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The importance of using heuristic technology in education

Abstract. *This article aims to identify the essence of heuristic technology and its role in education. Initially, it observes the relevance of the issue in the frame of global trends and a new paradigm in the education system. Authors write about the change from the traditional way of teaching to contemporary. Also, the authors make a survey monitoring the labor market about current demands of employers for a young specialist, which shows top thirty skills, qualifications, and characteristics employers want to see in a potential employee. They also make a comparative analysis of key competencies presented by the European Council and Kazakhstani Ministry of Education and Science and write about similarities and differences.*

The article also observes the forms and methods of heuristic technology, gives examples of using them with a short description of principles. Furthermore, the article deals with arguments for using heuristic technology in education and the authors conclude at the end of the article.

Keywords: *heuristic technology, education, method, key competencies, critical thinking, self-learning, self-realization.*

DOI: <https://doi.org/10.32523/2616-6895-2021-137-4-192-199>

Introduction

A human being can discover and invent, and the feeling of insight while creating or discovering something new or unknown is unexplainable. This ability can be supported and be grown or be restricted.

Several decades ago, education was a collection of knowledge and experience transferred from generation to generation. Such a transfer of information from a teacher to a student was enough to function effectively. However, today we see how the aim and the content of education have changed according to the demands of the labor market and global trends in general. The current issue shows that if you are just “a walking encyclopedia” in other words a container of knowledge, with no practical appliance, then

you are not effective enough to function today. A person in modern society needs to be quick and thoughtful in taking decisions, to put relevant aims and achieve them, to act productively in personal, educational, and professional spheres [1].

Thus, there appears the problem of correspondence in learners’ creative self-realization and acquiring cultural-historical achievements in different spheres, between learners’ creativity and educational standards [2].

Lately, the low inner motivation of learners and hyperbolization of formal values of education became real problems among teachers. There are more hardships with defining a problem and finding a solution on their own, thinking out of frame, thinking critically, and generalizing knowledge to solve non-typical tasks. This makes

the problem of using heuristic technology in education one of the most important issues.

To compare mentioned above problems and employers' demands we decided to analyze today's Kazakhstani labor market. We examined more than one hundred employers' advertisements in the pedagogical sphere to see what skills and qualifications are demanded [see table 1], and if they correlate with key competencies of the European Council [3] and Kazakhstani Ministry of Education and Science [1] [see table 2].

We have analyzed 100 employers' announcements for February and March 2021. Most of the announcements were for foreign language teachers and preschool educators, then for education managers, instructor's assistants, tutors, HR manager, philologist-translators [see table 1].

Table 1

#	Employer's demands for the specialist in educational and humanitarian spheres	Number of remarks
1	Work experience	46
2	Higher education diploma (Pedagogy or Philology)	31
3	High inner motivation to work (loving your profession)	26
4	High level of Foreign Language	25
5	Responsibility	27
6	Self-development	19
7	Creative and critical thinking	17
8	Good level of IT competence	15
9	Readiness to learn and accept new tendencies in education	14
10	Organization skills	13
11	Friendly attitude	12
12	Communicative skills	12
13	Being personal-oriented and personal-friendly	12
14	Readiness to work in a team	11
15	The readiness to perform the work for the best result	11
16	Flexible	10
17	Being active and initiative	8

18	Positive thinking	7
19	Punctuality	7
20	Being sociable	6
21	Business ethics	6
22	Having an easy and clear manner of explanation	5
23	Decency	4
24	Access to the internet	4
25	Being charismatic	3
26	Enthusiasm	2
27	Active life position	2
28	Being systematic at work	1
29	No need for previous experience	1
30	Public speaking skills	1

The monitoring of the labor market shows that skills like the ability to self-development, higher inner motivation to work, creative and critical thinking, and readiness to learn and accept new tendencies in education come in the top 10 most frequent demands for employees. Thus, this fact proves the importance of professional competence formation for future specialists, as all these skills are sub-competencies of it. Significant skills like being communicative, readiness to work in a team, being active and initiative, and being flexible are also reflected in this list as a must for most employers. One more interesting skill, which corresponds with professional competence, is a readiness to work for the best result. Many employers have it in their list of demands. The least popular demands for specialists are being systematic at work, no need for previous experience, public speaking skills [see table 1].

