HOW TO BALANCE SYNCHRONOUS AND ASYNCHRONOUS TEACHING AND LEARNING: A LOCAL STUDY

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Abstract. *The transition of higher education institutions to distance learning, caused by the spread of COVID-19, has highlighted the need to minimize the social distance of students and teachers, with the updated the use of blended learning; accordingly, studying synchronous and asynchronous e-learning modes to support them. This article discusses the balance of synchronous and asynchronous teaching and learning models and examines the attitude of teachers and students at higher education institutions to the choice of a particular learning mode. Based on the self-assessment of the educational process participants, the main factors influencing the choice of learning modes are presented, and the compliance of the obtained results with the developed theoretical model is analyzed. A comprehensive analysis of the survey results allowed us to assess the association*

between the adherence to a particular learning mode and gender, the status of the respondents, the type of educational activity, and the resource provision of the educational process. The proposed methodology and the obtained results can be used in the design of e-learning courses and the establishment of educational communication to ensure quality teaching and learning.

Keywords: Synchronous and Asynchronous Learning Modes, Survey, Principal component analysis, Higher education institution, Distance learning**.**

INTRODUCTION

Prior to the COVID-19 pandemic, the concept of blended learning as a combination of in-person (or class-based) and online learning was implemented in many universities in the educational process (Morze 2017, Su 2019). The outbreak of the COVID-19 pandemic changed the situation drastically. The transition to universal distance learning was sudden, which caused many problems for students, teachers, university administration boards, related to ensuring the quality of education under the conditions of quarantine restrictions (A. Wahab 2020). At the same time, educational institutions were given the opportunity to experimentally test previously developed theoretical models of distance learning and share successful practices. (Alqahtani & Rajkhan 2020, Tosun 2021).

The study of students' attitudes to: e-learning during the COVID-19 pandemic process is the subject of research by U. Akcil and M. Bastas (Akcil & Bastas 2021). K. Heng in his study of online learning during the COVID-19 pandemic (Heng 2020), analyzes such terminology as: e-learning, online learning, distance learning, blended and hybrid learning. Each of these concepts is based on the use of educational and digital technologies, but differs depending on how students participate in the educational process and what forms of educational activities are used.

The purpose of the study is to investigate the attitude of teachers and students to the use of different forms of students' educational activities in synchronous and asynchronous learning models to ensure the quality of the educational process.

The objectives of the study are as follows:

1. Based on an analysis of scientific publications and empirical experience, the authors build a theoretical model of synchronous and asynchronous learning in accordance with certain types of educational activities.

2. To determine the attitude of teachers and students to the use of synchronous (asynchronous) distance learning and check the compliance with the theoretical model.

1. SYNCHRONOUS AND ASYNCHRONOUS LEARNING MODES: THEORETICAL BACKGROUND

There are two basic formats of learning in an online environment: synchronous and asynchronous. The researchers provide a comprehensive definition, which is unanimous, of synchronous e-learning that includes two components - interaction and time. Based on these components, Khan defines synchronous e-learning as, "The participants-instructor interaction via the Internet in real time" (Khan 2006). Asynchronous learning means that the teacher and the students, taking the course, interact with the content of the course at different times (and from different places). The teacher provides students with a sequence of study units that they perform. Each unit can contain readable or downloaded media, online quizzes, discussion boards, and more. Asynchronous learning mode does not mean that participants in the educational process do not receive feedback from the teacher or grades for the activities performed. This happens constantly, but at a specific time or as needed.

The issue of the advantages and disadvantages of synchronous and asynchronous forms of organization of students' learning activities has been investigated in various aspects and conditions (Bower 2015, Lynette 2016). On the basis of the presented studies, it is possible to allocate comparison criteria (Table 1).

Table 1.

A comparison of synchronous and asynchronous Learning Modes

Comparison criterion	Synchronous	Asynchronous
Place of study	Students can ask questions and receive answers in the **real-time** mode during the live-session	Some students may not be able to attend at the **required time** due to technical or scheduling issues. They can be in different time zones
Student engagement	**Only a small number** of students will be able to ask questions during the live session	In the online discussion group, **all students** can ask questions or comment
Interaction	Students experience an enhanced sense of teacher presence. Real-time chats or working hours allow you to interact **in real**	Students can access the course content and initiate or respond to interactions with the teacher and their peers when it best suits **their**

	time, such as a conversation. It is possible to conduct classes in different formats, e.g., master classes and **group classes**	**schedule**. But watching a recorded lesson, students may feel less connected to the teacher and **less connected to the learning group**
Awareness	The teacher can assess students' understanding in real time and adjust the session accordingly. Students are **deprived of time to reflect** on the session and conduct additional research	Students **can view recorded** sessions to deepen their learning, or to revise before the final exam. Students can also review topics in discussion groups long **after these discussions** have taken place
Administration	Provides a **schedule** that helps those who have difficulty in self-organization	Students can **postpone classes** because they can always "do it later." Requires a higher level of self-awareness and self-study skills

