

NEW APPROACH FOR MAKING MORE ACTIVE THE STUDENTS' THINKING WHEN LECTURING ON SPECIAL ENGINEERING COURSES

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ABSTRACT: The text presents the main concepts of the method destined for activating the technical university students' brainwork. It is dealt with the objective reason and need to improve the results of the lecturing on special engineering courses. The paper also touches upon the physiological and psychological aspects of the problem posed. Recommendations are given for introduction of proposed method by reflecting the humanities and arts at lecturing.

THE PROBLEM OF ACTIVATING THE STUDENTS' THINKING

The up-to date world tendency is related to decline in the human culture, waste of ethical principles and rise of psychological stresses in society. These unfavourable circumstances, especially in the states of the former Soviet Union, lead the students to faith loss in themselves and their future. In connection with this the problem of overcoming the dissociation between the humanitarian and engineering courses is of great importance not only from the view-point of training the technical elite but, that is neither less significant, for moulding the professional ethics and the life-asserting aim positions of the generation to come.

Lectures on the theoretical fundamentals for any types of the engineering specialities are illustrated traditionally by means of the simplest examples. Meanwhile, the analysis of the processes going on in specific apparatuses done at the lectures on the special courses of study involves considerable amount of theoretical concepts in their combination and interaction. It is well known that at intervals of two or three semesters not only forgetfulness but difficulty in recognition of the earlier perceived basic pieces of information occur. The similar situation comes to light by results obtained at the test and examination period just at a stage of transition to studying disciplines of specialization.

At the same time much attention is devoted to the problem of training the engineering elite being notable for the harmonious development of personality of the highly qualified specialists. The outlined consideration pre-determines the notion about the modern lecture on the special course as the act of creative work aimed to create the new knowledge and earlier unknown images and ideas in the field of definite technical decisions.

The guidance of the student's attention in the direction of increasing its intensity and concentration, in this case, ought not to lean on stimulus of the purpose or needs of speciality, as it is considered to be obvious, by virtue of the fact that the rigid concentration of attention, necessary for consideration of

the complex physical phenomena, results in fast fatiguability and instability of attention.

Obviously, the conditions for creative perception of a lecture are also necessary as generally recognized way of using the specialized methods stimulating activating the brainwork of scientists, engineers and inventors.

The point of view to be discussed from here on is to substantiate the necessity and capabilities in reflecting the humanities and arts in lecturing the engineering courses. At the moment the problem has not got the adequate development yet.

NEED AND BACKGROUND OF THE NEW APPROACH

As the experience of the lectureship shows, activating the cognitive process at an exposition of the especially difficult physical phenomenon can be achieved by using, as a means of relaxation of the psychical stress and stimulation of the thinking, the images from the area of humanitarian values.

The distinction between modern heuristic methods of activating the creative work developed by A.F. Osborn [1], W.J.J. Gordon [2], F. Zwicky [3], etc. with the approach being considered consists in a level of excitation of a cerebral cortex neuron system and intensity of neurodynamics. Being continuously re-formed the neuron network of a cerebral cortex, during entering irritants of a high level, permits to use the stored knowledge more completely but at the same time results in overcoming the logic thinking by a way of generating the diverse reactions including the optimum solution which corresponds to the insight moment state of the researcher [4].

The considered method of activating the audience should not lead to deviation from logic thinking being operated with maximum probabilities on a way to the decision known to a lecturer. Therefore introducing the humanitarian values in the contents of a lecture should be co-ordinated with the volume of the short-term memory limited on quantity of information with

