The use of augmented reality technologies in the development of emotional intelligence of future specialists of socionomic professions under the conditions of adaptive learning

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Abstract

In modern conditions, innovative augmented reality technologies are actively developing, which are widespread in many areas of human activity. Introduction of advanced developments in the process of professional training of future specialists of socionomic professions in the conditions of adaptive training, contributes to the implementation of the principles of a personalized approach and increase the overall level of competitiveness. The relevant scientific article is devoted to the theoretical and empirical analysis of the features of the implementation of augmented reality technologies in the construct of traditional psychological and pedagogical support aimed at the development of emotional intelligence of the future specialist. The interdisciplinary approach was used while carrying out the research work at the expense of the general fund of the state budget: "Adaptive system for individualization and personalization of professional training of future specialists in the conditions of blended learning". A comprehensive study of the implementation of traditional psychological-pedagogical and innovative augmented reality technologies was conducted in the framework of scientific cooperation of STEAM-Laboratory, Laboratory of Psychophysiological Research and Laboratory of Psychology of Health in Bogdan Khmelnitsky Melitopol State Pedagogical University. The theoretical analysis considers the structural model of emotional intelligence of the future specialist of socionomic professions, which is represented by two structural components: intrapersonal construct of emotional intelligence and interpersonal construct of emotional intelligence. Each component mediates the inherent emotional intelligence of interpretive, regulatory, adaptive, stress-protective and activating functions. The algorithm of the empirical block of research is presented by two stages: ascertaining and forming research. According to the results of the statement, low indicators were found on most scales, reflecting the general level of emotional intelligence development of future specialists, actualizing the need to find and implement effective measures for the development of emotional intelligence components in modern higher education and taking into account information development and digitalization. As part of the formative stage of the research implementation, a comprehensive program "Development of emotional intelligence of future professionals" was tested, which integrated traditional psychological and pedagogical technologies and innovative augmented reality technologies. This program is designed for 24 hours, 6 thematic classes of 4 hours. According to the results of a comprehensive ascertaining and shaping research, the effectiveness of the influence of augmented reality technologies on the general index of emotional intelligence is proved. The step-by-step model of integration of augmented reality components influencing the ability to analyze, understand and regulate emotional states into a complex program of emotional intelligence development is demonstrated. According to the results of the formative study, there is a dominance of high indicators of the following components: intrapersonal (50%), interpersonal (53.3%). Thus, we can say that intrapersonal and interpersonal emotional intelligence together involve the actualization of various cognitive processes and skills, and are related to each other. Empirical data were obtained as a

result of conducting a psychodiagnostic study on an innovative computer complex HC-psychotest.

Keywords
AR technologies, emotional intelligence, adaptive learning, future specialists of socionomic professions

1. Introduction

1.1. The problem statement

New requirements of the society to the level of education, intelligence and development of professionally important personality's traits at different stages of professional genesis necessarily require changes in already developed educational technologies and, accordingly, training technologies for future specialists of socionomic professions. There exist current trends in the growth of social demand for an increase of the number of specialists of supporting professions. Under unstable pandemic conditions of the world community's existence, these specialists should be able to provide qualified assistance, demonstrate skills of the use of innovative interactive technologies and have developed IT competencies. At present, technologies, that bring the individual closer to their future professional environment, are significant. The fact of joining the European educational environment and expanding the value-semantic sphere of public consciousness oriented educational content for the value determination of domestic political, legal, socioeconomic, educational and scientific processes and actualized the introduction of innovative information technologies into the process of "new format" specialist's training. Under the revolutionary conditions of the development of modern augmented reality technologies, which allow modeling various professional tasks, the key objective of higher education and science is the actualization of support of youth in the process of their professional development in the renewed value-semantic space of information life. In recent decades, there has been a significant interest of scientists in the issue of emotional intelligence as a factor which influences the quality of person's life, their social status, success and competitiveness. In the comparative table of skills necessary for a successful career, proposed by analysts at the World Economic Forum in Davos at 2016, emotional intelligence is ranked as the sixth issue. Thus, emotionality

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becomes a more significant factor in a person's success. Emotional intelligence is one of the indicators of the development of professional qualities, as it provides the ability to understand the person's attitudes which are represented by the emotions, to manage their own emotional sphere, which is an important and necessary issue for a modern specialist of socionomic professions. In this case, the main objective of future professionals' training is the integration of traditional and innovative training technologies which are aimed at the development of emotional intelligence, individual understanding of socio-normative, personal, professional values and the development of professional self-awareness in general. The achievement of this goal within the framework of higher education, in particular in the field of future specialists' professional training, requires the development and implementation of innovative technologies into the process of the development of specialists' emotional intelligence as a component of sustainable and integrated personal and professional competencies.

The purpose of the article is to comprehensively analyze the features of the implementation of augmented reality components in the development of emotional intelligence of future professionals, taking into account the level of technological progress and the possibilities of modern higher education.

1.2. Literature review

The issue of emotional intelligence is relatively new for the scientific theory (the first studies on this subject appeared in the early 1990s), but nowadays it is a promising and popular research field. Most scholars view emotional intelligence as an integrative formation that includes cognitive, emotional, and personal qualities, and it is an acquired trait, ability/skill that can be developed. The term "emotional intelligence" was introduced into the scientific discourse with the works of Peter Salovey and John D. Mayer (theory of emotional and intellectual abilities), who interpreted it as the ability to track your own emotions and feelings of others, distinguish them and use this information to control thinking and actions [1]; as a complex construct consisting of abilities of three types: identification and expression of emotions, regulation of emotions, use of emotional information in thinking and activity. According to the authors, the structure of emotional intelligence includes 4 components: accuracy of evaluation and expression of emotions, use of emotions in mental activity, understanding of emotions and their management. Goleman [2] interprets emotional intelligence as "people's ability to interpret their own emotions and the emotions of others in order to use this information for the achievement of their own goals" [2]. Lioussine [3] views emotional intelligence as the ability to understand your own emotions and emotions of others and manage them. According to the author, "the ability to understand emotions" means that a person can: recognize emotion, i.e. establish the very fact of having both your own emotional experience or emotional experience of another person; identify an emotion, i.e. realize what kind of emotion he or she feels, and find a verbal expression for it; understand the reasons that caused this emotion and the consequences it will lead to. Lioussine [3] interprets the "ability to manage emotions" as an opportunity/ability to: control the intensity of emotions, first of all, to suppress excessively strong emotions; control the external expression of emotions; arbitrarily evoke one or another emotion. Modern scientific research is reflected in the following studies of foreign and domestic scientists:

- analysis of the relationship between the individual components of IQ and EQ taking into

account the subjective factor (Gignac [4]);

- analysis of the impact of the leader's emotional intelligence and the productivity and effectiveness of professional activities of his or her subordinates (Ivcevic et al. [5]);
- diagnostics and development of psychological patterns of emotional intelligence as a condition of mental health (Ihnatovych and Liashch [6]);
- emotional intelligence as a component of professional suitability and self-realization of preschool educators (Sabol et al. [7]);
- readiness of future teachers for the development of students' emotional intelligence (Dubovyk et al. [8]).

