modern information environment and the detection of disinformation and manipulative information. Critical thinking helps to comprehend, analyse, and evaluate information from various sources from an objective and prudent perspective.

Online learning, which is becoming increasingly popular today, both in the global educational environment and in

Ukraine, in particular, has undoubted advantages, providing access to a huge amount of knowledge and the ability to study anywhere. Y. Tsekhmister *et al.* (2022), studying the efficiency of teachers' working time, including in the online format, proves that teachers working in the online format do not show the same productivity and efficiency of teaching activities as their colleagues who teach in the traditional offline format. However, it is worth noting that the use of teachers' working time to introduce new material is more effective in online learning, which indicates the important role of modern technologies and online resources in the pedagogical process. At the same time, it is important to remember that today's youth receive a large flow of information, and this information should be thoughtful and critically evaluated. In this context, educators, teachers, and parents have a huge responsibility in fostering critical thinking skills in the new generation. As I. Tolmachova and S. Bader (2022) noted, this will help them not only to acquire knowledge but also to analyse, understand and critically evaluate the information they encounter in the online world, making them more informed and independent citizens.

In today's Ukrainian society, the education of patriotism is a pressing task as it has a potential role in shaping the national identity and civic engagement of young people. In the context of the hybrid war that is taking place in Ukraine today, the issue of patriotic education is particularly important, as such a war can influence the worldview and perception of social events by young people. Patriotic education involves the transmission of valuable patriotic values, pride in one's country and readiness to participate in solving social problems. This process helps young people develop national consciousness and a sense of belonging to Ukraine. Researchers of the hybrid war in Ukraine S. Savchenko and V. Kurylo (2018) conclude that patriotic education, in particular, contributes to the development of young people's skills in analysing and evaluating information, understanding different points of view, and comparing them. Raising a conscious citizen involves the ability to recognise manipulation and fake news, as well as the ability to express one's thoughts and views in a reasoned manner. Patriotic education is essential in modern Ukrainian society and helps young people to adapt to the challenges faced by Ukraine in the context of hybrid warfare. Patriotic education can contribute to the development of critical thinking in young people, which will help them to be knowledgeable and responsible citizens, able to analyse complex social issues and make informed decisions.

An important aspect of modern Ukraine is the development of critical thinking skills among the population, as well as their ability to analyse and evaluate negative experiences, in particular in the context of internally displaced persons (IDPs). The response strategy, developed by mental health professionals and adapted to the conditions of war and displacement, is designed to promote not only physical but also psychological and socio-cultural recovery of citizens. It involves the use of multifaceted approaches, cooperation between different sectors, resource orientation and reference to the theory of preferences, which promotes critical thinking. The implementation of this strategy is intended to help the population develop important skills of self-analysis and self-reflection, as well as awareness of their capabilities and responsibility in solving complex social problems. At the same time, I. Trubavina *et al.* (2021) emphasise the family approach and innovations that promote the development of

critical thinking in young people and their willingness to actively participate in solving social challenges, which are provided by interactive teaching methods. In this context, the development of critical thinking and awareness are key elements for information security and the ability of an individual to meet the challenges of the modern information society.

In particular, reflection, which is based on the individual's ability to analyse and possess the properties of metacognitive analysis, is becoming a particularly important aspect in ensuring information security (Lukitasari *et al.*, 2019; Symonenko & Grek, 2022). This aspect helps individuals to better understand the structure of the information they encounter, as well as to distinguish true information from fake and manipulative information. Improving metacognitive skills allows to filter, analyse and respond to information in the information environment more effectively. Developing people's reflection and critical thinking are important factors in ensuring their information security and ability to respond adequately to the challenges they face in the modern information environment. The concept of information and psychological security implies the relationship between

the psychological and information components in the system of ensuring human security. Another important aspect is the preservation of the system's integrity under the influence of information and psychological factors, the subject's readiness to act under threat and the use of protective mechanisms to ensure adequate conditions, contributing to the satisfaction of the individual's needs. Information and psychological security can also be seen as protection of the human psyche from negative information influences that can harm the normal development of the individual. Counteracting negative information influence goes through several stages: orientation in the situation, assessment of possible influence, identification of characteristic signs of psychological influence and implementation of protective mechanisms. Violation of information and psychological security can lead to various negative consequences, including mental health disorders, distorted perception of the world and changes in value orientations (Sweet & Michaelsen, 2023).

