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USE OF MIND MAPS IN LEARNING HUMANITIES BY HIGHER EDUCATION STUDENTS

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Abstract. The study aims to determine the influence of mind maps on teaching humanities to higher education students and to identify their potential for improving analytical, reflective, and cognitive skills. The research employed a comprehensive methodology combining standardized testing (Watson–Glaser Critical Thinking Appraisal, Reflective Practice Questionnaire, Coping Flexibility Scale–Revised), questionnaire survey, structured observation, and statistical methods such as analysis of variance (ANOVA), correlation analysis, and paired t-test. The empirical sample comprised 120 students majoring in humanities, randomly divided into control and experimental groups, which ensured the validity and reliability of the obtained results. The study lasted for two academic semesters and included pre-testing, experimental intervention, and post-testing. The results showed that 80% of students recognized the high effectiveness of mind maps in structuring and organizing learning materials, while 75% confirmed a noticeable improvement in critical and reflective thinking. The mean value in the Adaptive Coping category increased from 3.45 to 4.30, and in Self-Appraisal – from 3.00 to 4.00, while the effect size ranged from 0.70 to 0.80, confirming a statistically significant influence on learning outcomes. Mind maps also contributed to cognitive flexibility, interdisciplinary integration, and higher student engagement in the educational process. The scientific novelty of the study lies in the empirical verification of the long-term cognitive, reflective, and integrative effects of mind maps, confirmed for the first time in the context of humanities education. The research introduces a pedagogical model for integrating mind maps into university courses, offering a new perspective on the interaction between visual, analytical, and critical thinking. The practical significance lies in applying mind maps as an effective educational tool to enhance comprehension, structure knowledge, and improve students' autonomy, motivation, and cognitive activity in higher education.

Keywords*:* critical thinking, humanities, cognitive flexibility, knowledge organisation, knowledge integration, information visualisation.

1. INTRODUCTION

The growing interest in innovative teaching methods aimed at developing critical thinking, imagination, and deeper comprehension of learning material reflects a broader transformation in higher education. Such approaches are particularly relevant in the humanities, which are characterized by the complexity of knowledge structures and the need for multidimensional perception of phenomena, events, and concepts (Bond et al., 2021). One of the most promising tools that embody these principles is the mind map – a graphical method of information organisation that enhances visual thinking, facilitates logical connections between ideas, and supports a systematic understanding of complex content.

Mind maps not only help structure large volumes of material but also make learning more

creative, dynamic, and effective (Machado & Carvalho, 2020). They enable students to perceive information as an interconnected whole rather than isolated facts (Wu & Wu, 2020), stimulating analytical reasoning, intuition, and the capacity to draw meaningful conclusions (Merchie et al., 2022). In teaching humanities, where abstract concepts and theoretical generalizations dominate, the use of mind maps helps overcome learning difficulties by transforming complex ideas into visual structures, thus promoting better comprehension of interrelations among phenomena and ideas (Anratriningrum & Mulyono, 2020).

Researchers worldwide have explored diverse strategies to improve learning effectiveness and foster critical thinking through innovative educational technologies. Bond et al. (2020) conducted a systematic analysis of studies on student engagement and technology use in higher education, demonstrating how innovative tools can enhance academic performance. Hariyadi et al. (2023) emphasized the efficiency of mind maps in STEM education, where they substantially improved students' academic literacy within the framework of Education 4.0. Similarly, Aljawarneh (2020) underlined that innovative teaching technologies have become integral to modern higher education institutions (HEIs).

A systematic review by Zawacki-Richter et al. (2019) on artificial intelligence (AI) in higher education identified one of the key research directions as the search for effective methods of integrating technology into learning — including mind maps — to improve comprehension and retention. Adi and Mulyono (2019) studied the role of mind maps in shaping students' behavior related to food safety awareness, revealing their potential to influence thinking and perception. Ishikawa (2021) focused on cognitive aspects of spatial thinking and demonstrated that mind maps can enhance spatial reasoning, which is crucial for mastering abstract concepts typical of the humanities. Wan and Yu (2023) proposed adaptive learning models based on cognitive maps, confirming that such visualization tools facilitate knowledge integration and adjustment to new educational environments. Research by Flores Ledesma et al. (2024) and Orb Dávila et al. (2024) further expanded the field by exploring neutrosophic cognitive maps as mechanisms of structuring complex information in education.

In practical pedagogical applications, El Shaban (2022) demonstrated that using the Popplet app for mind-map creation improved student performance in language learning. Hasyim et al. (2024) confirmed that mind maps helped evaluate teachers' preparedness for online education in both urban and suburban settings. However, the existing literature also shows inconsistencies: while several studies report significant improvements in critical thinking and academic achievement, others find limited or ambiguous results. The impact of mind maps appears to depend on context, subject specificity, and learners' individual characteristics. Moreover, the role of emotional support and self-regulation in using mind maps effectively remains insufficiently explored.

