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Development of the potential for intellectual creativity

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Abstract. The article deals with potential uses of heuristic teaching, this underlying the development of the potential for intellectual creativity. The article elucidates heuristic methodologies used in academic settings, as well as the major methods and techniques for actualising students' creative thinking. Also, the paper substantiates the necessity and ways of applying them to academic classes of students.

Keywords: *creative personality, creative work (efforts), creative thinking, heuristic teaching*

The student's potential for creative work is a major contributor to his or her learning efficiency and successful research in higher-education setting. Nowadays, it is imperative for students to work towards acquiring a range of theoretical and practical skills as well as intellectual abilities, specifically those like an ability to develop and further one's expertise and put them to practical use when challenged by practical and unconventional tasks. Apart from that, they must be flexible and easy to adapt to a volatile environment, as well as being capable of finding various options for problem solving. Thus, in order to gain insight into effective ingredients to be utilised when encouraging creative potential, we need to focus on heuristic aspects.

As an innovative teaching technology, the paradigm of heuristic teaching has emerged from efforts by psychologists and educationalists in different countries, the former Soviet Union included. Among them are K. Rogers, A. Maslow (nature of and conditions for intellectual self-fulfilment), V. Pushkina (heuristics as a field of knowledge dealing with creative thinking), M. Lazereva (essence and methods of creative teaching), V. Solohuba (creative teaching as a way of fostering the environment conducive to creative personality development) et al.

An insight into etymology of the word *heuristics* shows that it means a way of discovering or inventing. This method is rooted in philosophical conception espoused by Socrates. It was not until the 20th century that this conception came into widespread use. Moreover, it gained practical dimensions, which is seen from coinages like *heuristic thinking, heuristic methods and techniques, heuristic quality.* Anyhow, heuristics is something relating to creative efforts, creative quests in particular.

Modern literature is replete with definitions of what heuristics is, those substantially differing at times. For instance, dictionaries of philosophy define heuristics as a science that studies creative efforts and methods employed in discoveries and learning. It is meant to develop frames of reference for addressing new tasks [6]. M. Mahkmudov holds that creative work is a heuristic activity which is about catching the main idea or essence underlying some concept, and also about the mechanics of hitting on some mode of action or thinking [1].

According to mathematician D. Poya, heuristics "overlaps with other fields of knowledge and sciences"; its individual areas are associated not only with mathematics, but with logic, pedagogy and philosophy as well. The object of heuristics is to explore methods for making discoveries and inventions [2]. In psychological decision making theory, heuristic efforts are identified with a set of rules, instructions or intuitive thinking [3].

Psychologist Y. Ponomaryov maintains that heuristics is "an abstract analytical science which studies one of the structural levels involved in generating creative efforts and their products." The Soviet Encyclopaedia provides the following definitions of what heuristics is: 1. Special methods used in the process of discovering (creating) something new (heuristic methods). 2. A field of knowledge that studies productive and creative thinking (heuristic efforts). V. Pushkin, a psychologist, holds the view that "heuristics is an area of knowledge that studies how new efforts are brought about by unordinary situations". Also, he argues that this area's enjoyment of status as a science is to be limited to heuristic processes that lead to these new efforts, with the latter to become the focus of mathematical description [5].

The efforts to explain what makes heuristics point to interpretive differences as to the content of this notion, these differences stemming from subjective views held by proponents of a particular conception. Creative quests and heuristics are to be integrated into a comprehensive whole by virtue of views and perceptions of what is transient, original and unique. As far as a notion of creative work is concerned, the above attributes are applicable to the results of this work, whereas methods and ways of achieving these results are relevant to heuristics.

Thus, the term *heuristics* can be applied to any methodological component of activity, teaching and learning activities included. In this case, when talking about heuristic activities to be pursued by students, we emphasise a new product being discovered, produced or generated in the course of learning. In specific terms, heuristic teaching is about teaching students how to carry out a search and add a novelty value to their knowledge and skills, as well as to work methods, personality traits and materialised products of education.

All this translates into a question: what is the role of a lecturer in activating students' heuristic thinking?"

This role lies in providing interaction between the lecturer and students by way of generating an informationally and cognitively based conflict between theoretically feasible problem solving and its impracticability. The latter is to be done to motivate students towards self-study based on problem-oriented learning. With the amount of the learning material quantified and its difficulty level determined, the lecturer is to presents it in the form of heuristic discourse or discussion, or by way of learning game. This is to be done by combining partial explanation of the new subject-matter with the statement of subject-matter related questions, cognitive tasks or experiments. For one, this encourages students to do independent search work. Also, it stimulates

them to master active communication techniques, formulate and solve learning problems.

On the other hand, it is important to explain the matter that cannot be learned through self-study and to set up a high level (exploratory and logical) of problem's relevance, as to a new situation, when the strategy of actions to be followed is unknown. Such activities are to be dominated by logical procedures for analysis, comparison and generalisation [4].

It should be noted that the kernel of heuristic teaching is to create Type III problem situations (Type II – more rarely), i.e. conflicts between theoretically feasible problem solving and its impracticability. This type of teaching is to be employed if students have a vast amount of basic knowledge and skills, which are necessary for doing particular tasks and assignments [5]. The elucidation of the role of a lecturer in teaching creative approaches will be insufficient, if there is no understanding of up-to-date and effective techniques of actualising creative thinking. As to the need for effective techniques of creative thinking actualisation, it should be observed that this problem dates back to a long time ago. Albert Einstein said, "Imagination is more important than knowledge. For knowledge is limited, whereas imagination embraces the entire world, stimulating progress, giving birth to evolution." Imagination (fantasy) is a psychological process that involves creating images and is based on one's processed perceptions formed in the past. Fostering these qualities in those who invent technologies is critical to overcoming amorphous and inert thinking and to accelerating efforts to find ways of doing assigned tasks. To achieve this purpose, one is to utilise a variety of heuristic techniques such as eliciting associations and drawing analogies, as well as control questions and technical contradiction elimination [5].