It is worth noting the components of critical thinking that contribute to an objective assessment of information and information security of the population (Table 1).

Table 1. Key aspects of critical thinking

No.	Aspect	Aspect description
1	Source analysis	It is important to check the authors and sources of information for veracity and objectivity. Whether the authors are qualified in a particular field and whether there are any conflicts of interest.
2	Fact-checking	Before accepting information as fact, check its veracity. Use reliable sources and fact-checkers.
3	Context comprehension	It is important to consider the context of the information. Information can be distorted if there is no information about the context in which it was presented.
4	Bias analysis	Consider the possible bias of the author or source. People and publications may have a particular bias, and this may influence the way they present information.
5	Critical questioning	Questions should be asked about the information that the individual receives. It is worth asking what evidence supports the statement and whether there are alternative points of view.
6	Self-criticism	Individuals need to be prepared to reconsider their views and beliefs and to respond openly to new information.

Source: compiled by the authors

The development of these skills will help an individual become a more informed and critical consumer of information in the modern information society. In this context, the concept of TBL, which is actively used in education to stimulate critical thinking and engage students in active learning, plays an important role. This approach allows students to develop analytical and critical thinking skills, which are important in an era of increasingly accessible information and the spread of fake news and disinformation. The skills acquired through teamwork help students to effectively identify sources of information, critically evaluate its veracity, and formulate informed conclusions. This approach not only enhances the quality of learning but also contributes to the development of important life skills that students will need in their future professional and personal lives. The concept of team-based learning is based on the principle of cooperation, interaction, and teamwork of students. The main aspects of TBL include teamwork, preliminary preparation of students for classes, active discussion of tasks, use of group decisions and responsibility for their learning (Whitman & Mattord, 2021).

TBL plays an important role in the development of students' critical thinking, as it encourages them to analyse information, develop arguments, make informed decisions, and apply their knowledge in practice. This approach actively stimulates students' cognitive activity. In addition, TBL helps to increase students' general awareness of a particular

area as they work together on the material and discuss it. This helps them gain a deeper understanding of the subject. Furthermore, working together in groups helps to develop students' communication skills. They learn how to communicate effectively, listen to others, discuss issues, and come to common decisions. It is important to note that TBL can be useful not only for the academic development of students but also for their preparation for the practical application of information security principles in real-life situations, which is becoming an increasingly important skill in the modern world. Information security principles are the main directions and principles that determine approaches to information protection and security of information systems. The basic principles of information security include the following aspects:

1. Confidentiality. This principle is concerned with ensuring the confidentiality of information, i.e., preventing unauthorised access to sensitive data. This is usually achieved through various measures such as encryption, access restrictions and user authentication.

2. Integrity. The principle of integrity involves ensuring that information remains intact and is not damaged or lost without authorisation. This may include controlling changes to information and verifying its integrity.

3. Accessibility. The principle of accessibility means ensuring that information is available to users who are entitled to it following their roles and functions. This also includes

measures to prevent denial of service and restore availability in the event of disruption.

4. Authentication. The principle of authentication involves verifying and confirming the identity of users and systems. This may involve entering passwords, using biometrics or other methods.

5. Authorisation. Authorisation defines the rights and restrictions of user access after authentication. It establishes which actions and operations are allowed for a particular user or group of users.

6. Auditing and monitoring. The principle of auditing and monitoring includes logging events and analysing system activities to identify potential threats and track user actions.

7. Physical security. This principle refers to the physical protection of information resources, such as server rooms, equipment, and storage media.

8. Threat and attack protection. Threat and attack protection principles cover measures to detect, prevent and respond to potential threats and attacks, such as viruses, hacker attacks and other threats to information security.

These information security principles are fundamental to the development of strategies and measures aimed at ensuring information security. They are guiding principles that determine the general direction of action in the field of protecting confidential information and ensuring the reliability of information systems. However, it is important to keep in mind that information security is a dynamic process, and these principles may change in line with growing threats and technological developments. Therefore, their constant updating and adaptation to new challenges is a necessary component of ensuring effective information security in the modern world.

Discussion

Numerous researchers have studied the peculiarities of using and educating critical thinking to form information security in modern society. It is worth comparing the results of studies conducted by different scholars with the results of this work to study the contribution of other researchers to understanding the principles of information security by developing critical thinking in the group and individual consciousness of the population.