In modern conditions of robotics development and modernization of the system of relations between artificial systems and the user, Yan et al. [9] presented the results of a comprehensive analysis of the progress of modeling emotional space in HRI. In the context of the information technology introduction into the process of diagnostics and development of emotional intelligence the study of the multimodal mood analysis is also a relevant one [10]. Lawson et al. [11] research the effectiveness of using the Hierarchical Attention – LSTM model based on Cognitive Brain limbic system (HALCB) in the context of neuroprogramming in order to analyze the effectiveness of identifying people's emotional states and reactions. In order to analyze the impact of augmented and virtual reality on the development of emotional intelligence and on the quality of recognition and transmission of relevant emotions by students, scientists have empirically proven the effectiveness of the use of animated virtual pedagogical agents, which demonstrate different range of emotions. In the pandemic conditions, according to Sturgill et al. [12], there exists an increased risk of anxiety, depression and other negative emotional states among students. At the same time, the authors state that with the development of emotional intelligence, as a construct of the body's self-regulatory system, it is possible to reduce the risk of negative emotional states. The researchers analyzed the effectiveness of Ajivar, an application that uses artificial intelligence and machine learning, in order to provide personalized assessment and development of emotional intelligence. Moreover, Dovbysh et al. [13] have proposed to use the information synthesis of the adaptive system in the diagnostics of emotional intelligence and mental state of a person, as this system is based on images of different faces and demonstrates a wide range of emotional states. Elor and Song [14] offer to use the author's ISAM development in the immersive virtual reality, in which the user evaluates the emotions of images using an immersive self-assessment mannequin, thus it will stimulate the development of cognitive structure of emotional intelligence, i.e. the ability to identify and constructively express their own emotions.

Theoretical analysis of the results of the study of the augmented reality technologies impact on various components of human emotional intelligence is presented in table 1.

Summarizing the analysis of the study of various aspects of emotional intelligence, most scientists claim that it is emotional intelligence that provides stress resistance and emotional stability and a balanced, objective and rational decision-making in the field of professional activity. A person with a high EQ skillfully finds a way out of difficult situations, easily and constructively solves problems; such person is friendly and pleasant to communicate with, he or she tries to avoid conflict situations, is self-sufficient and independent, realistically assesses his or her own abilities, such person is a proactive member of the society. Emotional intelligence

as a level of person's emotional awareness, as well as the ability to understand the emotions of other people, are important things for effective communication, which is a very vital quality for representatives of socionomic professions.

Table 1: Information on tools for exploring pervasive development

Authors	Study	Concept of study
Anna Ståhl, Kristina Höök, Martin Svensson, Alex S. Taylor, Marco Combetto (2009)	Experiencing the Affective Diary	The authors demonstrate the experience of developing and implementing a digital diary called "Affective Diary", which provides users with an opportunity to write down their notes, but it also allows the users to record data from body sensors and mobile devices regarding certain physiological and emotional states of the users [15].
Diana MacLean, Asta Roseway and Mary Czerwinski (2013)	MoodWings: A Wearable Biofeedback Device for RealTime Stress Intervention	Despite the increasing availability of sensors and methods for detecting stress, little attention has been paid to automated stress interventions and their actions. The authors introduced MoodWings: a wearable butterfly that displays the user's tense state in real time by means of activated wing movement. Researchers have developed MoodWings as a stress alert system and there is also a physical interface that allows users to manipulate their affective state. Accordingly, they have found out that MoodWings helps users to calm down and work better while fulfilling stressful tasks [16].
Daniel McDuff, Amy Karlson, Ashish Kapoor, Asta Roseway, Mary Czerwinski (2012)	AffectAura: An Intelligent System for Emotional Memory	AffectAura allows users to reflect on their emotional states for an extended period of time. Researchers have developed a multimodal sensor setup for continuous recording of audio, visual, physiological and contextual data, a classification scheme for predicting the affective state of the user, and an interface for displaying the user. The system constantly predicts the valence, excitement and activation of the user and associates it with event information, communication and data interaction [17].

Table 1 – *Continued from previous page*

Authors	Study	Concept of study
Pablo Paredes, Matthew K. Chan (2011)	CalmMeNow: Exploratory Research and Design of Stress Mitigating Mobile Interventions	The researchers have created four prototypes to study the usability and effectiveness of mobile interventions for stress management: *social networks* (a text interface using SMS to deliver alarm messages is created), *playing games* (commercially available mobile games with simple tasks such as mazes and basic interaction games (slopes, moves, rotations) as stimulation of the distraction factor are used), *managed acupressure* (uses two vibration tactile motors in the bracelet, which stimulate acupressure points in the wrists and chest; these points are known to reduce stress – the researchers used the Wizard of Oz technique to monitor the time of this stimulus), *controlled breathing* (using the same bracelet, participants are trained to breathe according to known methods of deep breathing; proper breathing rhythm is one of the key elements of achieving a calming effect). Authors researched the effectiveness of this comprehensive approach [18].
Akane Sano, Andrew J. Phillips, Amy Z. Yu, Andrew W. McHill, Sara Taylor, Natasha Jaques, Charles A. Czeisler, Elizabeth B. Klerman, Rosalind W. Picard (2015)	Recognizing Academic Performance, Sleep Quality, Stress Level, and Mental Health using Personality Traits, Wearable Sensors and Mobile Phones	The researchers have collected extensive subjective and objective data through mobile phones, surveys and sensors. The authors have analyzed daily and monthly behavioral and physiological patterns and identified factors that affect performance (GPA), Pittsburgh Sleep Index (PSQI), stress scale (PSS), and overall mental health score (MCS) with SF-12, using the data obtained [19].

In terms of student-centered approach, it is important to take into account the person's individual characteristics at different stages of professional genesis as it serves as a basis in the process of updating adaptive learning systems and building a personalized trajectory of the future specialist. Modern achievements in the development of technology allow expanding the functionality of supporting individual learning trajectories at different stages of professional genesis of students. Scientifically substantiated and pedagogically expedient introduction of modern adaptive systems into the educational environment promotes, according to scientists, the acquisition by this environment of signs of openness, personalization, which will allow access to quality educational content for all subjects, taking into account individual psychological characteristics. Adaptive learning systems are specialized software or services that adapt to the individual needs of individual students in the training process [20, 21]. These tools

are able to synchronize with the learning process, adapt to the progress of each student, and independently adjust educational and developmental content in real time. Adaptive learning systems in comparison with the developments of previous generations, better and faster to configure in the process, have the properties of flexibility, openness to modifications, which ultimately allows for individualization, personalization, personality-oriented approach in the professional development of a competitive specialist [22, 23]. Algorithms embedded in adaptive learning systems evaluate the results of individual progress of each student in real time and, depending on this, adjust the content, pace, etc. The functioning of such systems is based on a competency approach, focus on individual progress. This distinguishes them from traditional learning management systems designed for mass learning, linear courses. The main advantage of adaptive learning systems is their ability to determine how the student, taking into account individual typological features, cognitive, psycho-emotional capabilities, learns, how "progresses" in performing professionally oriented tasks, as well as providing accurate and timely feedback [24]. Given this, we consider relevant and promising to study the theoretical and practical principles of adaptive learning with an innovative component of the combination of traditional psychological and pedagogical technologies and innovative technologies of augmented reality in the development of professionally important qualities of the future specialist. According to the analysis of existing scientific and practical trends and developments on the introduction of modern AR technologies into a comprehensive system of future specialists' training under the conditions of adaptive learning, nowadays the issue of finding vectors of combining traditional psychological and pedagogical approaches and modern information technologies in the process of competence approach realization and development of emotional intelligence of future specialists of socionomic professions remains quite branched and understudied issue.

