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LEVERAGING AI TOOLS FOR ENHANCING PROJECT TEAM DYNAMICS: IMPACT ON SELF-EFFICACY AND STUDENT ENGAGEMENT

Abstract. The issue of maintaining group dynamics in flexible remote teams is currently in the focal point of attention not only of commercial companies and government agencies as a response to the changing conditions of work organisation, including those associated with the effects of the COVID-19 pandemic, but also of higher education institutions that train future professionals. Since intragroup dynamics is a key factor affecting team performance, this paper is the result of the study conducted as part of the Group Dynamics and Communications course at National University of Life and Environmental Sciences of Ukraine (NULES) to determine the potential of using AI tools as tools to support the group dynamics of self-organised teams during the implementation of educational projects. Based on the results of the free choice of project and team management tools, we categorised three groups among the 56 participants of the experiment according to the use or non-use of AI tools to enhance group dynamics, followed by self-assessment of the effectiveness of the selected tools in increasing their levels of self-efficacy and social engagement. The survey was based on a Likert scale measurement, and non-parametric methods of analysis and statistical hypothesis testing were used to process the results. The self-assessment confirmed that the incorporation of AI tools in the implementation of a team-based learning project did not influence the improvement of students' social engagement and the dynamics of self-efficacy for both effective and ineffective students. The authors identified the positive impact of using AI tools on its development for students with the average level of self-efficacy. We also presented an example of the use of Notion AI for enhancing group dynamics at each stage of team development according to B. Tuckman. The authors suggest that the impact of using AI tools in the process of implementing a group learning project depends more on personal characteristics of team members than on the choice of a specific AI model. Determination of application specifics of individual AI tools in the process of training future specialists in the implementation of various types of educational activities, particularly ethical considerations is recognised as an area for further research.

Keywords: group dynamics; educational project; AI tools; case study; self-assessment; higher education.

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1. INTRODUCTION

Statement problem. Although it is natural for people to unite in thematic communities and groups for professional and social interaction, the effects of the COVID-19 pandemic (global context) and the war in Ukraine have led to the need for remote work and teamwork among employees in various fields, and, as a result, the digital transformation of relevant institutions and commercial companies [1]. Moreover, change management, as one of the components of the digital transformation of any system or institutional environment, involves staff support and training [2]. It should be noted that, in contrast to individual training, group training implies that participants learn not only from their own experience, but also from the experience of their fellow team members through the processes of social, cognitive and interpersonal interaction. Furthermore, dynamic situations necessitate the ongoing development of team members, specifically aligning individual capabilities with team tasks and acquiring and mastering the necessary resources [3].

The above trends are also present in educational systems, where collaboration is usually used not only to share and generate new knowledge, but also to develop students' soft skills (e.g., communication, problem-solving, self-reflection, and self-regulation). In particular, the research area of computer-supported collaborative learning (CSCL) explores how to effectively combine the rapid development of information technology with collaborative learning and development in small groups [4]. Thus, the freedom of choice and technological saturation of the educational environment [2], on the one hand, has a positive impact on students' academic performance, and on the other hand, personal characteristics of small group participants, or rather their incompatibility, often lead to significant difficulties not only in the implementation of educational projects but also to negative experiences of group interaction in general. That is why the need to enhance the group dynamics of academic groups and student project teams is becoming more relevant.

Analysis of the recent research and publications. Optimisation of group dynamics in the process of implementing case-based learning is the subject of research by M. Kochis et al [5]. In particular, the authors emphasise the stimulating role of project-based learning in small groups not only for the development of student competences, but also for improving small group dynamics and ensuring psychological safety among peers. It should be noted that it is important to support students' responsibility for their own learning and team performance and to initiate discussions on ways to enhance group dynamics.

The positive impact of project-based learning on the training of engineering students is also reflected in the study conducted by a team of authors led by K. R. Ccama-Mamani [6]. We agree with the authors' opinion that despite the fact that basic engineering education often considers laboratory experiments as a practical component, these activities may not contribute to the development of soft skills; the pedagogical design and implementation of interdisciplinary projects are effective tools for developing professional and soft skills in students.

The effectiveness of the use of problem-based learning (PBL) and team-based learning (TBL) as universal for student development is also confirmed by the study of American researchers D. Kim and O. F. Iwuchukwu [7]. In particular, the authors used the approach of students' self-selection (self-organised groups) to form groups, and group development was studied using B. Tuckman's model.

In terms of tool support for group interaction, the most commonly used project management tool in the work of professional software development teams is Jira [8], and for educational projects it is Trello [9]. At the same time, and this is confirmed by a previous study by the authors of [9], the use of the Notion software (https://www.notion.so/product) as a tool useful for note-taking, project and task management, all in one workspace, is becoming

increasingly common. In 2023, for the first time (based on the results of a wide vote of 2022 respondents), this software tool was ranked among the 100 best tools for training (https://toptools4learning.com/) future professionals at higher education institutions [6], [10], in particular, for advising students on the effective management of remote project teams using online tools and technologies [11]. It should be noted that intragroup dynamics stands out as the primary factor influencing team performance.

The results of the research by A. Mohan et al. [12] show that there is no strict algorithm or rules for enhancing group dynamics, as this process depends on the context (task complexity, team maturity, selection of tools, etc.). Another aspect that influences group dynamics is the role of the leader, both at the level of team formation and registration of new members [13] but also in providing support throughout the project implementation [14]. At the same time, the spread of artificial intelligence technologies and AI potential for supporting business processes at higher education institutions [15] can be used to enhance group dynamics of self-organised groups of students. It is this trend that is under-researched against the background of an increase, starting from 2021, in the number of studies on the application of AI in higher education. For the most part, researchers distinguish the following directions [16]: Assessment/Evaluation (1), Predicting (2), AI Assistant (3), Intelligent Tutoring System (4), Managing Student Learning (5). In the context of this study, attention should be focused on determining the impact of the use of AI tools on various aspects of learning and teaching in the context of higher education in general and in a specific university in particular [17]. The communicative aspect of the application of generative AI, mainly language models, which is implemented as a model of human-machine interaction, emphasizes the role of AI in personal development of students [18]. Since today's students already use and are going to use AI tools for communication and learning, the task of university teachers and researchers in the field of education is to find effective pedagogical technologies and approaches that will allow students to optimally use these tools.