Source: Own work based on sources Matt Bower&Watts Lynette

Synchronous and asynchronous online learning have common features. The model of such a combination is implemented in Ohio (Lawless 2020). It stipulates that if asynchronous online classes are chosen, students do their work on a weekly schedule, receive immediate feedback on their performance, and plan group work when it is convenient for everyone. Synchronous online classes require attending classes almost every week together with teachers and classmates, participating in real-time discussions during classes, and improving their presentation skills. Both forms of learning require that all participants in the educational process attend classes from anywhere, students communicate regularly with teachers online and establish relationships with classmates. A survey (Hrastinski 2008) on asynchronous and synchronous e-learning methods found that each of them supports different goals. The scientist discovered that personal participation refers to a more exciting type of participation, suitable for less complex information exchanges, including task planning and social support. Cognitive participation refers to a more reflexive type of participation, suitable for discussing complex issues. All other things being equal, synchronous e-learning better supports personal participation, and asynchronous e-learning better supports cognitive participation.

Synchronous and asynchronous learning can be combined for delivering one course. Such a combination is called blended learning in didactics and can be implemented using the technology of inverted learning (Bergland 2020). In the literature, there is a review of different types of blending, which are based on the *content, scale, technology, learning space*, etc.

Irvine (Irvine, Code & Richards 2013) proposed a four-tiered model for ‘multi-access learning’ aimed at empowering students to customise the way in which they engage with their instructor and peers in a course. The core, underlying

principle is one of promoting autonomy in terms of how each student accesses the learning environment through a mixture of F2F delivery, synchronous online learning, asynchronous online learning, and open learning. Blended synchronous learning corresponds to the second tier of Irvine's model, which entails overlaying onto the core of the traditional, F2F classroom synchronous online access for remote students, enabling those students to take part in activities in real-time along with their classmates who are located on campus.

Researchers have demonstrated the positive practices of using inverted learning technology. For example, they (Kuzminska, 2017) proposed scenarios and tools for students' practical collaborative activities, as well as examples of learning objects that provide resources for self-study and research.

A study of a blended learning model in the context of distance learning (Goksu 2020) describes a mixing model based on a revised version of Bloom's taxonomy (Anderson 2001): the authors suggest dividing learning into such stages as memorization and understanding, which should take place offline asynchronously, then application and analysis – online synchronously, and evaluation and creation – offline asynchronously after the lesson.

Based on the analysis of the described practices and university experience represented by the researchers, according to the stages of students' educational activity, we offer a generalized theoretical model of blending synchronous and asynchronous learning (Figure 1). Here, each of the activities in the overall structure of the educational process in the university is divided into five parts, i.e. each share in the blended synchronous and asynchronous learning mode is 20%. The five-stage cycle of mastering a training module from goal setting to evaluation / assessment contains 9 stages, which may differ in time, order and structure depending on the competencies that are mastered. But in our structure of activities, they have the same weight. We consider the model (Figure 1) of proportional blending in relation to the ratio of synchronous and asynchronous learning – the ratio is 22:23.

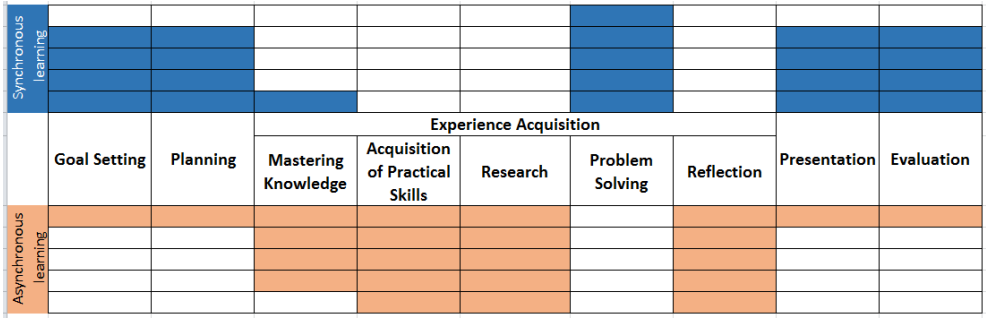

Figure 1. Model of proportional blending in relation to the ratio of synchronous and asynchronous learning

