

E-learning

Vol. 14

E-learning in the Transformation of Education in Digital Society

University of Silesia in Katowice
Faculty of Arts and Education Sciences
in Cieszyn

E-learning

Vol. 14

E-learning in the Transformation of Education in Digital Society

Monograph

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Katowice–Cieszyn 2022

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*E-learning Series is indexed in Journal Factor <http://www.journalfactor.org/>, Academic Research Index <https://www.researchbib.com/>, JIFACTOR.ORG, ceon.pl, Polska Bibliografia Naukowa <https://pbn.nauka.gov.pl> 9th vol., 10th vol., 11th vol., 12th vol. and 13th vol. indexed in Web of Science Core Collection
The E-learning series web-sites:
<https://us.edu.pl/wydzial/wsne/nauka-i-badania/serie-wydawnicze/seria-e-learning>
<http://www.ig.studio-noa.pl/pubusc.html>*

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ISSN 2451-3644 (print edition), **ISSN 2451-3652** (digital edition), **ISBN 978-83-66055-31-5**

Published by: STUDIO NOA for University of Silesia in Katowice
Faculty of Arts and Sciences of Education in Cieszyn

Printed in Poland

Scientific publication co-financed from the statutory research funds

Publication co-financed by the University of Silesia in Katowice



<https://doi.org/10.34916/el.2022.14>

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SPECIAL COURSE ON INFORMATION HYGIENE AS A TOOL FOR DEVELOPING YOUTH’S ABILITY TO RESIST INFORMATIONAL INFLUENCES

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Abstract: *The authors raise the problem of informational influences on young people, who are often thoughtless consumers of Internet content, and actualize the need to train young people in the skills of information hygiene. According to the results of the student survey, the trustworthiness of young people to information content and the lack of ideas about the possible negative impact of information technologies, computer applications, social networks, and services on their health were confirmed. The author’s special course on information hygiene is described as a tool for developing youth’s ability to resist informational influences. It is shown how the tasks of the special course are achieved: to form a responsible attitude toward the consumption of information content; develop the ability to counteract destructive influences based on emotional colouring (psychological manipulations, propaganda, disinformation, etc.); develop practical skills to verify media products for their critical evaluation; to improve the skills of protecting one’s own information space. The methods and tools of learning that contribute to solving the tasks are described. The results of the pedagogical experiment are presented, which confirm the effectiveness of the developed special course.*

Keywords: informational hygiene, informational influence, resistance to informational influences, special course on informational hygiene, professional training of youth.

1. INTRODUCTION

The development of digital technologies and widespread access to information sources and data via the Internet, the possibility of interactive interaction within the information resource, along with positive effects on society, contribute to the growth of social threats, including information aggression, manipulation of consciousness, cyber-attacks and cybercrime, etc.

The young generation, which grew up during the period of rapid development of digital technologies, confidently uses the Internet and digital tools for communication, education, and professional activities. Young people everywhere use mobile applications that are quick, often free of charge, installed, and quickly mastered. At the same time, a frivolous attitude towards digital technologies and tools gives rise to the consumption of information content of questionable quality, often reckless and thoughtless behaviour in cyberspace, as well as ignoring possible information threats. Young people's lack of skills in critical analysis of shared content, a critical look at subjective assessments of individual facts or opinions shared on the network, the inability to have their own point of view, and the ability to defend it with arguments often lead to such a trusting attitude to information that very often young people not only become a victim of manipulation but also contributes to the spread and further growth of false data, biased assessments of facts, the spread/popularization of ambiguous judgments, etc. It should also be mentioned about the irresponsible attitude to personal data (phone number, e-mail address, photo, texts, geolocation, etc.), which can be used by others for criminal purposes. This actualizes for the average citizen the ability to resist destructive information influences, and therefore the problem of young people observing information hygiene as a response to the various effects of Internet technologies and tools.

2. ANALYSIS OF THE DEVELOPMENT STATE OF THE PROBLEM

The importance of information hygiene began to be discussed at the end of the 20th – beginning of the 21st century. Thus, in the work (Eremin, 1995), a new scientific direction is initiated – information hygiene as a holistic system of knowledge about the patterns of influence of information (information technologies) on the state of mental, physical, and social health of a specific person and society as a whole.

According to Khalamendyk (2008), information hygiene should be considered at three levels – personal, social, and state. At the personal level, information hygiene contributes to solving issues of prevention and preservation of human health, determining information life priorities, saving one's time as the most valuable resource today. At the level of society, information hygiene contributes to the formation of information culture among its members, which, among other things, is designed to develop the ability to adequately perceive and quickly process data of various types (perceive, analyse, interpret, critically evaluate, disseminate, etc.). At the state level, information hygiene contributes to the implementation of an effective and balanced information policy in order to preserve the health of the nation and its spiritual culture.

The systematization of scientific results proved the presence of different approaches in marking the ability to resist informational influences. Along with the term “information hygiene” there is the following concepts:

- infomedia literacy and infomedia culture, which, according to their interpretation, also include a certain set of skills to work correctly with Internet sources, which is stated, in particular, in the works (Jeong, Cho, & Hwang, 2012; Bulatovic, Bulatovic, & Arsenijevic, 2014);
- information/digital literacy of young people (Zhu et al., 2021; Pérez-Torner & Tayie, 2012).

The generalization of scientific publications, which are devoted to the ability of society in general and youth, in particular, to resist informational influences, proved the relevance of such research in the countries of Eastern Europe (Belarus, Armenia, Bulgaria, Hungary, Georgia, Poland, Romania, Slovak Republic) (Fedorov et al., 2014); in Ukraine (Drushlyak, 2022); in Finland, Sweden, France, Germany, Great Britain and Spain (Horbenko, Hondiul, & Fruktova, 2020).

