The use of active learning methods for lifelong education

Anastasiia Anosova[1]

Olha Horpynchenko[2]

Olena Bulavina[3]

Hanna Shevchuk[4]

Tatyana Valentieva[5]

[1]Associate Professor, Department of Pedagogy, Psychology and Education Management, Communal Educational Institution of Kyiv Regional Council "Kyiv Regional Institute of Teachers' Postgraduate Education", 37 Yaroslav Mudry str., Bila Tserkva, 09100, Ukraine;
[2]Associate Professor, Department of Economics, Management and Commercial Activity, Central Ukrainian National Technical University, 8 University ave., Kropyvnytskyi, 25000, Ukraine;
[3]Associate Professor, Department of Pedagogy and Psychology, Faculty of Personnel Management, Sociology and Phycology, State Higher Educational Institution "Kyiv National Economic University Named After Vadym Hetman", 54/1 Peremohy ave., Kyiv, 03057, Ukraine;
[4]Associate Professor, Department of Pedagogics and Innovative Education, Lviv Polytechnic National University, 12 St. Bandery str., Lviv, 79013, Ukraine;
[5]Cenior Lecturer, Department of Preschool and Primary Education, T. H. Shevchenko National University "Chernihiv Colehium", 53 Hetmana Polubotka str., Chernihiv, 14000, Ukraine;

The use of active learning methods for lifelong education

Anastasiia Anosova[1], Olha Horpynchenko[2], Olena Bulavina[3], Hanna Shevchuk[4], Tatyana Valentieva[5]

[1]Associate Professor, Department of Pedagogy, Psychology and Education Management, Communal Educational Institution of Kyiv Regional Council "Kyiv Regional Institute of Teachers' Postgraduate Education", 37 Yaroslav Mudry str., Bila Tserkva, 09100, Ukraine;

[2]Associate Professor, Department of Economics, Management and Commercial Activity, Central Ukrainian National Technical University, 8 University ave., Kropyvnytskyi, 25000, Ukraine;

[3]Associate Professor, Department of Pedagogy and Psychology, Faculty of Personnel Management, Sociology and Phycology, State Higher Educational Institution "Kyiv National Economic University Named After Vadym Hetman", 54/1 Peremohy ave., Kyiv, 03057, Ukraine;

[4]Associate Professor, Department of Pedagogics and Innovative Education, Lviv Polytechnic National University, 12 St. Bandery str., Lviv, 79013, Ukraine;

[5]Cenior Lecturer, Department of Preschool and Primary Education, T. H. Shevchenko National University "Chernihiv Colehium", 53 Hetmana Polubotka str., Chernihiv, 14000, Ukraine;

E-mail: anosovaa@gmail.com[1], olhorpynchenko@gmail.com[2], bulavina.olena@kneu.edu.ua[3], shevchukanna@ukr.net[4], tatosha@ukr.net[5]

ABSTRACT

The aim was to study an impact of lifelong learning skills on using active learning methods by teachers to improve their qualifications and teaching practice and evaluate an active methods efectiveness for teachers with different duration of pedagogical experience. Methods. The study was conducted using mixed methods. Questionnaires, pedagogical experiment, methods of mathematical statistics were used. Results. The duration of pedagogical experience has equally affects the use of active methods of teaching men and women. Feynman Technique proved to be an effective active learning method for most teachers, which may be determined by the specifics of teaching and the peculiarities of this technique. Full Turn and Case Studies were the least effective methods. Conclusions. Men and women with smaller pedagogical experience are more interested in using active teaching methods for self-study and using in pedagogical practice. The ability of teachers to self-study have an influence on using of active teaching methods. Prospects. The results of the study are effective for improving self-learning skills of teachers and the representative of other professions; the Programme of studying active learning methods with their simultaneous use is effective for solving problems of varying complexity and in all spheres of human activity.

Keywords: Experience, qualifications, self-learning, teachers, time requirements.

1. INTRODUCTION

People's lives are constantly accompanied by gaining new experience, the need to learn new information and acquire new skills. This is due to the development of society as a whole, digitalization, the constant change of the environment and living conditions of each individual, scientific and technological progress and other reasons Bjursell et al. (2021). This necessitates the constant training of employees to update knowledge and skills in accordance with the requirements of society, the acquisition of the necessary knowledge in the chosen profession.

The basis of a full-value career is lifelong learning and the accumulation of opportunities for employment and quality performance of professional duties. Eppler-Hattab (2021) states that workers of all ages develop their knowledge and skills, which are combined with their life wisdom and experience, and help to acquire relevant competencies and skills. Kovács and Kálmán (2022) noted that bachelor's degree is only the initial level of knowledge to perform a certain job, and during professional activities specialists learn through various activities: from formal professional development programmes to interaction with colleagues, integration of different experiences outside work. Lifelong learning is relevant in relation to the goals of sustainable development, and an effective process of such learning requires an approach that combines formal education, non-formal and informal learning, andragogic, euthagogic and pedagogical approaches; contributes to the development and specification of sensorimotor skills and the consolidation and restoration of long-term

memory. Teaching professions require constant self-improvement of teachers, because in addition to teaching students, they need to improve their own skills.

Teaching professions require constant self-improvement of teachers, because in addition to teaching students, they need to improve their own skills. Many studies describes the positive impact of active teaching methods on learning effectiveness for adults. Nevertheless, it is interesting to investigate how teachers in their teaching practice and for their self-improvement use active teaching methods, what are the preferences of active teaching methods for teachers with different teaching experience and what active teaching methods men and women mainly choose. Despite the large number of studies on the effectiveness of active learning methods, there is not enough research on the use of these methods by teachers for self-study and for use in professional activities

In this regard, *the aim of the research* is to study the features of the use of active teaching methods by teachers who are engaged in improving their qualifications.