Source: Own work

2. THE ATTITUDE OF TEACHING STAFF AND STUDENTS TO THE USE OF SYNCHRONOUS OR ASYNCHRONOUS LEARNING

2.1 Research Design

To study the attitude of teachers and students to the use of synchronous and/or asynchronous learning, we applied cross-section (cross-section) and single-sample (single) research schemes. We developed a statistical survey (https://forms.gle/izrsJQKnwzVYYaB1A), which was distributed via social networks and messengers (Telegram, Viber, Facebook, Instagram). Of course, this in some way limits the audience of respondents, but still allows us to draw certain conclusions about existing trends and patterns. In general, the sample corresponded to the structure of the general population of respondents with a representativeness error of no more than 5%. A total of 129 people from ten institutions of higher education in Ukraine took part in the survey. Of these: 28 (21.7%) are lecturers, 28 are undergraduates and 73 (56.6%) are postgraduates (taking Master courses). 41.1% of respondents are males, which corresponds to the general population. All respondents reported that higher education institutions where they were studying or working used different learning management systems to implement e-learning (mostly LMS Moodle is used as such a system – this answer was provided by 64.4% of respondents), and for synchronous online communications, the most often used platforms included Google Meet (30.9%), Zoom (29.1%), Cisco Webex (21.8%), and Discord (12.7%). 65.9% of respondents reported that they always had access to computers and mobile devices with Internet access, 29.7% – had certain but uncritical restrictions. It should also be noted that respondents demonstrated a high level of digital competence. According to the results of self-assessment, which correlate with the results of previous studies done by the authors of the article (Kuzminska 2019), 49.6% of respondents evaluated their own level of digital competence as high, 31.8% - as expert, and only 1 participant – as basic. These data results indicate the readiness to the implementation of distance (blended) learning in higher education both at the level of institutional support and competence of the subjects of the educational process, so we can assume that the choice of Learning Modes depends on the personal characteristics of lecturers (as those who provide the educational process) and students (as customers of educational services).

To determine the attitude to synchronous and asynchronous learning of the subjects of the educational process, to identify links between groups of respondents who differ in status (undergraduates, postgraduates (master's degrees), faculty), as well as to determine the influencing factors and choice, the following hypotheses are formulated:

H1: The choice of Learning Modes does not depend on the status of the respondents, i.e. faculty and students equally determine the importance of synchronous or asynchronous learning.

H2: The choice of Learning Modes does not depend on the type of learning activity, but is determined only by personal characteristics.

H3. The choice of Learning Modes is influenced by the respondents' gender, their level of digital competence and resources (access to computer equipment and institutional learning management systems).

To confirm or refute the hypotheses in determining the adoption of a synchronous and (or) asynchronous learning regime, respondents were asked to:

- identify the type of Learning Modes, which is preferred (synchronous or asynchronous), in the implementation of the following activities: the actualization of (learning) goals, analysis of experience; the presentation and processing of theoretical information; study of the subject area; practicing skills (setting tasks for laboratory, seminar or practical work and their implementation); presentation and evaluation/assessment of educational results; problem-solving, reflection (group I questions, testing of hypotheses H1 and H2);
- indicate the availability of platforms and particular services to support asynchronous and synchronous learning in a particular higher education institution, assess the level of their own digital competence (according to DigComp 2.1), and provide certain personal data (gender, age, access to computers and the Internet) for determination of factors influencing the choice of Learning Modes (III group of questions, testing hypothesis H3);
- identify tools for the implementation of a particular type of educational activity, which is preferred by respondents (group II questions), in order to check the consistency of answers regarding the choice of Learning Mode in each case (group I questions). The consistency analysis of the answers will allow to find out how much the respondents understand the essence of the asynchronous and synchronous modes of learning, which is important for refuting or confirming the hypotheses.

During the data analysis, a set of methods and models was used to calculate all descriptive statistics. The choice of certain indices and criteria for evaluation was determined by the type of data, evaluation scale and limitations of the methods. The software tools for statistical data processing SPSS (Field 2013, Levesque 2005) were used for calculations.

At the first stage, most of the functions selected to determine the attitude of respondents to a particular mode of study in the survey process were evaluated by an ordinal two-point scale (1 – prefer synchronous mode, 0 – prefer asynchronous mode). To test the hypotheses, the method of analysis of two-dimensional frequency tables (conjugation tables) and the criterion χ^2 were used (Field 2013). Cronbach's alpha was used to assess the internal consistency of individual

questions of the questionnaire. The methods of analysis of the two-dimensional frequency tables were also used to study the connections between the main sections of the questionnaire and questions related to the use of tools for the implementation of a certain type of educational activity.

