



ISSN 2450-6486

www.ehs-ss.pl

DOI: 10.38014/ehs-ss.2020.2.07

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The impact of learning using adaptive intellectual learning systems on the psychological well-being of the learner

Introduction. Psychological well-being is a major component of a valuable human life and is a topic for a good number of researches by scientists in various fields of science. Today, however, there is a lack of research into the characteristics of this phenomenon and the factors that influence it.

According to the author, one of the factors influencing the state of psychological well-being is the opportunity to get a quality education, taking into account individual characteristics and needs of learners. In today's world, information and communication technologies are increasingly being used to adapt the learning process to the specific educational tasks and personal traits of the learner, which certainly affects the quality of education and promotes psychological well-being.

The use of adaptive intellectual educational systems in the educational process can be a factor that some way influences certain indicators of a person's psychological well-being (self-acceptance, personal growth,

etc.). We should also notice that an adequate level of physical health is one of the main factors for a valuable human life.

It is worth mentioning that the greatest success in learning is achieved by those who want to learn, who sets goals, those who are interested in personal growth. A comprehensive study of these components should be an important area of research for educators, psychologists and physicians.

Research topicality. In the 17th century the founder of scientific pedagogy Jan Amos Komensky said that the way to acquire new knowledge should be appropriate to the student's ability and level of development. He was convinced that the mind of a person is able to embrace anything. For this it is necessary to progressively and gradually move forward in learning, following the didactic rules: from the near to the far, from the familiar to the unfamiliar, from the general to the particular. And then students learn not different pieces of information, but master the system of knowledge [29].

According to the author, the actual problem of the classical educational system is an insufficiently personalized and individualized approach to a student, which significantly makes it harder to comply with the aforementioned didactic rules. After all, in the usual educational practice such indicators as an emotional state of a student at the time of the task, his temperament and individual pace, method and speed of information processing, etc., are not always taken into account. This is despite the fact that the very concept of an individual approach to students is one of the basic principles of teaching in pedagogy.

Such state of things in a classical educational process can adversely affect psychological well-being, which in turn correlates with the level of physical health of the learner [11]. Psychological well-being is a predictor of the health and long life of healthy people [21].

In order to achieve the highest degree of efficiency in the learning process, it is important to combine such factors as concentration, satisfaction and interest (which is possible through personalization of learning). In the absence of at least one of these components, it is almost impossible to achieve high results, which is why, according to R. Gilman, students feel that they are passive participants in the educational process and have low levels of motivation and involvement in the learning process [22].

Training with the help of intelligent adaptive learning systems should hypothetically influence the state of psychological well-being in a positive way, as intelligent adaptive learning systems (IALS) should build a learner's educational strategy based on personalization. According to V.

Devedžić's research, intelligent adaptive systems should not only actively assist a learner but also interact with a learner throughout a learning process [20].

Before analyzing the impact of training with the help of IALS on psychological well-being, it is essential to define the terms.

Psychological well-being. Nowadays, the issue of "psychological well-being" is revealed in the works of many scientists and researchers, such as G.V. Voronina, O.O. Kronik, O.V. Khukhlaeva, P.P. Fesenko, T.D. Shevelenkova, N. Bradburn, E. Diener, E.L. Deci, R.M. Ryan, C.D. Ryff, A.S. Waterman and others. Despite the increased interest in the topic, a common understanding of the term "psychological well-being" has not yet been developed. Different authors have their own meaning while being in concord with each other.

Psychological well-being, from N. Bradburn's point of view, is: "a subjective sense of happiness and overall satisfaction with life" [17]; in the sense of P.P. Fesenko it is "an integral indicator of the degree of human orientation to the realization of the main components of positive functioning (personal growth, self-acceptance, environmental management, autonomy, purpose in life, positive relations with others), as well as the degree of realization of this orientation, which is subjectively expressed in the feeling of happiness, contentment with oneself and one's own life" [14]; according to T.D. Shevelenkova, it is "a rather complicated experience of a person's satisfaction with his own life, which reflects both actual and potential aspects of a person's life" [17]; according to O.V. Khukhlaeva, "it is a systemic quality consisting of relatively autonomous, but hierarchically subordinate levels, which are formed in the process of development and education sequentially from the lower to the higher ones" [15]. Researches of C.D. Ryff, who understands psychological well-being through a number of variables, namely self-acceptance, positive relationships with others, autonomy, environmental management, purpose in life, and personal growth, are the most popular according to the problem.

