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EXPERT COMPUTER ASSESSMENT OF KNOWLEDGE

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Abstract. *The urgency of the study of "stem-education" as a factor in the development of "smart-society" is that this kind of society (smart-society) is a continuation of information (network) and "knowledge society", which is developing on the basis of smart technologies. The concept of smart society is at the heart of modern state-owned development programs of South Korea and Japan. In South Korea, the National Social Agency has developed a "Smart Society Strategy" that introduces the technological foundations of smart societies. The central issue of Smart-society is business, which makes managing more intelligent (flexible, intelligent) and activities aimed at using knowledge and innovation. The objectives of the study are to identify the "stem-education" endpoint through the use of electronic and collective technologies, which become more massive and effective, and through the use of natural, engineering and maternal education. It is no coincidence that this concept is documented in the Europe 2020 Strategy: Smart Growth Strategy, which includes the development of an economy based on knowledge and innovation, fosters sustainable growth, more efficient use of resources, and inclusive growth and strengthening of high employment. Countries such as the United States, China, Australia, the United Kingdom, Israel, and Singapore carry out state-of-the-art stem-education programs. The methodological basis of the study is systematic, structural, axiological, synergetic methods and approaches that have allowed disclosing stem-education as the leading trend in the world of educational space. Conclusion - It is proved that stem-education is an innovation that combines the traditions of natural and mathematical education, is based on the principles of fundamentalism and knowledge-based, combining technological, organizational, material and technical resources and human capital. As a result of the development of stem-education at the expense of ICT, business processes, governance, and management reform are undergoing change, leading to economic, social and managerial processes at a higher level in some of those societies. Smart society is a new quality of society in which the combination of the use of new technologies will allow people to improve the quality of their lives. This article presents philosophical and educational reflection of smart-society as a new model of the information society and presents its impact on human (intellectual) capital. It reveals timeliness of this topic, which is innovative and hardly developed. It analyses international experience in establishment and growth of smart-society and dimensions of axiological field of smart-society, which is based on axiological matrix of information and knowledge, which are considered and being civilized dimensions of modern society. The main idea is to prove the evolution of the information society to smart-society and the possibility of establishment of smart-society in Ukraine. The analysis of smart-society formation was made and its characteristics were defined, which claims priority role in the world information space formation and contribute to the competitiveness of Ukraine in the international information space.*

Keywords: *smart-society, stem-education, sustainable growth, human capital, intellectual capital, information, knowledge, education, knowledge economy*

Introduction.

The existing system of education does not determine the factor of self-education as educating one. The trainee is overloaded with a huge information flow. This flow is determined by the number and volume of educational

disciplines that correspond to the qualification characteristic of the specialty. Not enough attention is paid to the motivation for mastering the work program of a specific discipline for practical activities. When drawing up work programs for academic disciplines, there is no

focus on the learner's interest in the constant systematic replenishment of his knowledge.

In each academic discipline there are separate obligatory blocks. Such blocks can be: lectures, laboratory works, practical or seminar classes, course project or work, exam, test or test work. In the existing educational system, the teacher combines teaching and monitoring functions. At the same time, controlling functions begin to prevail over the main learning functions. The exam or test is the "whip" with which the trainee is loaded with all five blocks. So it is the "whip", which restrains the individuality of the student. The question appears: "How to transform the necessity of education in general and self-education in particular, into one of pleasant, not compulsory tasks?"

This question can be solved if we allow the student to determine what to study and how to learn. A teacher is relieved from the function of coercion and control of the learning process and give him the opportunity to pay more attention to the learning function.

2. Analysis of literary sources and statement of the problem.

The use of progressive learning tests provides students with feedback at the level of their professional research. Peer-assisted training and the achievement of the professional competence of education are becoming increasingly important in education [1]. Although the progressiveness of tests has been proven as a tool for direct and feedback to students, there is currently no fixed progress of tests that were created in collaboration with students focused on competence in education. In this study, the extent to which students can be included in the development of a progress test and demonstrates that aspects of knowledge related to their competence can be depicted on the basis of a competence test.

A two-level project with 144 questions (multiple-choice questions MCQs) was introduced and several alternative answers to each of them are proposed. It covered a group of medical subjects and a group of areas of competence. The project was carried out by three expert groups. A total of 31 students from seven medical schools in Germany took an active part in this event.