A significant number of features (respondents' characteristics) made it impossible to draw unambiguous conclusions about the general trends in the choice of a particular type of training regime by different groups of respondents. Therefore, data reduction methods were used for the processing. The first approach was based on an assessment of the total (aggregate) scores by groups in accordance with the selected types of educational activities. The method of a one-way analysis of variance (ANOVA) was further used to analyze the differences in the mean total scores (Kutner 2004). The second approach was based on the Principal Component Analysis (Jolliffe 2002), which allows for the conversion of data into such variables without a loss of information, the values of which determine the maximum value of the variance of the original features. A further analysis of the relationship between the factor values and groups of respondents was carried out on the basis of frequency tables using methods of a graphical data visualization.

When testing statistical hypotheses at all stages of the analysis, the decision was made on the basis of the p-value, which actually reflects the probability of error in rejecting the null hypothesis (errors of the first kind). The p-value for the rejection of the null hypothesis was taken equal to 0.05.

2.2 Findings

As a result of constructing frequency distributions of respondents' scores on each question of set I, where Learning Modes were determined according to each of the 8 defined types of learning activities (the analysis was performed using two-dimensional frequency tables), as well as according to summary values (a comparison of averages was carried out based on the method of a one-way analysis of variance), it was determined that students prefer the synchronous mode during the implementation of all these types of educational activities. Since the difference is not statistically significant for all groups of respondents, hypothesis H1 can be considered partially confirmed. Table 2 shows the average values of the sum of points for all types of educational activities for different groups of respondents, which shows that the average group value for teaching staff is less than for students.

Table 2.

Mean of summa score for all types of activities for different groups of respondents with the confidence interval

Status	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound

Teacher	28	24.43	5.48	1.04	22.30	26.55
Master	72	25.32	8.47	1.00	23.33	27.31
Bachelor	28	25.93	7.20	1.36	23.14	28.72
Total	128	25.26	7.60	0.67	23.93	26.59

Source: Own work

The analysis of the two-dimensional frequency tables (conjugation tables), as well as the criteria on the basis of which it is possible to assess the relationship between the distribution of answers for each question and other characteristics (gender, level of digital competence, etc.), showed that most features of communication observed at p> 0.05. The Cramér's *V* and the contingency coefficient ranged from 0.086 to 0.366, indicating a weak association between traits. Therefore, the main analysis focused on the analysis of total scores by the type of educational activity according to different categories of respondents (Table 3). Table 3 also shows the values of Fisher's criterion and p-value calculated by the ANOVA method.

Table 3.

Criteria for the significance of differences in total scores according to the main types of learning activities between groups of respondents

Types of learning activities	Gender		Status		Level of digital competence		Availability of technical and mobile means / devices		Learning management systems used in HEI	
	F	p-value	F	p-value	F	p-value	F	p-value	F	p-value
Actualization of goals, experience	1.45	0.23	1.70	0.19	2.46	0.07	**0.03**	0.86	3.35	0.07
Presentation of the theoretical background	**0.00**	0.95	5.56	**0.00**	0.31	0.82	3.91	0.05	1.02	0.31
Setting tasks	**0.02**	0.88	2.36	0.10	1.82	0.15	2.81	0.10	1.08	0.30
Subject area study	5.57	**0.02**	5.23	**0.01**	0.44	0.73	2.01	0.16	6.89	**0.01**
Presentation of results	3.33	0.07	0.93	0.40	0.41	0.74	1.31	0.25	0.28	0.60
Evaluation of outcomes	5.80	**0.02**	3.29	**0.04**	0.78	0.51	0.70	0.40	2.94	0.09
Problem solving	1.91	0.17	5.48	**0.01**	0.19	0.90	0.15	0.70	2.50	0.12
Reflection	12.26	**0.00**	2.49	0.09	0.14	0.93	0.74	0.39	2.82	0.10

Source: Own work

As a result, significant differences in the choice of a learning mode (synchronous or asynchronous) occur among teaching staff and students, and significant differences were found between undergraduates and postgraduates (masters). The difference between the groups of respondents according to their status was also tested by Tukey's test: the biggest differences were found between undergraduates and teaching staff, and undergraduates most need synchronous interaction in such areas as the presentation of the theoretical background, the subject area study, the evaluation of outcomes and problem solving. At the same time, the teaching staff prefer to use the asynchronous learning regime for the presentation and mastery of theoretical information, as well as research of the subject area (see Table 3), which confirms hypothesis H2 partially.

