USING BLOOM'S TAXONOMY TO ASSESS INFORMATION HYGIENE SKILLS

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Abstract: *The article raises the problem of assessing young people's information hygiene skills. The authors emphasize that despite the massive introduction of special courses on information hygiene, and the popularization of open educational resources on media literacy, Ukrainian society remains sensitive to informational influences, which is confirmed by hybrid military aggression. The authors consider a change in approaches to the evaluation of the results as one of the possible solutions to the situation. The article substantiates the appropriateness of using Bloom's taxonomy to assess the formation of youth information hygiene skills. The authors use theoretical (analysis of practices in the application of Bloom's taxonomy in the educational process, modelling of the evaluation process) and empirical (observation, expert evaluations, pedagogical experiment) research methods. A pedagogical experiment is described, the idea of which is to compare two methods of assessing the formation of information hygiene skills: an online test for checking the level of media literacy and a comprehensive test of information hygiene skills based on Bloom's taxonomy. The research model involved a double assessment of the formation of information hygiene skills in both ways. The first check took place after half of the course, and the second – at the end of the course. The evaluation results were*

compared. Based on the comparison of the results, the authors concluded that using Bloom's taxonomy for assessment provided advantages, as it allowed for the analysis of failure and ways to correct gaps in learning outcomes, while online tests gave higher skill assessments.

Keywords: information hygiene; Bloom's taxonomy; assessment; media literacy; information and communication competence; digital culture; professional training

INTRODUCTION

In the conditions of the globalization of the information space and the exacerbation of information wars, the professional activity of teachers deserves special attention, which should be directed not only to the subject education of young people but also to the implementation of educational and formative influences on them. One of these influences is the development of information hygiene skills among young people. Today, information hygiene is perceived as a field that addresses the impact of information on the overall well-being of society and its individual citizens. A frivolous attitude to information content enables informational influence on a person and his condition. Consuming informational content of dubious quality can lead to the neglect of potential information threats. The spread of false data and biased interpretations of facts results in a higher number of individuals falling victim to manipulation. Irresponsible handling of personal data on the Internet can be used for criminal purposes. The identified risks often depend on established behavioural reactions and communication habits of members of society. Countermeasures against risks are possible provided that relevant knowledge and skills are formed: an understanding of the work of the media, the ability to critically evaluate the content of the content, the ability to be responsible for its consumption, distribution, and production, the ability to adequately respond to it, etc. The formation of such skills currently depends on education. And if the processes involved in developing information hygiene skills among young people have already garnered the attention of Ukrainian scientists, then the outcomes of this development deserve special attention.

1. ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The problem of assessing the development of information hygiene skills cannot be considered new, as it is closely related to the safe use of information and digital technologies in general and the problems of media, information, and digital literacy formation in particular. The analysis of scientific results shows that scientists use different methods to determine the level of ability to safely use information technologies and tools.

Thus, in a study (Torres-Hernández & Gallego-Arrufat, 2022), which focuses on a review-analysis of articles devoted to the formation of digital competence in the field of security, all the results presented in the publications from 2013 to 2022 are based on the interview method. For example, the authors of the study (Bissonnette et al., 2021) used an interview method to find out how students use cognitive skills to

analyse scientific and pseudo-scientific information in news from the Internet. The results of the interviews showed that there is a significant gap between the use of critical thinking skills in understanding the text, quantitative evaluations, correct argumentation, and impartiality. In particular, students had difficulties justifying their own position and comparing value arguments. The publication (Černý, 2021) presents the analysis, systematization, and generalization of the subjective testimonies of high school students regarding information literacy, which is a confirmation of the use of the survey method. The work (Austin et al., 2016) examines the effectiveness of teaching media literacy through questionnaires. The results of processing questionnaires show that critical perception of media sources is an important basis for the development of critical thinking regarding media messages.

Successfully completing online tests or online surveys often makes the respondent complacent and does not prompt them to address the issue of developing the required skills. Therefore, it is important for course developers and teachers to use such practices for evaluating learning outcomes, which would meet the expectations of society and focus not only on students' awareness of problems and the presence of ideas about informational influences but also include testing practical skills in countering informational aggression. Among these approaches, we consider the practice of applying Bloom's taxonomy to be the most focused on building a clear system of educational goals and learning outcomes. Bloom's Taxonomy, also known as "Bloom's Taxonomy of Cognitive Objectives", is a model for classifying educational objectives according to levels of cognitive complexity (Bloom, 1956). Developed in 1956, it has been widely used for a long time as a tool for planning learning objectives, developing tasks, and evaluating learning achievements.