It should also be noted in publications that raise the problem of combating informational influences:

- V. Varynskyi et al. have analysed the state of the information hygiene segment of the Ukrainian Internet media in conditions of global threats (Varynskyi et al., 2021).
- Loukas, G., Murugesan, S., and Andriole, S.J. are focused on combating disinformation in the news and mass media (Loukas, Murugesan, & Andriole, 2022).
- Grimes, D.R. emphasizes the need to recognize the harmful effects of misinformation and take precautions to avoid the spread of misinformation (Grimes, 2020).

According to the results of the analysis, we state that in the conditions of the multiplicity of existing and potentially possible information threats in society, the need to reduce the negative impact of information processes on the health of young people is increasing. Such a need, on the one hand, requires the development of young people’s ideas about information hygiene and existing destructive influences, and, on the other hand, actualizes in the conditions of an educational institution the need to implement a special course on information hygiene (elective courses, groups, a number of extracurricular activities) as a tool designed to learn to see the risks of consuming information content and to distinguish dangers in the conditions of information confrontations.

The purpose of the article is to develop and experimentally confirm the expediency of implementing a special course on information hygiene for young people in the conditions of an educational institution.

Achieving the goal determined the solution of a number of tasks: 1) to investigate the real state of compliance with information hygiene by young people; 2) to develop the content of the special course on information hygiene and describe the features of its implementation; 3) to find out the impact of the special course on the ability of young people to resist informational influences.

3. MATERIALS AND METHODS

126 students of A.S. Makarenko Sumy State Pedagogical University and Sumy Vocational College of Economics and Trade were involved in the experiment.

The special course was implemented in 2020–2022 as a separate elective discipline or as one of the modules of standard courses (“Infographics in the work of a teacher”, “Data visualization”, “Internet security”).

To solve the first task, a survey was used as an empirical method of scientific knowledge. 126 respondents took part in the survey.

To solve the second task of the research, the experience of teachers available in the network regarding the implementation of courses on the formation of information security skills, own experience of teaching courses, and conversations with leading teachers of the departments of computer, psychological and sociological disciplines of A.S. Makarenko Sumy State Pedagogical University, Donbas State Pedagogical University, Borys Grinchenko Kyiv University were used.

To solve the third task, a non-parametric method of statistical evaluation of the data of the pedagogical experiment was used – the sign criterion, which was based on the results of the survey (Table 1). Each correct answer was valued at one point. The maximum that can be scored based on the evaluation results is 7 points.

Table 1. Survey on the ability to resist informational influences

№	Question	Answer options
1.	Fact vs judgment. Choose which, in your opinion, is a fact from the proposed ones.	<ul style="list-style-type: none"> • Information that contains a personal assessment. • An event that contains an emotional evaluation. • Information asserted or denied. • A real event that can be tied to a specific time or place. • Proven information. • Expression of a person's thoughts. • Exaggeration, generalization or one-eyed description of a fact.
2.	What do you think is effective in verifying the authenticity of information from the Internet? (several correct answers)	<ul style="list-style-type: none"> • It is impossible to verify the photo, so it is not necessary to pay attention to it. • It is worth checking whether the title corresponds to the main part of the message. • The author with the specified name and photo is a real person, so such information should be trusted. • It is necessary to check the presence of emotional influence in the message. • The presence of errors in the text is only typographical errors, so you should not pay attention to them.

№	Question	Answer options
3.	Which of the following statements do you think are correct? (several correct answers)	<ul style="list-style-type: none"> • Fake news often has flashy titles written in capital letters with exclamation marks. • Fake sites never make mistakes in spelling and punctuation. • Copies of well-known pages or sites are often created to promote fake information. • Fake news contains real photos and videos. • Many items of fake news have no publication date.
4.	Which of the following statements characterize, in your opinion, safe online behaviour? (several correct answers)	<ul style="list-style-type: none"> • I have the same logins and passwords for all my accounts on the network. • A password that contains numbers, upper and lower case letters, and symbols is the most reliable. • It is necessary not to disclose personal data. • I open all emails. • I do not trust information from suspicious sites.
5.	Using what tools do you think manipulators can collect our data in social networks?	<ul style="list-style-type: none"> • Tests. • Flash mobs. • Games. • All mentioned. • None of the above.
6.	How do you think a bot can be recognized? (several correct answers)	<ul style="list-style-type: none"> • There are no photos, or all photos were published in the same period. • On the page every day there are posts of their own, advocating the same position. • Bots usually have a small number of friends. • The bot page was created recently, perhaps a few months before an important event for the country. • One bot leaves only one comment under a post and does not respond to counter-comments.
7.	Choose three rules of behaviour in messengers that you think are safe.	<ul style="list-style-type: none"> • Do not open links from strangers. • Limit the ability to add you to communities. • Use the application only as a messenger. • Use the messenger to receive news sent by friends from the community. • Take part in draws. • Do not consume information from anonymous channels. • Check channels for artificial popularity.

Source: Own work.

4. RESULTS

4.1. The real state of compliance with information hygiene by young people

We conducted a survey to identify the state of information hygiene compliance by young people. 126 students from various educational institutions took part in the survey. Survey questions and their results are presented in Table 2.