1.1. Objectives/Questions

1. How does the disposition to self-learning of practicing teachers with different length of service affect their use of active learning methods in their pedagogical practice and for self-learning?
2. Do learners' preferences active learning methods differ depending on their pedagogical experience and gender?
3. What active learning methods will teachers use for learning in their professional practice after their more careful study?

2. LITERATURE REVIEW

Lifelong learning as a necessity for effective work has been considered by many experts. Lifelong learning is falsely considered adult education, or just self-study. Noble et al. (2021) indicate that lifelong learning significantly improves the quality of life of adults and has implications for cultural, social and political systems. Candy (2000) emphasizes that it covers all aspects of education and learning, both formal and informal, much more widely at any age and at any stage of life, regardless of who organizes such learning, or where and how it takes place. Deepa et al. (2021) writes about the importance of flexibility of training for professional development of workers, and emphasizes that this area is poorly studied. Şen and Yildiz Durak (2022) proved that the disposition towards lifelong learning in English teachers is closely linked to professional competence, technology integration, and therefore the use of active self-learning. Şentürk and Baş (2021) found that the lifelong learning trends of future teachers differ by gender, academic achievements, as well as interest and participation in the personal development course. The author points out that student-cantered learning determines their propensity for change and self-learning in the future. Nørgård (2021) indicated that popular online learning and hybrid education also influence the need for adaptation to lifelong learning. Bjursell et al. (2021) emphasized that the development of distance education has significantly increased the value of lifelong learning, but participation in distance work and lifelong learning is unevenly distributed among representatives of different professions, people with different social and financial status.

Modern educational institutions must adapt to social changes and use teaching methods to develop the skills required by the job (Brackin, 2016; Candy, 2000; Murillo-Zamorano et al., 2021). Curricula might be updated to meet the need for quality education (Asok et al., 2016; Ramírez-Montoya et al., 2021). For lifelong learning, it is effectively use active learning methods, because, according to Tharayil et al. (2018), they are more effective than traditional. Lavi et al. (2021) also note that only active learning methods contribute to the development of activity-specific skills and soft skills. Matsumoto-Royo et al. (2021) described the need to improve the teachers' qualifications, the focus on mastering the skills of applying active learning methods to maintain the quality of education.

Active learning means that learners monitor their progress independently, as well as seek and study the information they need. Ben-Eliyahu (2021) points out that the ability to learn despite difficulties in different contexts and situations, the ability to pass on their knowledge to younger generations, to acquire and use new knowledge is the basis of sustainable learning. Sung et al. (2022) proposed lifelong learning indicators such as strategic intent, support for learners, flexible learning, promoting learning, developing partners, quality, inclusivity, outcome. In addition, a kind of approach needed for adults education (Longworth, 1999; Ng & Baharom, 2018). Chuang (2021) also described the importance of social interaction and mutual exchange of experiences for adult learning. Collins et al. (2010) described many effective active learning strategies and methods for adults. However, research by Eynon and Malmberg (2020) shows that not all people receive the same benefits from using the Internet for learning. It is necessary to take into account social structures (age, gender, social and economic status, level of education, individual behaviour). Şentürk and Baş (2021) described the importance of learner-cantered learning to improve the quality of adult education.

2.1. Effective Active Lifelong Llearning Methods — a Review of the Existing Studies

Many studies have shown the effectiveness of active learning methods for students and adults. Argyropoulou (2021) shows the effectiveness of debate to deepen knowledge and transform knowledge in general. The use of the "debate" learning method contributed to the development of differentiated learning skills, encouraging critical thinking, gaining a comprehensive understanding of the topics discussed. Thongmak (2021) studied the impact of gamification on the effectiveness of lifelong learning, and the possibility of adding elements to online learning to increase the employees' internal motivation. Lock et al. (2021) emphasized the importance of choosing approaches to learning, namely the effectiveness of the heutagogy approach to lifelong learning.

Coorey (2016), Kakarougkas and Abdellatif (2022) proved that students had better understand the learning material in the course of mutual learning, which also contributes to the development of lifelong learning skills. Carr et al. (2020) and Ben-Eliyahu (2021) indicated that lifelong learning is relevant in terms of the sustainable development goals, while an effective learning process requires an approach that combines formal education, non-formal and informal learning, andragogical, euthagic and pedagogical approaches.

Murillo-Zamorano et al. (2021) experienced efficiency of the active method gamification in the educational process of students who studied macroeconomics for the development of a number of skills. Association (2020) presents an effective model of team online learning with the use of active methods. Casquero-Modrego et al. (2022) also found that teamwork (project work) using a practical approach improves academic performance and helps students acquire the necessary professional skills. Kakarougkas and Abdellatif (2022) proved the effectiveness of the Flipped Classroom Model as an active learning method. According to Hursen (2020), the application of Problem-Based Learning is effective for the development of future teachers' critical thinking.

Karaoğlan Yılmaz (2021) states that student satisfaction and motivation are important indicators of student involvement and motivation in Flipped Classroom learning. Motivation depends on how appropriate the learning methods are chosen and the content taught. A high level of motivation for self-learning is a predictor of the results of this learning.

Zhu and Zhang (2019) believe that it is necessary to divide the educational material into categories for active learning. Rizvi and Nabi (2021) point to the effectiveness of active online learning methods such as live lectures, cases, discussions. According to research conducted by Rizvi and Nabi (2021), the effectiveness of online certification courses through educational portals such as Coursera, Udemy is lower.

Limited information is a barrier to active lifelong learning, while employment and time constraints do not prevent people from learning. As Leyretana and Trinidad (2021) pointed out, the bigger problem is getting quality information on topics of interest to people. Radović et al. (2021) noted that the authenticity of educational assignments will positively influence the effectiveness, development of cognitive, professional and personal aspects of learners. Tharayil et al. (2018) described nuances such as students' resistance to active learning.