A significant number of Ukrainian scientific results relate to the practical application of Bloom's taxonomy. In scientific works, the problem of the consistency of educational goals and the design of learning forms according to the levels of Bloom's taxonomy (Sokolyuk, 2017) and the use of the methodology for evaluating educational achievements based on the competence approach is solved (Boliubash, 2017). Scientific studies provide evidence supporting the appropriateness of using taxonomy to determine educational outcomes. Therefore, it is reasonable to assume that assessing educational achievements in the development of information hygiene skills using Bloom's taxonomy will provide the most objective results.

The research question: Is it appropriate to use Bloom's taxonomy to assess the development of young people's information hygiene skills?

2. METHODOLOGY OF RESEARCH

The research employed both theoretical methods (such as the analysis of practices in the application of Bloom's taxonomy in the educational process, modelling of the evaluation process) and empirical methods (including observation, expert evaluations and a pedagogical experiment) to support the suitability of using Bloom's taxonomy for assessing the development of information hygiene skills.

The research was conducted in the 2022–2023 academic year at A.S. Makarenko Sumy State Pedagogical University with the involvement of leading experts from

Donbas State Pedagogical University. Assessment of students' information hygiene skills (specialty 014 Secondary education of A.S. Makarenko Sumy State Pedagogical University) took place based on the results of the elective course "Information Hygiene". The main ideas, content, and features of teaching the course are presented in works (Rudenko et al., 2022; Rudenko et al., 2023). The tasks (results) of the course study are defined as follows: to give an idea of the peculiarities of media work; form the ability to identify hate speech and counteract it; develop the ability to verify photos, videos, and text messages; develop the ability to identify stereotypes and discriminatory messages; develop ethical communication skills; develop digital security skills; develop the ability to resist manipulation, propaganda, and other destructive influences. The total number of experiment participants is 39 students and 7 lecturers.

The research idea is based on the comparison of two methods of assessing information hygiene skills. The first method involves is a media literacy test available on the Vseosvita resource (https://vseosvita.ua/test/mediahramotnist-650418.html). The selection was based on the generalized opinion of experts who had experience of teaching similar courses for less than five years and relevant scientific publications on media education issues. The first 10 resources offered by the Google search engine were taken by searching for "Media Literacy Tests". The criteria for choosing a test for experts were: the number and variety of questions; the possibility of testing not only knowledge but also skills; the possibility of testing the ability to verify data; compliance with the author's course. According to unanimous expert consensus, the Vseosvita resource provided a test that, met all the specified criteria. The test contained single- and multiple-choice questions, as well as those that required additional skills and actions on the Internet (skills for verification, search, etc.). The second method is a comprehensive test of information hygiene skills, which was developed by the authors on the basis of Bloom's taxonomy. The comprehensive test for information hygiene skills required students to earn a specific number of points by correctly completing various types of tasks. Experts approved the point distribution, which was then used to determine the levels of formation of information hygiene skills development. The research model included a a double assessment of the development of information hygiene skills using both methods. The initial assessment occurred halfway through the course, while the second assessment was conducted – at the end of the course.

3. RESULTS OF RESEARCH

We will employ Bloom's taxonomy to assess the development levels of formation of students' information hygiene skills. In order to assess the outcomes of the course, we have established four levels of information hygiene skills development: low – understanding of the essence of media work and their impact on society; medium – the presence of skills in the conscious use of media; sufficient – free interaction in the media environment, ability to analyse media content; high – effective use and interaction in the media, skills in creating, protecting, resisting the destructive effects of the media. In order to correctly determine the level of acquired knowledge and

skills using Bloom's taxonomy, it is appropriate to formulate control questions for a comprehensive section of educational achievements – tests for testing theoretical knowledge and practical tasks for testing the skills developed. The Questions developed for all levels of Bloom's taxonomy are presented in Table 1.

T a b l e 1. Control questions according to the levels of Bloom's taxonomy

The levels of Bloom's taxonomy	Key question words to construct a question	Examples of control questions
Information reproduction	What does it mean? Where? When? How many? Give examples.	What is a fake?
Understanding information	How do you explain? How do you understand? What's the difference?	How do you understand the term "information war"?
Information application	In what cases is it used? How to use it?	How to check the weather with Data Viewer?
Analysis	What are the main features (qualities, elements)? What does it consist of? What are the reasons? What are the consequences? What is the mechanism? What are the functions? What is the difference?	Give reasons for confirming or denying the authenticity of the media message.
Information assessment	Make an assessment, formulate conclusions, and justify the statement. What is evidenced by the presence of such elements as...?	How are "jeans" and the manipulation of consciousness related to each other?
Content creation	Present information in an unusual way (creatively)	Create a "Promoting healthy eating" meme.