The assessments were analyzed for the general test and differentiated according to thematic groups and areas of competence. A subsequent review and analysis showed that the students' answers to the MCQs were of high

quality and content regarding the verification of statistical criteria. It was also proposed to form a competence test on the Internet. The disadvantage of the development is that the proposed system does not identify gaps in the knowledge of a particular discipline. The paper [2] presents a report on the use of the method of knowledge assessment in the context of studying problems on the basis of the curricula of higher education institutions. This is the so-called test of progress. It is a sample of comprehensive knowledge in all fields of medicine. Its content reflects the ultimate goals of the curriculum. The test is periodically provided to students in accordance with the curriculum and the program, regardless of their year of study. The format excluded the opportunity for students to prepare themselves specifically, therefore, prevented frequent undesirable effects of objective tests, such as memorizing facts and interfering with groups of functioning. Many years of experience show that this format of testing works effectively. Its disadvantage is the lack of post-test analysis of the undigested material by students.

Increasingly, it is used to test the progress of knowledge in the field of medical education [3]. Testing is used in many cases and with several formats to reflect the diversity of curricula and evaluation objectives. The bulk of the test progress is based on the literature known today. The disadvantage of the system is the abundance of options and programs offered for testing. A student may find it difficult to choose.

The article [4] reports on the ongoing evaluation of the computer system (CEOTS) for the assessment of spoken English among Chinese university students. The automated system offers the only solution to the problem of negative feedback, the development of technologies necessary to meet current needs makes this study promising, but not solvable in the near future. The disadvantage is the unfinished research and the need to modernize existing computer systems.

The study, [5] was conducted in a bilingual environment, and is aimed at determining the level of training as one of the characteristics of the tested person. The study is aimed at finding a possible correlation between any of the eight types of information in the theory of M.I. Gardner and conducting EAP tests. 122 men, university students of the second year were selected as participants in the study. They were waiting for the final EAP exam and filled out a questionnaire for multiple researches. The

glasses tested in the EAP exam correlated with their multiple information. The result did not demonstrate any statistically significant difference between conducting EAP tests and any type of interviews; however, a positive correlation was observed among the eight types of the information itself, showing that all types of information are equally important and should be taken into account in dealing with the EFL context.

The current debate on the use of information and communication technology (ICT) [6] drew attention to the profiles and objectives of using ICT in schools. This study aims to identify the profiles of students using ICTs based on studies of the Norwegian International Computer and Information Literacy (ICILS) 2013 data (N = 2426). In order to study ICT usage profiles in schools and at home for various purposes such as recreation, research, information exchange and social communication, a person-centered approach and a hidden profile analysis have been chosen.

The aim of the study [7] was to evaluate the psychometric properties of the Internet Addiction Test (IAT) with 20 elements among a sample of 659 Italian university students enrolled in several degree courses at the same university. As a result of factor analysis, the Pearson correlations indicated that two factor models satisfied the criteria of a convergent and divergent regularity. This study confirms that IAT is an acceptable and reliable tool for measuring Internet addiction. The need to provide low-cost learning technologies, such as laptops or tablets in developing countries to bridge the digital divide, was analyzed by previous studies. For this aim, the Thai government launched the "One Tablet PC At the Daughter Element" (OTPC) and distributed 800,000 tablet computers among students nationwide in 2012. [8].

Empirical evidence of limitations in the effectiveness of using a tablet computer in the classroom is obtained. The acquisition of knowledge by students when using a tablet computer was studied. Two classes and 213 students in economically deprived areas of Northern Thailand have been studied. Data collection was based on questionnaires filled by students with the help of their teachers. The results showed that there were key differences in responses regarding gender of students and initial locations (urban residents compared to rural). Girls had a higher visual style of learning (M = 4.23) than boys (M = 3.96). Rural students

showed more competitiveness and higher levels of anxiety to use the tablet (M = 1.71) than urban students (M = 1.33).

The purpose of the study [9] is to study the technology of communication satisfaction, as well as the perception of competence in textual transmission. The technology of a controlled poll conducted through the exchange of text messages was polled by 329 college students in the US and Japan using the Internet. The results show that those who use managed cognitive technologies will feel this channel as sufficient. In addition, technology-driven is positively associated with the satisfaction of text messaging, as well as the competence in the exchange of text messages in terms of efficiency through groups.

The study [10] determines the factors that influence the intention of continuing bachelor students to use blogs to study the course of information management systems. A cross-sectional private survey was used to collect applicable data from 108 undergraduate students at a Canadian university. The results indicate that the perceived self-efficacy of personal expectation of the outcome and the perceived support for improving social ties are suitable antecedents to the initial adoption by students of using the blog for study. The internal motivational factor, perceived as a gaming one, has a significant effect of using the duration of the students blog to study.