Table 2. Results of the student survey

№	Question	Answer options (choose one of several)	% answers
1.	Do you have to participate in quizzes and games published on social networks?	So, why not have fun?	47%
		Never, I am wary of such offers.	53%
2.	The super program offers to see yourself with a different hairstyle. To do this, you need to download the application and grant access to the camera or photos.	Yes, because I have nothing to hide.	39%
		No, I am suspicious of such programs.	61%
3.	As soon as I inquired about the trip on the social network, similar messages immediately appeared in the feed. Why?	Social networks are tapped.	19%
		This is the work of special algorithms.	66%
		I do not know.	15%
4.	Why do you see news from some friends on social networks much more often, and from others there is no news at all?	Friends are just inactive in social networks.	42%
		Algorithms of social networks track the frequency of interactions.	51%
		I could be removed from friends.	7%
5.	„Sent a message to 10 friends!”. How do you react to „letters of happiness”?	I'll pass; it's not difficult for me.	13%
		Never send, it can be dangerous.	74%
		I don't want to waste time on it.	13%
6.	„We need to collect a million votes so that Viber or Facebook are not paid!” Would you like this call?	Yes, it's not difficult for me.	19%
		Yes, because I am for the free distribution of software.	19%
		First, I will check the validity of the call.	39%
		I will never like it. I read the terms of use (it's free).	23%

№	Question	Answer options (choose one of several)	% answers
7.	You are sure that the coronavirus is often incurable disease. Your friends on the social network think the same. Why?	We are in an information „bubble”.	51%
		All reasonable people think so.	49%
8.	Do you read the terms of the use of a web application before signing up?	No, I automatically agree with the rules.	66%
		Yes, I always read these rules.	34%
9.	„Democracy is the best political regime.” Is this fact or opinion?	Fact.	34%
		Opinion.	66%
10.	How much time do you spend on the Internet and social networks?	All the time.	76%
		From 2 to 5 hours a day.	20%
		From 1 to 2 hours a day.	4%
		Less than an hour a day.	–

Source: Own work.

The answer to the first question was almost equally divided by the respondents, which means that almost every second student participates in Internet tests or surveys, which are very common in social networks and are aimed at collecting the personal data of users.

The answers to the second question showed that almost every two out of five students do not see a problem in giving the application access to their phone’s camera or personal photos.

The third and fourth questions of the survey revealed that almost a third of respondents have no idea about the features and principles of the algorithms that are embedded in modern social networks.

The answers to the fifth, sixth and eighth questions indicate that every eighth respondent (13%) is an extremely trusting person and does not realize the risks that even a repost or like on a social network exposes him too and that 35–40% of respondents do not read the social network’s operating policy or the terms of its installation on their own mobile device.

The seventh question made it possible to determine the number of students who are really in an information bubble and do not have developed skills for critical evaluation of events and it’s almost half of them.

The answers to the ninth question confirmed that every third respondent does not distinguish between facts and judgments.

The tenth question confirmed that the vast majority of respondents are online on social networks “constantly” – three out of four respondents and a fifth of respondents spend from 2 to 5 hours communicating online every day. At the same time, no respondent mentioned that he spends less than an hour online.

The analysis of the answers confirmed our expectations regarding the trustworthiness of young people to information content and their lack of ideas about the possible negative impact of information technologies, computer applications, social networks, and services on their health.

4.2. Special course on information hygiene and forms, methods, and tools of its implementation

We have developed a special course "Information hygiene" designed to develop young people's understanding of the impact of information processes on their physical, mental and social health.

The special course is designed for 3 credits and is focused on solving such tasks.

Task 1. To form a responsible attitude to the consumption of information content.

Task 2. To develop the ability to counteract destructive influences based on emotional colouring (psychological manipulations, propaganda, misinformation, etc.).

Task 3. Develop practical skills to verify media products for their critical evaluation.

Task 4. Improve the skills of protecting one's own information space.

The distribution of the curricula and the features of the implementation of the special course are described in Table 3.

Table 3. Features of the implementation of the special course

Task	Hours \ of them independently	Form of training	Teaching method	Learning tool
Task 1. To form a responsible attitude to the consumption of information content.	10\6	Practical training	Conversation, discussion, content analysis, search methods	Petal diagram, exercises, Internet resources
Task 2. To develop the ability to counteract destructive influences based on emotional colouring (psychological manipulations, propaganda, misinformation, etc.).	16\6	Training, web quest	Creative, problem-solving, content analysis, explanatory and illustrative	Web trainer, exercises, Internet resources
Task 3. Develop practical skills to verify media products for their critical evaluation.	40\30	Master class, research project	Reproductive methods, explanatory and illustrative	Practical tasks, exercises, Internet resources
Task 4. Improve the skills of protecting one's own information space.	24\18	Practical classes, testing	Explanatory and illustrative, conversations	Exercises, Internet resources

Source: Own work.

Below we detail the ways we have chosen to solve the tasks.

4.2.1. Task 1. To form a responsible attitude to the consumption of information content

A responsible attitude to the consumption of information content is identified by us with limitations in the time spent on the network (the problem of time). For the awareness of the problem of time to occur, we suggest that each student construct a petal diagram (Figure 1) – on a 10-point scale, so that students can give a subjective assessment of the importance of different types of content for them. Based on the analysis of the diagram, we demonstrate how psychological dependence on Internet resources is formed/developed. We build similar charts for the time spent by the student on each type of content per day. We also compare the charts of different students and show how much time others spend. We draw analogies. We ask the following questions: “Why exactly is this type of content important to you?”, “Why do you spend the most/least time on a certain type of activity?”, “What other types of content do you consume? How often?”, “Why do you spend so much time-consuming entertainment content?”.