S o u r c e: Own work.

These questions facilitate the evaluation of both theoretical and practical outcomes in full accordance with the educational material with a gradual transition from lower (to a greater extent, reproductive and theoretical) to higher (to a greater extent, practical and analytical-creative) levels of the taxonomy, as well as the four levels of formation of information hygiene skills defined by us. To quantify the educational outcomes, we assigned points based on Bloom's taxonomy, which were agreed with the experts (Table 2).

According to this table, the following quantitative characteristics of the levels of formation of information hygiene skills were obtained: 0–7.5 points – low level, 7.5–15 points – average level, 15–22.5 points – sufficient level, and 22.5–30 points – high level. The chosen assessment method aimed to minimize subjectivity in evaluation. It included a combination of multiple-choice questions and practical tasks, which facilitated the characterization of each taxonomy level and the overall mastery of information hygiene skills.

Ta b l e 2. Evaluation table of educational achievements on the exam (according to Bloom's taxonomy)

Bloom's taxonomy level	Number of points	Number of questions	Points for one question
Reconstitution	5	5	1.0
Understanding	5	2	2.5
Application	5	2	2.5
Analysis	5	1	5.0
Assessment	5	1	5.0
Content creation	5	1	5.0
Total	**30**	**12**	

S o u r c e: Own work.

The Vseosvita resource test (online tests) included 24 questions of various types, including it also contained tasks for the practical detection of fakes. The questions included single and multiple-choice answers. Figure 1 shows the results of the initial assessment of educational achievements through both methods: the complex control based on Bloom's taxonomy (blue line) and the online tests (orange line). Based on the outcomes of comprehensive control (blue line), only 9 out of 39 students (23%) students out of 39 have achieved a "sufficient" and "high" levels, demonstrating their capacity to analyze and evaluate information in accordance with the cognitive complexity levels of Bloom's educational tasks. The orange line, representing the results of the online survey, shows that only 6 out of 39 students (15%) in the group attained an academic achievement exceeding 50%. The visual results are presented in figure 1.
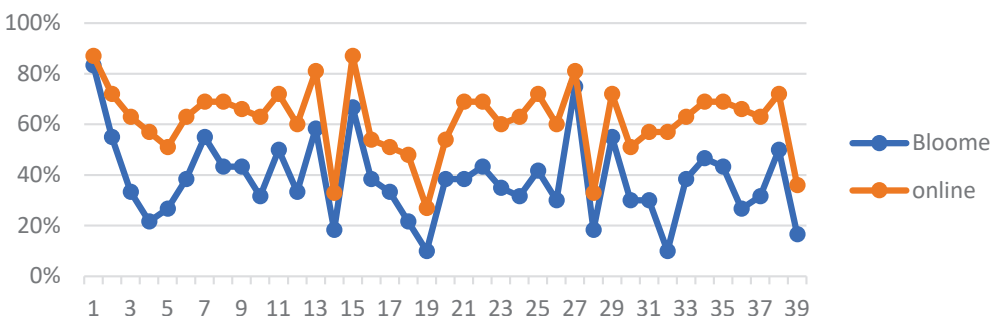

F i g u r e 1. The results of the first cut of educational achievements

S o u r c e: Own work.

The results of the second cut of educational achievements are presented in Figure 2. According to the outcomes of comprehensive control (blue line), 24 out of 39 students (61%) reached "sufficient" and "high" levels, which signifies their ability not only to reproduce and apply but also to analyse and evaluate information, in line with the cognitive complexity levels of Bloom's educational tasks. The orange line (online test results) shows that the entire group has achieved educational outcomes exceeding 50%, implying their proficiency in managing media content and their ability to analyse and evaluate it.
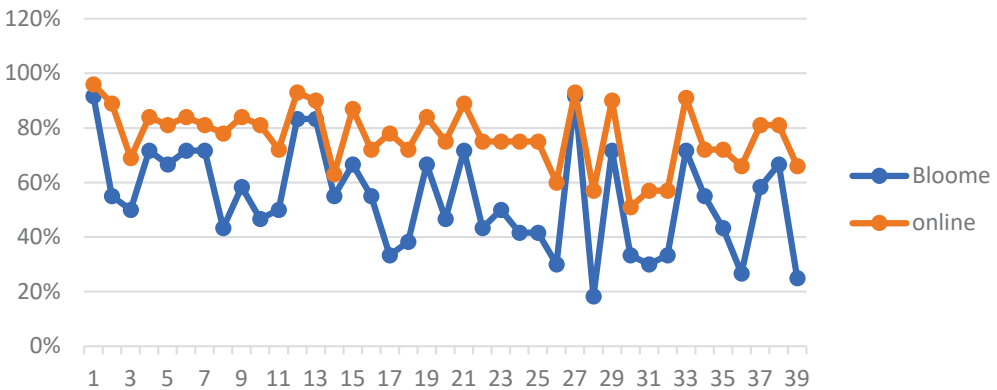