2. Research methods

The interdisciplinary approach was used while carrying out the research work at the expense of the general fund of the state budget: "Adaptive system for individualization and personalization of professional training of future specialists in the conditions of blended learning", state registration number: 0120U101970. A comprehensive study of the implementation of traditional psychological-pedagogical and innovative augmented reality technologies was conducted in the framework of scientific cooperation of STEAM-Laboratory, Laboratory of Psychophysiological Research and Laboratory of Psychology of Health in Bogdan Khmelnytsky Melitopol State Pedagogical University.

The methods used in the process of research are the following:

1) theoretical – analysis, synthesis, comparison, generalization, systematization of theoretical and research data (identification of the research problem and selection of the approaches to the analysis of emotional intelligence of future specialists of socionomic professions, general principles and advantages of augmented reality technologies in the development of emotional intelligence as a factor of effective professional self-realization, definition of basic research concepts);
2) the experiment was conducted in four stages:

A. organizational stage – formation of a representative sample, development of a program of ascertaining and formative experiment, choice of methods of qualitative and quantitative analysis of empirical data.

B. ascertaining stage – psychological diagnostics with the help of computer psychodiagnostic complex HC-psychotest and Google Forms:

  1. Questionnaire "EmIn" by D. Lioussine. This technique includes four scales (interpersonal and intrapersonal emotional intelligence, emotion recognition and emotion management), five subscales (understanding other people's emotions, managing other people's emotions, understanding your own emotions, managing your own emotions, control over expression) and an integrated indicator of overall emotional intelligence, which is a sum of the subscales.

  2. Reflexive survey (compiled by the authors using Google Forms) provided an opportunity to summarize the subjective assessment of personal and behavioral changes of respondents after the experimental impact. In our study, we used both qualitative and quantitative approaches to the study of the issue, in order to supplement the results and cross-validate the data obtained.

C. Formative stage. At the formative stage of the study, a comprehensive program "Development of emotional intelligence of future professionals", which integrated traditional psychological and pedagogical technologies and innovative augmented reality technologies, was implemented. This program was carried out within the framework of the certification program for future specialists of socionomic professions "Self-management: development of sanogenic potential of the personality", which was implemented using Moodle. At the formative stage we integrated traditional psychological training on the use of cognitive-behavioral, relaxation, art-therapy and case-study techniques and the innovative opportunities of gamification with AR technologies. The formative stage was carried out on the basis of STEAM-Laboratory.

D. Statistical processing of experimental data. The SPSS for Windows 12.0 was used for statistical processing of the data.

3. Research results

The theoretical construct of our study is the analysis of priority opportunities and mechanisms for the use of AR technologies in the development of future specialist's emotional intelligence in the sphere of higher education under the conditions of adaptive learning. The development of emotional intelligence is one of the areas of psychological and pedagogical support of the professional development of students of the socionomic type of professions. Taking into account the activity approach, we analyze the model of emotional intelligence of the future specialist of socionomic professions, which is presented in figure 1.

In the context of the presented structural model, future specialist's emotional intelligence is represented by two constructs:

  1. Intrapersonal construct of emotional intelligence:
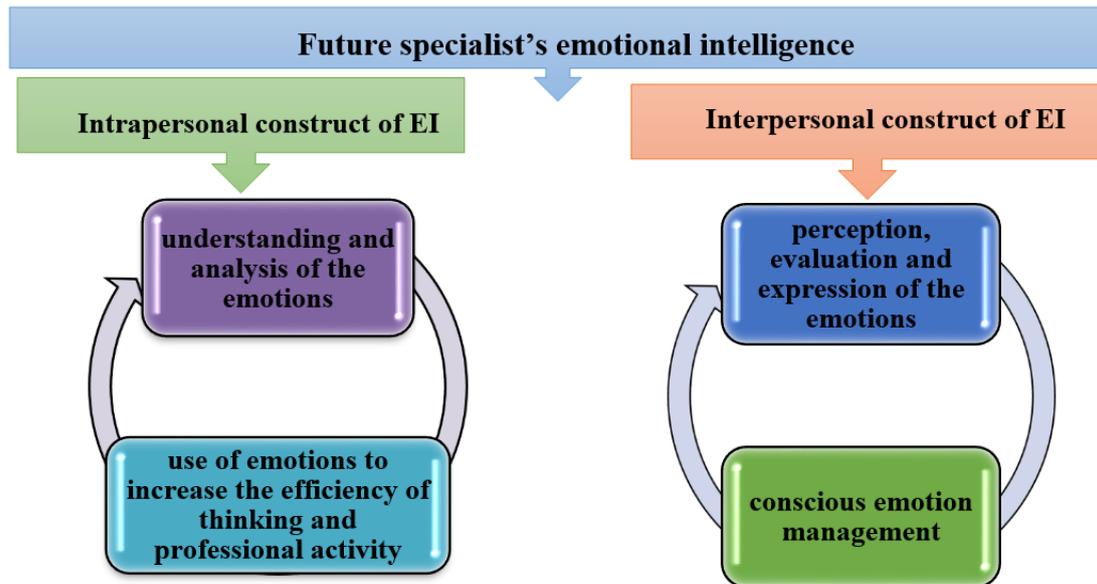   a) Understanding and analysis of emotions:

Figure 1: Structural model of emotional intelligence of the future specialist of socionomic professions.

- ability to label emotions and verbalize them; understanding the difference between different in name but similar in content emotions (e.g, like and love);
- ability to interpret the meaning of changes in emotions, understanding of causal relationships (e.g, the emergence of grief after loss);
- ability to understand a set of feelings, for example: simultaneous love and hate, or such a mixture of feelings as reverent fear (which consists of fear and astonishment);
- ability to recognize unexpected changes in emotions (e.g, a change in anger for pleasure, or a change in anger for embarrassment).

b) The use of emotions to improve the effectiveness of thinking and activities:
- use of emotions to focus on priority things which should be thought over, focus on important information;
- use of bright and accessible emotions as additional aspects of thinking and memory;
- use of emotional mood swings to change the perspective of individuals (from optimistic to pessimistic) and to expand the diversity of possible views on certain events;
- actualization of those emotions that contribute to the solution of certain tasks (e.g, a good mood facilitates the solution of creative and practice-oriented tasks).

2. Interpersonal construct of emotional intelligence:
a) Perception, evaluation and expression of emotions:
- ability to identify emotion in physical states, feelings and thoughts;

- ability to identify the emotions of others reflected in paintings, works of art etc., through language, sound; manifestations and behavior;
- ability to accurately express emotions and needs associated with these feelings;
- ability to distinguish exact / inaccurate, real / invalid expressions of feelings.

b) Conscious management of emotions:
- ability to remain open to feelings both pleasant and unpleasant;
- ability to consciously pay attention or distract your attention from emotions, depending on the assessment of their informativeness or usefulness;
- ability to consciously control your own emotions and emotions of others (e.g, to recognize the typicality, influence, clarity of emotions);
- ability to control your own emotions and emotions of others (e.g, to reduce negative emotions and increase pleasant ones without reducing or enhancing the information they can convey).