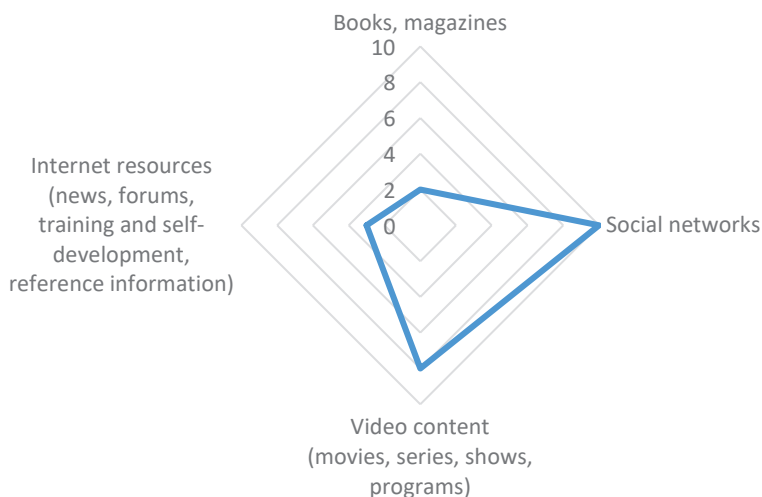


Figure 1. Information space of the student

Source: Own work.

We explain that the goal of all digital giants, such as Facebook, and YouTube, is to increase the time spent by the user on their network, for which mechanisms are borrowed from the gambling industry. Therefore, the analogy of “gambling – social networks” seems appropriate: raising the mood, avoiding the feeling of loneliness, success, etc. At this stage, we explain the peculiarities of the human brain in relation to the emotional colouring of life. We ask additional questions: “Why do digital giants benefit from you staying online?”, “How do digital giants make money?”, “How often do ads appear? What does it depend on?”, “Do you know the cost of advertising?”, “Is it possible to order advertising for a certain type of consumers?”, etc. Students

try to find answers to the questions on their own. It is possible to split into groups to study different social networks and their functioning. Then there is a discussion. Based on the results of the discussion and awareness of the time problem, we formulate recommendations together with the students, including, for example:

- install the application “Digital well-being” (<https://play.google.com/store/apps/details?id=com.google.android.apps.wellbeing&hl=uk&gl=US>) and adjust screen time (disable notifications, set time limits on various applications, enable night mode, etc.);
- adjust the “comments”, “recommended videos”, “automatic playback” options;
- in the Chrome browser, configure the News Feed Destroyer application News Feed Eradicator for Facebook (<https://chrome.google.com/webstore/detail/remove-youtube-recommende/khncfooichmfjbepaaebmommmgaepoid>).

4.2.2. Task 2. To develop the ability to counteract destructive influences based on emotional colouring (psychological manipulations, propaganda, misinformation, etc.)

Emotional sensitivity and social passivity are characteristic of young people. Such a feature simplifies the manipulation of their consciousness through informational influences with an emotional colour. It is important to convey to students that their emotionality blocks the mechanisms of thinking, which are used to manipulate their consciousness. To do this, it is worth providing statistics on the distribution of emotional messages compared to neutral ones (for example, Research: The Emotions that Make Marketing Campaigns Go Viral. <https://hbr.org/2013/10/research-the-emotions-that-make-marketing-campaigns-go-viral>) and recommend mastering the practice of “emotional pause” (students should find out on the Internet what this practice is and how it is implemented).

We also offer to analyse the “fact-judgment” pair (Figure 2), in order to develop students’ skills of emotionless data analysis and to check the news feed of various online resources in order to identify judgments with an emotional colour.



Figure 2. Examples for choosing facts and judgments

Source: Own work.

We also consider exercises for creating a list of facts and examples of judgments on various informational sites to be effective, including news resources.

To demonstrate to students that most of them are in an information bubble, we solve an exercise developed by the international organization IREX (<https://www.irex.org/region/europe-eurasia/ukraine>).

Exercise. It is suggested to circle the statements with which you agree. If 3 statements are circled diagonally, vertically or horizontally, then you are in an information bubble (Figure 3).

I receive news from social networks and pages of my friends	My feed has more opinions I agree with than I don't	I get more likes than outrage emojis
I unsubscribe from those who disagree with me	All my friends voted for the same political candidate as me	In the comments on my posts, everyone agrees with my opinion
I do not consider arguments that contradict my beliefs and worldview	I don't delete cookies from my devices (or don't know what they are)	When I see a headline that I immediately disagree with, I don't read the article

Figure 3. An example of an exercise to determine being in an information bubble

Source: Own work.

After students understand the problem of the information bubble, it is important to explain the principles of social network algorithms and search queries. Focus students' attention on the fact that each user action (favourite, comment, view, repost, search request) is analysed by special programs that detect the user's preferences and based on them, form a "sheet" of information content for a specific account. Information that the user ignores gradually disappears from the mentioned list. As a result, an information bubble is formed, in which search algorithms, and not the user, determine which posts will be in the feed, and which sites will be the first in the ranking of submissions for a specific search query. Falling into an information bubble is also facilitated by psychological factors, in particular, emotions, cognitive distortions, and the inability to distinguish fact from judgment.

Among the negative consequences of falling into an information bubble, we note the imbalance (non-objectivity) of opinions, prejudiced confidence in one's rightness, omission of really important messages, and falling under the manipulative influence. After the students become aware of the problem of the destructive influence of Internet content based on emotional colouring, we determine together their ways to solve the specified problems:

- to work in "Incognito" mode, delete cookies, clear/delete search history, etc.);

- to diversify the search bar, including thorough search based on the principle of balance of opinions, alternative opinions, etc.;
- to develop skills to distinguish facts from judgments, taking into account the emotional colouring of judgments.

4.2.3. Task 3. Develop practical skills to verify media products for their critical evaluation

Media products (text, video, audio, photo) are today a common resource of the Internet space. Their simplified distribution has contributed to the appearance of fakes (unreliable data), so the ability to verify data is relevant for further adequate perception of content.