Analyzing existing views on the definition of this concept, we can conclude that it characterizes the area of experiences and states inherent in a healthy person. Not for nothing is the concept of "psychological well-being" taken by the World Health Organization (WHO) as the main criterion for determining health, in which health is not only the absence of disease or physical defects, but also the state of complete physical, mental and social well-being [3].

Along with the concept of “psychological well-being”, scientists use a number of similar terms: “self-actualization” (A. Maslow); consciousness of life (V. Frankl); life satisfaction (E. Thorndike), happiness (M. Seligman, M. Argyle), subjective well-being (E. Diener, A.S. Waterman, L.V. Kulikov, R.M. Shamianov), topical and ideal psychological well-being (P.P. Fesenko, T.D. Shevelenkova).

An extended analysis of the phenomenon of “psychological well-being” was carried out by P.P. Fesenko and T.D. Shevelenkova [17]. They reveal a specific character of this phenomenon in the following approaches. One approach is related to the hedonistic and eudemonic understanding of this phenomenon (N. Bradburn, E. Diener, A.S. Waterman and others). A hedonistic understanding of psychological well-being brings it to a state of overall satisfaction and a sense of happiness. Psychologists who include themselves in eudemonistic trend tend to identify psychological well-being with personal growth and a desire for self-actualization [10].

N. Bradburn describes the concept of “psychological well-being” in terms of satisfaction - dissatisfaction. In his view, psychological well-being is achieved by striking a balance between the two types of affect, the positive and the negative one [17]. He describes this process the following way: the events of daily life that carry joy or disappointment, reflected in our minds, accumulate as a correspondingly colored affect. What saddens us and what we experience is summed up in the form of negative affect, the same events of daily life that bring us joy and happiness contribute to the increase of positive affect. The difference between positive and negative affect is an indicator of psychological well-being and reflects a general sense of contentment or dissatisfaction with life.

The researcher of the psychological well-being phenomenon E. Diener uses the concept of “subjective well-being”, which he introduced in scientific circulation. In fact, the meaning of this term is very close to the interpretation of psychological well-being that was proposed in the concept of N. Bradburn. He views subjective well-being through the features of subjectivity, the presence of positive indicators and the global dimension. Subjective well-being is intended not only to serve as an indicator of how depressed or anxious a person is, but also to demonstrate how much one is happier than another, that is, the author equates subjective well-being with the experience of happiness. Thus, it can be argued that a person has a high level of subjective well-being if in most cases he or she is enjoying life, and only in certain situations does

he/she experience unpleasant feelings such as sadness or anger. On the contrary, at a low level of subjective well-being a person is dissatisfied with life, he/she rarely feels a sense of joy and love, which are replaced by various negative emotions. [13].

Recently, in foreign psychology (Sandvik, Diener, D.G. Myers, Seidlitz, J. Wilson) the concepts of real "psychological well-being" and "declared" or "avowed happiness", that is subjective "psychological well-being" have been distinguished. Scientists have received conflicting facts about their relationship. Thus, the subjective well-being of a person depends on objective reality (quality of life) and correlates with the indicators of objective satisfaction. J. Wilson gave a psychological portrait of a person with a peak sense of subjective well-being, including both subjective and objective (eg., health, material income, etc.) characteristics: young, healthy, well educated, well-paid, extraverted, optimistic, carefree, religious, married person with high self-esteem, morale, any gender and level of intelligence [1].

E. Diener and E.M. Suh, found that links between objective and subjective variables are not always available. For example, there is no correlation between the level of material income and psychological well-being. However, the influence of socio-economic factors on psychological well-being continues to be the object of study of scientists, in particular this issue is highlighted in the works of R.Z. Sharapova [16]. Indeed, satisfaction and other aspects of subjective well-being depend not only on the objective state of the world, but also on the expectations, values and goals, cognitive processes of a human.

However, subjective well-being is not a completely subjective indicator – it is a real human condition, it is truly objective because of it corresponds to actual work of a brain, real facial expression and various types of real behavior.

The eudaimonist understanding of the problem phenomenon rests on the notion of "personal growth" – a major and much-needed aspect of well-being. This approach is typical of the views of A.S. Waterman. He understands psychological well-being as social well-being [6].

The ideas of eudemony were used to describe the content of "psychological well-being" by the scientist O.O. Kronik, who described this condition as a form of experiencing the fullness of being associated with self-realization [4].

M. Seligman develops the theme of happiness being close to the topic of psychological well-being within the framework of positive psychology.