Each of these groups of abilities mediates the fact that emotional intelligence has interpretive, regulatory, adaptive, stress-protective and activating functions. The interpretive function of emotional intelligence allows a person to productively decipher emotional information (emotional facial expressions, voice, intonation, etc.), which contributes to the accumulation and systematization of knowledge, as well as to the formation of person's own emotional experience. The regulatory function of emotional intelligence facilitates the state of emotional comfort and ensures the adequacy of the external expression of human emotions. Adaptive and stress-protective functions of emotional intelligence are used to update and stimulate the mental reserves of future professionals in difficult life situations. The activating function of emotional intelligence provides a flexible ability for congruence in communication. Taking into account the rapid process of information modernization of higher education, it is important to analyze the possibility of the impact of augmented reality technologies on the psycho-physiological characteristics of future professionals and develop a procedural model for implementing traditional psychotechnologies and augmented reality technologies into the process of emotional intelligence development.

Augmented reality (AR) is a technology that allows computer programs to create and identify a virtual layer of information with any marker or object in the real physical world [25]. AR technology opens new opportunities for emotional inclusion into the educational process and development of practical skills [26]. The practical combination of virtual and real experience enriches the personality-oriented activities of students, affects their sensory system in terms of educational materials perception [27]. Computer platforms such as Google Glass, MS HoloLens, Google ARCore, Apple ARKit, etc. are used when working with augmented reality technology [28]. The main feature of these technologies is the direct connection to the real world, while virtual reality, which is being gradually introduced into the education system, lacks this feature [29]. Augmented reality technology allows you to simultaneously see and use virtual and real objects in the human world [30]. The research, conducted by Layered together with Neuro-Insight, states that stimulation of the brain's cognitive functions development becomes more effective through the introduction of augmented reality technologies. Thus, impact on the person can be carried out only through the computer screen (sight), with impact on other sense

organs (hearing, sense of smell, position in space, tactile sensations, sensations of temperature, feeling of acceleration), or in various combinations. An example of such technologies is a virtual reality environment in which a person can manipulate virtual objects as real ones: for example, by moving their hands or when you can "add" a real object to a virtual environment, and it will interact with virtual objects. The graphic image is close to reality and it influences the sensory system of the organism, centers of emotional pleasure and promotes the inclusion in the right hemisphere of the brain. Accordingly, the reflection of the simulated space and the effect of personal participation in virtual events make AR technology a relevant psychological and pedagogical tool, which is universal in the training process due to the feeling of real inclusion in a particular situation. In addition, AR technology has the potential to make the training process more effective as it helps to integrate knowledge into reality through emotional engagement [31]. In this regard, when developing a procedural model for the development of future specialist's emotional intelligence a number of aspects were taken into account. In particular, the development of emotional intelligence through augmented reality technology, as it:

- gives the opportunity to evaluate themselves objectively, respond to life and professional situations adequately, maintain emotional comfort;
- is an effective means of optimizing professional development of students of socionomic professions through the development of their emotional readiness for the professional activity;
- has a purposeful impact on the development of individual components.

During the development of this model, three blocks were identified: target, content-operational and analytical (figure 2).

The aim of the proposed model is the development of emotional intelligence of future specialists of socionomic professions, which is a way of optimizing their professional development at the stage of professional training under the conditions of adaptive learning.

The relevant program "Development of emotional intelligence of future professionals", which integrated traditional psychological and pedagogical technologies and innovative technologies of augmented reality, was implemented into the context of empirical research conducted on the basis of STEAM-Laboratory, Laboratory of Psychophysiological Research and Laboratory of Psychology of Health in Bogdan Khmelnitsky Melitopol State Pedagogical University. This study was conducted from September to December 2020 as a part of a certification program for future professionals of socionomic professions "Self-management: the development of sanogenic potential of the individual", which was implemented using the Moodle system. Future psychologists and social workers (the fourth-year students) took part in the ascertaining and formative stages of the experiment.

The sample was randomized, the total number of respondents in the experimental and control groups was 60 people. The sample was formed using a stratometric method with representative modeling. In the framework of our study, by general population, we mean a group of future socionomic specialists with certain characteristics. These characteristics are due to the requirements and specifics of future professional activity, age, level of professional integration and the research hypothesis. In our study, we suggested that the use of augmented reality technologies
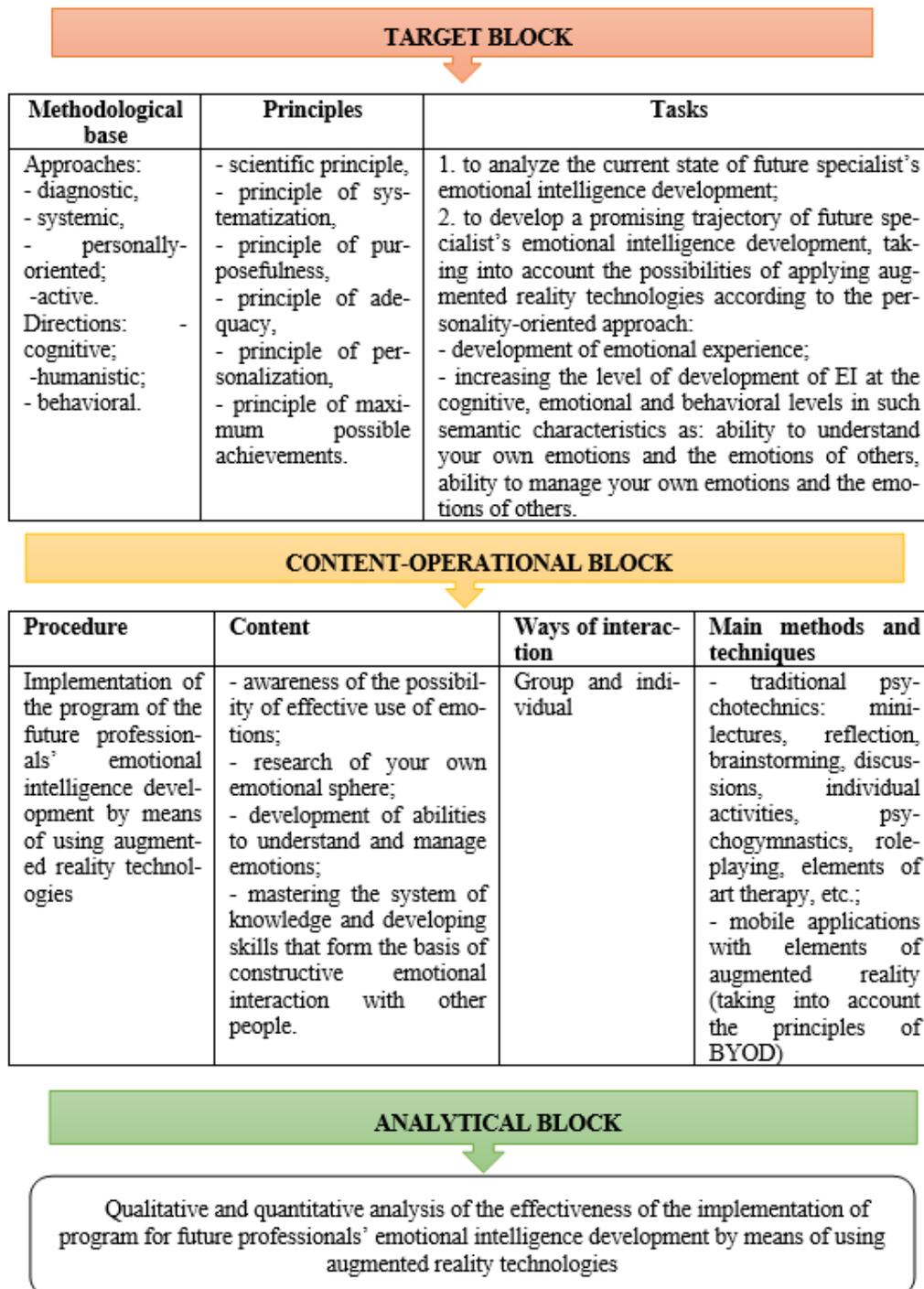
TARGET BLOCK