In classes, we offer students exercises to verify text messages, photos, and videos to form/develop their relevant skills.

Text message verification exercises

1. Find out the type of message (fact or opinion), determine the purpose of the message (who benefits from it?), and check the presence of emotional impact, and the presence of errors in the text.
2. Determine the date of the message, the author (real person, bot), the reputation of the primary source (official site, “yellow” press, fake site, etc.), and the presence of links to confirm the information.
3. Perform structural analysis of the message (heading, body, comments). The main elements of structural analysis and examples are given in Table 4.

Table 4. Analysis of text messages

Method	Example	Goal	Warning
Too emotional a headline.	“Shock!!!!” “You won’t believe it!”	An appeal to the reader’s emotions in order to reduce the degree of critical analysis	Judgment is presented as fact. Psychological manipulation. Exaggeration.
The title does not correspond to the content of the article.	“The British and the russians had a blast at the resorts of the world!”	Increase the number of views (clickbait).	It is about the rating of the visit to the resort (cut out of context).
The article contains opinions, assessments, and assumptions, but not facts.	“Everyone says...” “You can’t be silent...”	To shape public opinion in a direction beneficial to the author. Disorientation, intimidation, propaganda.	Trying to influence the perception of the world, not to inform.

Method	Example	Goal	Warning
Use of hate speech, labeling, and unethical statements.	“Radicals and nazis use the civilian population...”	Formation of favorable stereotypes in the mind.	Propaganda, negative influence.
Statistics, numbers.	President of belarus lukashenko “My father died at the front”. a. lukashenko was born on September 30, 1954.	Presentation of information in a favorable light for lukashenko	Misinformation attempts to embellish, extinguish the event.

Source: Own work.

Photo verification exercises

1. In the Google Chrome browser do right-click on the image and select “Find this image in Google”. The search result will provide publication dates, sites, and similar photos. Figure 4 shows an example of an unreliable photo.

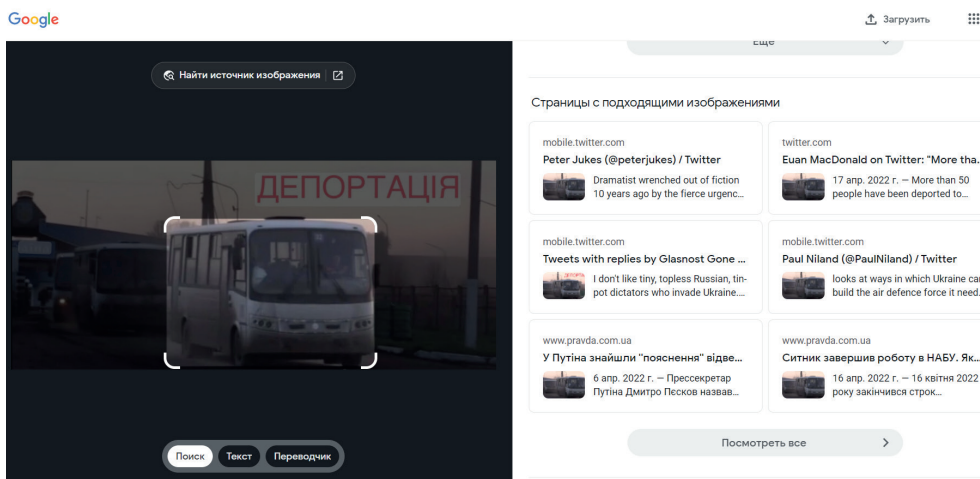


Figure 4. An example of an unreliable photo

Source: Own work.

2. Install the Tineye service extension in the browser. The service allows you to find not only the original photo but also additional metadata. Found photos are sorted by publication date, so you can see if the photo has been edited and when the original version was published. The photo, which was edited and presented in another publication, is presented in Figure 5.

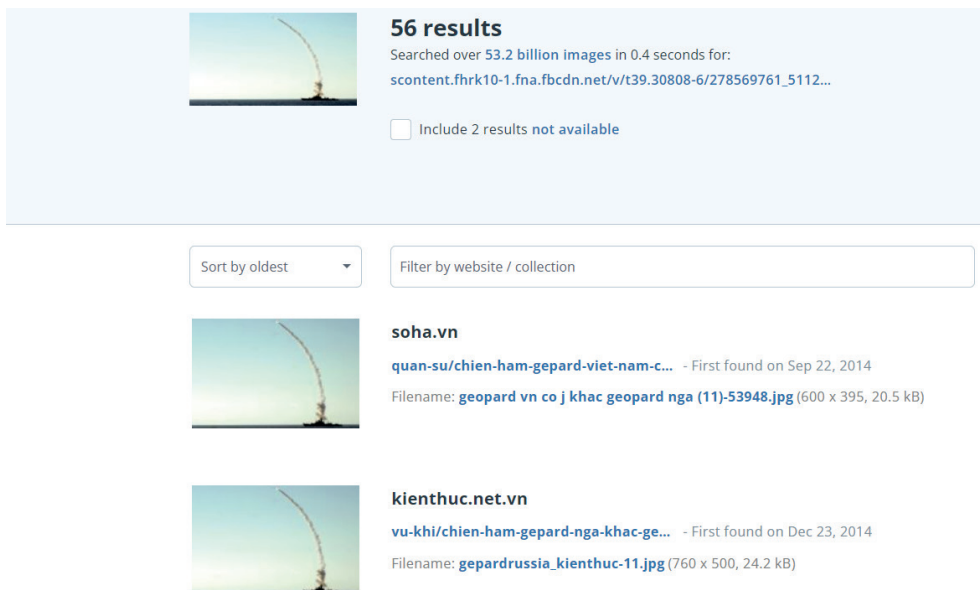


Figure 5. A photo that has been edited and featured in another post

Source: Own work.