One of the most critical techniques for actualising creative thinking is evoking associations. Now let us look at what an association is. This notion is used to mean the reflection in the human mind of connections between such entities as objects, facts of life and natural phenomena, psychic perceptions, sensations, motor actions, beliefs etc. Normally, associations do not involve active perceptions. What essentially defines the originality, vividity and vibrancy of associations is the individual's interests, reactions and momentary consciousness orientation. Psychological research reveals that human potential for generating associations is solely time-limited, which is why associations can be viewed as a source of complementary information, with the latter to be used in creative work [5].

The main objective of generating associations is to shake stereotypes about the object to be improved, as well as activating imagination and fantasies and finding analogies which may be of help. When used in creative quests, associations may serve as direct prompts by way of analogy between an object under study and an object to be improved, i.e. an invention. This latter quality of associations holds the greatest value and has a lot of heuristic power. Associations are discerned by way of similarity, contrast and contiguity. Similarity-based associations may be utilised as reference data for heuristic inversion (the search carried from start to finish) techniques, whereas contiguity-based ones as tools for transformations in space and time. All examples of association generation fall into two groups: techniques for free associations and techniques for controlled associations. Free associations are those which are generated without any content-related or grammatical limitations. In this case, an association may be expressed by any word or a word group. The generation of controlled associations is limited to specified conditions. These conditions, for example, may include the generation of contrast-based associations expressed by a particular word-class (part of speech), symbols, signs and suchlike. The generation of free and controlled associations is triggered by a fast response to a stimulus word. A response to a stimulus word is highly individual and depends on one's intellect, temperament, psychophysiological state etc. A stimulus word may generate associations in the form of groups, or as sequences, when an association elicited by a stimulus is taking over as a stimulus word for another association [4].

A primary stimulus for generating associations can be in the form of sensations, symbols or entities found the surrounding world, as well as in the form of an object improved and key words associated with it. Generating of a set of associations can facilitate new technical solutions and setting tasks to further evaluate an object, as well as discovering all potential attributes and qualities of the object. A sequence of associations can be seen as a heuristic technique for departing from traditional stereotypical comparisons and analogies and for pinpointing connections (analogies) between an object and a remote notion (association). This technique can facilitate the identification of new functions, attributes and qualities of an object.

As is mentioned above, the effectiveness of all heuristic techniques, associations included, is not as much about finding a direct route to decision-making, as about mental preparation for an "a-ha" moment and establishing a link consciousness and alter ego and going on to rely on intuition [4].

As to the major techniques used for actualising creative activity, one of the major ones is to be referred to as the method of "key questions". It expedient to use the method of heuristic questions when collecting extra information to deal with a problem situation or ordering information available in the midst of completing a creative task. Heuristic questions provide an additional stimulus, form new strategies and tactic for solving creative tasks. It is not by accident that in academic parlance they are referred to as leading or prompting questions, as clearly worded questions leads a student to come up with a way of solving a problem or with the correct answer.

It is noteworthy that the tradition of heuristic questions goes back to ancient times. For instance, Roman philosopher Quintillian widely used them both for scholarly and practical purposes. He recommended to all prominent politicians that, in order to garner enough information about a particular event, they should put themselves the following seven key (heuristic) questions and answer them: who? what? what for? where? by what? how? when? [4]

The method of heuristic questions is based on the following regular patterns and corresponding principles: 1. Issues of concern and optimalities. Questions being posed in a proper way, the issues of concern are brought down to an optimal level. 2. Fragmentation of information (heuristic questions permit the split of tasks into sub-tasks). 3. Purposiveness (every new heuristic question forms a new strategy, i.e. a purpose of activity). The method of heuristic questions is advantageous in the way of being simple and

fit for any task. Heuristic questions are especially good for developing intuitive thinking, this being a logical path to complete a creative task. The faults and limitations of this method lie in its inability to generate original ideas and solutions. As well as that, like other heuristic methods, it does not guarantee an ultimate success when working with creative tasks [5].

Thus, being involved in creative intellectual work is a prerequisite for successful theoretical and practical studies to be pursued in higher learning settings. Indisputably, the role of a lecturer is critical to actualising creative thinking. Equipped with techniques of actualising heuristic thinking in the classroom environment, especially such as methods of associations and heuristic questions, a lecturer is more likely to elicit better learning performance from students. With heuristic learning, rather than gaining readily available knowledge, students generate knowledge and experience as their own intellectual product, and this is to be done either by means of self-study or with the help from a lecturer.

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Козицкая И.В. Развитие потенциала для интеллектуального творчества

Аннотация. Статья посвящена использованию техник эвристического обучения, которые лежат в основе развития потенциала интеллектуального творчества. Представлены эвристические методики, используемые в академической среде, а также основные методы и приемы для актуализации творческого мышления учащихся. Кроме того, статья обосновывает необходимость и пути применения творческого подхода для повышения интеллектуальных успехов студентов.

Ключевые слова: *творческая личность, творчество, творческое мышление, эвристика обучения*