The purpose of this study is to determine the potential of using generative AI tools as a tool for enhancing group dynamics of self-organised teams in the process of implementing educational projects.

Reinforcing the importance of self-organised, agile, and self-developing teams [1], as well as relying on the proven relationship between self-efficacy and student engagement in learning and academic performance [19], we set the following **objectives** to achieve the purpose of our study:

1. To explore the potential of AI-powered applications in enhancing group dynamics of self-organised student teams working on learning projects.
2. To empirically assess the influence of these AI tools on enhancing students' self-efficacy during the implementation of learning projects.

2. RESEARCH METHODOLOGY

To achieve the objectives, we relied on the methodological foundations of the literature review process as a research method. For instance, this approach was applied in analysing methods and technologies for supporting group dynamics, as well as in exploring application of artificial intelligence tools in education [20]. Additionally, case study and survey methods [21] were employed to meet the first and second objectives of the study, respectively, involving student participants.

This research was conducted as part of the study of the Group Dynamics and Communication discipline by 4th year students of National University of Life and Environmental Sciences of Ukraine (Software Engineering educational programme).

To address the first objective, we offered students a case study of an educational project with the Veterinarian Handbook working title (Fig. 1).

Task statement: to disseminate information on the prevention of diseases of certain breeds of animals among veterinary workers, farmers and a wide range of stakeholders, including students of specialised educational programmes, there is a necessity to develop an IT solution (chatbot) based on the materials provided in the format of a text document to promptly inform (provide information in two languages: Ukrainian and English) these categories of potential users. The proposed solution should not "require" additional technological or financial investments for its implementation and maintenance, as well as the need for additional training for potential users to use it.

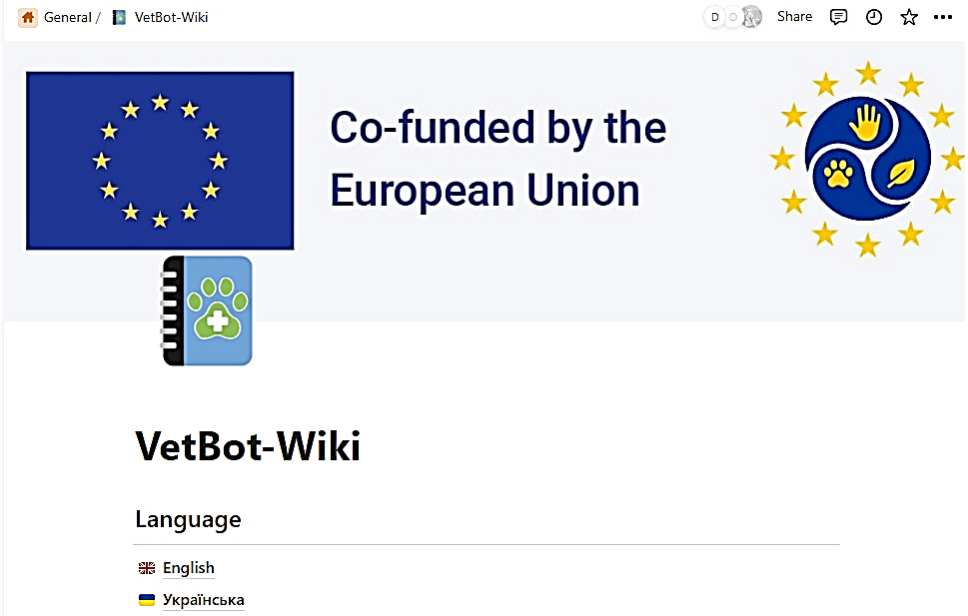


Fig. 1. The example of case implementation: the main page of the reference book with logo and background cover demonstration

The conditions for the implementation of the training project were:

- the team building method: we carried out the project in small groups (3-4 people), students joined groups according to their own free will (self-organised teams [7]);
- the teams implemented the educational project over five weeks in accordance with the educational programme of the Group Dynamics and Communications discipline;
- students of each group chose the group interaction environment for team and project management according to the concept of group dynamics independently, however, the environment (in accordance with the tasks of the discipline, including the analysis of successful practices of professional IT teams) should include (and justify the choice) a task manager [9], data warehouse, tools for collaborative work with documents, software development tools, services for supporting team communication (instant messengers, video conferencing services, time trackers, etc.);
- the use of artificial intelligence tools [21] was not part of the requirements for the implementation of the educational project, nor of the restrictions - students independently determined what it was necessary and they selected necessary tools;
- group dynamics was monitored according to the team development model by B. Tuckman [23]; during the five stages of group development (forming, storming, norming, performing, adjourning) students kept observation journals and generated reports (self-reporting).

Since the results of the analyzed empirical studies prove the effectiveness of students' use

of educational assistance based on AI tools for the development of self-regulation [24], a process by which students actively control and direct their learning activities using various cognitive and behavioural techniques (correlated with the concept of group dynamics), the first objective of our study was to identify the potential use of AI tools to enhance group dynamics of self-organized teams in the process of implementing educational projects.

Given that self-efficacy [25] and engagement [26] are, on the one hand, indicators of students' self-regulation [24], and, on the other hand, affect their academic performance [27], the survey method was used to achieve the second objective of our study, and in-depth interviews were additionally conducted.

In this study, we used pre- and post-tests to determine the level of self-efficacy and student engagement in the process of implementing the learning project (see Appendix). The self-assessment and social engagement questionnaires were borrowed for use in the study from [25], [28] as they had been tested and had a margin of error of no more than 2%.

The self-efficacy scale, which uses a 5-point Likert rating system (determining the attitude to the proposed statements on a 5-point scale: 4 - strongly agree, 0 - strongly disagree) was developed based on the generalized self-efficacy scale [25] and translated for Ukrainian students. After the translation into Ukrainian, a reliability analysis was conducted, which yielded a result of 0.72, indicating its sufficient reliability. Since self-efficacy is defined in [24] as a student's belief in their ability to mobilise motivation, cognitive knowledge, and action plans to meet the specific requirements of a given situation, we used this scale (pre- and post-tests) to determine the impact of using AI tools on students' self-efficacy in the course of a learning project.