3. Verification using geolocation. The services of Google Maps, Google Street View, and the Chinese service Baidu allow you to get comprehensive information about the place of the event. Careful analysis of the image for the presence of visual clues (street names, road signs, buildings, trees) allows you to compare the photo with a real map of the area and find the exact location of the camera at the time of taking the photo.

Video verification exercises

1. Checking the publication date. If it is not displayed in the lower corner of the result of the command View page code – Search – publishDate, then in the HTML code it is possible to see the exact date of publication (Figure 6).



Figure 6. The result of executing the video publication date search command in the HTML code

Source: Own work.

2. Verification of the reliability of weather conditions according to the date of publication. To verify the video, you can use the Wolfram Alpha service, which will allow you to compare the weather conditions on the video with the actual weather conditions on that day and in that place. To do this, you need to enter the text in the search field according to the template “weather city date month year”. An example of an application is presented in Figure 7.

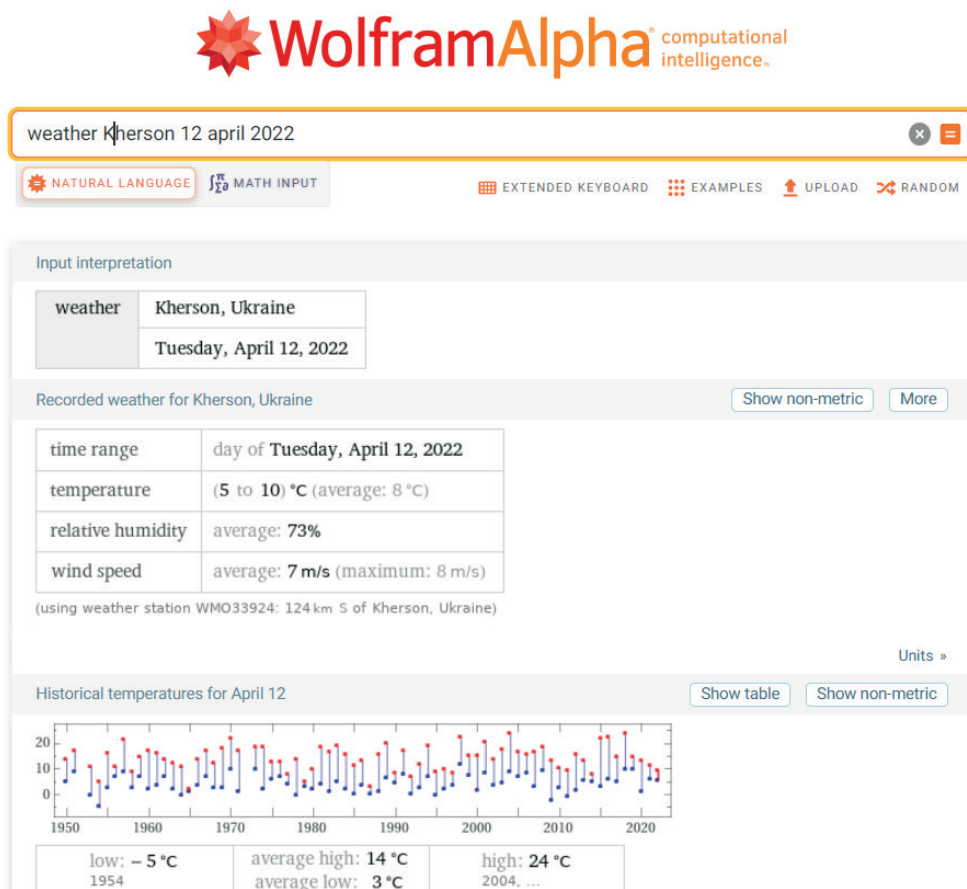


Figure 7. An example of using the “weather city date month year” template

Source: Own work.

3. Use of video analysis services. Features such as breaking down the video into keyframes, searching for similar videos on the network, and exact download time are provided by the free services YouTube DataViewer (a plugin installed in the Google Chrome browser) and InVID (<https://citizenevidence.amnestyusa.org/>). Table 5 provides some characteristics of these services.

Table 5. Characteristics of video analysis services

Characteristic	InVID	YouTube DataViewer
Download date/time	+	+
Search for old versions of videos	+	+
Video fragmentation and reverse search by video thumbnails in all search engines	+	–
Contextual information about the author of the video, source, geolocation, comments, presence of links	+	–
Magnifier lens (detailed analysis of scaled video screenshots)	+	–
The right to video	+	–
OCR (analysis of text on video, images)	+	–
CheckGif (a tool for proving forgery or authenticity)	+	–

Source: Own work.

As the table shows, the InVID service has more powerful functionality, and therefore we offer students research projects on video verification using it. Mastering the plugin is possible on your own or through master classes that include:

- for verification of photo mastering of computer tools – image analysis (image ID, platform, publication source, time of creation, link, number of likes, number of retweets, image URL), lens (zooming to analyse the details of the image), metadata (if the image contains geocoordinates, it points to this place on the Google map), CheckGif (visual evidence of image forgery by superimposing the processed image on the original image using mathematical software);
- for verification of video acquisition of computer tools – video analysis (location (if detected), most interesting comments, reverse image search), key-frame (segmentation of video by keyframes, which can then be searched by left-clicking on Google or using contextual menu on Google, Yandex, TinEye, Bing, Karma Decay (for Reddit) and Baidu images), thumbnails, metadata.