To confirm or refute hypothesis H3, the association between a Learning Mode, which respondents prefer, and the level of their digital competence (according to the results of self-assessment), gender, access to computers and the Internet, the availability of support to learning in HEI (both in synchronous and asynchronous modes). As a result, hypothesis H3 was rejected, because the choice of Learning Modes does not depend on the level of digital competence (assessment was performed on the chi-square criterion at p-value> 0.05) – respondents with different levels of digital competence equally assess the optimality of synchronous and asynchronous mode. Also, the commitment to a particular Learning Mode is not significantly affected by resource provision (an assessment was conducted according to Fisher's criterion at the level of p-value> 0.05) both at the level of free economic education (platforms and services to support e-learning) and the level of individual respondents (access to computer technology and the Internet). The respondents' gender does not affect the choice of a Learning Mode (an assessment was conducted according to Fisher's criterion at the level of p-value> 0.05) either.

Thus, the hypotheses about the association between the choice of a particular Learning Mode with the gender, status and level of digital competence of the subjects of the educational process, as well as the type of learning activities and resources were partially confirmed.

As part of the analysis of the consistency of the respondents' answers, we constructed tables of conjugation between the features that reflect the respondents' choice of Learning Modes according to the types of learning activities (group I questions) and the tools used by respondents to implement them (group II questions). The analysis of these tables showed that the respondents demonstrate the greatest consistency of answers about their attitude to the choice of a learning mode for the presentation and processing of theoretical information (Figure 2).

Significant differences were revealed in the implementation of other types of learning activities. In most cases, the degree of consistency of the answers depends on the status of the respondents – the higher the status, the greater the consistency. The latter is the basis for making assumptions about the feasibility of using a hybrid mode, which involves the use of synchronous and asynchronous learning,

and the share of synchronous communications should increase in undergraduate education, including the formation of soft skills, in particular, critical thinking, time management, acceptance decisions, responsibilities and agility. However, this assumption needs further investigation. Indexes reflecting the internal consistency of the questionnaire were also evaluated, namely Cronbach's alpha was 0.7, Guttman's lambda-2 (Guttman's λ^2) was 0.75, and the intragroup correlation coefficient was 0.7. Such indeces indicate sufficient reliability of the questionnaire.

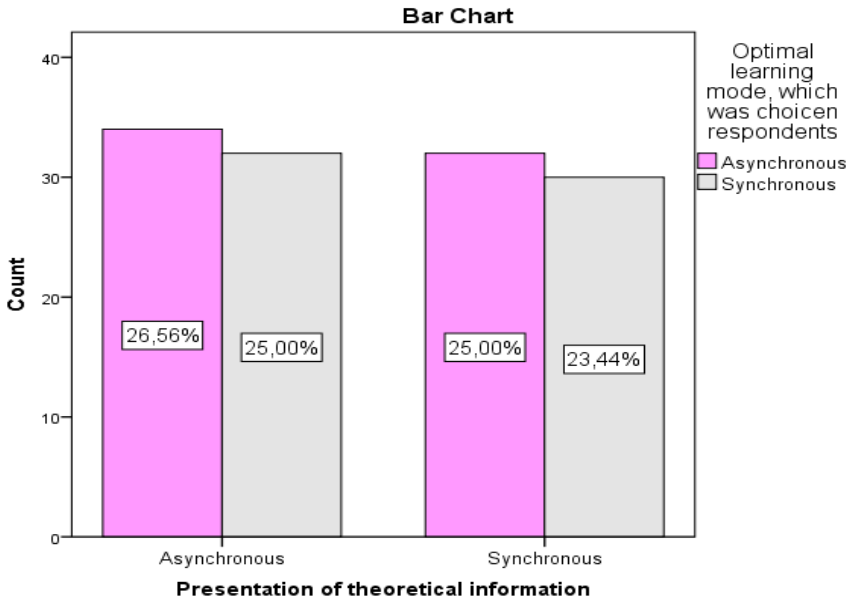

Figure 2. Distribution of the respondents' answers to the choice of a learning mode

Source: Own work

To identify learning modes that are preferred by teaching staff and students for different types of learning activities, it was decided to reduce the dimensionality of the data. To reduce the data, the principal component analysis (PCA) method was used, which was performed on the basis of 8 features using orthogonal rotation (varimax). The Kaiser-Meyer-Olkin (KMO) Measure confirmed the adequacy of the sample for factor analysis: KMO = 0.527, which is above the allowable limit of 0.5 (Field 2013). The criterion of Bartlett's test of sphericity χ^2 (36) = 91.88, at p <0.0001, which indicates a fairly high correlation between the studied features. Table 4 shows the load factors after rotation. The features are referred to the main components by the absolute values of the coefficients of the inverse matrix (the corresponding cells are highlighted in color).