The article [11] presents the results of a study of the quality of student responses to tests, depending on their preparation. In a group of students, standardized tests are harmful. The best students on average have the worst results of standardized tests. These conclusions are based on the results of an experiment conducted among 4,300 high school students in Kazakhstan. A comparison of student scores on standardized tests used for secondary school is made. Students are eligible to receive state grants for higher education funding, with the same scores as students controlled by a specially designed test to measure skills such as problem solving, critical thinking and the student's IQ level. Then, using a random sample of 182 students participating in the experiment, other ways to determine the intellectual abilities of the student are analyzed. It is found that the number of books at home and the level of English are qualitative precursors of the student's intellectual abilities, which is consistent with the findings obtained in other countries. Therefore, universities are encouraged to consider these

characteristics during admission to the university.

The article [12] analyzes the influence of the model of "personality-oriented» pedagogy, in which students use an independent approach to study the material using information systems in the introductory course, with pre-established deadlines for conducting lectures and exams.

This new paradigm was implemented in several sections of the introductory course of information systems for two semesters of time. According to the new model, the textbooks were used to help students master the material; all other materials were available through the Internet. Exams were given using a practical package of targeted online testing. It included multiple choices from True / False answers to the student's choice when testing. This approach allowed us to establish the degree of mastering and understanding the conceptual part of the course.

The students' anonymous survey was used to obtain the results of their perception of the level of training that took place within the new paradigm, as well as to determine the degree of student satisfaction with the design course and pre- / post-test.

An analysis of previous studies has made it possible to establish a general drawback of previously used computer testing systems. Such a shortcoming is the lack of the ability to determine not only the volume of the learned material of the studied subject, but also to tell the student what exactly he needs to study again

in order to increase the volume of his knowledge in this discipline.

The aim of the work is the development of an expert training and monitoring system for assessing knowledge that determines specific gaps in the learning of the material for the trainees and proposes to fill the missing knowledge from their own base.

3. Objectives of the study:

Analyze and highlight common shortcomings in existing systems for assessing students' knowledge;

Form a program of expert assessment of knowledge.

4. Materials and methods of research.

When researching by induction, the principles of teaching students system are formulated.

5. Results of the research

To reduce the amount of student load and grant him the right to determine the desired type of training, it is proposed to fill each of the five allocated blocks with questions from adjacent blocks. So, for example, the block 1 - lectures should contain the questions of block 2 - laboratory works, block 3 - practical and seminar classes, block 4 - course project or work, calculation and graphic work; block 5 - exam, test or credit, figure 1.1. Filling each block with questions of other blocks ensures the availability in each training block of questions guaranteeing the performance of the qualification characteristic of the specialty.

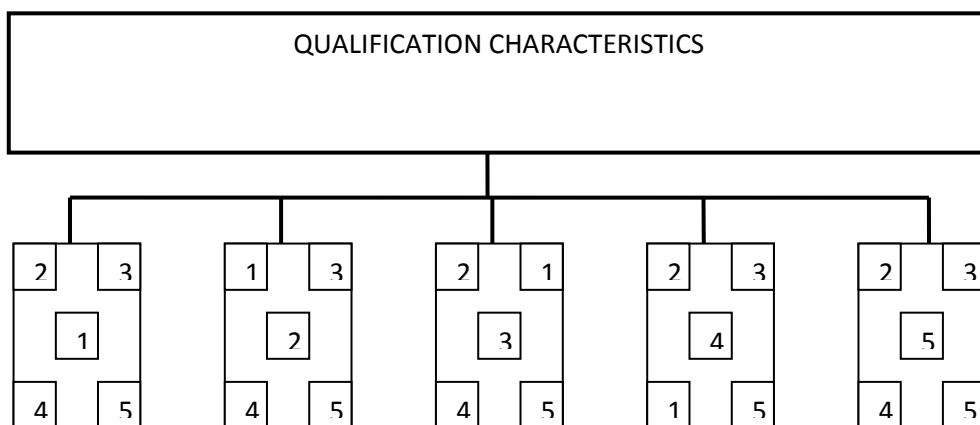


Figure 1 - Block diagram of the knowledge assessment program

After such methodical preparation the student is given the right to choose one of five obligatory educational blocks at his own will.

Thus, the student's workload is reduced fourfold without affecting his professional training. The student is entitled to choose one of the proposed

integrated blocks, which most corresponds to his creative individuality. When the choice is made independently without pressure from outside, then training becomes a pleasant necessity. A supervisory function is removed from the teacher. The liberated more than four times the time interval can be filled with other kinds of spiritual or physical development of the personality not only of the student, but also of the teacher. Therefore, the ideology described above is based on the development of an expert training system (ETS).

The result of using ETS is the lack of pressure of the teacher's authority on the student's personality, the independent choice of topics and the excellent knowledge of the course, since the "3" and 4 "scores are an analogy of a flown up pilot who does not know how to land an airplane with passengers, or a surgeon who cut , but not able to sew.