In view of the foregoing, it was interesting to investigate how the disposition towards self-learning is related to the use of active learning methods in a selected sample of teachers with different length of service, and what are the differences in these criteria between men and women.

3. METHODS

3.1. Research Procedure

The study was conducted in four stages:

1. Analysis of research on the effectiveness of active learning methods for people of different ages and qualifications;
2. Planning the research design and features of the study: the choice of methods and ways to assess their effectiveness, the plan of method application;
3. Conducting an experiment and evaluating the results;
4. Drawing conclusions and providing recommendations.

3.2. Sampling

The research was conducted at the T.H. Shevchenko National University "Chernihiv Colehium", Faculty of Preschool, Primary Education and Arts, the Department of Preschool and Primary Education, Department of Economics, Management and Commercial Activity, Central Ukrainian National Technical University, and Pedagogy, Psychology and Education Management Department, Communal Educational Institution of Kyiv Regional Council "Kyiv Regional Institute of Teachers' Postgraduate Education".

The study involved 160 teachers різних напрямів підготовки who were engaged in improving their qualifications. Table 1 shows the sample composition.

Table 1: The sample composition

Gender/length of service	5-10 years	11-15 years	16-20 years	20 and more years	Total
Men	16	23	21	9	69
Women	23	29	24	15	91

3.2.1. Methods

To study the benefits of certain methods for adults (in this study — teachers) involved the following:

1. Survey on knowledge of active learning methods for self-study and for use in pedagogical practice (through questionnaires), research on the lifelong learning skills through a survey developed by Kirby et al. (2010);
2. Study and practical application of active teaching methods in the course of advanced training (in the face-to face and distance learning formats);
3. Re-survey on the preferences of active learning methods.

The Lifelong Learning Skills Survey consists of fourteen questions that describe five personality traits.

Examples and descriptions of active learning methods are available at https://www.queensu.ca/teachingandlearning/modules/home.html.

Questionnaire #1 was used before the experiment, Questionnaire #2 — after the experiment. The questionnaires contained questions of whether teachers study independently, what methods they use, whether they are effective?

Questionnaire #1

1) Do you use lifelong learning methods to improve your knowledge and qualifications?
2) If so, choose which methods you use
a) for self-study –
b) For large and small groups
a. Case Studies
b. Full Turn
c. Postcards on Parade
d. Group Reading
e. Expert Evaluation
f. Pros/Cons Grid
g. Round Table
h. Debate
i. Professional Activity Modelling
j. Teaching Others
k. Active Games Method.
3) Communicating the topic (11 topics were studied in the course of the advanced training)
4) Evaluating the effectiveness of the active learning method on the Likert scale (1 — not effective for me, 5 — very effective).
5) Teachers also worked on 8 topics independently using the convenient active learning method:
a. 1-minute story/reflections;
b. Postcards on Parade;
c. Pros/Cons Grid;
d. Case Studies;
e. Feynman Technique;
f. SQ3R (survey, question, read, recite, review);
g. Active Search Testing;
h. Splitting Up Information.

The advanced training involved studying the peculiarities of active learning methods, their application for large and small groups, study and independent completion of the assignment on the use of active learning methods for self-study.

This study lasted for two weeks for each subgroup followed by a re-survey on preferences and prospects for further use of active learning methods in their teaching practice and for their self-improvement.

The questionnaires were presented in Google Forms, the answers were processed in Google Tabs. All those who underwent advanced training at the time of the experiment took the survey among those who took advanced training courses using active learning methods (160 people).

Differences and preferences in the choice of active learning methods were analysed for:

a) self-learning and improvement of their professional competencies;

b) the use of certain active learning methods in pedagogical practice between teachers with experience of 5-10 years, 11-15 years, 16-20 years, 21 and more years, and between men and women with specified experience.

The obtained survey data were analysed with the help of mathematical statistics, differences between preferences were determined through Student's t-test, top preferences for active learning methods — by sorting, the impact of learning and applying active learning methods on the dynamics of preferences and future use in pedagogical practice.

4. RESULTS

In Ukraine, secondary school teachers improve their qualifications by studying at higher educational institutions that conduct such training every five years. Traditionally, this takes the form of a course of lectures, exams, writing term papers. To conduct the experiment, the first advanced training session involved a survey of teachers to study how they use active learning methods for self-study and in their pedagogical practice.

A survey and pedagogical experiment were conducted with the use of active learning methods during training to improve the lifelong learning process for this category of society, to learn about how teachers independently improve their skills on their own. Pre-experimental survey: Do teachers use active learning methods to improve their knowledge, skills and abilities? Do they use those to teach their students?

4.1. Summative Experiment Results

A survey on whether teachers learn independently using active learning methods shows that most teachers didn't know about some learning methods. Many teachers didn't know about some methods, while they used some of them subconsciously in need of self-study (Table 2).

Table 2: The results of a teachers' pre-experimental survey on whether they use active learning methods

Answer options / Purpose	I know	I know and use for myself	I know and use in my practice	I use without knowing the theory of this method	I don't know
For large and small groups (in pedagogical practice)	7.37%	0.18%	6.25%	6.04%	80.16%
For self-study	3.54%	1.88%	2.92%	12.64%	79.03%

The results of the survey show that most teachers do not use active learning methods because they don't know about them. The answer "I do not know" includes not only theoretical ignorance of the method of active learning, but also lack of knowledge about the practical application of methods and their value for teaching students or for themselves.