Thus, the education institutions focused on training specialists in the educational sphere should consider the demands young specialists face while looking for a job. Another significant factor that should be considered is State and Global Educational Standards. We have also compared the list of key competencies in Kazakhstan and according to European Council [see table 2].

As we see key competencies in both Educational Standards focus on the same abilities

Table 2

Key competencies according to European Council	Key competencies according to state documents of Ministry of Education and Science of Republic of Kazakhstan
<u>Learning</u> - an ability to gain benefit from the experience - an ability to organize connection between knowledge and to order it - an ability to organize learning approaches - an ability to solve problems - an ability to organize self-learning	- to teach a learner to self-organization, and to show the real way to self-realization (by spiral): I – self-studying – self-education - self-learning – self-affirmation – self-identification – self-regulation – self-development – self-cognition – self-actualization – self-realization.
<u>Searching</u> - an ability to request different databases; - an ability to hold a questionnaire; - an ability to consult an expert; - an ability to receive information; - an ability to work with documents and classify them;	- to teach new thinking through cognition and self-organization
<u>Thinking</u> - an ability to connect past and present events - an ability to evaluate critically the aspects of social development - an ability to resist hardships and intercurrent; - an ability to assume an attitude in the discussion and express your own opinion; - an ability to see the significance of political and economic surroundings in which learning and working processes take place; - an ability to evaluate social habits connected with health, consumption, and environment; - an ability to evaluate art and literature works [2]	- to teach a learner to analyze events in general and in dynamics on his/her own - being objective while evaluating self-abilities as a pedagogue of new formation, knowing your strength and weakness, which are significant for this profession (self-regulation, self-evaluation, emotional intellect, communicative, didactic abilities, and others) - to gain general culture of intellectual activity, (thinking, memory, perception, imagination, attention), behavior, communication, plus pedagogical. - to be able oriented in contemporary integrational processes, in world educational space development tendencies [1]

and skills, however, there are some differences, which are clear to understand for cultural and social features. For example, if self-learning in European Council's document is written as just another ability to gain, in Kazakhstani Educational standard self-learning is presented as a new way of thinking and spiral model of work throughout the self-learning process. This main difference relates to diverse mentality and worldview. As a result, there appears a problem for employers looking for a specialist who meets

all the demands, and educational institutions not able to correspond them [see table 2] [1,3]

Heuristic technology in use

For this reason, according to scientists a good solution to the problem of correspondence in learners' creative self-realization and acquiring cultural-historical achievements in different spheres, between learners' creativity and educational standards, maybe the modeling

creative activity based on learning material. It will prepare students to solve real creative tasks, which develops cognitive abilities and research skills, and that is the meaning of learning with the use of heuristic technology [4].

While analyzing diverse resources we conclude that Heuristics is:

- 1) Scientific-applied discipline, which studies creativity;
- 2) Way of solving problem questions (tasks);
- 3) Teaching method;
- 4) One of the ways to create computer programs.

In the education system, we should study heuristics deeper, as a teaching method and its opportunities in the teaching process. So, heuristics as a teaching method is a method when a teacher does not transfer ready knowledge but allows learner's self-education, more independent knowledge acquisition. After analyzing different sources, we came up with the following definition of heuristic technology:

Heuristic technology is a technology, which aims to develop learners' creative abilities and to create situations in frames of which they realize their creative and research ideas. The aim of heuristic technology is not only to transfer, memorize and cognize the knowledge but also to use gained knowledge as conditions and sphere of producing the learner's creative self-product.

Forms and methods of heuristic technology are those, the aim of which is leading to new educational results of students:

- Ideas
- Essays
- Project work
- Research work
- Crafts
- Fiction

Or any other type of creative work. There are various forms of heuristic technology in education [5] However, we consider the following forms to be more beneficial in training future teachers:

- A heuristic lesson
- Mind map (brainstorming)
- Business game
- Project work
- Writing an essay

A heuristic lesson

A heuristic lesson implies learners and a teacher holds a lesson with the real product in the end. All methods and forms used in the lesson should aim to realize this product [4]. The task should be clear; with no strict instructions and demands; personal-oriented should have social importance. As an example, we may take the following task:

Work in mini-groups of three people and prepare a fragment of the lesson to develop speaking skills. After the lesson, make feedback answers the question: Which method is more beneficial for young learners while developing speaking skills. Give your reasons.