The elements grouped on the basis of the same components suggest that component 1 (PCA1), called Learning Experience Acquisition, combines the

presentation and mastery of theoretical background, the subject area study, in particular through practical skills development, problem solving, and reflections; component 2 (PCA2, Goal Setting) unites goal updating, experience analysis and task setting; component 3 (PCA3, Presentation of experience) – presentation and evaluation of learning activity outcomes.

Table 4.

The results of factor analysis of the determination of Learning Modes (based on respondents' answers) (N = 129)

Types of learning activities	Component		
	PCA1	PCA2	PCA3
Goal updating and experience analysis (VAR1)	0.26	**0.79**	-0.01
Presentation of the theoretical background (VAR2)	**0.52**	0.03	0.10
Task setting (VAR3)	-0.05	**0.74**	0.07
Subject area study (VAR4)	**0.63**	-0.34	0.04
Tasks implementation (VAR5)	**0.39**	-0.28	0..29
Presentation of outcomes (VAR6)	-0.04	0.09	**0.80**
Evaluation (VAR7)	0.13	-0.02	**0.79**
Problem solving (VAR8)	**0.66**	0.19	-0.13
Reflection (VAR9)	**0.57**	0.20	0.07

Source: Own work

The graphical representation of the results of the application of the principal component analysis method (Figure 3) provides the grounds to assert that the initial correlation of features divides the initial data in no more than three directions, which led to the selection of the three main components.

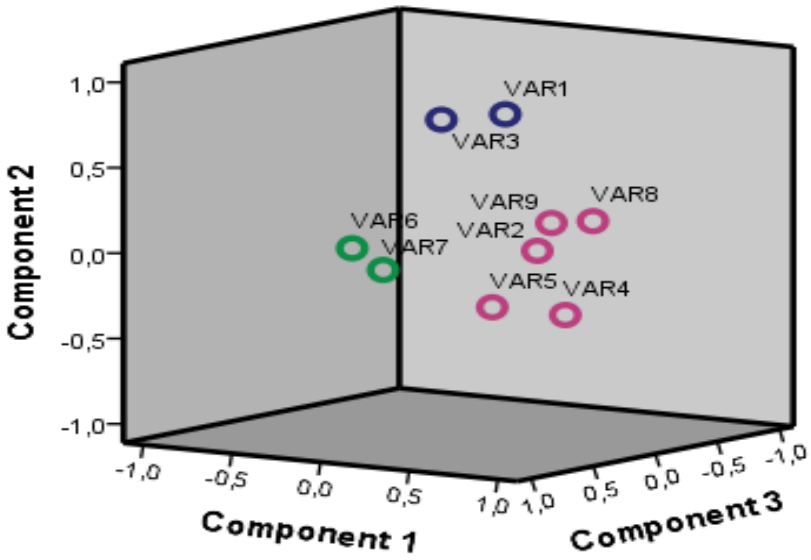

Figure 3. The diagram of the main component selection according to the distribution of the selected features values (Component Plot in the Rotated Space)

Source: Own work

Further analysis of the obtained factor values based on the principal component analysis method in terms of respondents' groups did not show significant differences on the basis of gender, status, a level of digital competence and access to technical means.

According to the developed theoretical model of Balance Synchronous and Asynchronous teaching and learning, for the implementation of PCA2 and PCA3 components, synchronous Learning Mode is preferred, i.e. the share of synchronous interactions prevails, and for PCA1 – asynchronous. To check the degree of conformity of the factor analysis results to the theoretical model, additional ordering of respondents' answers was performed according to the calculated factor values of the main components, which were ranked by the percentile method and divided into four groups: 1 – respondents who prefer an asynchronous Learning Mode; 2 – respondents who more often prefer an asynchronous mode than synchronous; 3 – respondents who more often prefer a synchronous mode than asynchronous; 4 – respondents who prefer a synchronous Learning Mode.

Analyzing the obtained frequency distributions for different respondent groups, we can assume that faculty use (a clear relationship is found) an

asynchronous Learning Mode (Figure 4), which corresponds to the theoretical model, to gain learning experience (PCA1).