He introduces the concept of a pleasant life, a good life and a meaningful life, thereby trying to understand what well-being really is. A pleasant life strives for positive emotions, and one can see parallels between it and hedonistic well-being. In a good life, a person uses their strengths for reward in the form of activities that they enjoy. Finally, a meaningful life is to use your strengths while serving something that is bigger and higher than an individual. Seligman believes that both activity-oriented and sense-oriented things can be considered as eudemonistic.

Psychological well-being is also considered on the basis of the study of the problem of an individual's positive psychological functioning (A. Maslow, C. Rogers, G. Olport), whose indicator is the autonomy of personality. Autonomy refers to the perception of one's behavior as congruent with one's intrinsic values and desires. Autonomy is based on support and lack of control from other people.

Another approach to the study of the phenomenon of "psychological well-being" is connected with the previous one and developed in line with humanistic psychology (C. Ryff, P.P. Fesenko, T.D. Shevelenkova). Psychological well-being was seen as a holistic experience, manifested in the form of a subjective sense of happiness, satisfaction with oneself and one's own life, and related to basic human values and needs. The methodological roots of C. Ryff theory are the provisions of humanistic psychology about personal growth, self-acceptance, autonomy, self-determination, etc. The described theory served as a basis on which the original method of psychotherapy and the original questionnaire "Scales of psychological well-being" were created. It is widely recognized and is actively used in scientific research related to the study of various areas of psychological well-being. At present, the laws of dependence of psychological well-being on sex, age, and cultural identity have been sufficiently studied, and work is underway to study other factors affecting psychological well-being [26].

The diversity of views on the problem of psychological well-being implies difficulties in identifying its main components. Thus, different approaches offer different indicators to evaluate this phenomenon, and accordingly different models. The psychological content of the subjective psychological well-being of the individual is multifaceted and multidimensional. The more varied, the richer is the life of the subject, the more specific is the position of the individual in life, the more complex the composition of subjective well-being and, perhaps, the deeper the inner world of man and his richer relations with others.

After analyzing different theoretical perspectives on understanding the essence of psychological well-being, we will draw on the theory and model of the researcher C.Ryff.

C.Ryff explains the multicomponent model of psychological well-being through its components, just self-acceptance, positive relationships with others, autonomy, the ability to manage the situation, the presence of life goals, the level of personal growth.

1. *Autonomy*. A person with high autonomy, able to be independent; he is not afraid to oppose his opinion to the majority opinions, can afford non-standard thinking and behavior; he evaluates himself based on his own preferences. The lack of a sufficient level of autonomy leads to conformism, unnecessary dependence on the opinion of others, such a person is difficult to make decisions; his behavior and way of thinking are strongly influenced by society.

2. *The ability to manage the situation*. To manage the situation (environment) implies the availability of qualities that lead to the successful mastery of different activities, the ability to achieve what is desired, to overcome the difficulties on the way to achieve their own goals, to effectively use different life circumstances. A person with a low level of ability to manage the situation, has an inability to cope with day-to-day things, a sense of selflessness, incompetence, a sense of inability to change or improve something in order to achieve what is desired.

3. *The level of personal growth*. Personal growth implies a desire to develop, learn and perceive something new, as well as a sense of self-progress. If personal growth is impossible for some reason, it can result in a feeling of boredom, stagnation, lack of faith in one's ability to change something, mastering new skills and values, and in diminishing interest in life.

4. *Positive relationships with others* in this case are understood as an ability to empathize and an ability to be open to communication, as well as having the skills to help establish and maintain contact with others. In addition, this characteristic includes one's desire to be flexible in interaction with others, the ability to compromise. Lack of this quality indicates loneliness, inability to establish and maintain a trusting relationship, unwillingness to seek compromise, seclusion and despondency.

5. Another important component of psychological well-being is the *presence of life goals*, which is associated with a sense of awareness of existence, a sense of value of what was in the past, happening in the present and will continue in the future. Lack of life goals leads to a sense

of senselessness, longing, and boredom.

6. *Self-acceptance* reflects positive self-esteem of oneself and one's life in general, awareness and acceptance not only of one's positive qualities, but also of one's shortcomings, the opposite side of self-acceptance – a sense of dissatisfaction with oneself, manifested in the negative evaluation of certain qualities of one's personality, dissatisfaction with one's past [26].

Thus, analysis of different approaches has shown that there is a diversity of views on the problem of psychological well-being of the individual, and within the different views, different indicators are proposed to evaluate this construct. However, psychological well-being is not a simple linear sum of many criteria but depends on a large number of variables.

Intelligent Adaptive Learning Systems. Adaptability in learning is defined as the ability to coordinate and adapt the learning process to the pace of learning, the level of mastering the material by the student, as well as the ability to provide different means of training [18].