The engagement scale was borrowed from the engagement scales in mathematics and science proposed by Wang et al. [28] and was used in this study to determine the homogeneity of groups on the basis of group interaction (Social engagement). Although the study [24, Table 6] found that the use of AI tools had the least impact on the development of Social engagement, this characteristic is important for determining the homogeneity of groups by team interaction. The scale is a five-point Likert scale and, as proven in previous studies, has a fairly high reliability and validity. We translated 4 statements from the Social engagement category into Ukrainian. In translating the questionnaire questions, we took into account the content component, which might differ from the language of the original questionnaires, so the error in the assessment using this tool should not exceed 5%. The reliability of the modified questionnaire was also determined. As a result, the reliability was 0.68, which is considered to be a sufficiently acceptable reliability.

The participants of the experiment, as mentioned above, were students who independently formed teams of 3-4 people, selected project and team management tools according to the concept of group dynamics, including AI tools. As a result, three independent samples were formed out of 56 participants (the number was sufficient to draw conclusions about certain areas of assessment, the representativeness error does not exceed 5%):

- *Gr1* (13 students): did not use AI tools or used them fragmentarily;
- *Gr2* (29 students): used ChatGPT to help solve problems during their educational project; in general, the use of AI tools was unsystematic;
- *Gr3* (14 students): used the built-in AI Notion as an assistant at different stages of the project (https://www.notion.so/product/ai).

The main hypothesis was that the self-efficacy of students who used AI tools systematically or partially would be higher at the end of the project than those who did not use AI. To test the main hypothesis, the following partial hypotheses were formed:

H1: The utilization of AI tools during the implementation of a team-based learning project does not significantly enhance students' social engagement.

H2: The impact of employing AI tools in an educational project implementation is

contingent upon personality traits; specifically, for students with a high (or low) level of self-efficacy, the utilization of AI tools to facilitate group dynamics will be negligible.

H3: For students with an average level of self-efficacy, the influence of using AI tools is notable, yet it remains independent of the tool selection. That is, irrespective of whether students employ the integrated AI assistant in Notion or ChatGPT to address challenges at various project stages, their self-efficacy scores will improve.

To determine the benefits of using a single project management tool with a built-in Notion AI module containing templates and tips in accordance with project and team management processes to increase students' self-efficacy, we conducted additional in-depth interviews with students who used AI tools in the course of implementing a training project (*Gr2, Gr3*) and showed high self-efficacy results - these are *Gr3* students.

In the course of data analysis, we used a set of methods and models to calculate all descriptive statistics. The choice of certain indicators and criteria for evaluation was determined by the type of data, the evaluation scale, and the limitations of the methods. The SPSS statistical data processing software toolkit was used for calculations [29].

3. RESULTS OF THE RESEARCH

3.1. Exploring the potential of artificial intelligence to enhance group dynamics in self-organized teams

Since, according to the results of the survey [9] students with some professional experience chose Notion for project management, we offer a description of the use of this particular service to enhance group dynamics at each stage of team development during the implementation of the Veterinarian Handbook project as a kind of compensation for the lack of research on the use of Notion to support educational projects.

In addition, among the various combinations of groupware services chosen by the teams to implement the educational project (the most common services were Microsoft 365 cloud office services and integration of Trello functionality with Google Workspace), the use of Notion was the most appropriate for this educational project (determined by the results of the requirements analysis and formalisation of project tasks); it allowed increasing team productivity with just one application (announced in the Notion help guide); provided users with support at different stages of project implementation by Restrictions on the free use of this service, namely the limit on the number of participants in one team (5 people) and the number of samples of the built-in AI module, also favoured the use of Notion for small groups in the framework of educational projects.

It should be noted that since Notion was chosen for project and team management by students (*Gr3*) who had a high level of self-efficacy and engagement and demonstrated the highest quality products as a result of the educational project (this parameter was not taken into account in this study), we suggested considering the materials of one of these teams as an example (Fig. 1).

Creating a chatbot as a companion (used to navigate reference information) to the information materials provided by the customer in the form of a text document was the team decision (the team implemented a project called "Chatbot"). Rationale: Notion integration with Telegram allowed not only to accomplish the task but also to improve group dynamics, and the design of reference information in the form of a Notion reference book (Fig. 2) enabled to structure data for the "bot work" and to provide the ability to edit Notion wiki pages in the process of interacting with customers or developing the information base.

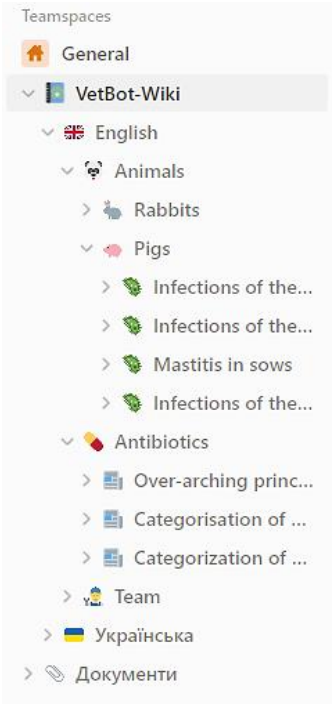


Fig. 2. Organisation of reference information in Notion: structure of the Wiki - a reference guide for bot navigation

Like other project management systems, Notion functionality allows users to create a team workspace (Fig. 3a). Since a user (student) can have several projects (Fig. 3b), it is advisable to develop different logos and covers for project recognition to facilitate orientation. For the same reason, different covers were chosen for different pages of the workspace to add visuals that make it easier to navigate within the project.