The lifelong learning skills of teachers with different lengths of service were studied in order to investigate additional reasons for the use or the failure to use active methods in pedagogical practice and for their self-improvement. The results obtained were compared between the groups by length of service through the Student's t-test (Table 3).

Table 3: The results of comparing the disposition for lifelong learning with different lengths of service (through Student's t-test, $p > 0.05$)

Gender	Length of service	11-15 years	16-20 years	20 and more years
Men	5-10 years	0.86	0.90	0.55
	11-15 years	-	0.74	0.38
	16-20 years	-	-	0.62
Women	5-10 years	0.32	0.41	0.65
	11-15 years	-	0.29	0.54
	16-20 years	-	-	0.66

It can be concluded based on the survey results that the length of service does not affect self-learning skills in women and men, the differences between groups by length of service (which is almost always equivalent to age) are statistically insignificant.

4.2. Experimental Programme Description

The Programme of Study and Application of Active Learning Methods, which fully meets the goals of advanced training courses, was developed to conduct the experiment. The Programme involved the study of theoretical information about active learning methods and their practical application in group classes and for self-study. The following structure was developed (Figure 1).

In turn, each class took the following form:

I. Introduction into active learning methods for large and small groups, namely:

1)For large and small groups

a. Case Studies

b. Full Turn

c. Postcards on Parade

d. Group Reading

e. Expert Evaluation

f. Pros/Cons Grid

g. Round Table

h. Debate

i. Professional Activity Modelling

j. Teaching Others

k. Active Games Method.

2)II. Communicating the topic (11 topics were studied in the course of the advanced training)

3)III. Evaluating the effectiveness of the active learning method on the Likert scale (1 — not effective for me, 5 — very effective).

4)Teachers also worked on 8 topics independently using the convenient active learning method:

a. 1-minute story/reflections;

b. Postcards on Parade;

c. Pros/Cons Grid;

d. Case Studies;

e. Feynman Technique;

f. SQ3R (survey, question, read, recite, review);

g. Active Search Testing;

h. Splitting Up Information.

Self-study of topics through the active learning method was followed by the teachers' evaluation of the effectiveness of the method for them and justification (optional) of their choice with an assessment (a few words, convenient or inconvenient method, helps or does not help to improve knowledge).
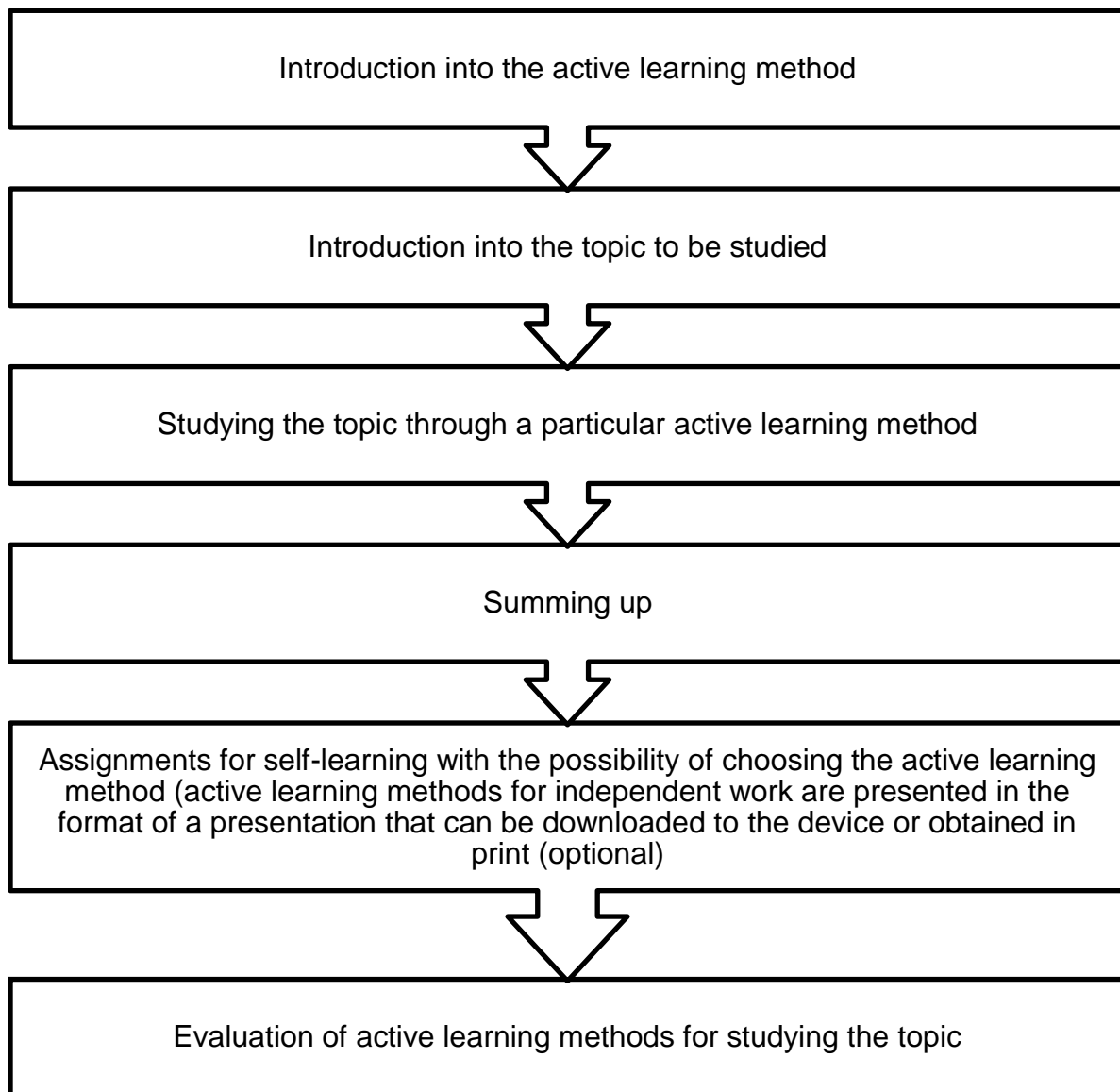
```
┌─────────────────────────────────────────────────────────────────────┐
│             Introduction into the active learning method             │
└─────────────────────────────────────────────────────────────────────┘
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│                Introduction into the topic to be studied             │
└─────────────────────────────────────────────────────────────────────┘
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│       Studying the topic through a particular active learning method │
└─────────────────────────────────────────────────────────────────────┘
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│                              Summing up                              │
└─────────────────────────────────────────────────────────────────────┘
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│   Assignments for self-learning with the possibility of choosing the │
│   active learning method (active learning methods for independent    │
│   work are presented in the format of a presentation that can be     │
│   downloaded to the device or obtained in print (optional)           │
└─────────────────────────────────────────────────────────────────────┘
                                  ▼
┌─────────────────────────────────────────────────────────────────────┐
│          Evaluation of active learning methods for studying the topic│
└─────────────────────────────────────────────────────────────────────┘
```