4.2.4. Task 4. Improve the skills of protecting one’s own information space

The results of the survey proved that students have a superficial attitude to security in the information space. Their knowledge is limited only to the ability to set passwords and biometric authentication.

In order to form/develop the skills to protect one’s own information space, we offer the exercise “Logical chain”, in which the first sentence announces a potential (not always safe) action, for which students propose a chain of further potential dangers. The following dangers are discussed, for example: “If I talk a lot about myself on the Internet, then...”, “If I feel safe accepting friend requests from strangers, then...”, “If I grant access to the camera or geolocation to installed computer programs, then...”, “If I don’t update my software and operating system, then...”, “If I irresponsibly open an email, then...”, “If I use public Wi-Fi networks when accessing my mobile bank, then...”.

4.3. Results of a pedagogical experiment

The effect of the special course “Information hygiene” on the ability of young people to resist informational influences was tested in the conditions of a pedagogical experiment using the non-parametric criterion of signs (Grabar & Krasnjanskaja, 1977). Null hypothesis: the special course does not affect the ability of young people to resist informational influences.

Alternative hypothesis: the special course affects the ability of young people to resist informational influences.

We recorded two results: at the beginning of studying the special course (Result 1) and after studying it (Result 2). The results (Result 1 and Result 2) were determined by the students’ answers to the questions in the questionnaire, which are listed in Table 1. The obtained results are presented in Table 6.

Table 6. Results of students before and after studying the special course

Student	Result1	Result 2	Student	Result 1	Result2	Student	Result 1	Result 2	Student	Result 1	Result 2	Student	Result 1	Result 2	Student	Result 1	Result 2
1	2	4	22	4	3	43	3	6	64	3	3	85	2	3	106	4	4
2	2	4	23	4	3	44	1	3	65	3	3	86	2	3	107	4	4
3	2	3	24	4	2	45	1	3	66	3	3	87	2	3	108	4	4
4	3	4	25	4	6	46	2	3	67	4	4	88	3	2	109	4	4
5	3	4	26	4	3	47	2	3	68	4	4	89	3	2	110	5	5
6	4	3	27	4	3	48	2	3	69	4	4	90	3	2	111	3	3
7	3	4	28	4	6	49	3	7	70	4	3	91	3	5	112	3	3
8	3	5	29	5	3	50	3	2	71	4	3	92	3	5	113	3	3
9	3	5	30	3	6	51	3	4	72	4	5	93	3	2	114	2	3
10	3	3	31	3	4	52	3	2	73	4	6	94	4	5	115	2	4
11	2	2	32	3	4	53	3	4	74	5	3	95	2	3	116	2	4
12	2	2	33	2	4	54	3	4	75	3	6	96	2	3	117	3	6
13	3	3	34	2	4	55	4	3	76	3	2	97	2	3	118	3	2
14	1	1	35	2	4	56	2	4	77	3	2	98	2	4	119	2	4
15	1	1	36	3	4	57	2	4	78	2	3	99	1	4	120	3	6
16	2	2	37	3	4	58	2	4	79	2	3	100	1	4	121	2	3
17	2	2	38	2	4	59	2	4	80	2	3	101	2	4	122	2	3
18	2	2	39	3	5	60	2	3	81	3	2	102	2	4	123	2	4
19	3	3	40	3	5	61	4	4	82	3	2	103	2	4	124	2	7
20	3	3	41	1	3	62	4	4	83	2	3	104	1	4	125	2	4
21	3	3	42	1	3	63	4	4	84	3	4	105	2	4	126	1	5

Source: Own work.

Based on the obtained results, Table 7 was formed to speed up the statistical analysis.

Table 7. Dynamics of student results

Score dynamics	Negative, «-»	Unchanged, «0»	Positive, «+»	Number of changes, $n=«-»+«+»$
Number of respondents	21	39	66	87

Source: Own work.

Since $T_{exp} = 66$ (this is the number of “+” signs in the sample), $n = 87$ (this is the number of respondents who experienced changes in the results), then the area of acceptance of the null hypothesis after the relevant calculations: [34.36; 52.64] at the significance level of 0.05.

Since T_{exp} is beyond the range of acceptance of the H_0 hypothesis, an alternative hypothesis should be accepted with the conclusion that the author's technique affects the ability of young people to resist informational influences. Since the assessment of skills constructed by us is accumulative, the exit of T_{exp} (this is the number of positive shifts in the number of students) beyond the critical segment on the right means that a conclusion should be drawn precisely about the positive (not negative) impact of the special course on the ability of young people to resist informational influences.

5. DISCUSSION

The purpose of our research was to develop an effective special course on information hygiene due to the revealed low threshold of compliance with information hygiene by young people and, as a result, the tendency of young people to be manipulated, gullible in perceiving misinformation, unconsciously condoning criminal actions in cyberspace. The developed special course involves the use of active learning methods (trainings, master classes, problem-based lectures) and a significant number of practical tasks that are solved under the guidance of a tutor who acts as a coordinator and consultant. Therefore, the implementation of a special course today is possible rather in the conditions of formal training. However, within the framework of educational and professional training programmes, such courses are not mandatory (unless we are talking about narrow-profile specialties such as journalism) and are offered as a variable component of professional training.

It should be noted that the problem we considered is gaining popularity in the Ukrainian educational space, and similar courses are distributed on various online educational platforms:

- ED-ERA resource (<https://www.ed-era.com/>) offers free interactive courses «Online course on media literacy» and «Fact check: trust-verify» on methods of information influence on consciousness;
- VUMONLINE resource (<https://vumonline.ua/>) contains the course «Verification on the Internet» on methods of detecting disinformation and informational provocations;

- the national media project Filter (<https://filter.mkip.gov.ua>) is focused on the formation of media literacy of Ukrainians and the ability to detect manipulation.