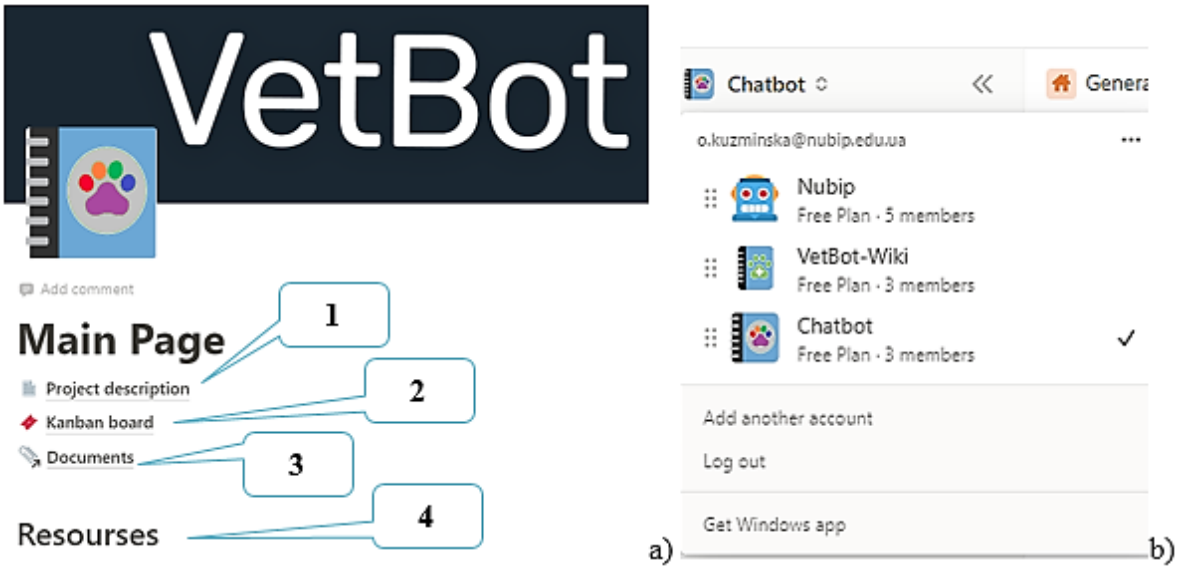


Fig. 3. Organisation of Notion user workspaces: a) the main page of the Chatbot workspace; b) the list of workspaces for an individual user

To support the implementation of the project, the main page of the Chatbot space (Fig. 3a) contains:

– a page with a general description of the project (1), which includes the project topic, task description, links to useful resources, as well as a list of project team members and

their contact details;
- a kanban board (2) for assigning tasks and managing the process of their implementation by team members;
- a page with all useful/used/created project documents (3);
- a separate section of resources provided by the client (4), which contains a page with the terms of reference; in our case, the terms of reference were described in a Google document, the link to which was left on this page, which allows users to track the history of changes.

At certain stages, in accordance with the project objectives AI tools integrated into Notion were used to help plan and detail task descriptions; generate different types of texts (Fig. 4), including brainstorming, creating task lists, meeting agendas; translating and improving texts created by team members.

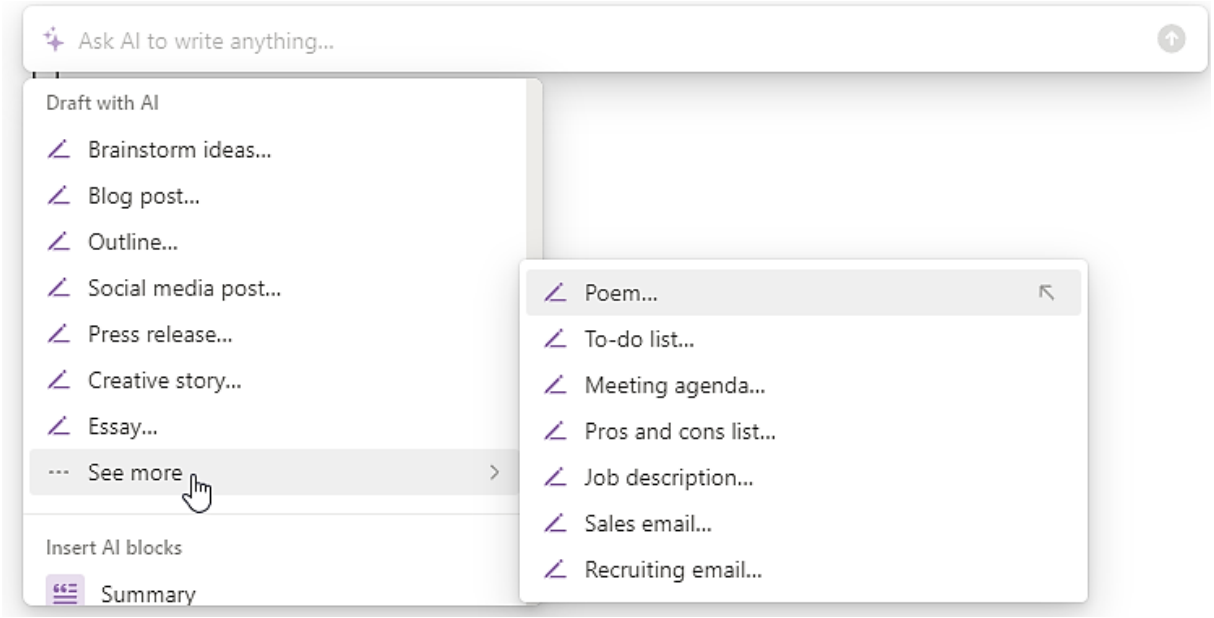


Fig. 4. Notion AI templates of thematic texts

In order to track group dynamics (understood as a system of behavioural and psychological processes that occur within a small group), in accordance with B. Tuckman's structure, freeze-frames were created during the course of the training project. In the case of self-organised teams, students used Notion and the built-in AI module to effectively interact at each stage of team development. A summary report of one of the teams is presented in Table 1.

Table 1.