Methodological base	Principles	Tasks
Approaches: - diagnostic, - systemic, - personally-oriented; -active. Directions: - cognitive; -humanistic; - behavioral.	- scientific principle, - principle of systematization, - principle of purposefulness, - principle of adequacy, - principle of personalization, - principle of maximum possible achievements.	1. to analyze the current state of future specialist's emotional intelligence development; 2. to develop a promising trajectory of future specialist's emotional intelligence development, taking into account the possibilities of applying augmented reality technologies according to the personality-oriented approach: - development of emotional experience; - increasing the level of development of EI at the cognitive, emotional and behavioral levels in such semantic characteristics as: ability to understand your own emotions and the emotions of others, ability to manage your own emotions and the emotions of others.

CONTENT-OPERATIONAL BLOCK

Procedure	Content	Ways of interaction	Main methods and techniques
Implementation of the program of the future professionals' emotional intelligence development by means of using augmented reality technologies	- awareness of the possibility of effective use of emotions; - research of your own emotional sphere; - development of abilities to understand and manage emotions; - mastering the system of knowledge and developing skills that form the basis of constructive emotional interaction with other people.	Group and individual	- traditional psychotechnics: mini-lectures, reflection, brainstorming, discussions, individual activities, psychogymnastics, role-playing, elements of art therapy, etc.; - mobile applications with elements of augmented reality (taking into account the principles of BYOD)

ANALYTICAL BLOCK

Qualitative and quantitative analysis of the effectiveness of the implementation of program for future professionals' emotional intelligence development by means of using augmented reality technologies

Figure 2: Model of introduction of augmented reality technologies in the process of development of emotional intelligence of future specialists.

in the process of professional training at the stage of initial integration into the profession has a positive effect on the development of emotional intelligence of future professionals of socionomic professions. Also, in the process of forming a randomized sample, the possibility of the influence of an additional parameter – the individual psychological characteristics of the respondent, which were recorded in the protocols and forms of the study, was not excluded.

The diagnostic unit of the research was implemented on the basis of the Laboratory of Psychophysiological Research using the hardware-software complex (APC) "HC-Psychotest", which includes many different psychological and psychophysiological techniques that allow researchers to implement a multilevel approach to solving practical diagnostic problems. As a result of the use of this complex in the field of psychodiagnostics, the Laboratory of Psychophysiological Research uses models that interpret test results through various psychodiagnostic techniques, computer versions of psychodiagnostic techniques with automated psychodiagnostic output in the form of coherent, consistent text. In the framework of our study, the complete set "Candidate" was used (figure 3). It is an effective and easy-to-use tool for career guidance and professional selection of candidates for the vacancies regardless of their work experience. "Candidate" provides an opportunity to assess the level of professionally important psycho-physiological qualities and professional competencies, as well as to predict the further development of the specialist and to conduct in-depth professional psychodiagnostics.
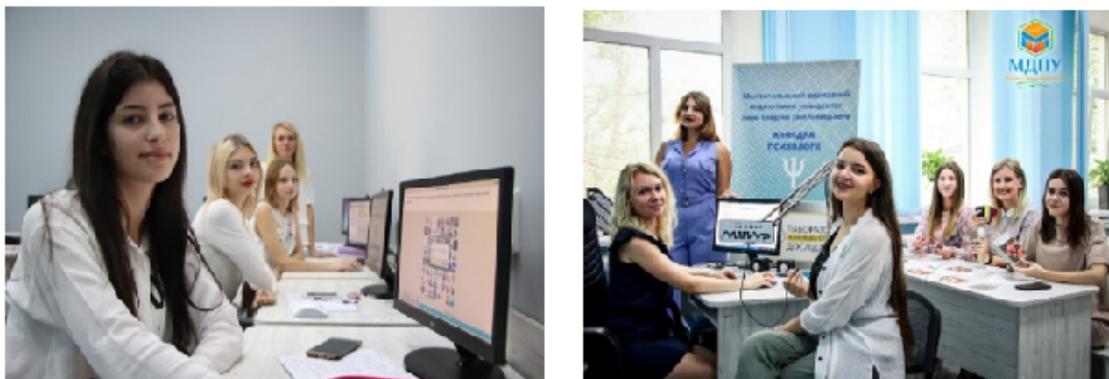

Figure 3: Carrying out diagnostic procedures with the help of the computer complex HC-psychotest.

The psychodiagnostic procedures were conducted in two stages (primary diagnosis – September 2020, secondary diagnosis – December 2020). In order to identify the dominant level of emotional intelligence of future specialists of socionomic professions, we chose the questionnaire of emotional intelligence "EmIn" by D. Lioussine One of its advantages is that in addition to five subscales and four general scales, it also has a general scale of results. According to this method, we obtained the following average scores on the sample, which are shown in table 2.

According to the results of the ascertaining experiment, the dominance of the low level of development of the general index of future specialists' emotional intelligence (50%) was identified. When analyzing the components of emotional intelligence of the individual we found out the following indicators:

Table 2

Diagnostic quantitative indicators according to the questionnaire "EmIn" by D. Lioussine

Scales	Very low	Low	Medium	High	Very high
InterEI (interpersonal emotional intelligence):	13.3% (8)	58.3 % (35)	21.7% (13)	6.7% (4)	0% (0)
InterU (understanding of other people's emotions)	8.3% (5)	61.7% (37)	25% (15)	5% (3)	0% (0)
InterM (management of other people's emotions)	18.3% (11)	53.3% (32)	16.7% (10)	11.7% (7)	0% (0)
IntraEI (intrapersonal emotional intelligence):	10% (6)	43.3% (26)	35% (21)	6.7% (4)	5% (3)
IntraU (understanding of your own emotions)	10% (6)	30% (18)	48.3%(29)	8.3% (5)	3.4% (2)
IntraM (management of your own emotions)	15% (9)	55% (33)	25% (15)	5% (3)	0% (0)
IntraE (control over expression)	6.7% (4)	46.7% (28)	33.3% (20)	8.3% (5)	5% (3)
UE (understanding of emotions)	8.3% (5)	46.7% (28)	36.6% (22)	6.7% (4)	1.7% (1)
ME (management of emotions)	13.3% (8)	51.7% (31)	25% (15)	8.3% (5)	1.7% (1)
General emotional intelligence	11.7% (7)	50% (30)	30% (18)	6.7% (4)	1.7% (1)

- dominance of low level of development of interpersonal emotional intelligence (58.3%). Within the framework of this component, a low level of development was found on the scales of InterU (understanding of other people's emotions) – 61.7% and InterM (management of other people's emotions) – 53.3%. Accordingly, respondents experience difficulties in analyzing and interpreting other people's emotional states based on external manifestations of emotions (facial expressions, gestures, sound of the voice) and/or intuitively; have difficulties in showing sensitivity and empathy for other people's inner states;
- dominance of low level of development of intrapersonal emotional intelligence (58.3%). The corresponding result is reflected in a low level of development on such scales as ME (management of the emotions) – 55%, IntraE (control over expression) – 46.7%. At the same time, the ability to understand your own emotions: recognition and identification, understanding of the causes, ability for verbal description, which is reflected in the scale of UE (understanding of emotions) is at the medium level of the development – 48.3% (29).

