ANALYSIS OF EXISTING CONCEPTS OF SMART STRUCTURES

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Abstract. *Considering the state of research in the field of smart education, it can be noted that a comprehensive study of many of its aspects has not actually been carried out. The concept of "smart education" is much less common in foreign and domestic scientific literature than, for example, the concept of "e-learning". This article addresses these issues.*

Keywords: physics, *concepts of smart structures, education, smart technologies, e-learning.*

The term "smart technology" has gained popularity relatively recently, but the term itself has been known in the scientific community for the past 40 years. Initially, the term, which appeared in the field of aerospace research, was borrowed by other branches of science. Discourse analysis shows that the concept of "smart" in relation to such categories as structure, technology and materials is quite well-established.

For the first time, the concept of a smart structure was mentioned in the context of aerospace technologies, the creation of which was supported by three trends: the transition to new materials, the use of new material properties, and advances in the field of electronics and information technology [7]. The main function of smart structures is to respond to the environment and changes in it in a predictable (defined) way through sensors, signals, communications and other elements integrated into it. Smart structures are not only capable of supporting or resisting mechanical stress, but they can also reduce vibration, mitigate acoustic noise, maintain the integrity of the structure itself during operation and during its lifetime, and change the shape of structural elements or mechanical properties under the influence of external stimuli.

The concept of a smart structure includes such a concept as smart materials [9]. It is noted that "smart materials" can exhibit the property of "smart" only in interaction with the external environment of the system. Smart materials are characterized by the ability to automatically recognize changes in the external environment and respond to them with a given action.

Considering the state of research in the field of smart education, it can be noted that a comprehensive study of many of its aspects has not actually been carried out. The very concept of "smart education" is much less common in foreign and domestic scientific literature than, for example, the concept of "e-learning". Most of the studies provide specific examples of systems and solutions related to the field of smart education. Examples of the implementation of various systems in the field of education that implement the smart education paradigm are given in [5]. In some of these works, as well as in articles [7] and studies [2], a number of features are considered that are characteristic of systems that comply with the principles of smart education.

The system of concepts in the field of smart education is a loosely structured set of several perspectives from the point of view of which this field is usually considered. The creation of a conceptual scheme is aimed at systematizing several such perspectives. This systematization is necessary to build a general theory of smart education.

The formation of concepts in itself is a methodological technique for conducting research in the field of Smart education. Concepts related to the sphere of smart education are systematized, classifications are created.

Obviously, the creation of classifications and the definition of concepts always reduces the objects and phenomena of a certain subject area to a certain schematic structure. In order for this reduction to be minimal, and also to allow one or another phenomenon, technology, solution, electronic educational resource to be attributed to the field of smart education, it is necessary to show that some resources and technologies are more in line with the field of smart, while others are less . To do this, it is necessary to show how concepts are interconnected, how it is possible that a concept that does not have, for example, all the signs of smart, nevertheless, belongs to this area. It is assumed that, for example, when defining an educational smart technology, we believe that some technologies are better representatives of this class than others, and show on the basis of which we represent this element as the best instance of the class.

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