

The role of smart materials in building a contemporary learning environment

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Abstract:

The educational systems in Egypt follow a trend to advance the educational process in all its axes, and the research discusses one of those axes, the most important of which is the educational environment, where the research problem lies in the lack of optimal utilization of modern technology for intelligent and interactive materials in building an attractive educational environment characterized by flexibility of its internal elements and in line with the physiological and psychological variables at that age. In order to achieve the objectives of the study, the research deals with the different systems of smart materials and their types, the needs of the educational environment in the new system and how to employ smart materials to create a contemporary educational environment that suits the new curricula and systems, and the research extracts a set of results and recommendations that could enhance the educational environments by using interactive smart materials.

Keywords: Sustainable Design, Smart Materials, Intelligent Internal Space, Smart Classes

Introduction:

Conceptual Framework

Modern Materials and their Types

The modern materials and the technological boom that has caused it a great impact on the architecture and interior design in general and the design of furniture in particular, as each material has its own nature, capabilities and limitations, so technology entered to extend to those limits and reconfigure them to have characteristics that were not previously present, therefore, the designer has a major role in finding out these variables in a conscious and renewed manner and formatting them in order to achieve his goals in building his interactive environment.

Bio Materials

It is one of the most important raw materials that have been shed light on and many researches have been conducted on it, as it is produced from renewable energy sources, and through it, carbon dioxide is used in the production of degradable plastics in order to make a quantum leap in the therapeutic systems.

Non-Variable Materials

They are those that are not affected by chemical and physical influences, such as the change in temperature, and they are produced in the form of metal alloys and are used in various functions.

Recyclable Materials

They are those raw materials that are made from crushing the waste of used raw materials and recycle them again, and their quality is usually less than the quality of the original materials.

Semi-Smart Materials

They are the materials that are affected only once by external physical and chemical influences... and others, and cannot be returned to their original condition, which they were easily on.

Smart Material

They are those materials that are distinguished by the ability to easily return to their original condition after changing their external appearance or color after being exposed to an external influence (physical or chemical) after the disappearance of that effect.

Hybrid Materials

They are those raw materials that can be obtained from combining at least two different elements to produce a new element that bears the properties of those elements.

Nano- Materials

They are raw materials of very small sizes, and it is considered a breakthrough in the development of materials through new and innovative functions, so it can be used in some scratch-resistant paints.

The Technological Characteristics that distinguish Smart Materials from Traditional Ones

- The ability to store and sense energy at the time of high temperatures, and to release it when the temperature drops.
- The ability to disassemble and install, light weight, ease of replacement and durability.
- The ability to transform and change to suit the surrounding environment.
- The ability to work in an electronic system, as it is possible to control these materials remotely.

Smart Materials used in Architectural Designs

Smart materials have many shapes and specifications and have different applications to all fields and industries, and the learner here chooses smart materials that are used in architecture, interior design and furniture industry depending on the nature of the research, but there is no formality of the methods of classifying these raw materials, as they are multiple and each has its different applications, so the learner chose the most common classification, which is the classification in terms of reactions.

Summary

- There is a deficiency in preparing the educational environment to suit the new requirements in the developed system for education in the basic education stage.
- The educational environment in basic education schools needs to be developed in parallel with the development in curricula and teaching methods.
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- Raising the level of students' cognitive and exploratory performance by building and structuring the traditional educational environment in basic education schools in a manner that matches the requirements of the new educational system.
- The use of smart materials through some components of the educational environment such as (walls, floors, blackboards, windows, seats and tables) contributes to raising the efficiency of the educational process and helps to develop students' cognitive and exploratory orientations.

Findings

- Smart materials technology and its applications can reshape the concept of architecture, interior design and furniture design.
- The applications of smart materials in the educational environment have an impact on developing the cognitive and exploratory skills of students of the basic education stage.
- Smart materials can be applied to some terms of the educational environment in line with the educational process activities.
- By applying smart materials in the educational environment, we can solve problems related to sustainability, maintenance and design flexibility.

Recommendations

- Encouraging researchers in the field of design to conduct joint research with researchers in the field of Nanoscale and smart materials to find out the latest applications for use in the design field.
- The use of smart materials must be encouraged in all educational environments at the level of the Arab Republic of Egypt, as their benefits are not limited to the development of the educational process only, but most of these materials help in saving energy and assisting in the maintenance process.
- The necessity of conducting studies to determine the extent of the economic feasibility of generalizing the use of smart materials to educational environments.

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