Fig. 1. The structure of the Programme of Study and Application of Active Learning Methods in the course of advanced training

4.3. Post-Experimental Survey

The results of teachers' evaluation of the effectiveness of active learning methods to study the topic showed a significant advantage of some methods over others, and the difference in teachers' preferences for some active learning methods depending on the length of service (Table 4).

Table 4: Rating of the effectiveness of active learning methods for pedagogical practice for teachers with different lengths of experience

Item No.	Name of the active learning method	Length of service	Name of the active learning method	Length of service	Name of the active learning method	Length of service	Name of the active learning method	Length of service
		5-10 y. rate		11-15 y. rate		16-20 y. rate		20 and more y. rate
1.	Teaching Others	4.33	Teaching Others	4.22	Professional Activity	4.54	Active Games Method	4.15

					Modelling			
2.	Professional Activity Modelling	4.26	Professional Activity Modelling	4.05	Debate	4.32	Teaching Others	4.06
3.	Debate	3.85	Debate	4.01	Active Games Method	4.15	Professional Activity Modelling	3.85
4.	Round Table	3.66	Active Games Method	3.98	Teaching Others	4.06	Round Table	3.47
5.	Pros/Cons Grid	3.55	Round Table	3.68	Round Table	3.84	Debate	3.39
6.	Group Reading	3.11	Expert Evaluation	3.45	Pros/Cons Grid	3.38	Pros/Cons Grid	3.25
7.	Active Games Method	2.38	Pros/Cons Grid	3.21	Group Reading	3.04	Group Reading	2.35
8.	Postcards on Parade	2.35	Group Reading	2.35	Postcards on Parade	2.33	Expert Evaluation	2.28
9.	Expert Evaluation	2.22	Postcards on Parade	2.22	Expert Evaluation	2.24	Postcards on Parade	2.25
10.	Full Turn	2.22	Case Studies	1.85	Case Studies	1.65	Case Studies	1.32
11.	Case Studies	1.24	Full Turn	1.22	Full Turn	1.35	Full Turn	1.05

According to the analysis of teachers' evaluation of the effectiveness of active learning methods for use in pedagogical practice, teachers with different lengths of experience considered Teaching Others, Professional Activity Modelling, Debate, Round Table and Active Games Method as the most effective ones. The Case Studies and Full Turn methods are not considered very effective. The teachers pointed out in the notes to the results that the use of Full Turn and Case Studies methods is not always rational in considering the topics that students study in school.

Analysis of evaluating the effectiveness of active teaching methods for teachers' self- improvement shows interesting results (Table 5).

Table 5: Ranking of the effectiveness of active learning methods for self-learning for teachers with different lengths of service

Item No.	Name of the active learning method	Length of service	Name of the active learning method	Length of service	Name of the active learning method	Length of service	Name of the active learning method	Length of service
		5-10 y. rate		11-15 y.		16-20 y.		20 and more
1.	Feynman Technique	4.7	Feynman Technique	4.54	Feynman Technique	4.45	Feynman Technique	4.58
2.	Splitting Up Information	4.3	Pros/Cons Grid	3.88	Splitting Up Information	4.24	SQ3R	3.85
3.	Pros/Cons Grid	3.8	Splitting Up Information	3.82	Active Search Testing;	3.71	Active Search Testing;	3.35
4.	1-minute story/ reflections	3.7	Postcards on Parade	3.69	Postcards on Parade	3.55	Pros/Cons Grid	3.33
5.	SQ3R	3.7	Case Studies	3.55	Pros/Cons Grid	3.47	Postcards on Parade	3.25
6.	Postcards on Parade	3.6	Active Search Testing;	3.55	SQ3R	3.38	Splitting Up Information	3.21
7.	Case Studies	3.2	SQ3R	3.36	1-minute story/ reflections	3.11	Case Studies	2.54

| 8. | Active Search Testing; | 3.2 | 1-minute story/ reflections | 3.24 | Case Studies | 1.28 | 1-minute story/ reflections | 2.25 |

Feynman Technique was the undisputed leader among active learning methods for teachers with different lengths of experience, which can be explained by the specifics of this method and its affinity with the teachers' work. Teachers rated This method was rated the highest (average 4.56±0.06 points), and significantly higher than other teaching methods ($p>0.05$). Other methods were ranked in different dynamics, but significant differences were observed only in the Case Studies method in the group of 16-20 years of experience, and 1-minute story/reflection in the group of 20 or more years of experience.

Surveys of teachers on whether they will use active learning methods for self-learning and for their pedagogical practice show that most tend to use active learning methods (Table 6).