We consider the task a good sample of a heuristic lesson because first, each group would have a product (ready fragment of the lesson). Secondly, the task does not contain strict instructions. Thirdly, it is personal-oriented to some extent because students choose one of the fragments of their peers and make feedback. And lastly, it has social and professional importance, because students try to give a solution to the question "how to develop speaking skills of young learners".

Mind map (brainstorming)

Mind map supposes learners to work in mini-groups in a friendly and free atmosphere discussing different ideas connected with the task. The main principle of this method is to discuss all possible ideas, even the craziest ones, only in such conditions there can genius thoughts be born [4]. The following question can be a good sample of a brainstorming task:

In mini-groups (3-4 people) make a mind map answering the question "Why do we need learning styles?"

The question for brainstorming should motivate learners to think and to utter as many ideas as possible, and by discussing and exchanging opinions to think critically and gain knowledge. The feedback of a teacher, in this case, can be only as a remark of "an interesting idea", or even they may vote for "the most interesting and argumentative idea".

Business game

As an educational method, a business game demands active participation in an imaginary or true-to-life situation. It has some similarities with a case study and role-plays; however, they are different. The business game implies diverse situations to solve even the impossible ones, while a case study supposes to solve only real problematic situations, and role-plays are situations when each person has a definite role, and the situation is given from the side of the given role. As you may see business games are easier to organize and demand more creative and critical thinking from participants, as it has no strict instructions and gives more freedom for learners' imagination and cognitive abilities [6]. The sample task can be the following:

Imagine that you are presenting your methodology of teaching English to young learners to the representatives of the Ministry of Education. Work in a group of three people and make a short analysis defining the advantages and disadvantages of different methodologies (Montessori, Zaycev, etc.) and present the best way (your own) to work with young learners while teaching a foreign language. The form of presentation is up to you.

Project work

Project work is widely used in education lately. However, not many understand the real essence of the project work. Many learners in educational institutions present ready information and present it in the form of a presentation, but, a project work implies gaining knowledge while preparing a project and solving a problem in the end. Project work can be both individual and in groups, or even in big teams. The big responsibility of a teacher is to make the task-specific and problematic for students to have an opportunity to see a result as a creative product [7]. A sample of project work for teacher training specialty can be the following:

In teams make a project on the theme: My classroom management: Dos and Don'ts.

The task is personal-oriented and allows learners preparing their product after analyzing

different others'. In other words, they gain knowledge about classroom management from different resources and create their own, or they recall in their memory different teachers and fulfill the task according to their empirical experience.

Writing an essay

Writing an essay or any composition is one of the oldest and the most effective ways to stimulate any skills. Even though the structure and style of writing have definite rules, the content of this work is purely creative, that is what makes it heuristic. Writing is a good way to systematize the flow of thoughts on paper. For example, the teacher may give learners the following task:

Write an essay answering the question "What drawbacks can a young teacher face while teaching vocabulary and ways to solve them"

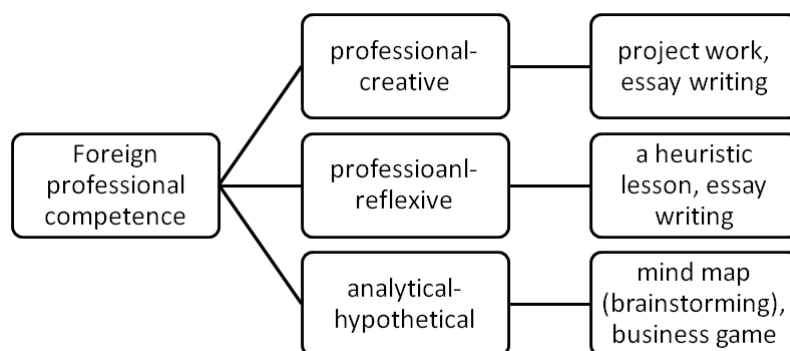
Learners have to use the knowledge they gained before and solve the problem. This individual and beneficial for developing the critical thinking of a learner.