F i g u r e 2. The results of the first cut of educational achievements

S o u r c e: Own work.

The two surveys showed not only a different level in the assessment of information security skills. A comparison of the results showed that:

- the correlation of data on the first and second slices is confirmed (correlation coefficient 0.85864 and 0.85328, respectively), which allows us to compare them;
- the online survey (yellow columns of the tables) in most cases gives a higher assessment of skills, which demonstrates both the first and second slices of educational achievements. At the same time, the average rating of the group according to the online survey is such that it is possible to talk about an average sufficient result (62%>50% and 77%>50%), and, therefore, sufficient formation of the information hygiene skills of young people. According to the results of the online survey at the end of the course, all students scored more than 50% of the correct results. At the same time, the averages for evaluation according to Bloom (blue columns of the tables) show that, in percentage terms, the average score does not give grounds to say that the students' information hygiene skills were successfully formed before the end of the course (38%<50%) and only in 54% (>50%) of students after the end of the course;
- comparison of the results of the assessment according to Bloom before and after studying the course shows that it significantly affects the development of skills of "understanding information," "applying information," and "creating content" (the results would differ more than twice) and moderately affect the

development of other skills (about + 20%). This demonstrates the complexity of the questions of levels 4 and 5 of Bloom's taxonomy for students (students' analytical and evaluation skills develop poorly). Therefore, it is correct to conclude that insufficient focus of the course on the development of analytical and evaluation skills and the need to focus on such tasks that will develop them;

- the analysis of the results according to Bloom makes it possible to identify gaps that can be eliminated during the next teaching of the course: according to the results of Table 5, it is clear that the students in the middle of studying the course solve the tasks of reproduction and application of knowledge better than with regard to the perception of information, its comparison and analysis. That is, at that moment, the students had not yet fully formed the lowest levels of taxonomy - reproduction, understanding, application, and therefore training tasks of this type require either an improvement, an increase in their number, or an increase in the time to solve them;
- assessment of educational achievements based on Bloom's taxonomy has a number of advantages. First of all, the development of control measures requires their comparison with the goals and objectives of the course and therefore is precisely focused on checking the desired result. Secondly, the result forms based on Bloom's taxonomy allow you to systematically and systematically track problems with the assimilation of the material and correct them in a timely manner. Thirdly, a transparent evaluation system allows reflection of educational results not only for the teacher but also for students.

4. DISCUSSION

At the beginning of the military aggression, it turned out that the majority of Ukrainian society and especially the youth does not have sufficient skills to resist informational influences. Open educational resources of the world (Yurchenko et al., 2021), as well as in Ukraine (like VumOnline (https://vumonline.ua/), grant projects (such as Filter: National Project on Media Literacy (https://filter.mkip.gov.ua/), as well as spot implementation of special courses on media literacy into educational programs for training specialists turned out to be insufficient, as a large number of reposts of fake information, emotional vulnerability through e-communication in chats, transfer of personal data to dubious accounts, etc. are observed in social networks. Thus, the contradiction between society's expectations regarding the formation of a sufficient level of skills for safe interaction on the Internet and the existing skills of this type among members of society is actualized. Special emphasis is placed on young people, who are today the most active in social networks. The ability to behave safely on the internet is established in school and develops in institutions of professional or higher education. At the same time, it is checked, as practice shows, in most cases through surveys and tests, which does not guarantee the formation of practical skills to a greater extent.