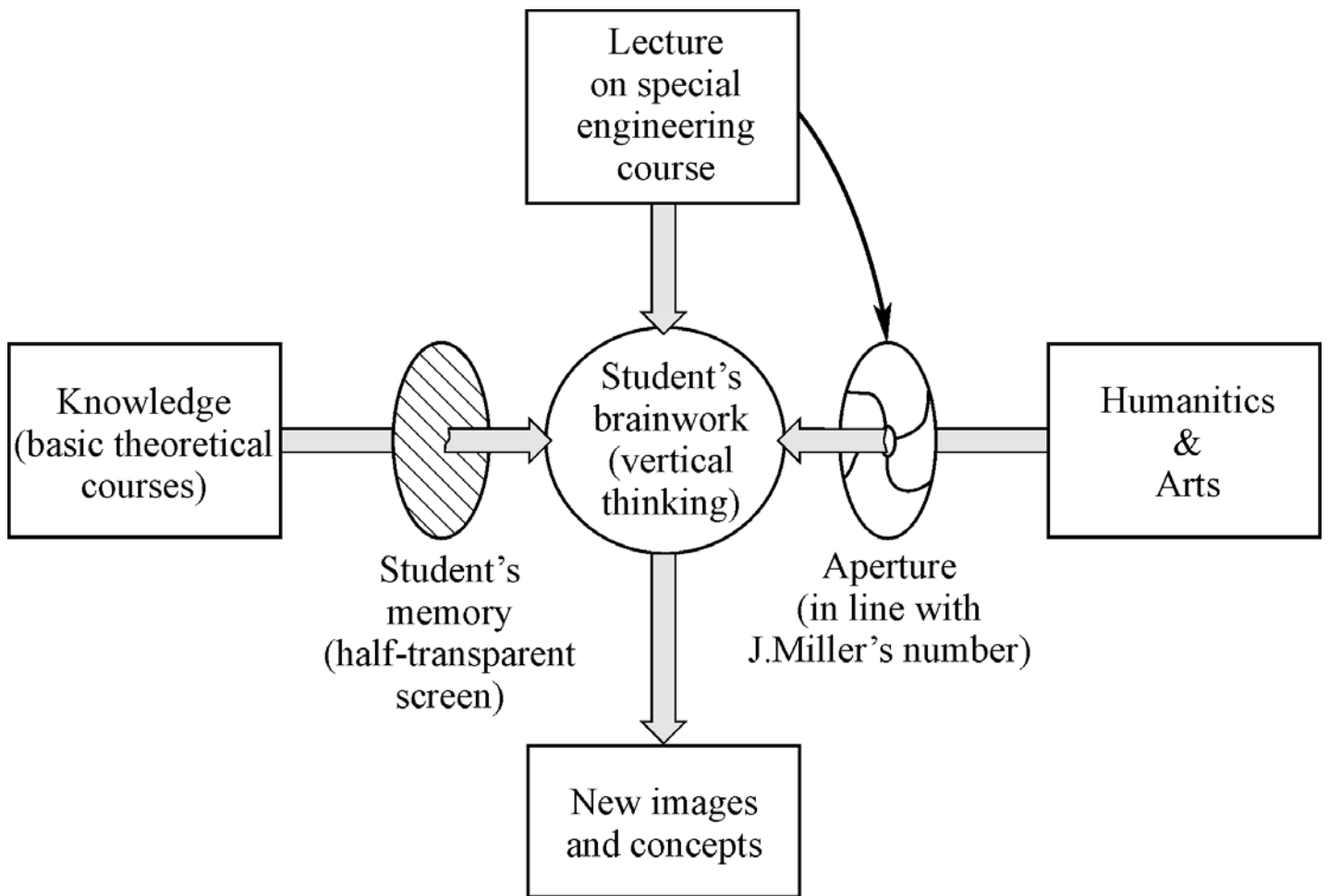


Figure 1. Information flow diagram of the method destined for activating the brainwork.

the number determined by J. Miller. The less essential change in neuron structures of the cerebral cortex occurring in the case permits to keep the post-arbitrary attention to the engineering problem being considered and to obtain the positive effect in perceiving the subject of study (see Fig.1).