Regardless of numerous studies confirming the importance of innovative teaching methods, the issue of mind map effectiveness in teaching humanities remains open. Although this tool has been shown to be an effective means of improving information understanding and memorising, challenges related to its implementation require additional analysis. In particular, it is important to explore the effectiveness of mind maps in the development of critical thinking, a creative approach to studying, and the ability to integrate knowledge within different subjects.

In the academic field, there is a lack of effective methods that would contribute to the deep assimilation of humanities material by higher education students. Despite the availability of general tools for visualizing knowledge, the problem is the lack of a comprehensive approach to structuring, integrating, and critically interpreting educational content within the scope of humanities. There is also a contradiction between students' need for interdisciplinary thinking and traditional forms of presenting material, which complicates the creation of a holistic system of knowledge and analysis skills.

The aim of the study is to determine the influence of mind maps on teaching humanities to higher education students. The aim involved the fulfilment of the following research objectives:

1. Analyse the influence of mind map use on the improvement of students' knowledge structuring and systematisation.
2. Study the influence of the use of mind maps on the development of students' critical thinking.
3. Study students' ability to integrate knowledge in different humanities with the use of mind maps.
4. Evaluate the effectiveness of mind maps in the improvement of learning and memorising educational material.

Research hypothesis: the use of mind maps in teaching humanities enhances the effectiveness of learning for higher education students, improves the structuring of knowledge, develops critical thinking, strengthens the ability to integrate interdisciplinary information, and contributes to the formation of cognitive flexibility.

A new type of interactive tasks was proposed in this study based on the use of mind maps as a tool for structuring, understanding, and integrating humanities knowledge. This approach was adapted to the specifics of humanities students, taking into account their need for visual generalization of information, development of critical thinking, and interdisciplinary analysis. The study also empirically confirmed the effectiveness of such an approach specifically for higher education students of humanities-related majors.

2. RESEARCH METHODS

2.1. Research procedure

The study is quasi-experimental with control group (CG) and an experimental group (EG) for the purpose of evaluating the effectiveness of problem-based tasks aimed at developing students' critical thinking.

The study was conducted in three stages: diagnostic (pre-test), experimental (intervention), and final (post-test). At the first stage (pre-test), participants of both groups – EG (n=60) and CG (n=60) – underwent standardized testing using the following tests:

- Watson-Glaser Critical Thinking Appraisal (WGCTA) – to determine the level of critical thinking;
- Reflective Practice Questionnaire (RPQ) – to measure the level of reflective thinking;
- Coping Flexibility Scale-Revised (CFS-R) – to assess cognitive flexibility.

In addition to testing, students filled out the author's questionnaire (see Appendix 1), which included 11 questions aimed at studying the attitude towards mind maps, assessing their effectiveness, impact on the organisation of knowledge, and the development of thinking. Uninvolved structured observation using an observation map was also carried out. The map parameters included level of involvement, quality of interaction, independence of thinking, manifestations of analysis and synthesis.

The second stage (experimental) lasted 12 academic weeks. The EG students systematically worked with mind maps in humanities classes (Pedagogy, Culture of Professional Speech, Foreign Language, Methodology of Teaching Humanities, etc.). They performed tasks individually and in groups, created maps manually or using digital tools (XMind, MindMeister). The CG studied according to the traditional programme without the use of mind maps. The dynamics of activity, involvement, and thought processes of the EG students were observed throughout the period.

The third stage (post-test) involved the repeated administration of all instruments (WGCTA, RPQ, CFS-R, author's questionnaire, observation card) for both groups. The obtained data were compared with the results of the pre-test in order to identify changes under the influence of the experiment.

2.2. Sample

The study was conducted from September 2023 to April 2024 in the Department of Preschool, Elementary Education and Arts of T.H. Shevchenko National University "Chernihiv Collegium" and Foreign Languages Department of the State Institution "South Ukrainian National Pedagogical University named after K. D. Ushynsky". The study sample included 120 students in the 1st and 2nd

years of study at the Department of Preschool, Elementary Education and Arts and Foreign Languages Department. The age of the participants ranged from 18 to 22 years, as this period is characterised by active cognitive development and critical thinking formation. Selection of the first and second years of study was stipulated because of mastering basic professional skills by students in this stage. They also began to actively develop analytical thinking, which is essential in the learning process.

The gender distribution was 75% women and 25% men, which corresponds to the typical demographic parameters of these departments. Students majoring in Elementary Education and Foreign Languages were selected for the study to evaluate the influence of problem tasks on the development of critical thinking in different educational contexts.

Sampling criteria included age, gender, course, major, and voluntary participation. The sample was formed on the basis of voluntary participation, and students were randomly selected from the groups, which were ready to participate in the experiment. Sampling was conducted by the lecturers of departments of preschool and elementary education and Western and Eastern languages, who coordinated the studies.

The participants were distributed into groups by random sampling from among the students who voluntarily agreed to participate in the study. The equivalence of the EG and CG, at the sampling stage, was ensured through an initial diagnostics of the level of academic performance, and the level of critical thinking conducted by using an adapted version of the Watson-Glaser Critical Thinking Appraisal. The obtained results made it possible to distribute the participants so that the average indicators of both groups did not have statistically significant differences at the initial stage, which ensures the validity of the experimental comparison. Therefore, each group included students with a different but balanced level of training, which allowed an impartial assessment of the effectiveness of using mind maps in the educational process.