Self-report on the use of Notion AI tools to support group dynamics at each stage of team development according to B. Tuckman

No	*Stage*	*Brief description of the stage*	*Instrumental support for group dynamics*	
			Examples of using Notion	*Examples of using Notion AI*
1	Forming	Forming a group, getting to know each other; often participants do not understand tasks and how to perform them	- Creating a workspace (Fig. 2); - Creating a project description (goal, tasks, details, etc.); - Forming the team list; - Creating and distributing the first tasks and assigning responsibilities	- Assisting in creating clear and appropriate task texts and descriptions of individual project elements; - Assisting in formulating tasks in general

No	*Stage*	*Brief description of the stage*	*Instrumental support for group dynamics*	
			Examples of using Notion	*Examples of using Notion AI*
2	Storming	Participants start to go beyond the boundaries set in the formative phase	- Setting up a "Forum or Discussion": - Writing and discussing tasks using comments in tasks to resolve conflicts; - Distributing tasks according to the relationships in the team	- Creating texts that are appropriate in tone to prevent inaccuracies in communication between team members; - Using brainstorming functions to create templates (Fig. 4) to resolve conflicts that arise
3	Norming	Participants begin to resolve differences, recognise the strengths of peers	- Editing roles and responsibilities based on experience; - Creating a "Code of Conduct" (a special document on the rules of team interaction)	Using tasking functions to speed up team work
4	Performing	The group reaches this stage when there is no disagreement about the hard work and the team is moving smoothly towards the goal	- The structure and processes are already ingrained - If all disagreements and inaccuracies are resolved, the established format of work and task control can be used - Additional tracking (tables, graphs) tracking the dynamics of tasks and other indicators of team performance	If no new problems arise, then at this stage, all of the above functions are simply used to increase the team efficiency
5	Adjourning	Disengagement; anxiety about separation and termination	- Analysing reports and building a knowledge base: - Generating reports to summarise experience; - Preserving workspace organisation structures for future projects	Summarising, identifying advantages and disadvantages to analyse the experience gained

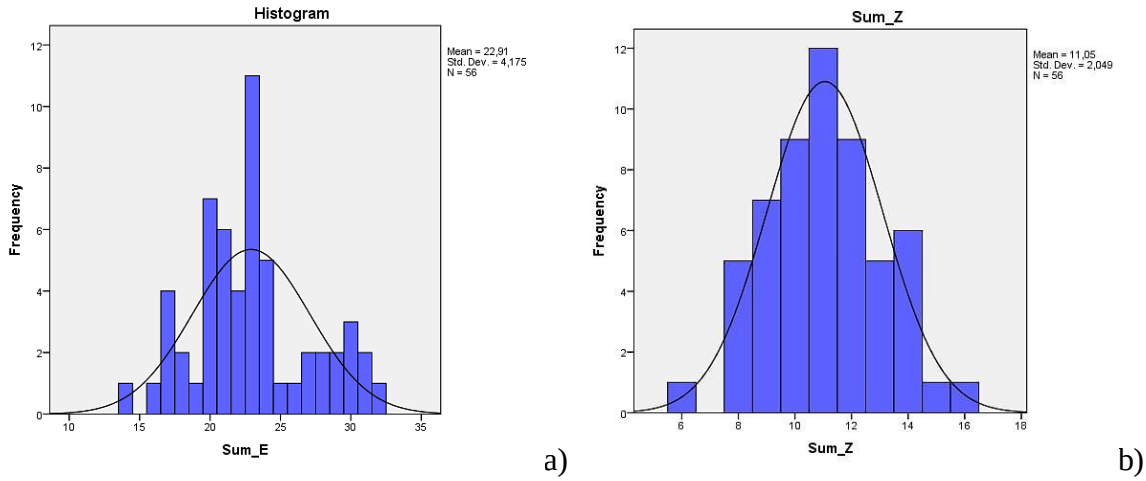
Additional interviews conducted with students who used Notion to enhance group dynamics in the course of their educational project confirmed the ease of use of this tool for managing small groups and projects as announced by the developers. The advantages of using a single tool (the AI module is integrated into Notion) included assistance in managing projects and tasks, the allocation of separate workspaces and the availability of tools for managing them, sufficient functionality (no need to use several applications, such as Google Docs, Trello) to increase productivity, the ability to document and comment on processes, tasks, and documents, including the availability of "support" for different types of documents and real-time interaction.

3.2. Empirical assessment of AI tool influence on student engagement and self-efficacy during educational project implementation

To experimentally verify the impact of AI tools on engagement and self-efficacy, 56 students (*Gr1 - Gr3*) were asked to complete a pre-test to assess their level of self-efficacy and a Social engagement questionnaire before completing a project in the Group Dynamics and Communication discipline (Appendix). We employed a stratified sampling approach to select students for this experiment, aiming to ensure our sample accurately represented the broader population of students using AI in their studies. While we acknowledge the inherent limitations of our sample size, which may introduce potential errors affecting the findings generalizability,

we consider this sample size adequate for our study. It allows us to conduct univariate statistical analyses effectively, with a representation error not exceeding 5%.

The distribution of aggregated self-assessment scores across eight items of the self-efficacy scale is presented in Fig. 5a, with its distributional characteristics detailed in Table 2. Examination of Fig. 5a reveals a distribution approximation normality with the mean coinciding with both the mode and median. However, a slight leftward skewness is observed, and the Kolmogorov-Smirnov test has failed to substantiate the normality of this distribution. Similarly, the aggregate scores derived from the social engagement scale do not conform to a normal distribution, as evidenced by Table 2 and Fig. 5b. Consequently, non-parametric methods were predominantly employed for hypothesis testing due to the non-normality of the distributions.



a) b)

Fig. 5. Distribution of total scores based on the results of self-assessment of students' self-efficacy (a) and Social engagement questionnaires (b)

Table 2.

Descriptive characteristics of the distributions of total scores on the questionnaires of self-efficacy (Sum_E) and social engagement (Sum_Z)

Statistics

		Sum_E	Sum_Z
N	**Valid**	56	56
	Missing	0	0
Mean		22.91	11.05
Std. Error of Mean		.558	.274
Median		23.00	11.00
Mode		23	11
Std. Deviation		4.175	2.049
Variance		17.428	4.197
Skewness		.362	.083
Std. Error of Skewness		.319	.319
Kurtosis		-.288	-.184
Std. Error of Kurtosis		.628	.628
Range		18	10
Minimum		14	6
Maximum		32	16
Percentiles	**25**	20.00	10.00
	50	23.00	11.00
	75	24.75	12.00

Since students independently chose their projects and team management support tools and formed teams according to their own free will (self-organised teams), a comparison of the overall mean scores for the three groups (*Gr1 - Gr3*) showed that the group that did not use AI tools (*Gr1*) had significantly lower self-efficacy scores than *Gr2* and *Gr3* (Fig. 6). To compare the groups with each other, the nonparametric Kruskal-Wallis test for independent samples was chosen [30]. The t-statistic value was 25 with a p-value of 0.0, which is less than 0.05.