If to speak about competencies they develop, the list will be long. Above pure creative and research competencies, we may point out foreign professional competence, which we decided to divide into three sub-competencies like professional-creative, professional-reflexive, and analytical-hypothetical. All the forms of heuristic methods mentioned above are in action to develop these sub-competences. For instance, project work and writing an essay develop professional-creative sub-competence, a heuristic lesson, and writing an essay develop professional-reflexive sub-competence, and brainstorming with business game develop analytical-hypothetical sub-competence (see the following scheme).

Opportunities and conditions for using heuristic technology in the teaching process

Using heuristic technology leads to learners' development in different aspects. Here are some opportunities it implies:

- Develops learner's self-learning, which leads to self-managing and self-organization and self-realization will be a result, which corresponds with the Educational Act of Republic of Kazakhstan;



- Learners will be able to realize their creative potential during they solve a task. Learners will have an opportunity to utter their ideas freely and learn to think out of the box, think critically;

- Learners will have an opportunity to create positive inner motivation to solve and

- Learners will form inter-personal relationships with each other;

- Learners will learn to use the knowledge they have gained in different situations.

To fulfill this positive effect of heuristic technology, the teacher should clearly and correctly organize a teaching process, to take into account all details and learning abilities of each student. There are several conditions to realize all opportunities of heuristic technology:

- The right motives to teaching and learning process
- Being interested
- Being creatively active
- Freedom of actions, choice, and task variability
- A positive atmosphere in the classroom

Conclusion

Meeting all global educational trends in this quickly changing world may be difficult, because society demands for a specialist are extremely high today, and they are increasing day by day. To develop a person who is capable to use gained knowledge in different professional and non-standard situations, a person who can make quick and creative decisions, a person who is responsible for their self-development, thinks critically, and is eager to work with the high motivation we have to develop creative, cognitive and professional skills. That is the main objective of the modern education system.

The solution of it can be using heuristic technology in the teaching process to develop a person who thinks critically and out of the box, who is flexible for the stress of failure, and utters different ideas with no fear of misunderstanding, because learners know how to listen and discuss. After analyzing all mentioned above, we strongly recommend using heuristic technology in the teaching process.

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Эвристикалық технологияны білім саласында қолданудың маңызы

Аңдатпа. Мақалада жаһандану жағдайындағы Қазақстанда білім беру мен шетелдік білім беру жүйесінің жаңа парадигмаға көшудегі өзектілігі ашып көрсетіледі, білім берудегі дәстүрлі және заманауи тәсілдері салыстырмалы тұрғыда қарастырылады, білім беру саласындағы болашақ қызметкерлердің біліктілігін анықтау мақсатында еңбек нарығында жүргізілген мониторинг нәтижесіне сипаттама беріледі. Еуропа Кеңесі мен Қазақстан Республикасы Білім және Ғылым Министрлігі қабылдаған негізгі компетенцияларға салыстырмалы талдау жасалып, қабылданған біліктіліктің өзара ұқсастығы мен ерекшелігіне жалпылама түсінік беріледі. «Эвристикалық технология» ұғымының мәні және оның білім берудегі рөлі айқындалады. Эвристикалық технологияның формалары мен әдістері, жұмыс принциптері және оларға арналған тапсырмалар қарастырылады, осы технологияның білім берудегі тиімділігі негізделеді.

Түйін сөздер: эвристикалық технология, білім саласы, әдіс, негізгі біліктілік, сыни ойлау, өзіндік жұмыс, өзіндік жүзеге асыру.

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Важность использования эвристической технологии в образовании

Аннотация. В статье раскрывается актуальность перехода системы образования и иноязычного образования в Казахстане на новую парадигму в условиях глобализации, приводятся сравнения традиционного и современного подходов в образовании, описываются результаты мониторинга рынка труда с целью определения компетенций у будущих сотрудников в сфере образования. Дается сравнительный анализ ключевых компетенций, принятых Советом Европы и Министерством образования и науки Республики Казахстан, и в общих чертах приводятся сходства и различия принятых ключевых компетенций. Раскрываются сущность понятия «эвристическая технология» и ее роль в образовании, рассматриваются формы и методы эвристической технологии, принципы работы и примерные задания к ним, определяется эффективность данной технологии в системе образования.

Ключевые слова: эвристическая технология, система образования, метод, ключевые компетенции, критическое мышление, самостоятельная работа, самореализация.

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