Thus, low indicators on most scales, which reflect the overall level of future professionals' emotional intelligence development, prove the need to search for and implement effective measures for the development of components of emotional intelligence in modern establishments of higher education. The trends in information development and digitalization should be also taken into account.

In the process of planning, development and implementation of the formative stage of the empirical study, the total sample of respondents was divided into a control group ($n = 30$) and an experimental group ($n = 30$). The experimental group included students who have low rates of emotional intelligence on five scales. During October-November 2020, the experimental group took part in a comprehensive program "Development of emotional intelligence of future professionals", which integrated traditional psychological and pedagogical technologies and innovative augmented reality technologies (table 3). This program is designed for 24 hours, 6 thematic classes of 4 hours. Students of the experimental group participated in the program twice a week. The corresponding program was implemented on the basis of the Laboratory of Psychology of Health and STEAM-Laboratory.

Table 3: The structure of the complex program "Development of emotional intelligence of future professionals" with the elements of augmented reality

Thematic planning	Aim	Traditional psycotechnics	AR technologies
Block I. Development of intrapersonal emotional intelligence			
1. Getting to know each other. Emotions and their role in professional and personal life	• participants' acquaintance with the ground rules and opportunities this training provides; • brainstorming ideas about emotions, emotional intelligence; • acquaintance with the main mistakes and prejudices in the world of emotions and "mistakes of thinking".	exercises: "Poem", "Guess the emotion", "Write down the emotions"; goal-setting: "Drawing of the palm"; brainstorming: "Positive and negative sides of emotions"; mini-lecture: "The concept of emotions and EI", discussion: "Why do we need different emotions?"	Aryzon AR Studio AR Study

Table 3 – *Continued from previous page*

Thematic planning	Aim	Traditional psycotechnics	AR technologies
2. Understanding your own emotions	• research of your own emotional sphere; • development of abilities to understand your own emotions; • improvement of the ability to accept your own emotions.	exercises: "Stereotypes of emotions understanding", "Words", "Irrational thoughts", "Emotion-Event-Thought", "10 situations"; projective drawing: "Magic world of emotions"; mini-lecture: "Understanding emotions".	Moment AR Emotions
3. Ways of man-aging your own emotions. Work with negative emotions	• development of abilities to manage your own emotions; • awareness of the causes of negative emotions; • acquaintance with the basic techniques of reducing psycho-emotional stress.	exercises: "Draw the mood", "My negative emotions"; "Causes of negative emotions", "Scale of emotions", "Path of emotions", "Me-statement"; visualization "Temple of Silence"; mini-lecture: "Algorithm for working off negative emotions"	Paint Draw AR Interactive sandpit
Block II. Development of interpersonal emotional intelligence			
4. Understanding other people's emotions. Verbal and nonverbal indicators of emotions	• development of the ability to empathize; • development of the ability to understand other people's emotions; • understanding emotional messages and corresponding reactions of the interlocutor.	exercises: "Pass the emotion", "Unexpected guest", "Headbands", "Story with three emotions", "Verbalization of emotions of others", "Phone conversation", "Epithets", mini-lecture "Expression of emotions"	AR effect AR Camera Virtual Hologram Photo Editor App Body Language Psychology Secrets

Table 3 – *Continued from previous page*

Thematic planning	Aim	Traditional psycotechnics	AR technologies
5. Establishing constructive relationships with other people: emotional aspect	• development of other people's emotions management skills; • study of barriers to emotional interaction; • mastery of knowledge and development of skills that form the basis of constructive emotional interaction.	exercises: "Manipulation warm-up", "Depreciation", "Acceptance of emotions of others", "Reflection on emotions", "Constructive relations"; discussion "Influence of emotional states of others"; mini-lecture "Algorithm for managing the emotions of others"	How Are You Feeling? Clay + Augmented Reality Alyssa - Virtual & AR Talking Girl Simulator
6. Round-up. Self-reflection	• evaluation of your own achievements and analysis of development prospects	exercises: "My achievements (collage)", feedback techniques	Universe of Emotions

Analysis of the impact of AR technology elements (from the Google Play library) on the development of person's emotional intelligence components:

- *AR effect.* Using the application to create AR effects, you can add virtual characters to photos and videos, as well as entire virtual scenes in order to analyze and interpret the emotional world of a person. Available ready-made themes allow you to insert various elements into the image, control emotional expressions, wear "emotional" face masks. Your video search engine can show stunning augmented reality scenes based on the world around you and scenes of interpersonal interaction. Face recognition technology, provided by Sony and SmartAR mechanism, allow you to automatically recognize faces and 3D objects and add elements of augmented reality to them. And the palm recognition mechanism allows you to identify the palms of people in shot, provides even more opportunities to insert interesting additions to people's emotional reactions.
- *Paint Draw AR.* In Paint Draw AR, the respondent has the opportunity to create three-dimensional drawings. The use of appropriate art technology reduces internal psycho-emotional stress, gives a chance to analyze your own emotional state from the point of view "here and now" and actualizes the manifestation of positive emotions.
- *Aryzon AR Studio.* The corresponding application brings augmented reality into a completely new dimension, provides the chance to view 3D models from Sketchfab and Google

Poly, save them in your library and model them. As part of the program, respondents are invited to compile their own catalog of emotional images from various spheres of personal and professional life.

- *Moment AR.* This app requires a MERGE Cube and a smartphone or tablet. The corresponding application was installed on tablets in the Laboratory of Psychology of Health and used within the theme "Understanding your own emotions". Moment works with Merge Cube to provide an interactive audiovisual experience based on the real world, and uses the latest augmented reality technologies. You need to bring the camera of the mobile device to the Merge Cube, and the interactive and exciting characters of the Moment application come to life. The characters represent different emotions and depict a wide range of emotional situations and social interactions. The respondent chooses from many different emotional situations by simply tapping on different characters on the screen.
- *Emotions.* The corresponding application allows you to visualize, accumulate and interpret the relationship of personal emotional state and certain life events, which is an important component in the process of developing a constructive coping strategy of behavior in various stressful situations.
- *How Are You Feeling? Clay + Augmented Reality.* With the help of playing cards "I'm Clay Feelings Kit" in augmented reality students have the opportunity to explore the features of the main emotions, change them, analyze situations that contribute to the manifestation of certain emotions, develop a strategy to overcome negative emotional states.
- *AR Camera Virtual Hologram Photo Editor App.* With the help of this application, program participants can create their own library of holographic images of different emotional states of people, it develops the ability to recognize and analyze the emotional world of the individual.
- *Alyssa - Virtual & AR Talking Girl Simulator.* The application presents a realistic girl with natural facial expressions, emotions and movements. It provides an opportunity to analyze different situations and your own emotional states and finally it leads to building a communicative process.
- *Universe of Emotions.* The application is used for the analysis of your own emotions and significantly develops emotional intelligence. The application library presents a range of more than 2000 emotions. The user can label his or her emotional state.
- *Body Language Psychology Secrets.* The application is focused on the development of non-verbal communication skills and the ability to recognize the semantic context of certain gestures, poses, pantomime.
- *AR Study.* This application is used by students to analyze the psychophysiological mechanisms of the person's emotional-volitional sphere and to identify certain disorders.