In addition, the ETS unloads the student; it still frees the teacher from having to re-read the texts of already written and recognized textbooks on the lectures. These texts are

preliminarily identified in the database and the knowledge base of the ETS. The teacher has the opportunity to devote more time in classroom meetings with students to the results of his and other modern scientific achievements. Now the work of the teacher will be evaluated not for the conscientious and most complete presentation of the material of the textbooks of other scientists, since for the presentation of this material the reward has already been received once by the authors of the textbooks.

6. Conclusions

1. There is a lack of existing systems for assessing the level of knowledge of students - the lack of the ability to determine not only the amount of material learned in the subject studied, but also a list of specific topics for re-examination after the assessment.

2. The program of expert evaluation of knowledge in the form of a flowchart with the selected blocks of knowledge, tasks and skills is created, which allows the teaching staff to use it in the context of a separate academic discipline.

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ЕКСПЕРТНА КОМП'ЮТЕРНА ОЦІНКА ЗНАТЬ

Анотація. Актуальність теми дослідження полягає у відсутності можливості визначити обсяг засвоєного матеріалу предмета, що вивчається, що не дозволяє студенту зрозуміти, що потрібно вивчити повторно, щоб підвищити обсяг своїх знань з даної дисципліни. **Головна мета** статті – розробка експертної навчальної та контролюючої системи оцінки знань, що визначає конкретні прогалини в засвоєнні матеріалу учнем і пропонує заповнити прогалини знань з власної бази. **Завдання дослідження:** проаналізувати і виділити загальні недоліки в існуючих системах оцінки знань студентів; сформулювати програму експертної оцінки знань. **Методологія.** При дослідженні методом індукції сформульовані принципи системи навчання студентів, що дозволило встановити недолік існуючих систем оцінювання рівня знань студентів і, на підставі цього, запропонувати нову програму експертної оцінки знань у вигляді блок-схеми. **Результати дослідження.** Розроблено експертну навчальну систему оцінки знань, що визначає конкретні прогалини в засвоєнні матеріалу, дозволяє визначити і заповнити відсутні знання студенту з власної бази. Сформована програма експертної оцінки знань у вигляді блок-схеми з виділеними блоками знань, завдань, умінь, яка дозволяє викладацькому складу використовувати її в розрізі окремої навчальної дисципліни. **Висновки.** Встановлено недолік існуючих систем оцінювання рівня знань студентів – відсутність можливості визначити не тільки обсяг засвоєного матеріалу предмета, що вивчається, а й перелік конкретних тем для повторного вивчення після проведеного оцінювання.

Сформовано програму експертної оцінки знань у вигляді блок-схеми з виділеними блоками знань, завдань, умінь, яка дозволяє викладацькому складу використовувати її в розрізі окремої навчальної дисципліни.

Ключові слова: оцінка знань, блок-схема, комп'ютерна оцінка, програма експертної оцінки.

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ЭКСПЕРТНАЯ КОМПЬЮТЕРНАЯ ОЦЕНКА ЗНАНИЙ

Аннотация. Актуальность темы исследования состоит в отсутствии возможности определить объем усвоенного материала изучаемого предмета, что не позволяет студенту понять, что нужно изучить повторно, чтобы повысить объем своих знаний по данной дисциплине. Главная цель статьи – разработка экспертной обучающей и контролирующей системы оценки знаний, определяющей конкретные пробелы в усвоении материала обучаемым и предлагающая восполнить недостающие знания из собственной базы. **Задачи исследования:** проанализировать и выделить общие недостатки в существующих системах оценки знаний студентов; сформировать программу экспертной оценки знаний. **Методология.** При исследовании методом индукции сформулированы принципы системы обучения студентов, что позволило установить недостаток существующих систем оценивания уровня знаний студентов и, на основании этого, предложить новую программу экспертной оценки знаний в виде блок-схемы. **Результаты исследования.** Разработана экспертная обучающая система оценки знаний, определяющая конкретные пробелы в усвоении материала, позволяет определить и восполнить недостающие знания студенту из собственной базы. Сформирована программа экспертной оценки знаний в виде блок-схемы с выделенными блоками знаний, задач, умений, которая позволяет преподавательскому составу использовать её в разрезе отдельной учебной дисциплины.

Выводы. Установлен недостаток существующих систем оценивания уровня знаний студентов – отсутствие возможности определить не только объем усвоенного материала изучаемого предмета, но и перечень конкретных тем для повторного изучения после проведенного оценивания. Сформирована программа экспертной оценки знаний в виде блок-схемы с выделенными блоками знаний, задач, умений, которая позволяет преподавательскому составу использовать её в разрезе отдельной учебной дисциплины.

Ключевые слова: оценка знаний, блок-схема, компьютерная оценка, программа экспертной оценки.

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