In order to verify the equivalence of the EG and CG a pre-test was conducted before the experiment using three instruments: the WGCTA, the RPQ, and the CFS-R. A structured observation card was also used, which included an assessment of learning activity, quality of interaction, and signs of critical thinking during classes.

The obtained data were analysed using the Student's t-test for independent samples. The results of the statistical test revealed no significant differences between the mean values of the EG and CG ($p > 0.05$), giving grounds to state that the samples were equivalent at the initial stage of the study.

2.3. Study methods

Several empirical methods were used in the study, in particular: standardised questionnaires, which enabled complex evaluation of the influence of mind maps on the learning process.

1. *Testing*

Watson-Glaser Critical Thinking Appraisal was used to evaluate the influence of mind maps on the development of students' critical thinking (Watson & Glaser, 2020). This test identified the students' cognitive abilities in the analysis, interpretation, substantiation, and evaluation of information, which are the key components of critical thinking.

2. *Reflective Practice Questionnaire* (Fuertes-Camacho, 2021) was used to determine the influence of mind maps on students' abilities in knowledge integration and deep self-reflection. It was used for evaluation of the contribution that mind maps make to material understanding and their influence on the ability to integrate different subjects.

3. *Coping Flexibility Scale-Revised* (Kato, 2020) was used to measure the students' ability to adapt to new knowledge and establish interdisciplinary relations. The use of mind maps was expected to facilitate an increase in cognitive flexibility, which was evaluated with this scale.

4. *Questionnaire survey.*

The EG students completed surveys aimed at evaluation of the attitude to mind map use, perception of the effectiveness of this method, and influence on knowledge organisation and structuring (Appendix

1).

5. *Observation*

The pedagogical observation was used to evaluate the students' behaviour during task performance with the use of mind maps. Observation enabled analysis of students' interaction with tasks and the extent to which this tool helps in learning material.

All standardized questionnaires used in the study — the WGCTA, RPQ, and CFS-R — were translated into Ukrainian and adapted to the local educational context. The adaptation process included translation, back-translation and editing, taking into account the linguistic and cultural characteristics of the student audience.

The instruments were validated through expert assessment of content relevance and testing on a pilot sample (n = 30) of students who were not included in the main sample. The reliability of the scales was: WGCTA – $\alpha = 0.81$; RPQ – $\alpha = 0.86$; CFS-R – $\alpha = 0.78$, which indicates an acceptable level of internal consistency and confirms the possibility of their use in the Ukrainian higher education system.

2.4. Observation method

As part of the empirical study, an uninvolved structured observation was used. It was carried out throughout the entire period of experimental training. The observation was carried out by the researcher during classes held in the EG. The subjects of the observation were humanities students (n = 120), who participated in the implementation of the technique of using mind maps in classes in a number of basic and professionally oriented subjects. The situations in which the observation was carried out included various forms of educational interaction: individual creation of mind maps, group construction of conceptual structures on course topics, analysis and mutual evaluation of maps of classmates, presentation of results, as well as discussion with the teacher.

The observation was carried out in classes in such subjects as Introduction to the Profession, Pedagogy, Language Culture, History of Philosophy, and Methodology of Teaching Humanities, as they involve a significant load on analytical thinking, interdisciplinary generalization, and also require logically structured knowledge from students. This made it possible to assess the dynamics of the development of skills in analysis, synthesis, argumentation, information systematization, and teamwork.

The observation results were recorded by developing a structured observation map, which contained five main parameters:

– the level of student involvement in the learning process (determined on a scale from passive perception of the material to proactive participation in group work);

– the quality of interaction with the teacher and other students (activity in discussions, questions, proposals for joint work, were taken into account);

– the ability to present and argue one's own ideas (clarity, logic, providing examples were taken into account);

– signs of critical thinking (the ability to express doubts, search for alternatives, and apply logical reasoning);

– the ability to integrate knowledge from different topics and subjects when creating mind maps.

All observations were recorded systematically after each lesson. At the end of the study, the results were subjected to quantitative and qualitative analysis in order to trace general trends in changes in students' learning activity, the level of their cognitive flexibility, critical thinking, and interdisciplinary connections in acquiring knowledge on the humanities. The obtained observations were also compared with the results of the survey and standardized questionnaires to ensure comprehensive verification of the study's findings.

2.5. Statistical analysis

The *ANOVA* was used to evaluate differences between the CG and EG. Correlation analysis was used to study the relationship between the level of mind map use and the development of key cognitive

skills. As students were tested twice (before and after the introduction of mind maps), a *paired t-test* was used to compare mean parameters for each group in two situations. *Descriptive statistical methods* (mean value, standard deviation) were used for description and general analysis of the obtained data.

3. RESULTS AND DISCUSSION

Table 1 presents the results of testing students' critical thinking before and after mind map use measured with the WGCTA.