An integrative combination of traditional psychotechnologies, based on art therapy, psychodrama, gestalt therapy and coaching technologies, is an innovative component in the structure of the program "Development of emotional intelligence of future professionals". The program was piloted on the basis of the Laboratory of Psychology of Health (figure 4 (a)) and

used augmented reality technologies, provided due to the material and technical support of the STEAM-Laboratory (figure 4 (b))
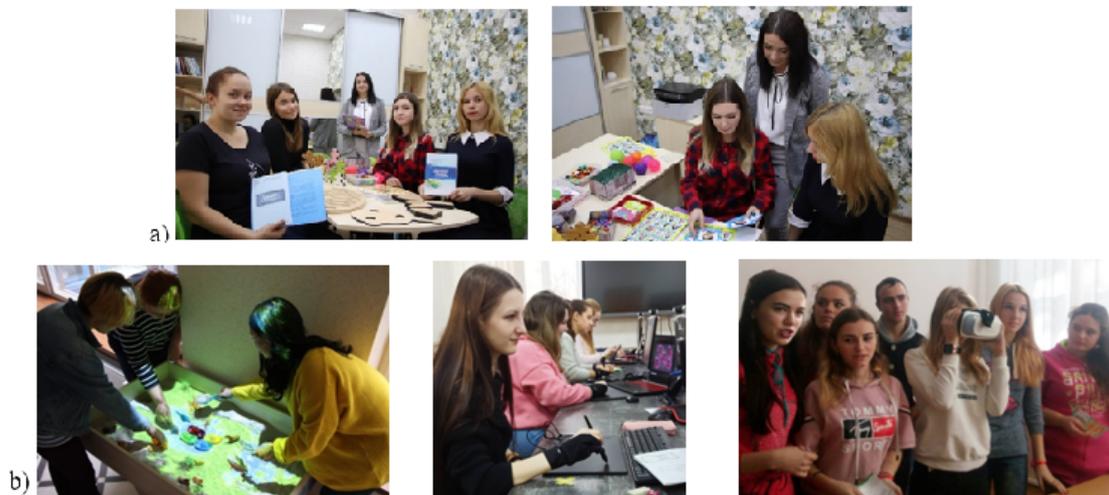

Figure 4: Practical implementation of the program "Development of emotional intelligence of future professionals" with the introduction of elements of augmented reality.

In the context of the analysis of the formative experiment effectiveness a secondary diagnostic study was conducted with the control and experimental groups' respondents in December 2020. Psychodiagnostic research was also done using the computer complex HC-psychotest. According to the results of the formative research, a certain dynamics in the process of development of emotional intelligence of future specialists of socionomic professions was revealed (figure 5).

Accordingly, the results of the analysis of the effectiveness of "Development of emotional intelligence of future professionals" program with components of AR technologies, the following issues were found out:

- an increase in the general level of emotional intelligence development, dominance of a high level – 53.3%. Such results demonstrate the dynamic development of future professionals' ability to understand their own emotions and emotions of other people and manage them;
- an increase in the level of understanding of emotional states, dominance of high indicators on the corresponding scale (46.7%). High scores on the scale of "ability to understand emotions" show that future professionals have significantly developed the ability to recognize emotion, i.e. to establish the very fact of the presence of their own emotional experience as well as the emotional experience of other people; these respondents have the ability to identify the emotion, or to identify what kind of emotion is felt by the future specialist or another person; they also have demonstrated the ability to verbalize emotional states. It was found out that by the end of this program, future professionals have learnt to establish causal links between emotional states, to understand the peculiarities of
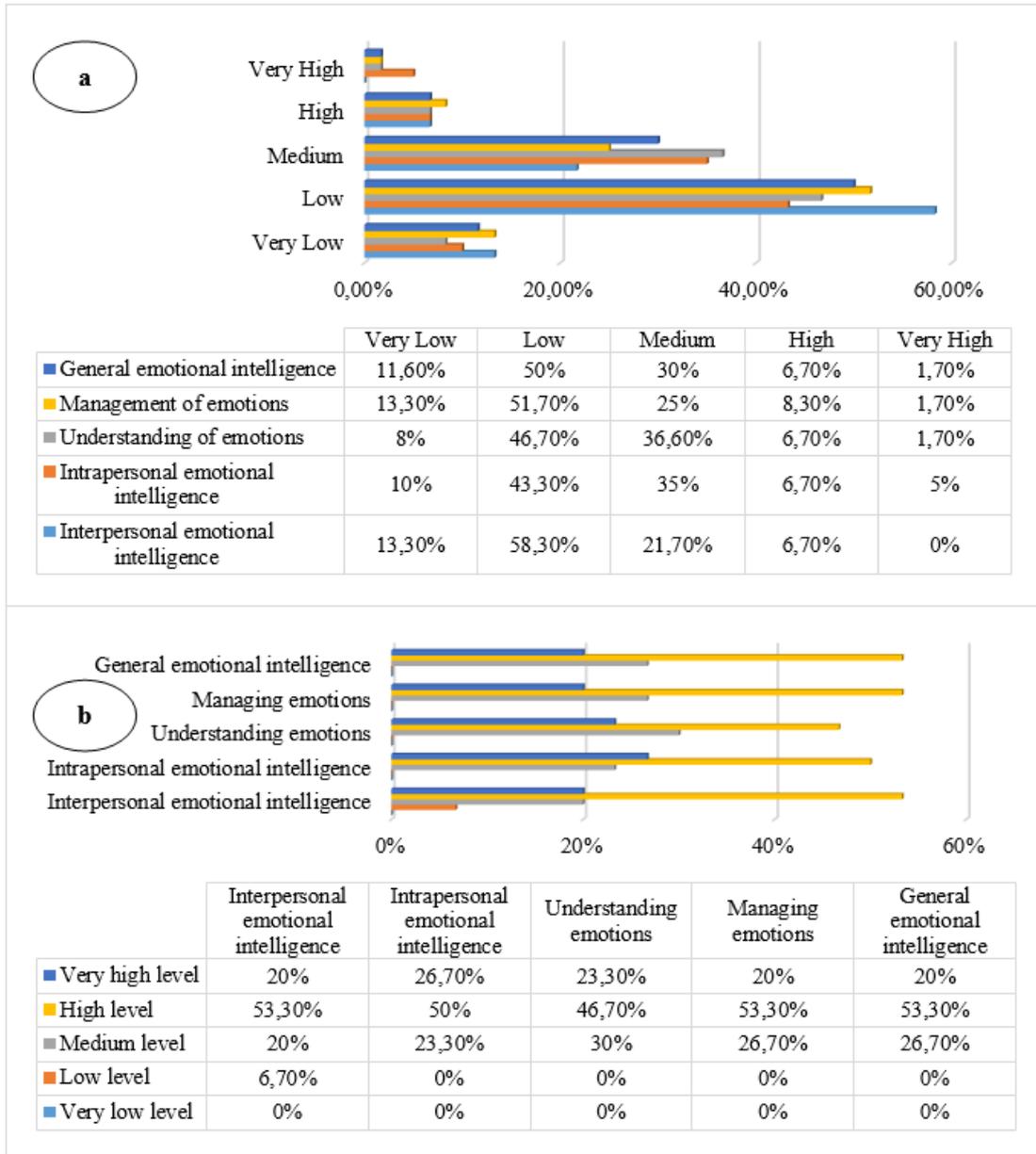
a