Z. Alkhalil *et al.* (2021) note that with the growing popularity of the Internet, people are increasingly sharing their personal information in the online environment, which leads to vulnerabilities in a large amount of personal data and financial transactions, which become a tasty morsel for cyber criminals. Phishing, according to scientists, is one of the most effective forms of cybercrime that allows attackers to deceive users and gain access to important information. Since the first phishing attack was recorded in 1990, scientists are convinced that this type of attack has grown into a sophisticated and dangerous tool. Scientists emphasise that phishing is now considered one of the most common types of online fraud, as phishing attacks can lead to serious losses, including the loss of confidential information, identity theft, and sources of confidential business information and even national secrets. The researchers emphasise that the development of critical thinking is an important tool for preventing phishing and ensuring people's information security. Comparing the results of the study, it is worth agreeing that modern society requires awareness and a high level of critical thinking to ensure the safety of the population in the modern world.

I. Warsah *et al.* (2021) emphasise that collective learning in groups has a significant and beneficial impact on the development of critical thinking skills among young people. The researchers point out that group cooperation helps to preserve and maintain these skills, improves emotional literacy, motivation to learn, cognitive development, and broadens knowledge. Compared to the results of this study, it is worthwhile to agree that collective learning in groups does have a positive impact on the formation and development of critical thinking, as this approach to learning not only strengthens critical thinking skills but also forms the overall readiness of young people to actively participate in solving social problems and challenges.

S.L. Jackson (2015) points out the importance of critical thinking. The scientist emphasises that critical thinking is an integral part of a modern personality, as it allows analysing and evaluating information objectively, considering possible distortions and subconscious biases. The researcher emphasises that critical thinking helps to identify weaknesses in the information flow, and therefore, the ability to think critically is an important tool for the development of individual and mass consciousness of the population. Compared to the results of this study, it is worth noting that critical thinking is a really important tool for the development of society and ensuring information security in the modern world, in particular for Ukrainians who are experiencing massive information attacks by the aggressor, Russia.

M. Mackay and A. Tymon (2013) emphasise the importance of developing critical thinking and analysis skills under conditions of uncertainty. Scientists point out that modern society and professional activities often face complex situations and uncertainty, where there are not always clear answers or solutions. Scientists view critical reflection as a tool that helps individuals analyse and evaluate different opportunities, risks, and alternatives in the face of uncertainty. They emphasise that developing these skills becomes especially important in the modern educational process, where students must learn to work with uncertainty and develop the ability to adapt to changing conditions. Thus, the researchers emphasise that learning critical reflection and dealing with uncertainty contribute to the development of flexible thinking and readiness to solve complex problems in various spheres of life and professional activity, which should be agreed with, since in the modern world, where change and uncertainty have become the norm, and individuals must be ready to adapt to new conditions and seek creative solutions to solve complex problems, critical thinking and reflection skills are especially important.

M. Stamp (2011) notes the basic principles and practices of information security and emphasises the importance of protecting information in the modern information environment and the dangers associated with cybercrime and violations of confidentiality, integrity, and availability of information. The scientist emphasises that information security requires an integrated approach that covers technical, organisational, and human aspects. The researcher draws attention to such key topics as information security in networks, encryption, authentication, incident management and information security policies in modern society. In comparison with the results of this study, it should be noted that information security is indeed critical for most spheres of life and society as a whole.

M. Rarita (2022) points out that the independent development of critical thinking in young people is not an automatic process, and, therefore, this skill should be systematically nurtured and supported by the appropriate educational environment. The scientist points out the need for active learning and cultivation of critical thinking, especially in the current conditions of digital progress. This notion should be compared with the results of this study, which emphasise the importance of teaching critical thinking to the younger generation, especially in the context of the current educational paradigm, particularly in the context of Ukraine, which is at war and also faces the spread of disinformation and provocations in the digital space sponsored by Russia.