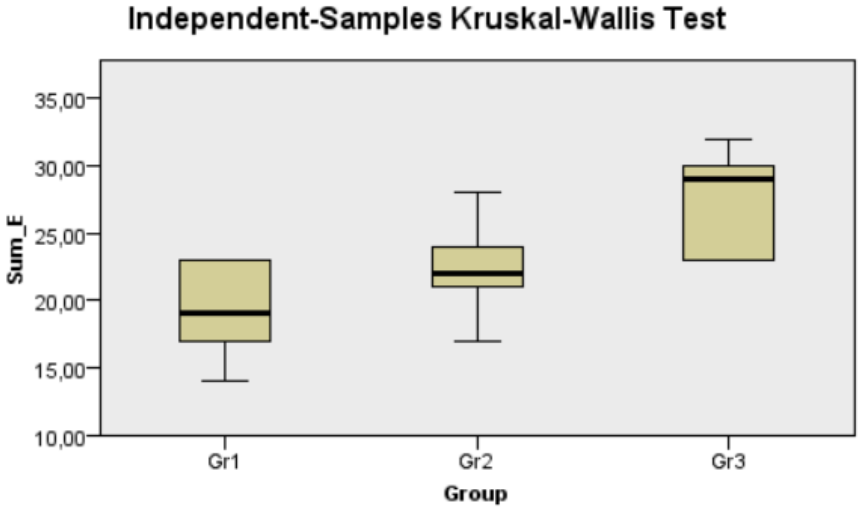


Fig. 6. Comparison of total scores on self-assessment of self-efficacy of representatives of different groups of participants in the experiment

According to the results of students' self-assessment of their own level of social involvement, there was no significant difference between the groups in terms of overall scores (Fig. 7).

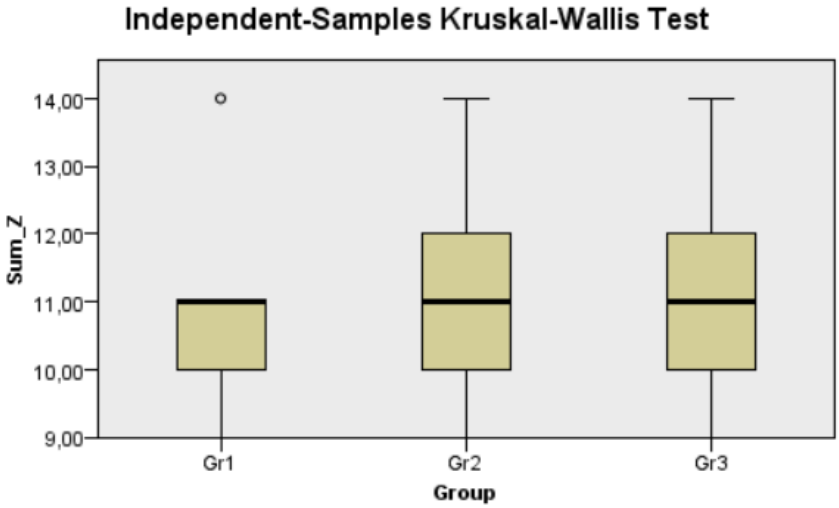


Fig. 7. Comparison of overall scores on student engagement in different groups

This comparison has shown that it is possible to assess the impact of AI tools only for assessing the level of self-efficacy of individual students, since groups are not homogeneous in terms of general self-efficacy scores and the results may be influenced by other factors related to group work, including the level of social engagement of team members.

The lack of a significant difference in the self-assessment results of students' social engagement levels between Group 1 and Group 3, both before the initiation of the educational project (t-statistic = 1.281 with a p-value = 0.527, which is greater than 0.05) and after its completion (t-statistic = 3.513 with a p-value = 0.173, which is also greater than 0.05), indicates

that we have failed to reject the null hypothesis. This suggests that the observed differences are not statistically significant and conclusions obtained in [24] are confirmed. Therefore, further attention was focused on assessing the impact of using AI tools only on students' self-efficacy.

To compare the effectiveness of the impact of AI tools on improving self-efficacy, we selected only those students (GM group, 33 people in total, selected from three groups *Gr1* - *Gr3*: 6 students from *Gr1*, 22 from *Gr2*, 5 from *Gr3*) who rated themselves at the average level (20-24 points) in the entry survey, i.e. whose total scores fell within the quarterly interval. Also, based on the results of the entrance self-assessment, we identified two more groups of students who rated themselves at high (HG, 25-32 points, 14 people: 5 from *Gr2* and 9 from *Gr3*) and low (LG, less than 20 points, 9 people: 7 students from *Gr1* and *2* from *Gr2*) levels, and checked whether their self-assessment changed after working in groups on projects with and without AI models. In general, most students who rated themselves at the lowest level (LG) did not use AI tools (*Gr1*) for the project; students who rated their own effectiveness as the highest (28-32 points) mostly chose Notion AI (*Gr3*).

After the implementation of the project (3.1), the self-assessment of self-efficacy was repeated and the median values of the overall results were compared by groups of students who chose different applications (*Gr1* - *Gr3*).

Thus, during the project, the results of the self-assessment for *Gr1* students who had average scores in the initial self-assessment (there were 6 students) remained virtually unchanged. Figure 8 shows the difference in ranks in the grades before and after the project. To compare the change in scores, we chose the Wilcoxon signed rank test [30], which is a non-parametric test (equivalent to the dependent t-test), since the application of this test does not require data normality. The assumption of normality for the distribution of total scores by group was violated in our study, since some groups are small and it is not possible to prove the normality of the distributions of scores by group.

Therefore, for *Gr1*, the comparison of scores did not provide sufficient evidence to reject the hypothesis of equality of median values. The t-statistic was 3 with a p-value of 0.157, which is significantly higher than the threshold of 0.05. This indicates that the application of selected project and team management tools during the educational project did not significantly alter the students' perceptions of their self-efficacy in enhancing group dynamics.