Table 6: The results of the pre-experimental survey on the promising use of active learning methods

Gender	5-10 years	11-15 years	16-20 years	20 and more years	Total
Men	20.48%	17.39%	20.29%	15.94%	73.91%
Women	24.18%	23.55%	19.78%	9.89%	71.43%

According to the results of this survey, men with a length of service of 5-10 years are more likely to use active learning methods than those with 20 years of experience or more ($p>0.05$). Women with 5-10 years of teaching experience are significantly more likely ($p>0.05$) to use active learning methods for their self-improvement than those with 11-20 and 20 years of experience or more (Table 6).

A study of the impact of self-learning ability and the long-term use of active learning methods shows a positive correlation in all groups of teachers with different lengths of service, except the group of 20 or more years (Table 7).

Table 7: Correlation between the self-learning ability and the promising use of active learning methods after the experiment

Gender/ Length of service	5-10 years r	11-15 years r	16-20 years r	20 and more years r
Men	0.55	0.59	0.62	0.35
Women	0.61	0.54	0.64	0.41

The results show satisfaction with the learning process and the desire to further develop their knowledge and skills in individuals who studied in the experimental group. Adults who took part in the experiment gained knowledge that allowed them to continue self-learning, that is constantly stimulate cognitive activity.

5. DISCUSSION

Teachers who participated in the study confirmed the need to improve knowledge throughout life, and their lifelong learning skills, depending on the length of service, almost do not differ. It confirms and complements the results obtained (Bjursell et al., 2021). After all, the value of specialists on the labour market, and therefore the opportunities for work, directly depends on the level of knowledge (Carr, 2020; Eppler-Hattab, 2021). In order to learn effectively, self-education skills must be developed, and the use of active learning methods will help improve the quality of learning outcomes for adults. It is important for teachers to master active learning methods to improve their knowledge level, as well as to use these methods in the practice of working with schoolchildren.

The lifelong learning ability of the teachers who participated in the study practically does not differ depending on the length of experience. A statistically higher probability of using active learning methods for self-learning and for use in pedagogical practice was observed in the results of the survey of women with 5-10 years and 11-20 years of experience and those who have been teaching for more than 20 years. Among men, such a difference in the perspective of using active learning methods was only among men whose length of service was 5-10 years and 20 or more years. It continues and complements the results obtained by Şen and Yildiz Durak (2022), who found that the self-learning skills depend on the length of service, but it may be due to the personnel

composition of the teachers who participated in the study. Also, men with 20 or more years of experience are more likely to use active learning methods for lifelong learning than women with the same length of pedagogical experience. It is necessary to take into account the length of service and the characteristics of women and men when choosing training methods (Şentürk & Baş, 2021). Along with this, it is important to take into account the mode of training (online, offline), because the success of training for teachers with different lengths of experience and other personal characteristics also depends on it (Eynon & Malmberg, 2020). Nørgård (2021) also writes about the need for teachers to improve their knowledge in connection with the introduction of distance and mixed learning. Likewise, Eynon andd Malmberg (2020) write about the need for continuous improvement and self-education in connection with the development of Internet technologies. Also, the results obtained in this study. Such results can be explained by the peculiarity of the sample, the practical need to improve the respondents' knowledge and skills in connection with the introduction of distance and blended learning. The data obtained contradict the data obtained by Şentürk and Baş (2021) on the gender-dependent lifelong learning skills.

The data obtained in this study confirm the data of Eppler-Hattab (2021) and Tserklevych et al. (2021) on the integration of life experience of teachers with longer length of service with learning skills required in current working environment and thus maintaining lifelong self-learning skills of teachers with different seniority. It is important for adults to cooperate and share teaching experience, use different teaching methods for self-education and improve their qualifications (Chuang, 2021). The most favorable conditions for this are the time of advanced training courses, when teachers with different experience can discuss the issues of self-study and the peculiarities of teaching.

The pre-experimental survey shows that the level of application of active learning methods by teachers for both pedagogical practice and self-learning is not very high. This is mostly caused by the lack of knowledge about the methods themselves and their effectiveness. In view of the guidance of Deepa et al. (2021), Ramírez-Montoya et al. (2021) and Bjursell et al. (2021) on the need for lifelong learning, improving qualifications of the employees and inadequately developed strategies in this direction, the Programme of Study and Application of Active Learning Methods was developed for teachers, which was used during the advanced training courses. It also continues the findings of Lock et al., (2021) regarding the importance of choosing a choice of learning approaches for adults, and on the necessity of implementing active learning methods for adult education (Matsumoto-Royo et al., 2021).

The data obtained on whether teachers will use active learning methods show the positive impact of the study and practical application of active learning methods on their future use for their self-learning and in pedagogical practice. This is confirmed by Leyretana and Trinidad (2021), who stated that obtaining quality information on topics of interest and need to people is a herald of quality self-learning, as well as Rizvi and Nabi (2021) on the effectiveness of active learning methods in teacher-assisted learning. Şen and Yildiz Durak, (2022) also proved that the use of active learning methods and lifelong self-education predicts the pedagogical competence of teachers. The results of the research show the need to study active learning methods for teachers during professional development courses, which will greatly improve their pedagogical qualifications and ability to learn throughout their lives. The study of active learning methods by teachers with different pedagogical experience during advanced training courses is quite effective, because teachers have the opportunity to acquire new knowledge, test it in practice, and exchange experience with colleagues (Kovács & Kálmán, 2022).

5.1. Limitations
This study has the following limitations - a contingent of participants, application of the program for a certain period of time (30 hours for each), study of active methods in the mode of familiarization and practical application.