Therefore, adaptive learning is learning that takes into account individual characteristics, abilities and knowledge of students in the educational process organization. Adaptive systems, where individual characteristics of students and their learning activities are taken into account as comprehensively as possible, are called intelligent adaptive learning systems. IALSs allow students to follow their own educational direction, which greatly improves the quality of learning. The effectiveness of IALS is driven by the use of information and communication technologies, and increasingly by artificial intelligence.

At present, there is still no single interpretation of the term “adaptive training systems”, and this is primarily related to the various functions they perform. Most often, adaptive training systems are understood to mean an intelligent e-learning system (Kose & Arslan), an adaptive online learning system (Lo, Chan & Yeh), an intelligent learning system (Yuanyuan & Yajuan).

In this paper, we review adaptive intelligent learning systems to identify the impact of learning with their use on the psychological well-being of learners within the context of the humanistic paradigm.

The topic of development and practical use of adaptive learning systems is studied by S.M. Prym, P.I. Fedoruk, Y.V. Bunturi, V.I. Gritsenko, V.Yu. Bondar, S.V. Tsyutsyura, V.Yu. Bykov, Y.G. Nosenko, M.P. Shyshkina, P. Brusilovsky, L. Pugliese, E. Lavieri, R.A. Sottolare, U. Kose, J.J. Lo, V. Devedžić and others.

P.I. Fedoruk examines the problems of theory, methodology, methods and construction of intelligent adaptive systems for individual distance learning based on the latest Web-technologies. The scientist notes that the technology of constructing an individual adaptive direction of learning when creating an adaptive training course is quite non-trivial both a mathematical and methodical problem [12].

Such scientist as S.M. Pryima investigated features of effective functioning of intelligent adaptive learning systems for adults which were based on technology Web Mining to use valuable knowledge [8]. The researcher concluded that the use of IALS allows a student to build not only an individual educational direction but also an individual educational strategy that provides a psychological correction of an individual's stereotype action, his thinking and mechanisms of self-realization.

Such researcher as Yu.G. Nosenko in her work "Adaptive learning systems: essence, characterization, state of use in national educational institutions" argues that the learning system is adaptive if it:

- adapts to different styles and pace of learning;
- contains statistically accurate cognitive models that allow to determine and verify the reliability of the achieved level of competence of students;
- correctly implements adaptive sequence for accurate and continuous real-time data collection on student performance and use of this data for automatic correction of the educational roadmap;
- contains functionality for adaptive evaluation;
- accurately identifies corrections and corrective actions through adaptive, norm-based and criteria-based assessment;
- is able to critically measure how successfully the student has mastered the educational content and how actively he has been involved in the educational process;
- can develop comprehensive competency frameworks that can index learning outcomes [7].

Let us consider the elements of adaptive technology such as content adaptation, assessment adaptation and sequence adaptation, and the training systems that use them.

Content Adaptation. The main purpose of content adaptation is to obtain the most valuable skill by consistently learning its components. In this case the tools with adaptive content based on the analysis of the quality of student's responses adapting to them determine the sequence of the material taking into account the errors to study in order to achieve

the optimal path of learning information and skills. We can consider the following platforms with adaptive content: LearnBop, ST Math, Ck12. These are visual training programs, and programs that break down complex tasks into smaller ones.

The idea behind the *adaptation of assessment* is that the system analyzes the student's response and, depending on the quality of the answer, gives access to a more complex task, either equivalent or easier in the event of a mistake. Adaptive assessment tools are commonly used to periodically monitor and produce detailed statistics.

The most difficult element is the *adaptation of the sequence*. Many indicators need to be considered and analyzed (beginning from the correctness of the student's response to his or her interests and psychological status). The stages of implementing the adaptive sequence include data collection, analysis and, which is most difficult, adaptation to each student. The best representatives of adaptive learning tools are Knewton and Fishtree. The key factor here is the analysis of a large number of parameters, which allows offering the optimum information structure and level of complexity of tasks.

The highest performance has those intelligent adaptive education systems that can combine multiple strategies at once. For example, an adaptation of both content and sequence is practiced by the platforms Mastering, Smart Sparrow, Dreambox and others [12]. The ones like Aleks, ScootPad combine adaptive evaluation and sequence.

Despite the fact that the IALS has not yet become widespread in the world, according to [19] in the near future such adaptive training systems will become the basis of new educational personalization strategies. Now high priority is given to the introduction of information and communication technologies into education [5].

Of course, IALS are not yet perfect and there are many issues that have not been solved yet. First of all, the issues of ethics and transparency in the collection, use, and dissemination of data [25].