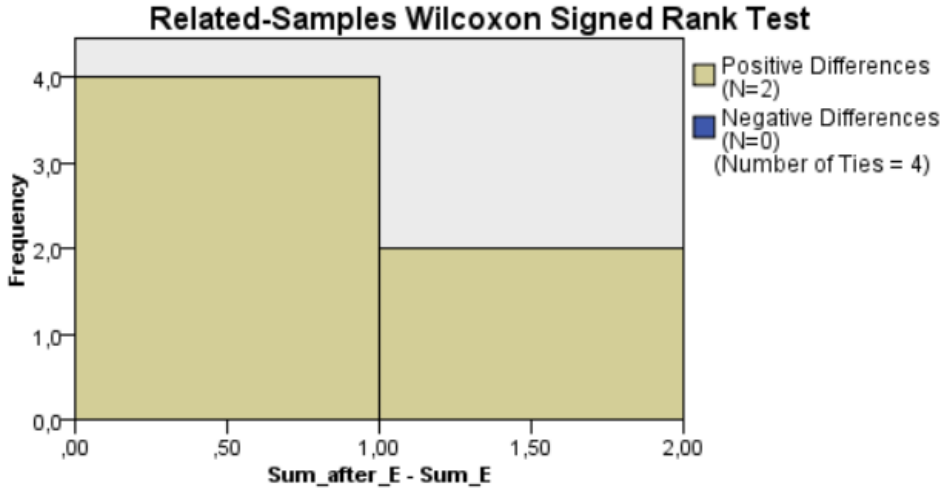


Fig. 8. Wilcoxon test results comparing overall self-assessment scores for Gr1 students who did not use AI tools for project and team management

The same students who rated themselves at an average level after working on projects using AI tools rated themselves much higher after completing their educational projects. For example, for 22 students from *Gr2*, we rejected the hypothesis that the median values of self-

efficacy scores were equal according to Wilcoxon's test: The t-statistic was 253 with a p-value of 0.0, which is significantly less than 0.05. Figure 9 shows the difference in the ranks of the self-assessment scores before and after the project.

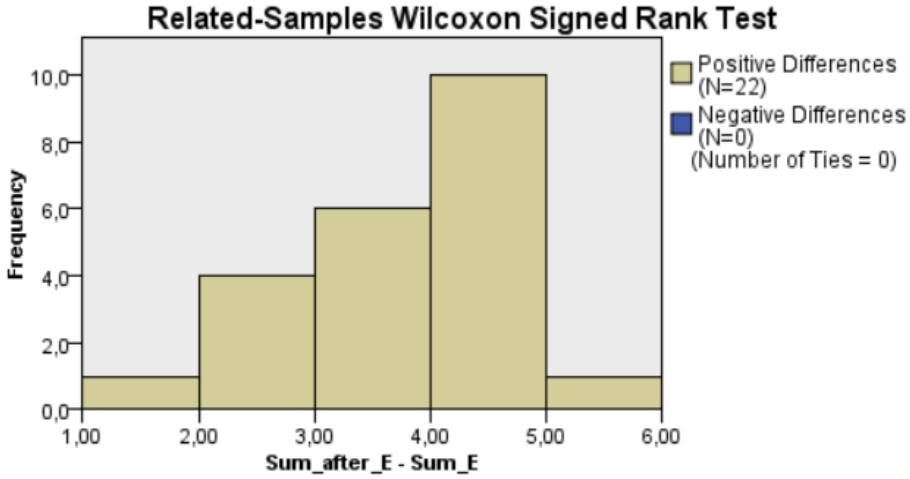


Fig. 9 Wilcoxon test results comparing overall self-efficacy scores for Gr2 students who used ChatGPT as a project and team management assistant

For 5 students from *Gr3*, the hypothesis of equality of the median values of the total self-efficacy scores before and after the project was also rejected (Fig. 10): the t-statistic was 15, with a p-value of 0.038, which is also less than 0.05.

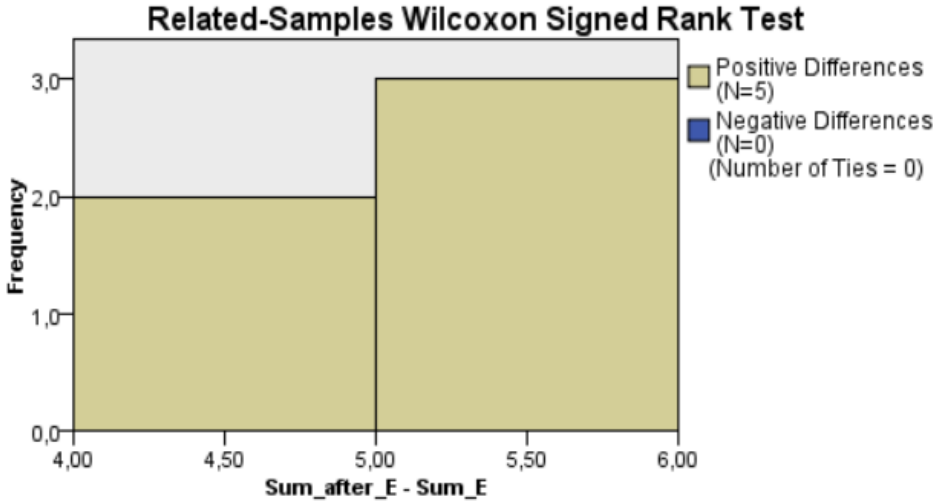


Fig. 10. Results of the Wilcoxon test for comparing the self-efficacy total scores of Gr3 students who used Notion AI during the project

It should be noted that for students who had an average level of self-efficacy (according to the results of the entrance survey) from *Gr2*, self-efficacy after the project has a more positive trend than for students from *Gr3*. However, there is insufficient data to identify the use of a specific AI tool as a factor of influence. Therefore, hypothesis *H3* can also be confirmed.