5.2. Practical Recommendations
The active learning methods should be used with a view to the following aspects:
− Trends in development of and needs for skills and knowledge for a particular profession;
− The level of skills and knowledge of participants in the learning process;
− Selection of material necessary for the study of a particular audience and certain individuals;
− Peculiarities of the participants' perception of certain teaching methods for each individual or the group as a whole.

Taking into account the individual needs, skills and abilities of a person who learns throughout life is crucial in the effectiveness of certain active learning methods.

5.3. Future studies
Prospects for further research involve testing the quality of knowledge gained through certain active learning methods, surveys of respondents who participated in the study on the use of active learning methods for self-study and pedagogical practice, the benefits of using certain methods, the effectiveness of certain active learning

methods in studying particular subjects, for students of different ages. Future research can be aimed at studying active learning methods over a longer period, other ways of their application, studying active methods online, studying the effectiveness of active learning methods for lifelong learning in different contexts (improvement of subject knowledge, improvement of teaching skills). It is worth conducting a study of the effectiveness of the application of active learning methods in the educational process of schoolchildren of different ages.

6. CONCLUSIONS

The need for self-study is also urgent in terms of the introduction of distance learning, the need to learn new methods of distance and blended learning, influence students and improve performance. The lifelong learning skills of teachers who participated in the study does not differ much depending on the length of their service, as well as between men and women. These self-learning skills are directly related to the use of active learning methods to improve one's level of knowledge. The pre-experimental survey shows a low percentage of the use of active learning methods because of the lack of knowledge about them.

After the experiment, the rating of preferences of active learning methods shows some preference of the Feynman Technique, which is somewhat related to teaching. The prospects for the use of active learning methods after their study and practical application is significantly higher than before the experiment ($p > 0.05$). There are high correlations between the self-learning skills and the promising use of active learning methods.

REFERENCES

1. Argyropoulou, E. (2021). Can "debate" transform teaching and learning in higher education? European Journal of Education and Pedagogy, 2(3), 178–185. https://doi.org/10.24018/ejedu.2021.2.3.142
2. Asok, D., Abirami, A. M., Angeline, N., & Lavanya, R. (2016). Active learning environment for achieving higher-order thinking skills in engineering education. 2016 IEEE 4th International Conference on MOOCs, Innovation and Technology in Education (MITE). http://dx.doi.org/10.1109/mite.2016.020
3. Association, I. R. M. (2020). Research anthology on developing effective online learning courses (4 Volumes). Information Resources Management Association.
4. Ben-Eliyahu, A. (2021). Sustainable learning in education. Sustainability, 13(8), 4250. https://doi.org/10.3390/su13084250
5. Bjursell, C., Bergmo-Prvulovic, I., & Hedegaard, J. (2021). Telework and lifelong learning. Frontiers in Sociology, 6. https://doi.org/10.3389/fsoc.2021.642277
6. Brackin, D. M. (2016). Reading strategies for adult learners. In S. Danver (Ed.), The SAGE Encyclopedia of Online Education (pp. 943-945). SAGE Publications, Inc. http://dx.doi.org/10.4135/9781483318332.n301
7. Candy, P. C. (2000). Reaffirming a proud tradition. Active Learning in Higher Education, 1(2), 101–125. https://doi.org/10.1177/1469787400001002002
8. Carr, A., Balasubramanian, K., Atieno, R., & Onyango, J. (2020). Lifelong learning to empowerment: Beyond formal education. In Expanding Horizons in Open and Distance Learning (pp. 69–86). Routledge. http://dx.doi.org/10.4324/9780429292941-6
9. Casquero-Modrego, N., Núñez-Andrés, M. A., & Iniesto-Alba, M. J. (2022). Effects of small-group learning on the assessment of professional skills through a PBL activity. Transactions in GIS, 26(4), 1735–1753. https://doi.org/10.1111/tgis.12897
10. Chuang, S. (2021). The applications of constructivist learning theory and social learning theory on adult continuous development. Performance Improvement, 60(3), 6–14. https://doi.org/10.1002/pfi.21963
11. Collins, J., Harkin, J., & Nind, M. (2010). Manifesto for learning: Fundamental principles. A&C Black.
12. Coorey, J. (2016). Active learning methods and technology: Strategies for design education. International Journal of Art & Design Education, 35(3), 337–347. https://doi.org/10.1111/jade.12112
13. Deepa, V., Sujatha, R., & Baber, H. (2021). Ageing and Learning Agility –Mediating role of learning perception and Moderating role of technology leverage. International Journal of Lifelong Education, 40(5–6), 514–531. https://doi.org/10.1080/02601370.2021.1991501
14. Eppler-Hattab, R. (2021). From lifelong learning to later life self-employment: A conceptual framework and an Israeli enterprise perspective. Journal of Enterprising Communities: People

and Places in the Global Economy, ahead-of-print(ahead-of-print). https://doi.org/10.1108/jec-01-2021-0014

15. Eynon, R., & Malmberg, L. (2020). Lifelong learning and the Internet: Who benefits most from learning online? British Journal of Educational Technology, 52(2), 569–583. https://doi.org/10.1111/bjet.13041

16. Hursen, C. (2020). The effect of problem-based learning method supported by web 2.0 Tools on academic achievement and critical thinking skills in teacher education. Technology, Knowledge and Learning, 26(3), 515–533. https://doi.org/10.1007/s10758-020-09458-2

17. Kakarougkas, A., & Abdellatif, R. (2022). A Flipped Classroom Approach and Digital Learning in an Undergraduate Molecular Biology Course Breadcrumb. Journal of College Science Teaching, 51(3). https://www.nsta.org/journal-college-science-teaching/journal-college-science-teaching-januaryfebruary-2022/flipped