Tab. 1

The WGCTA results for the pre- and post-testing in the EG

Questions	**Mean (Pre-Test)**	**Mean (Post-Test)**	**Standard Deviation (Pre-Test)**	**Standard Deviation (Post-Test)**	**p-value**	**Effect Size (Cohen's d)**
Recognizing Assumptions	3.25	4.05	0.58	0.5	0.002	0.7
Evaluating Arguments	2.89	3.95	0.62	0.55	0.005	0.6
Drawing Conclusions	3.75	4.15	0.55	0.52	0.001	0.8
Interpreting Information	3.1	4.0	0.6	0.51	0.003	0.75
Problem Solving	3.5	4.2	0.57	0.54	0.004	0.72

Source: developed by the authors based on the collected data about the participants in the experiment

Significant improvement in the mean indicators for all aspects of critical thinking was observed after the introduction of mind maps. In particular, the mean value for the Recognizing Assumptions item increased from 3.25 to 4.05. The standard deviation decreased from 0.58 to 0.50, indicating more stable results among participants. The effect size for this parameter (Cohen's d = 0.70) indicates significant influence. A similar tendency was observed in relation to other categories. For example, the mean value for Evaluating Arguments increased from 2.89 to 3.95, and a p-value of 0.005 indicates a statistically significant difference. The largest increase was fixed in the Drawing Conclusions category, where the mean value increased from 3.75 to 4.15. The effect size (0.80) indicates a significant influence of mind maps on this aspect of critical thinking. Generally, all p-values are lower than 0.05, which confirms the statistical significance of changes in all aspects of critical thinking after the introduction of mind maps. The effect size for all categories exceeds 0.60, which indicates a significant influence of intervention on the improvement of students' cognitive skills.

The results show significant improvement in knowledge integration and deep self-reflection after mind maps introduction (Figure 1).

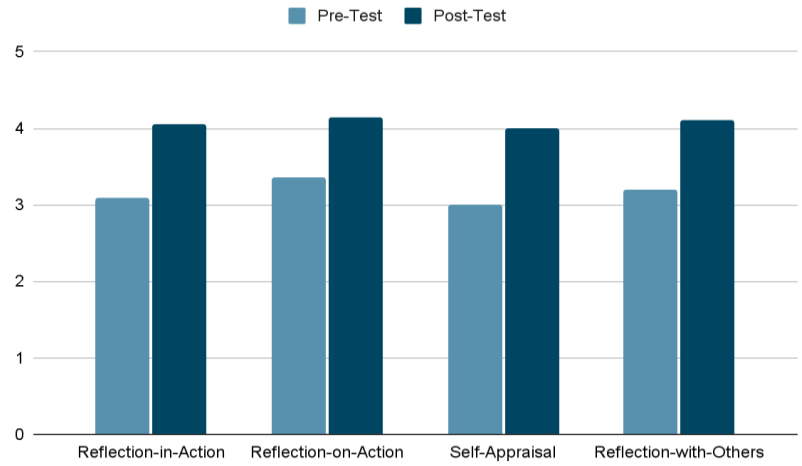

Fig. 1. Reflective practice questionnaire: pre-test vs post-test in the EG
Source: developed by the authors based on the collected data about the participants in the experiment

The mean value in the category Reflection-in-Action increased from 3.10 at the beginning of the study to 4.05 after it. This result indicates that students could better adapt to new conditions and use knowledge in a dynamic environment. The noticeable improvement was also observed in the Reflection on Action category, where the mean value increased from 3.35 to 4.15, indicating enhanced students' ability in the analysis of their own actions after the experiment. The standard deviation decrease from 0.50 to 0.40 demonstrates variance reduction among participants. Most students showed a stable level of reflexive thinking. The Self-Appraisal category also demonstrated a significant increase from 3.00 to 4.00. This indicates that students began to better evaluate their own skills and achievements after mind maps were used. The standard deviation decrease from 0.52 to 0.42 indicates improvement in the stability of these evaluations among participants of the study. The mean value increased from 3.20 to 4.10 in the Reflection with Others category, which reflects the improvement of students' skills to exchange reflexive ideas and discuss learning materials with others. This parameter is important for the development of cooperation and critical thinking within a group, which became possible due to mind maps. All p-values received during the statistical analysis were lower than 0.05, which confirms the statistical significance of changes in every category. The effect size varied from 0.65 to 0.80, which indicates the significant influence of mind maps on the students' ability of reflection and knowledge integration.

Table 2 presents the results of the study conducted with the use of the CFS-R, which evaluated the students' ability to adapt and create interdisciplinary relationships. The Table demonstrates mean values before and after the use of mind maps for each of three categories: Evaluation Coping, Adaptive Coping, and Re-Coping.