	Very Low	Low	Medium	High	Very High
■ General emotional intelligence	11,60%	50%	30%	6,70%	1,70%
■ Management of emotions	13,30%	51,70%	25%	8,30%	1,70%
■ Understanding of emotions	8%	46,70%	36,60%	6,70%	1,70%
■ Intrapersonal emotional intelligence	10%	43,30%	35%	6,70%	5%
■ Interpersonal emotional intelligence	13,30%	58,30%	21,70%	6,70%	0%

b

	Interpersonal emotional intelligence	Intrapersonal emotional intelligence	Understanding emotions	Managing emotions	General emotional intelligence
■ Very high level	20%	26,70%	23,30%	20%	20%
■ High level	53,30%	50%	46,70%	53,30%	53,30%
■ Medium level	20%	23,30%	30%	26,70%	26,70%
■ Low level	6,70%	0%	0%	0%	0%
■ Very low level	0%	0%	0%	0%	0%

Figure 5: Dynamics of development of emotional intelligence of future specialists in the conditions of introduction of augmented reality technologies: a) the results of the control group of respondents; b) the results of the experimental group of respondents.

different emotions, to analyze the cause of their occurrence and the impact of emotional state on the effectiveness of tasks fulfillment in the process of professional activity;
- according to the results of the comprehensive program piloting an increase in the level of

self-control over emotional states and the overall level of emotional management (53.3%) was revealed. The ability to manage emotions means that the future specialist can control the intensity of emotions, first of all, suppress excessively strong emotions; he or she is able to control the external expression of emotions, if necessary, arbitrarily evoke a particular emotion. These respondents have the ability to understand and control both their own emotions and the emotions of others.

General emotional intelligence consists of two components: interpersonal and intrapersonal emotional intelligence. According to the results of the formative research an increase in the level of these components development was identified. Thus, there is a dominance of high indicators of these components: intrapersonal (50%), interpersonal (53.3%). So, we can say that the combination of intrapersonal and interpersonal emotional intelligence stimulates the actualization of various cognitive processes and skills, and types of emotional intelligence are related to each other. In order to statistically analyze the effectiveness of the implementation of emotional intelligence development program, we used Wilcoxon's T-criterion, which is aimed at the assessment of the difference between two conditions using experimental data with repeated measurements. The study with repeated measurements includes only one sample, and each respondent in the sample is measured twice. The difference between two dimensions for each person is recorded as an estimate for that person. The Wilcoxon criterion requires that the differences should be ranked from smallest to largest in terms of their absolute value, regardless of sign or direction. In the context of using this criterion, the following hypotheses were stated:

H_0: There is no difference between two methods. Thus, in the general population there is no tendency for differences to be systematically positive or systematically negative. In the conditions of our research it is the presence of no statistically significant changes in the indicators of emotional intelligence before and after the experimental impact.
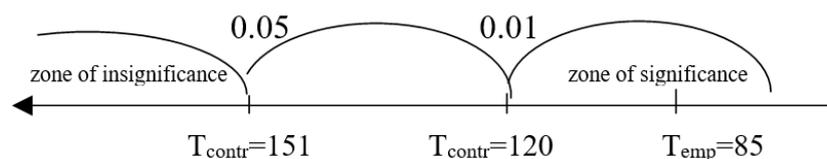
H_1: there is a difference between two methods. Thus, in the general population, differences in indicators are systematically positive or systematically negative. In the conditions of our research it is the presence of significant positive changes – an increase in the level of the components of emotional intelligence development and an increase in the overall index of emotional intelligence as a result of experimental impact. After the statistical data processing in the control group, no significant changes in the level of development of emotional intelligence were identified.

According to the results of statistical processing of empirical data Wilcoxon criterion, we found statistically significant variables in the indicators of the general level of development of emotional intelligence among the respondents of the experimental group. Thus, at $T_{emp} = 82$

$$T_{contr} = \begin{cases} 151 & (p \leq 0.05) \\ 120 & (p \leq 0.01) \end{cases}$$

Accordingly, $T_{emp} < T_{contr}$, building an axis of significance:

Analysis of the axis of significance shows that the relevant rates fall into the zone of significance. Thus, we accept hypothesis H_1 and can claim that the variables recorded in the experiment are not random, but are significant at the 1% level. Accordingly, a comprehensive program for the development of emotional resilience with components of augmented reality, implemented in the certification program for future professionals of socionomic professions

$$\text{0.05} \qquad \text{0.01}$$

zone of insignificance · zone of significance

$T_{contr}=151 \qquad T_{contr}=120 \qquad T_{emp}=85$

"Self-management: development of sanogenic potential of the individual", implemented through Moodle, contributed to the development of emotional intelligence of future professionals socionomic professions and is an effective tool in the development of professionally important qualities in terms of adaptive learning.

4. Conclusions and recommendations for future research

In the process of professional development of future specialists of socionomic professions affiliative needs, the desire for a sense of self-worth are especially pronounced. However, these aspirations do not always coincide with the real possibilities. Increased emotional sensitivity can both promote and complicate the processes of interpersonal interaction, integration into the profession, stimulating in the latter case the emergence of uncomfortable emotional states. It is the ability of the future specialist to effectively manage emotional states determines a positive mood in communication and allows the choice of attractive behavior in relation to the environment and stimulates the desire for active social interaction in the process of solving professional problems. Reflection of one's own emotional experiences in relation to problematic or stressful situations of professional interaction encourages a rational correlation of the desired communicative behavior and real communicative opportunities, which also contributes to the conscious choice of status positions in communication and professional self-realization. Analysis of the phenomenology of emotional intelligence in the implementation of a comprehensive program with elements of augmented reality in the context of adaptive learning showed the positive dynamics of intrapersonal transformations (from awareness of emotional experiences to awareness of communicative choices and coping strategies, which in some way affects conscious choice tasks). The "training effects" identified during the correctional and developmental work confirm the importance of reflection emotional experiences in the process of interaction and the specifics of the application of augmented reality technologies in integration emotional and intellectual processes. According to the results of implementation and testing of the development program with elements of augmented reality, it was found that increasing the ability to understand and manage emotions by specially organized means promotes the development of components and general level of emotional intelligence, optimization of sociopsychological adaptation – involvement in integration processes and professional activities. The determined efficiency of integration of augmented reality technologies and traditional psychological and pedagogical techniques becomes a priority direction of reforming the system of adaptive learning in the context of professional training, which, in turn, actualizes the prospects of further research on relevant issues.

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