18. Karaoğlan Yılmaz, F. G. (2021). An investigation into the role of course satisfaction on students' engagement and motivation in a mobile-assisted learning management system support flipped classroom. Technology, Pedagogy and Education, 1–20. https://doi.org/10.1080/1475939x.2021.1940257

19. Kirby, J. R., Knapper, C., Lamon, P., & Egnatoff, W. J. (2010). Development of a scale to measure lifelong learning. International Journal of Lifelong Education, 29(3), 291–302. https://doi.org/10.1080/02601371003700584

20. Kovács, Z., & Kálmán, C. (2022). Professional learning in the workplace. Journal of Adult Learning, Knowledge and Innovation, 4(2), 41-43. https://doi.org/10.1556/2059.2021.00046

21. Lavi, R., Tal, M., & Dori, Y. J. (2021). Perceptions of STEM alumni and students on developing 21st century skills through methods of teaching and learning. Studies in Educational Evaluation, 70, 101002. https://doi.org/10.1016/j.stueduc.2021.101002

22. Leyretana, K., & Trinidad, J. E. (2021). Predicting or preventing lifelong learning? The role of employment, time, cost, and prior achievement. Journal of Adult and Continuing Education, 147797142110545. https://doi.org/10.1177/14779714211054555

23. Lock, J., Lakhal, S., Cleveland-Innes, M., Arancibia, P., Dell, D., & De Silva, N. (2021). Creating technology-enabled lifelong learning: A heutagogical approach. British Journal of Educational Technology, 52(4), 1646-1662. https://doi.org/10.1111/bjet.13122

24. Longworth, N. (1999). Making lifelong learning work: Learning cities for a learning century. Psychology Press.

25. Matsumoto-Royo, K., Ramírez-Montoya, M. S., & Conget, P. (2021). Opportunities to develop lifelong learning tendencies in practice-based teacher education: Getting ready for education 4.0. Future Internet, 13(11), 292. https://doi.org/10.3390/fi13110292

26. Murillo-Zamorano, L. R., López Sánchez, J. Á., Godoy-Caballero, A. L., & Bueno Muñoz, C. (2021). Gamification and active learning in higher education: Is it possible to match digital society, academia and students' interests? International Journal of Educational Technology in Higher Education, 18(1). https://doi.org/10.1186/s41239-021-00249-y

27. Ng, H., & Baharom, S. S. (2018). An analysis on adult learners' satisfaction in online education programmes. International Journal of Interactive Mobile Technologies (IJIM), 12(7), 70. https://doi.org/10.3991/ijim.v12i7.9665

28. Noble, C., Medin, D., Quail, Z., Young, C., & Carter, M. (2021). How does participation in formal education or learning for older people affect wellbeing and cognition? A systematic literature review and meta-analysis. Gerontology and Geriatric Medicine, 7, 233372142098602. https://doi.org/10.1177/2333721420986027

29. Nørgård, R. T. (2021). Theorising hybrid lifelong learning. British Journal of Educational Technology. https://doi.org/10.1111/bjet.13121

30. Radović, S., Hummel, H. G. K., & Vermeulen, M. (2021). The challenge of designing 'more' experiential learning in higher education programs in the field of teacher education: A systematic review study. International Journal of Lifelong Education, 40(5–6), 545–560. https://doi.org/10.1080/02601370.2021.1994664

31. Ramírez-Montoya, M. S., Andrade-Vargas, L., Rivera-Rogel, D., & Portuguez-Castro, M. (2021). Trends for the future of education programs for professional development. Sustainability, 13(13), 7244. https://doi.org/10.3390/su13137244

32. Rizvi, Y. S., & Nabi, A. (2021). Transformation of learning from real to virtual: An exploratory-descriptive analysis of issues and challenges. Journal of Research in Innovative Teaching & Learning, 14(1), 5–17. https://doi.org/10.1108/jrit-10-2020-0052

33. Şen, N., & Yildiz Durak, H. (2022). Examining the relationships between English teachers' lifelong learning tendencies with professional competencies and technology integrating self-efficacy. Education and Information Technologies. https://doi.org/10.1007/s10639-021-10867-8

34. Şentürk, C., & Baş, G. (2021). Investigating the relationship between teachers' teaching beliefs and their affinity for lifelong learning: The mediating role of change tendencies. International Review of Education, 67(5), 659–686. https://doi.org/10.1007/s11159-021-09917-7

35. Sung, J., Sheng, Y. Z., Liau, A. K., Xinhui, A. C., Liu, L., & Coates, H. (2022). Augmenting the role of higher education institutions in lifelong learning: Designing an indicator framework for policy application. International Journal of Chinese Education, 11(1), 221258682110729. https://doi.org/10.1177/22125868211072931

36. Tharayil, S., Borrego, M., Prince, M., Nguyen, K. A., Shekhar, P., Finelli, C. J., & Waters, C. (2018). Strategies to mitigate student resistance to active learning. International Journal of STEM Education, 5(1). https://doi.org/10.1186/s40594-018-0102-y

37. Thongmak, M. (2021). A model for enhancing employees' lifelong learning intention online. Learning and Motivation, 75, 101733. https://doi.org/10.1016/j.lmot.2021.101733

38. Tserklevych, V., Prokopenko, O., Goncharova, O., Horbenko, I., Fedorenko, O., & Romanyuk, Y. (2021). Virtual Museum Space as the Innovative Tool for the Student Research Practice. International Journal of Emerging Technologies in Learning, 16(14), 213-231. https://doi.org/10.3991/ijet.v16i14.22975

39. Zhu, Y., & Zhang, W. (2019). Active learning for active ageing: Chinese senior immigrants' lifelong learning in Canada. Educational Gerontology, 45(8), 506–518. https://doi.org/10.1080/03601277.2019.1662933