T. Tang *et al.* (2020) note that the formation of students' critical thinking is impossible without considering the motivational component. The researchers emphasise that motivation is an integral part of the process of teaching critical thinking, and it is important to consider it. In this context, according to scientists, the use of modern digital technologies and, in particular, game-based learning methods is becoming an important means of stimulating student motivation. The researchers note that the use of technological innovations makes learning more exciting and attractive to the younger generation, which, in turn, contributes to a more successful formation of critical thinking. In addition, the use of digital learning tools, according to the researchers, allows for tracking students' progress and development, which enables teachers and educational institutions to effectively analyse the results and improve teaching methods aimed at developing critical thinking in young people. Comparing the results of this study, we should agree with the position of scientists that considering the motivation and use of digital technologies in the process of forming students' critical thinking is an important element, as it contributes to improving the learning process and development of young people.

Critical thinking is an essential element of information security in the modern world. Research conducted by Ukrainian and international scholars, as well as the results of this study, indicate a significant impact of the development of critical thinking skills on the overall level of information security in society. This demonstrates the need for active implementation of initiatives aimed at developing critical thinking among the population of Ukraine, especially in the context of the spread of disinformation and hybrid warfare waged by Russia. It also underlines the need to integrate modern methods and technologies into the education process to ensure more successful development of critical thinking among the Ukrainian population and make society more resilient to the impact of disinformation and manipulation.

In this context, it is crucial to understand and implement the principles of critical thinking as a key element of information security that helps people to be more aware, cautious, and responsible in the digital environment.

Conclusions

The development of critical thinking skills is essential in today's information environment, as it allows one to effectively evaluate and analyse information, as well as distinguish between truthful data and disinformation and manipulation. Critical thinking is becoming a key skill for an objective perception of the world around us in situations of information overload and rapid change.

This study highlighted the importance of critical thinking in the modern information world and its key role in ensuring the information security of the population. The study examined various aspects of critical thinking, including important elements of this skill, such as the ability to analyse information sources, verify facts, understand context, identify biases, formulate critical questions, and the ability to independently evaluate one's thoughts and conclusions. This expanded perspective helps to better understand how critical thinking works and how it can be developed. This study also included an exploration of the concept of team-based learning (TBL), which is actively used in education to stimulate critical thinking and engage students in active learning, which allowed us to understand how modern teaching methods can support and develop this skill. A particularly important aspect of the study is its use in the context of the Ukrainian population, especially in the context of the war with Russia. War in the modern world begins not only in the military field but also in the information space. In this context, the development of critical thinking becomes an important factor in protecting national interests and information security.

Future researchers in the field of critical thinking and information security should pay attention to studying the impact of cultural characteristics, values and beliefs on the development and expression of critical thinking in different cultures, as well as analysing the ethical issues related to the use of critical thinking to protect information security, including privacy and ethical compliance in the online environment.

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Conflict of interest

None.

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Критичне мислення як фактор інформаційної безпеки в сучасному світі

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Анотація. Доступ до інформації в сучасному світі безпрецедентно простий завдяки інтернету та соціальним мережам. Однак це також створює перевантаження інформацією та загрозу дезінформації. Критичне мислення стає ключовим навиком для відсіву достовірної інформації від фейків та маніпуляцій, що робить цю тему актуальною. Мета дослідження – визначити роль критичного мислення в гарантуванні інформаційної безпеки населення в сучасному світі. У дослідженні використовувалися методи аналізу, систематизації, синтезу та узагальнення. Дослідження підтвердило, що критичне мислення – важливий фактор у сфері інформаційної безпеки населення, а також розглянуло основні аспекти критичного мислення та його складники, зокрема аналіз джерел інформації, перевірку фактів, контекстне розуміння, дослідження упередженості, формулювання критичних питань і самооцінки. Дослідження також ретельно аналізує ключові аспекти навичок критичного мислення та розглядає концепцію командного навчання (TBL), яка є активним підходом до освіти, спрямованим на стимулювання критичного мислення студентів та залучення їх до активного процесу навчання. Результати дослідження висвітлюють особливості та важливість розвитку навичок критичного мислення в українського населення, особливо в умовах війни з Росією, оскільки війна проявляється не лише на військовому фронті, а й в інформаційному просторі, тому розвиток критичного мислення стає важливим елементом захисту національних інтересів та інформаційної безпеки. Результати дослідження можуть бути використані дослідниками для розробки конкретних рекомендацій і стратегій для підвищення рівня критичного мислення серед населення та покращення інформаційної безпеки

Ключові слова: особистість; рефлексія; розвиток; індивідуальна та масова свідомість; кіберзлочинність