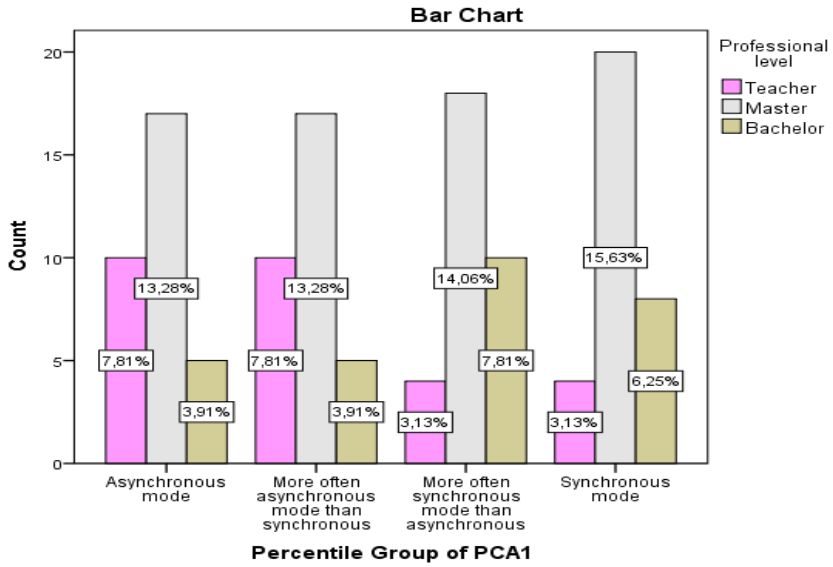

Figure 4. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Learning Experience Acquisition" and the status of respondents

Source: Own work

Instead, students do not have a clear distribution, although on average (we analyze the average factor values of the first component), undergraduates are more likely to implement a synchronous Learning Mode. Such data can be interpreted as students' lack of experience of independent learning, self-doubt or unwillingness to take responsibility for the course and outcomes of their own learning activities.

As for the *Goal Setting* (Figure 5), as in the previous case, teaching staff demonstrates a clear dependence – they prefer a synchronous Learning Mode. The situation with undergraduates is similar, but on average they prefer an asynchronous interaction. It should be noted that the possible reasons for such an attitude may include a lack of experience in goal setting or the assumption that undergraduates do not consider this type of activity important, as they need synchronous interaction for "important activities". Another reason may be the lack of a systematic approach to learning goal-setting in the process of pedagogical design of individual disciplines or modules, as well as the training system as a whole, and students' engagement in this process.

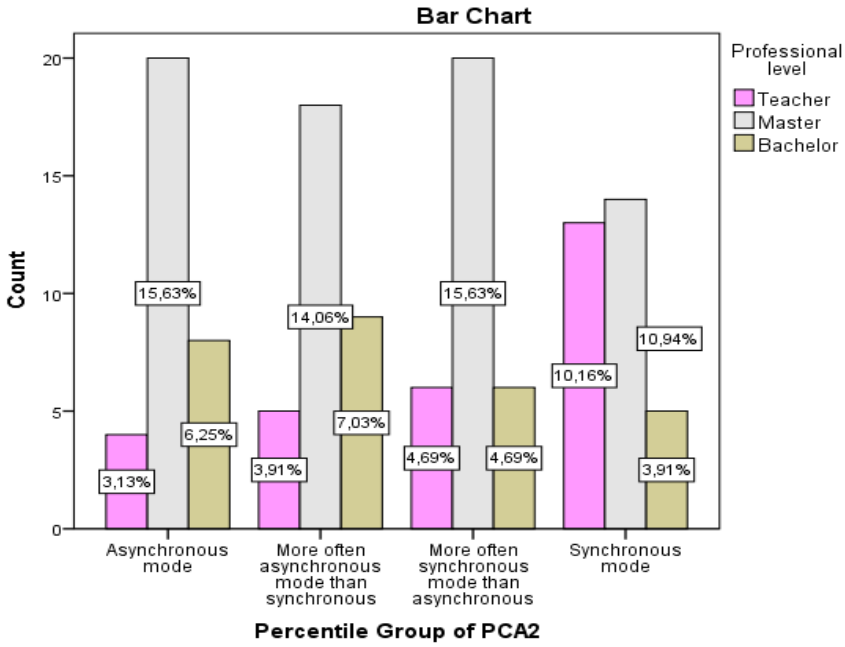

Figure 5. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Goal Setting" and respondents' status

Source: Own work

In the *Experience Presentation* (Figure 6), no clear intergroup dependence was found. However, the analysis of average values is a reason to assume that postgraduates prefer an asynchronous Learning Mode, and undergraduates – synchronous. The choice of synchronous interaction by undergraduates in this case is considered expedient (corresponds to the theoretical model). The choice of asynchronous way of presenting the learning activities outcomes and their evaluation by postgraduates can be interpreted as a result of their high level of independence and formed soft skills. Since the vast majority of postgraduates combine studying with working in the specialty, in this case, asynchronous interaction can save time and other resources, which is also justified. The lack of a clear division among teaching staff can be interpreted as the implementation of a student-centered approach, provided that when designing courses or modules, teachers will "offer" tools and strategies for implementing both Learning Modes at the choice of students.