Tab. 2

The CFS-R results for pre- and post-testing in the EG

Categories (CFS-R)	Mean (Pre-Test)	Mean (Post-Test)	Standard Deviation (Pre-Test)	Standard Deviation (Post-Test)	p-value	Effect Size (Cohen's d)
Evaluation Coping	3.2	4.1	0.6	0.5	0.001	0.75
Adaptive Coping	3.45	4.3	0.58	0.48	0.002	0.8
Re-Coping	3.1	4.05	0.62	0.49	0.003	0.7

Source: developed by the authors based on the collected data about the participants in the experiment

The results showed a significant increase in the students' ability to adapt to new knowledge and

establish interdisciplinary relations after the introduction of mind maps. According to the cognitive flexibility scale, the mean value in the Evaluation Coping category increased from 3.20 to 4.10. This indicates the improvement in student's ability to re-evaluate and correct their learning strategies as a response to new challenges. The standard deviation decreased from 0.60 to 0.50, indicating the stability of the results among participants. The mean value increased from 3.45 to 4.30 in the Adaptive Coping category after the use of mind maps, which demonstrates that students improved their ability to generate alternative strategies to solve interdisciplinary tasks. The standard deviation decreased from 0.58 to 0.48 which indicates that most students achieved a stable level of adaptive flexibility after the use of this approach. These changes are also confirmed by the significant effect size (Cohen's d = 0.75), which indicates the great influence of mind maps. The results in the Re-Coping category should be noted separately, as the mean value here increased from 3.10 to 4.05. This demonstrates that students significantly improved their skills in adaptation and repeated use of more effective strategies in their learning. A decrease in standard deviation from 0.62 to 0.49 underlines that most participants consistently demonstrated improved skills in repeated adaptation.

The conducted correlation analysis showed that increased cognitive flexibility is tightly related to the students' achievements in establishing interdisciplinary relations. The correlation coefficient between the Adaptive Coping parameters and the ability to knowledge integration was r = 0.65. This indicates a positive relationship between adaptive flexibility and the successful solving of interdisciplinary tasks. This indicates that students, who are more flexible with learning strategies, better integrate knowledge of different subjects. All p-values were lower than 0.05, which confirms the statistical significance of changes. All effect sizes exceeded 0.70, indicating a high level of the influence of the use of mind maps on the students' cognitive flexibility.

Figure 1 presents the results of the EG students' survey concerning their attitude toward the use of mind maps. The chart demonstrates the percentage of positive responses in key main categories: frequency of use, ease of adaptation, effectiveness, knowledge integration, and influence on critical thinking.

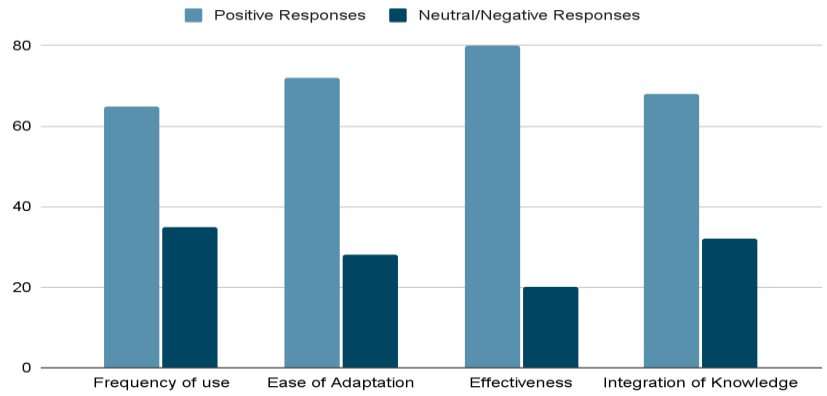

Fig. 2. Student survey results on the use of mind maps in the EG

Source: developed by the authors based on the collected data about the participants in the experiment

The results of a questionnaire survey conducted among the EG students indicate the high effectiveness of the mind maps use in the learning process. Most respondents (65%) noted that they used mind maps often or very often while learning, which indicates their popularity and relevance among students. Only 10% of respondents noted that they almost had not used this tool. It is interesting that 72% of respondents informed that adaptation to mind maps use was easy or very easy. Only 8% experienced difficulties in adaptation, which indicates the convenience of this method use in the learning process. Students have also highly evaluated the influence of mind maps on knowledge organisation: 80% of respondents admitted this tool to be effective or very effective for the systematisation of educational material. This confirms that mind maps help to structure large

information volumes, making preparation for examinations and tests easier. Only 5% of students stated that mind maps were ineffective for them, which indicates a generally positive effect.

The analysis of the results presented in Table 3 indicates a significant improvement in the EG students' performance after the introduction of the mind mapping. In particular, the average score on the critical thinking test (WGCTA) increased from 59.2 to 81.4, demonstrating a significant increase in the ability to logically analyse, justify conclusions, and recognize logical errors. In the CG, the corresponding increase was less pronounced (from 58.7 to 64.5), which may indicate the impact of conventional learning without interactive methods.