PROCEDURES, MEANS AND IMPLEMENTATION

In order to make the best use of the method it is advisable to take, as the starting points, the following keynote concepts and subjects from the area of the ethics, arts, philology, mythology, aesthetics and industrial design:

- "La morale est dans la nature des choses" (J.Necker), that is, morals can be discovered in the technological characteristics of the machines and apparatus as it determines the matter of the work, its intensity and special features.
- Machines and apparatus must be adjusted to a person but not on the contrary (one of the important principles in ergonomics).
- The responsible decisions being taken in the professional situations ought to be in good agreement with the individual moral responsibility but not to be taken under cover of the common one. This principle follows from the A.Schweitzer's idea that everyone ought to have a reverential attitude towards the life. (The idea can be realized by analysing and classifying the possible disputed ethical situations in the branch of the industry being of great interest to the audience).

- Be apprenticed to the nature (suggest broad potentials for application the general structural shapes and features in the living things to technical systems).
- Commentaries on the etymological peculiarities of technical terms being introduced during delivering a lecture. (For example, the autotransformer is more aptly called in German "Spartransformator" for that term shows the economical advantages of apparatus by comparison with English, French, Spanish, Italian and Russian analogous terms, etc.).
- Mythological and biblical subjects reflected in the chefs d'oeuvre of the painting, sculpture, literature and instrumental music. (For example, it can be pointed out the distinctions between the works of art created on the same subject by the dissimilar masters).
- The decisions in the industrial design which are of historical and professional interest. (For example, mention may be made of the constructional features of the high voltage transmission line along the Via Appia built in the 3rd-c. B.C.).

First of all one should use the humanitarian values similarly by association of ideas with the lecture subject matter or with the words describing the separate concepts of the phenomenon being expounded. The use of direct analogies is not excluded either. Each kind of arts (music, poetry, painting, sculpture, architecture, etc.) can be considered in this case not only as assembly of particular works of art but also in respect of its history and art but also in respect of its history and development. Special consideration must be given to the

problems of theory of knowledge in the sensual form emphasizing that the latter ones supplement the scientific cognition of truth.

The informative level of a lecturer in separate kinds of humanities and arts should be at the level of an enlightened amateur or animation like a hobby. It is known that in the latter case the knowledge and even skill of a person in the separate areas of art can be at the level of professional activity. The insufficient competence of a lecturer can result in compromising of the method.

The application of the outlined method of activating the lecture process promotes faster destruction of a barrier between a lecturer and audience which causes the feeling of satisfaction from "meeting" with the objects of world culture and stimulates the interest to spiritual values of the mankind that ultimately promotes the increase of self-appraisal of the students.

The author's experience was gained during lecturing the university courses on "Principles of Scientific Researches", "Reliability and Monitoring in Electrical System Equipment", "Transient Processes in Electrical Systems". On delivering the lectures the ideas of the outstanding thinkers of the 20th century as V. Frankl [5], A. Schweitzer [6], M. Heidegger [7], etc., were used.

Basing on commonness of the psychological features both the creative work in engineering and in all spheres of the arts the peculiarities of the creative work of the great composers, painters and architects as P. Hindemith, A. Schonberg, I. Stravinsky, F. Brangwyn, M. Dobuzhinski, F. Maserel, Le Corbusier, etc., were considered as well as the original engineering solutions having aesthetics value.

CONCLUSION AND RECOMMENDATIONS

It should be noted that the positive result of using the humanitarian values can be achieved only under conditions when the lecturer continually takes a keen interest in spiritual values. Readdressing to the same humanitarian reference points seems inadmissible.

On the way of implementation of the considered method of activating the thinking there are quite a few difficulties since it can not be formalized like the-so-called problem lectures or mentioned above methods of activating the engineering creative work at designing by going to the lateral (unstereotyped or illogical) thinking [8].

In this connection there is a necessity in exchange of opinions between the lecturers even in separate cases of effective application of the method. This is out of question that the outlined method is of interest for the experts in the field of psychology in the university education.

The author comes to the conclusion that the integration of the humanities and arts into engineering education directly at lecturing the engineering courses provides the auspicious conditions to stimulate the students for the active thinking.

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