The problem of the formation of information hygiene skills is raised at the global level in the context of the formation of media literacy of the population. In 2016, UNESCO formulated five laws of media information literacy (MIL). The third law

appeals to the ability to resist informational influences: «Information, knowledge, and messages are not always value neutral, or always independent of biases. Any conceptualization, use, and application of MIL should make this truth transparent and understandable to all citizens.». The fifth law emphasizes that the ability to resist information threats is formed over a long period of time through the acquisition of a person's own dynamic experience ("Media and information literacy is not acquired at once. It is a lived and dynamic experience and process. It is complete when it includes knowledge, skills, and attitudes when it covers access, evaluation/assessment, use, production and communication of information, media and technology content") (Joyce, 2017). This proves that the problem of forming the ability of Ukrainian youth to resist informational influences in the realities of military aggression is extremely urgent, and its solution requires the acquisition of appropriate experience over time, which is naturally carried out in the conditions of educational institutions of various levels (Drushlyak et al., 2022; Ostroha et al., 2021).

Profound social changes are currently underway, with the development of cyber culture necessitating the analysis and cultivation of skills to adapt and thrive within it. Therefore, the authors emphasize that society today needs critical thinking from everyone in its own information interaction. Another review (Silber-Varod et al., 2019) confirms that information literacy and critical thinking are the most in-demand skills of the 21st century. These skills are basic for information hygiene, and therefore should not only be formed but also constantly developed.

In (Aguaded et al., 2022), attention is focused on the fact that the development of IT has had an unexpected impact on people's lives, changing the values of society. The ability to use IT not only in the profession, but also in everyday life has become the norm for society and led to the demand for appropriate training (media education), and the problem of determining the level of its formation in the last 10 years is relevant. Another review study assessed the digital competencies of teachers (García-Ruiz et al., 2023). The authors analyse a sample of 66 Web of Science and Scopus publications published between 2017 and 2022. They prove that it is a common practice for researchers to develop their own tool for assessing digital competencies – questionnaires, and self-assessments. However, the authors recommend supplementing author surveys with other tools that can objectively assess the actual level of competence. The authors' conclusion correlates with our assessments of the subjectivity of most methods for assessing the formation of information hygiene skills. The study (Semenog et al., 2020) advocates for assessing media education skills through specially developed tasks. This study has an objective measure of information security skills, but at the same time, it offers a more sophisticated way to assess such skills.

The study resulted in the identification of additional problems that hinder the effective implementation of Bloom's taxonomy in the educational process. Among these challenges are: low awareness among teachers about this method and its advantages; the significant time required to develop tasks and assessment criteria; and a lack of awareness of the importance of aligning course objectives with programmatic outcomes.

CONCLUSION

In the conditions of a hybrid war, there is a risk under the influence of information becoming a target for manipulation, not recognizing information attacks, and becoming a tool in the hands of the enemy, spreading dubious content. Leveling of such risks is possible through the formation of information hygiene skills of every member of society: idea of the peculiarities of media work; ability to identify hate speech and counteract it; ability to verify photos, videos, and text messages; ability to identify stereotypes and discriminatory messages; ethical communication skills; digital security skills; ability to resist manipulation, propaganda, and other destructive influences.

Considering UNESCO's recommendations and the findings of humanitarian research, one potential solution to address the formation information hygiene skills is the development of a variety of training courses within the framework of formal and informal education, which can also be widely disseminated on digital educational platforms. The success of such courses is often measured through formal methods (such as attendance records, tests or surveys), which may not always provide a comprehensive assessment of acquired knowledge or effectively guard against future negative informational influences. Therefore, the assessment of information hygiene skills is a problem in the field of education that can be solved using Bloom's taxonomy.

Bloom's taxonomy allows to formulate tasks according to the levels of cognitive complexity of educational goals (reproduction, understanding, application, analysis, evaluation, creation). The developed control tasks, as the conducted experiment showed, allow not only to determine the level of formation of information hygiene skills. Tasks aligned with Bloom's taxonomy, in contrast to other assessment methods, allow for the identification of gaps in educational outcomes across different levels of cognitive complexity. Consequently, they are more accurate and appropriate than surveys, interviews, or tests.

The results of the pedagogical experiment provide a basis for recommending the development and evaluation of skills for resisting informational influences: development and implementation of courses on the formation of information hygiene skills will be more effective in the case of using Bloom's taxonomy; for the introduction of complex control of the formation of information hygiene skills according to the levels of Bloom's taxonomy, it is important to reproduce the intermediate results for their further reflection; teachers of information hygiene courses should be careful to use the relevant tests available on the Internet for control since in most cases they do not always adequately evaluate the students' information hygiene skills.

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