Students who had high self-assessment scores (regardless of the group they worked in) before the project, showed the same high scores after the project: the t-statistic was 6, with a p-value of 0.083 for *Gr2*, and the t-statistic was 0, with a p-value of 1 for *Gr3*. The situation is the same with students who assessed their capabilities at a low level: the t-statistic was 3, with a p-value of 0.157 for *Gr1*, and the t-statistic was 3, with a p-value of 0.157 for *Gr2*. These results provide a basis to support the hypothesis *H2* of our study, indicating consistent self-

assessment scores among students both before and after the project without statistically significant changes.

Thus, the partial hypotheses and the main hypothesis regarding the influence of AI tools on the self-efficacy and social engagement of self-organized student groups are strongly supported by the data.

3. CONCLUSIONS

To remain competitive and manage the ever-increasing complexity of the global economy and changing workplace conditions, including those associated with the impact of the COVID-19 pandemic, institutions and commercial companies rely on teams that are adaptable and continuously learning. Intragroup dynamics is a major factor affecting team performance. Therefore, the formation of a high degree of students' readiness for effective teamwork is one of the tasks of contemporary higher education.

The analysis of empirical studies shows that there is no fixed algorithm for improving intragroup dynamics: it depends on the complexity of the tasks, the method of team formation, the maturity of the team, the availability of tools, technical and technological support, etc. On the other hand, the proven impact of students' motivation and free choice of team building and technological support, including the use of AI models, during implementation of educational projects on increasing the level of academic engagement (cognitive, behavioural, and emotional) is the basis for expanding such studies to determine the impact of using AI tools to support the group dynamics of self-organised project teams, namely, to identify the impact of self-efficacy and social engagement of students.

In the study we employed stratified sampling of 56 students, ensuring our sample reflected the broader study focus accurately. While this size is statistically sufficient for univariate data analysis and provides preliminary insights, but we acknowledge potential representativeness errors and their impact on the generalizability of our findings. Future research should expand the sample size and its diversity to enhance applicability and mitigate these limitations. The results of the pedagogical experiment, which involved 56 students studying Group Dynamics and Communications, can be the basis for the following conclusions:

- the use of AI tools in the implementation of a team-based learning project does not significantly enhance student social engagement; that is, the improvement of group dynamics relies more on the development of students' soft skills than on technological support for group interaction processes. However, the use of AI tools can help to reduce cognitive and emotional barriers at various stages of project implementation and team development.
- the impact of using AI tools during the implementation of an educational project varies with personal characteristics. For students with high or low self-efficacy, the use of AI tools to support group dynamics will be negligible. Conversely, for students with an average level of self-efficacy, the impact of using AI tools is significant.
- the influence of AI tools on enhancing the self-efficacy of individual students during the implementation of team-based learning projects is not contingent upon the choice of tools. In this project, students employed both the built-in AI in Notion and ChatGPT to assist with problem-solving at different project stages.

Given the relevance of the issue of using AI tools in education, it seems promising to conduct additional research to determine the specifics of the use of individual AI tools in the training of future specialists in various educational fields including ethical considerations in the implementation of diverse types of learning activities.

APPENDIX

Self-Efficacy Scale

E1 I will be able to achieve most of the goals that I have set for myself
E2 When facing difficult tasks, I am certain that I will accomplish them
E3 In general, I think that I can obtain outcomes that are important to me
E4 I can succeed at most any endeavor to which I set my mind
E5 I will be able to successfully overcome many challenge
E6 I am confident that I can perform effectively on many different task
E7 Compared to other people, I can do most tasks very well
E8 Even when things are tough, I can perform quite well

Social Engagement Scale

Z1 I am willing to look for different ways to solve problems and use the ideas of team members
Z2 I try to understand the ideas of other team members
Z3 I try to work with others who can help me with the project
Z4 I try to help others who have problems with the project implementation

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ВИКОРИСТАННЯ ЗАСОБІВ ШТУЧНОГО ІНТЕЛЕКТУ ДЛЯ ПІДТРИМКИ ГРУПОВОЇ ДИНАМІКИ ПРОЄКТНИХ КОМАНД: ВПЛИВ НА САМОЕФЕКТИВНІСТЬ ТА ЗАЛУЧЕНІСТЬ СТУДЕНТІВ

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Анотація. Питання підтримки групової динаміки гнучких віддалених команд на сьогодні у фокусі уваги не лише комерційних компаній та державних установ як відповідь на мінливі умови організації праці, зокрема й пов'язані з наслідками пандемії COVID-19, але й закладів вищої освіти, де здійснюється підготовка майбутніх фахівців. Оскільки внутрішньогрупова динаміка є головним фактором, що впливає на продуктивність команди, цей документ є результатом дослідження визначення потенціалу застосування засобів штучного інтелекту (ШІ) для підтримки групової динаміки самоорганізованих команд у процесі реалізації навчальних проєктів. Дослідження проведено під час вивчення дисципліни «Групова динаміка і комунікації» у НУБіП України. За результатами вільного вибору засобів управління проєктом та командою, серед 56 учасників експерименту було виокремлено три групи відповідно до застосування чи не застосування засобів ШІ для підтримки групової динаміки з наступним самооцінюванням ефективності застосування обраних інструментів на підвищення власного рівня самоефективності та соціальної залученості. Опитування грунтувалось на вимірюванні за шкалою Лайкерта, а для опрацювання одержаних результатів були використані непараметричні методи аналізу та перевірки статистичних гіпотез. У результаті самооцінювання не підтверджено вплив засобів ШІ на соціальну залученість ефективних та неефективних студентів та їх самоефективність у процесі реалізації командного навчального проєкту. Для студентів з середнім рівнем самоефективності визначено позитивний вплив застосування засобів ШІ. Наведено приклад застосування Notion AI для підтримки групової динаміки на кожному етапі розвитку команд за Б. Такманом. Висловлено припущення, що ефект застосування засобів ШІ у процесі реалізації групового навчального проєкту більшою мірою залежить від особистісних характеристик

учасників команд, ніж від вибору конкретного інструмента. Вивчення особливостей застосування, зокрема й етичних, окремих засобів ШІ у процесі реалізації різних видів навчальних діяльностей визначено як напрями подальших досліджень.

Ключові слова: групова динаміка; навчальний проєкт; засоби штучного інтелекту; успішні практики; самооцінювання; вища освіта.

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