Tab. 3

Results of pre- and post-tests on the WGCTA, RPQ, and CFS-R questionnaires in the CG and EG

Questionnaire	**EG (pre-test)**	**EG (post-test)**	**CG (pre-test)**	**CG (post-test)**
WGCTA (Critical Thinking)	59.2	81.4	58.7	64.5
RPQ (Reflective Thinking)	61.7	84.6	61.3	66.2
CFS-R (Cognitive Flexibility)	58.9	80.2	59.1	65.7

Source: developed by the authors based on the collected data about the participants in the experiment

On the RPQ, the EG students improved their scores from 61.7 to 84.6, indicating the development of self-observation, the ability to introspect, and rethink the learning experience. The CG showed only a slight increase (from 61.3 to 66.2), which again emphasizes the effectiveness of the implemented method.

In the case of the CFS-R, positive dynamics were also recorded in the EG students: an increase from 58.9 to 80.2, which confirms the improvement of the ability to adapt to new information and interdisciplinary integration of knowledge. In the CG, this indicator changed insignificantly (from 59.1 to 65.7).

In general, the data demonstrate a statistically significant increase in indicators only in the EG, which gives grounds to assert the effectiveness of using mind maps in the learning process. These results are fully consistent with the research hypothesis regarding the positive impact of mind maps on the development of students' cognitive and reflective skills.

Mind maps also facilitated the development of interdisciplinary relationships: 66% of students noted that mind maps significantly helped them to integrate their knowledge of different subjects. The influence on the development of critical thinking was also positive: 75% of students noted that mind maps significantly improved their skills in information analysis and synthesis. Figure 3 illustrates the distribution of students, who used mind maps in studying different humanities subjects.

The largest percentage of students used this method for learning Literature (305) and History (25%); 20% of students chose Philosophy, and 15% — Sociology. The lowest share of students (10%) used mind maps for Cultural Studies. Analysis of the obtained results showed that mind maps have different influence levels depending on subject specifics. For example, mind maps were the most useful in Literature and History for structuring large volumes of information and chronological events. This method enabled students to better integrate various theoretical approaches and make the material easier to understand in regard to Philosophy and Sociology. The lowest percentage of the use of mind maps in Cultural Studies may be caused by the focus of this subject on complex interdisciplinary relations. Therefore, students may need additional time to adapt this method to specific subject requirements. Generally, mind map introduction positively influenced the learning process in all humanities, contributing to better knowledge integration and critical thinking development.

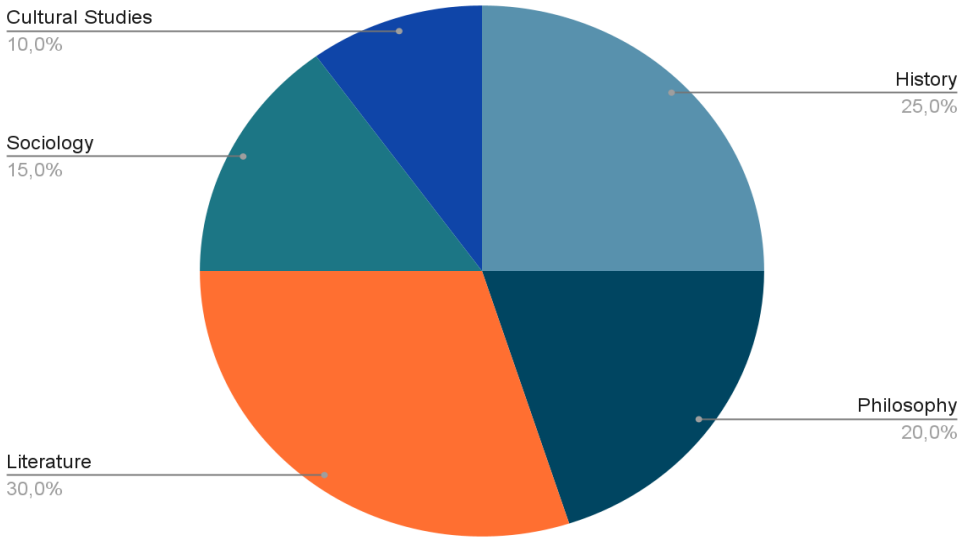

Fig. 3. Distribution of students using mind maps in humanities subjects in the EG
Source: developed by the authors based on the collected data about the participants in the experiment

The results of the study confirm the significant influence of mind maps on the improvement of knowledge organisation and critical thinking development among humanities students. These results correspond to the study of Stokhof et al. (2020), who found that mind maps use in education improves the effectiveness of question formulation in students, thereby improving academic results.

Similar to the results of Astriani et al. (2020), our study also indicates the positive influence of mind maps on the development of students' metacognitive skills. In the study by Basri and Syamsia (2020), mind maps showed high effectiveness in the improvement of composition writing skills. Our results correspond to the mentioned findings, but we also found that mind maps influence structuring large knowledge volumes, going beyond writing skills only.

According to the study by Zheng et al. (2020), mind maps positively influence the students' self-esteem and motivation. This is also presented in our study: 75% of students noted enhanced motivation and better material understanding due to the use of mind maps. Fu et al. (2019) studied the influence of mind maps in the context of studying foreign languages, and their results confirm the effectiveness of this method in academic performance improvement.