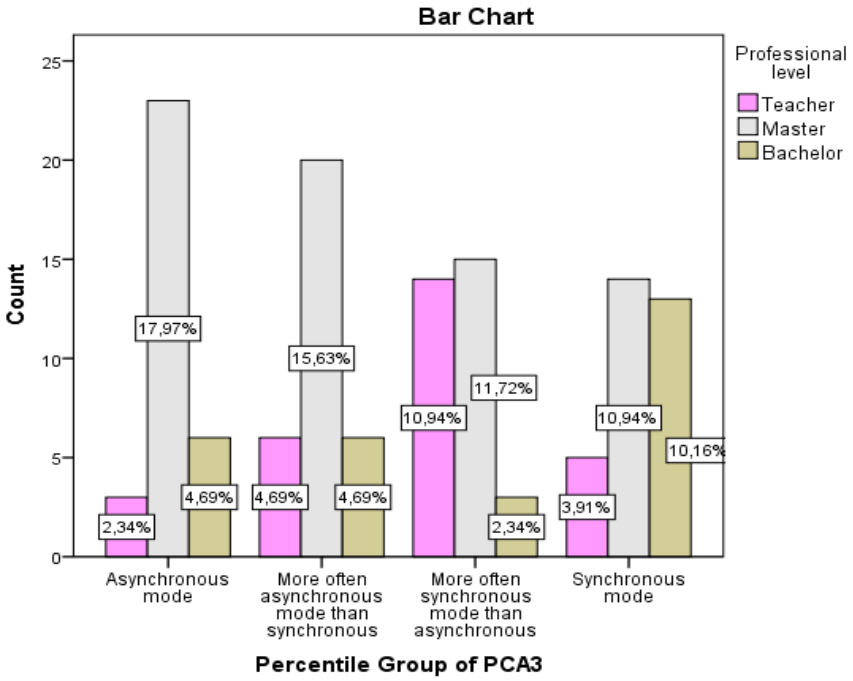

Figure 6. Distribution of respondents' response frequencies by groups determined on the basis of factor values for the first main component "Experience Presentation" and respondents' status

Source: Own work

CONCLUSIONS

The study of asynchronous and synchronous e-learning methods discovered that each supports different purposes, which should be taken into account while designing e-learning courses and educational communication of faculty and students.

According to the results of the theoretical models analysis and methodologies of synchronous and asynchronous Learning Modes application, it was established that in the process of actualization of students' learning experience, formation and coordination of learning goals, as well as presentation and evaluation of learning outcomes, it is advisable to prefer the use of synchronous Learning Mode, that is, the share of synchronous interactions predominates, and in the process of students' learning experience acquisition, the use of the asynchronous one is preferable.

The results of an empirical study to determine the attitude to the choice of Learning Modes, which involved 129 teachers and students of higher education institutions in Ukraine, did not reveal the dependence of choice on gender, the respondents' level of digital competence and resources at both an institutional and personal level. However, the dependence of the choice on the status of the subjects of the educational process and the type of learning activity was revealed. Undergraduates most need synchronous interaction in such areas of activity as: presentation of theoretical background, the subject area study, an evaluation of learning outcomes and problem solving. Faculty prefer to use the asynchronous learning mode in the presentation and mastery of theoretical background and research of the subject area.

Since the reliability of the questionnaire developed by the authors was confirmed by statistical methods, it is possible to state with a high degree of probability that:

- the greatest compliance with the theoretical model was shown by faculty in their attitude to the choice of Learning Modes for the organization of teaching;
- undergraduates, regardless of the type of activity, prefer the synchronous Learning Mode;
- non-detection of a clear dependence among postgraduates can be interpreted as the presence of learning experience, in particular in the choice of tools and Learning Modes, i.e., postgraduates are not dependent (the dependence is not strong) on the proposal for the organization of learning activities.

Although these assumptions require further investigation, they can be taken into account (at the level of educational needs) in the process of pedagogical design of e-learning courses. The implementation of a student-centered approach in education also needs additional research. In this context, the design of digital learning networks and personal learning environments is promising.

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