But, regardless of the high quality of such courses, they have shortcomings inherent in informal online education in general: lack of interactive interaction, insufficient level of self-organization of course participants, insufficient level of their concentration skills, etc.

6. CONCLUSION

1. The problems facing the world due to globalization processes, caused by the development of information technologies and means, become especially relevant in the conditions of a military threat. Among such problems are informational influences that are implemented in virtual space, on society as a whole and on each individual citizen, in particular. The reduction of informational influences is possible provided that every member of society observes informational hygiene, the idea of which should be formed already in educational institutions. At the same time, the results of the survey proved that the majority of students today: have a low threshold of awareness of the importance of personal data protection; are gullible, not in the habit of checking information; have weak ideas about the operation of algorithms of the functioning of social networks; do not distinguish fact from judgment; have a low level of critical thinking in information consumption. As a result, students can easily be manipulated, believe misinformation, spread fakes, unknowingly indulge in criminal activities, and share personal data without realizing the possible consequences.
2. One of the ways to solve the problem of information hygiene compliance by every member of society is the purposeful formation of ideas among young people about the existing destructive effects of information technologies. Such formation is possible through the introduction of a special course on information hygiene (elective course, a group, a number of extracurricular activities) as a tool designed to teach how to see the risks of consuming information content and distinguish dangers in the conditions of information confrontations. The special course should solve the following tasks: to form a responsible attitude to the consumption of information content; to develop the ability to counteract destructive influences based on emotional colouring (psychological manipulations, propaganda, disinformation, etc.); to develop practical skills to verify media products for their critical evaluation; to improve the skills of protecting one's own information space.
3. Experimental verification of the effect of the special course on the ability of young people to resist informational influences proved its effectiveness. However, it left a number of problematic issues open, including: the problem of formulation/clarification/definition of information hygiene rules and technologies (practices) for their compliance; the problem of the young generation's lack of high-level thinking skills (analysis, synthesis, generalization, comparison, deduction, induction, analogy, critical evaluation, etc.). Their solution requires separate research at the interdisciplinary level of sociology, pedagogy and psychology.

REFERENCES

- Bulatovic, L.L., Bulatovic, G., & Arsenijevic, O. (2014). The education of future teachers of multimedia literacy in Serbia." In EDULEARN14: 6th International Conference On education and new learning technologies (pp. 590–597).
- Drushlyak, M.G., Semenog, O.M., Hrona, H.V., Ponomarenko, H.P., & Semenikhina, O.V. (2022). Typology of internet resources for the development of youth's infomedia literacy. *Information Technologies and Learning Tools*, 88(2), 1–22. <https://doi.org/10.33407/itlt.v88i2.4786>.
- Eremin, A.L. (1995). K voprosu razvitiya novogo napravleniya – informacionnoj jekologii [On the issue of developing a new direction – information ecology]. In *Abstracts of the 1st International Conference*. St. Petersburg: MANEB Center (pp. 238–239).
- Fedorov, A.V., Levickaja, A.A., Chelysheva, I.V., Murjukina, E.V., & Grigороva, D.E. (2014). *Media education in Eastern Europe*. Moscow: MOO "Informacija dlja vseh".
- Grabar, M.I. & Krasnjanskaja, K.A. (1977). *Application of mathematical statistics in pedagogical research Nonparametric methods*. Moscow: Pedagogika.
- Grimes, D.R. (2020). Health disinformation & social media. The crucial role of information hygiene in mitigating conspiracy theory and infodemics. *EMBO REPORTS*, 21, 11, 51819. <https://doi.org/10.15252/embr.202051819>.
- Horbenko, H., Hondiul, O., & Fruktova, Y. (2020). Non-formal education of educators in media centers of leading European countries: educational and methodological aspect. *Continuing Professional Education Theory and Practice*, 4, 103–109. <https://doi.org/10.28925/1609-8595.2020.4.13>.
- Jeong, S., Cho, H., & Hwang, Y. (2012). Media Literacy Interventions: A Meta-Analytic Review. *Journal of communication*, 62, 3. <https://doi.org/10.1111/j.1460-2466.2012.01643.x>.
- Khalamendyk, V.B. (2008). Informatsiina hihiiena yak faktor zberezhenia psykhiichnoho zdorovia liudyny [Informational hygiene as a factor in preserving human mental health]. *Humanitarnyi visnyk Zaporizkoi derzhavnoi inzhenernoi akademii [Humanitarian Bulletin of Zaporizhzhya State Engineering Academy]*, 35, 83–91.
- Loukas, G., Murugesan, S., & Andriole, S.J. (2022). Information Hygiene: The Fight Against the Misinformation "Infodemic". *IT Professional*, 24, 2, 16–18. <https://doi.org/10.1109/MITP.2022.3163007>.
- Pérez-Tornero, J.M. & Tayie, S. (2012). Teacher training in media education: curriculum and international experiences. *Comunicar*, 20(39), 10–14. <https://doi.org/10.3916/C39-2012-02-00>.
- Varynskyi, V., Varynska, A., Kostytsky, M., & Kushakova-Kostytska, N. (2021). Information security and information hygiene on internet media. *Nexo Revista Científica*, 34(01), 120–128. <https://doi.org/10.5377/nexo.v34i01.11291>.
- Zhu, S., Yang, H.H., Wu, D., & Chen, F. (2021). Investigating the Relationship Between Information Literacy and Social Media Competence Among University Students. *Journal of educational computing research*. 0735633121997360. <https://doi.org/10.1177/0735633121997360>.