Lin (2019) emphasises the importance of mind maps in facilitating reflective learning, especially in English text writing. Our study confirms this approach, as mind maps also contributed to the development of students' reflexive thinking. Aşıksoy (2019) studied the influence of computer-based concept maps on education. This is similar to our approach, but we focused on mind maps use in traditional learning. Bataineh and Al-Majali (2023) studied the use of mind maps for the improvement of grammar skills of English as a Foreign Language (EFL) students, and our findings reflect a similar influence on cognitive skills.

The study by Sari et al. (2020) found that mind maps significantly improve the development of students' critical thinking and academic performance in general. Our study also demonstrates significant improvement in cognitive skills, which is consistent with the results of Lya (2022) and Nurlaela et al. (2021). They also confirmed the effectiveness of mind maps use in different learning environments. Their conclusions on the development of skills in knowledge integration and thinking correspond to our findings, where students demonstrated improved ability to integrate knowledge of different humanities subjects. Finally, the study by Chen et al. (2019) emphasizes the positive influence of concept maps in combination with augmented reality on motivation and academic performance.

Unlike previous studies, this study proposed interactive learning tasks based on mind maps, specially developed taking into account the cognitive characteristics of humanities students. The use of

mind maps demonstrated high efficiency in structuring a large amount of theoretical material, developing critical thinking skills, and the ability to integrate knowledge from different subjects. The obtained results confirm the appropriateness of using this tool specifically in working with humanities, which is a new direction in the methodology of teaching humanities in higher education.

The research hypothesis, which predicted a positive impact of mind maps on learning humanities, developing critical thinking, cognitive flexibility, and integration of knowledge, was confirmed. Statistically significant improvements in the EG on all questionnaires indicate that mind maps really contribute to a deeper understanding of the material, its better structuring, and the development of analytical skills.

The practical value of the obtained results is the possibility of integrating mind maps as an effective pedagogical tool in learning humanities in higher education. They can be used to improve the quality of learning complex theoretical material, the formation of interdisciplinary connections and the stimulation of students' cognitive activity.

The results of the study give grounds to establish new empirical data on the impact of mind maps on the humanities students' learning. Unlike earlier studies, we proved that the use of mind maps not only contributes to better structuring of knowledge, but also significantly increases the ability to integrate interdisciplinary information and develop critical thinking in higher education. It is especially important that the effect was found when working specifically with junior students of pedagogical and philological majors, which was poorly studied earlier.

In addition, the results may be particularly useful in online learning and blended learning environments. Mind maps as visual tools can support cognitive activity, flexibly adapt to new information delivery conditions, promote independent work of students, and ensure integrative understanding of material from various sources.

However, the study has certain limitations. One of them is the use of predominantly self-report methods, which is associated with the subjectivity of responses and possible bias of participants. It is also worth noting that the results of the study may be less representative of other age groups of students or representatives of other cultural and educational environments. The number of participants was also limited, which also affects the generalizability of the conclusions.

At the same time, there is a possibility of an alternative interpretation of the obtained results. The positive dynamics of the development of students' critical thinking could be due not only to the introduction of mind maps, but also to additional factors, in particular, the increased attention of researchers and teachers to the EG participants, which could contribute to the growth of their learning motivation and activity. This phenomenon is partly explained by the Hawthorne effect.

In the theoretical dimension, the results of the study confirm the appropriateness and effectiveness of constructivist approaches to learning humanities. The use of mind maps as a visual tool contributes to a deeper understanding of the material, the development of analytical thinking and students' ability to holistically perceive educational content. This provides grounds for further improvement of methodological teaching strategies in the context of higher education.

3.1. Research limitations

One of the main limitations of this study is the relatively small sample of students. This may be insufficient to represent all possible variations in the use of mind maps in different educational institutions and cultural contexts. Furthermore, the study was focused on humanities, so the results may not be generalised to other areas of knowledge, in particular Technical and Natural Sciences.

3.2. Recommendations

We recommend active implementation of mind maps in the learning process of humanities to improve knowledge organisation, development of critical thinking, and integration of interdisciplinary knowledge. To achieve maximum effect, it is recommended to conduct training on the effective use of

this tool, especially for students who have not previously used mind maps.

4. CONCLUSIONS

The results of the study demonstrate that the integration of mind maps into the learning process of humanities significantly improved students' academic performance and cognitive outcomes. After the experimental intervention, the mean values for key parameters increased notably: in the Adaptive Coping category from 3.45 to 4.30, in Self-Appraisal from 3.00 to 4.00, and in the Evaluation Coping category from 3.20 to 4.10. The effect size ranged between 0.70 and 0.80, indicating a strong and statistically significant influence of mind maps on learning efficiency and critical thinking development. Overall, 80% of respondents rated mind maps as a highly effective tool for structuring knowledge, and 75% confirmed a clear improvement in analytical and reflective skills. Students from the experimental group also demonstrated better ability to integrate interdisciplinary information, with the correlation coefficient between adaptive flexibility and knowledge integration reaching r = 0.65. Mind maps thus proved to be a productive pedagogical tool that supports the formation of cognitive flexibility, interdisciplinary competence, and reflective self-regulation. Their use enhances not only knowledge organisation and comprehension but also contributes to the development of autonomous and critical thinking among higher education students. The study provides empirical evidence of long-term benefits of mind maps and opens perspectives for further research on their role in digital learning and adaptive educational environments.