It is worth mentioning that today in the world there are already developments in the field of artificial intelligence, capable of recognizing, interpreting and modeling human emotions. These are affective information technologies based on the ability to use a camcorder to capture facial expressions, gestures and even human replicas (for example, the developments of such companies as Realeyes, Affectiva and others). According to the predictions of the development of educational technologies in the world [19], in the future such technologies will be used

in the improvement of intelligent adaptive learning systems that will be able to respond to a student's emotions.

Conclusions. This work examines the possibilities of a positive impact of learning with the use of intelligent adaptive learning systems on the psychological well-being of the learner in terms of personification and individualization of the educational process.

High efficiency of educational activity leads to self-esteem, which among other things positively influences the ability to manage the situation, increases the self-acceptance of the individual and his autonomy that is the main components of the psychological well-being of an individual.

It is important and necessary to study comprehensively the impact of introducing both information and communication technologies and adaptive learning systems based on artificial intelligence into educational process on the state of psychological and physiological health, taking into account pedagogical, psychological, social, ethical, economic and other aspects.

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Abstracts

TARASOWA ANNA. Możliwości wpływu nauczania za pomocą adaptacyjnych intelektualnych systemów edukacyjnych na dobrostan psychologiczny uczących się. W artykule przeanalizowano teoretyczne podejścia do definicji zjawiska dobrostanu psychologicznego. Ujawniono cechy adaptacyjnych intelektualnych systemów edukacyjnych (AISE). Pokazano możliwość pozytywnego wpływu zastosowania adaptacyjnych intelektualnych systemów edukacyjnych na dobrostan psychologiczny tego, kto pragnie się uczyć. Poruszone są pytania dotyczące dalszego badania kompleksowego wpływu nauczania z wykorzystaniem technologii informacyjnych i komunikacyjnych na zdrowie psychiczne i fizjologiczne człowieka jako elementów pełnego życia.

Słowa kluczowe: dobrostan psychologiczny, technologie informacyjne i komunikacyjne, adaptacyjne intelektualne systemy edukacyjne, indywidualna trajektoria uczenia się, zdrowie psychiczne, zdrowie fizyczne.

ТАРАСОВА АННА. Можливості впливу навчання з використанням адаптивних інтелектуальних навчальних систем на психологічне благополуччя того, хто навчається. В статті проаналізовані теоретичні підходи до визначення феномену психологічного благополуччя. Виявлені особливості адаптивних інтелектуальних навчальних систем (АІНС). Показана можливість позитивного впливу використання адаптивних інтелектуальних навчальних систем на психологічне благополуччя того, хто прагне навчатися. Поставлені питання подальшого вивчення комплексного впливу навчання з використанням інформаційно-комунікаційних технологій на психологічне та фізіологічне здоров'я людини як складових повноцінного життя.

Ключові слова: психологічне благополуччя, інформаційно-комунікаційні технології, адаптивні інтелектуальні навчальні системи, індивідуальна траєкторія навчання, психологічне здоров'я, фізичне здоров'я

ТАРАСОВА АННА. Возможности влияния обучения с использованием адаптивных интеллектуальных обучающих систем на психологическое благополучие обучающегося. В статье проанализированы теоретические подходы к определению феномена психологического благополучия. Выявлены особенности адаптивных интеллектуальных обучающих систем (АИОС). Показана возможность положительного влияния использования адаптивных интеллектуальных обучающих систем на психологическое благополучие того, кто стремится к обучению. Поставлены вопросы дальнейшего изучения комплексного влияния обучения с использованием информационно-коммуникационных технологий на психологическое и физиологическое здоровье человека как составляющих полноценной жизни.

Ключевые слова: психологическое благополучие, информационно-коммуникационные технологии, адаптивные интеллектуальные обучающие системы, индивидуальная траектория обучения, психологическое здоровье, физическое здоровье

TARASOVA ANNA. **The impact of learning using adaptive intellectual learning systems on the psychological well-being of the learner.** *In the article, the theoretical approaches as to the description of the phenomenon of psychological well-being are analyzed. Besides, the peculiarities of the adaptable intellectual educational systems (AIES) are explored. Also, the possibility of the positive influences of the usage of adaptable intellectual educational systems on the psychological well-being of the individual who strives for education is displayed. In addition, the questions on the further examination with the usage of the information and communication technologies on such topics as mental health and physiological health of a human being as the components of the productive life are raised as well.*

Keywords: *psychological well-being, information and communication technologies (ICT), adaptable intellectual educational systems, individual learning path, mental health, physical health.*