Author Contributions:

Tatyana Valentieva conceptualized the study, coordinated the research design, and supervised data interpretation. Antonina Pak was responsible for the development of the methodological framework and statistical analysis. Viktoriia Dokuchaieva contributed to data collection, organisation of experimental materials, and analysis of empirical results. Iryna Soroka provided theoretical justification and assisted in writing the analytical sections. Olena Stepanenko edited the manuscript, structured the visual data, and ensured compliance with academic style and formatting requirements. All authors approved the final version of the article and agreed to be accountable for its content.

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Валентьєва Тетяна, Пак Антоніна, Докучаєва Вікторія, Сорока Ірина, Степаненко Олена. Використання ментальних карт у вивченні гуманітарних наук студентами закладу вищої освіти. *Журнал Прикарпатського університету імені Василя Стефаника*, **13** (1) (2026), 129-144.

Метою дослідження є визначення впливу інтелект-карт (mind maps) на вивчення гуманітарних дисциплін у закладах вищої освіти та виявлення їхнього потенціалу для вдосконалення аналітичних, рефлексивних і когнітивних умінь студентів. У роботі застосовано комплексну методологію, що поєднує стандартизоване тестування (Watson-Glaser Critical Thinking Appraisal, Reflective Practice Questionnaire, Coping Flexibility Scale-Revised), анкетування, структуроване спостереження та статистичні методи — дисперсійний аналіз (ANOVA), кореляційний аналіз і парний t-тест. Емпіричну вибірку становили 120 студентів гуманітарних спеціальностей, випадковим чином розподілених на контрольну й експериментальну групи, що забезпечило валідність і надійність отриманих результатів. Дослідження тривало два навчальні семестри та включало пре-тестування, експериментальне втручання і пост-тестування. Результати показали, що 80 % студентів відзначили високу ефективність інтелект-карт у структуруванні навчального матеріалу, а 75 % — суттєве покращення критичного й рефлексивного мислення. Середнє значення за категорією «адаптивне копінгування» зросло з 3,45 до 4,30, а за категорією «самооцінювання» — з 3,00 до 4,00; величина ефекту коливалася в межах 0,70-0,80, що підтверджує статистично значущий вплив на результати навчання. Інтелект-карти також сприяли когнітивній гнучкості, міждисциплінарній інтеграції та підвищенню залученості студентів у навчальний процес. Наукова новизна дослідження полягає в емпіричному підтвердженні довготривалих когнітивних, рефлексивних і інтегративних ефектів використання інтелект-карт, що вперше кількісно доведено в контексті гуманітарної освіти. Запропоновано педагогічну модель інтеграції інтелект-карт у структуру університетських курсів, яка розкриває новий погляд на взаємодію візуального, аналітичного та критичного мислення. Практичне значення полягає у використанні інтелект-карт як ефективного освітнього інструменту для покращення розуміння й структурування знань, підвищення автономії, мотивації та когнітивної активності студентів у системі вищої освіти.

Ключові слова: критичне мислення, гуманітарні науки, когнітивна гнучкість, організація знань, інтеграція знань, візуалізація інформації.

Appendix 1

Questionnaire for the evaluation of mind maps use

Part 1: General questions:

1. How often do you use mind maps in education?
- Very often
- Often
- Rarely
- Very rarely
- Never

2. How easy did you find adaptation to the use of mind maps?
- Very easy
- Easy

- Average
- Difficult
- Very difficult

3. Did mind maps help you to improve material understanding?

- Helped a lot
- Helped
- Partially helped
- Did not help
- Were not helpful at all

Part 2: Evaluation of the effectiveness of mind maps

4. In your opinion, how effective are mind maps for educational material organisation?

- Very effective
- Effective
- Moderately effective
- Somewhat effective
- Ineffective

5. Did mind maps help you to structure information while preparing for examinations and tests?

- Yes, helped a lot
- Yes, helped somewhat
- Partially helped
- Did not help
- Were not helpful at all

6. How well did mind maps contribute to the integration of knowledge from different disciplines?

- Contributed a lot
- Contributed
- Partially contributed
- Did not contribute
- Did not contribute at all

Part 3: Influence on the development of critical thinking

7. Have mind maps influenced your critical thinking?

- Improved significantly
- Improved
- Partially improved
- Have not improved
- Have not improved at all

8. Did mind maps help you to improve your skills in information analysis and synthesis?

- Helped a lot
- Helped
- Partially helped
- Did not help
- Were not helpful at all

Part 4: Feedback and proposals:

9. What did you like the most in mind maps use?

_Your answer: _____

10. What are the disadvantages and difficulties you noted while using mind maps?

_Your answer: _____

11. What would you recommend improving in this method use in the learning process?

_Your answer: _____

Thank you for the answers!