The Relationship between the Display Style of Information In An Augmented Reality Environment And The Level Of Mental Capacity And Its Effect on The Production Skills Of Digital Educational Games and Technological Acceptance Among Educational Technology Students

by

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Summary

Introduction

This study aims to address the incapability in the skills of the Digital Educational Games among students of the Educational Technology in the light of the relationship between the style of displaying information (discrete - integrated) and the level of mental capacity of students and the extent of students' acceptance of this technology.

The problem of the study:

The study problem can be identified in the need to reveal the impact of the interaction between the different display style of layers of augmented reality (discrete - integrated) and the level of mental capacity on the skills of designing and producing digital educational games and technological acceptance among students of educational technology. In order to solve this problem, the current study attempts to answer the main question:

What is the effect of the interaction between layers of information display in augmented reality and mental pursuit on developing the skills of producing digital educational games and technological acceptance among students of educational technology?

The questions of the study:

From this main question, the following sub-questions are branched, which the study tries to answer:

- What are the skills of producing digital educational games to be developed among students of educational technology?

- What are the criteria for designing an augmented reality environment based on the interaction between information displaying style (low- medium-high) and mental capacity (low- medium-high)?

- What is the proposed conception of the augmented reality environment based on the interaction between information displaying style (low- medium-high) and mental capacity (low- medium-high)?

- What is the effect of a difference in information displaying style (separate - integrated) in augmented reality on developing the skills of producing digital educational games and technological acceptance among educational technology students?

- What is the effect of the difference in the level of mental capacity (low - average- high) on developing the skills of producing digital educational games and the technological acceptance of educational technology students?

- What is the effect of the interaction between layers of information displaying with augmented reality and mental capacity on developing the skills of

producing digital educational games and technological acceptance among students of educational technology?

The objectives of the study:
The objectives of this study are:
1. Measuring the effect of the style of presentation the layers of information in augmented reality (discrete) on developing the skills of producing digital educational games and technological acceptance among students of educational technology?
2. Measuring the effect of the style of displaying layers of information display with augmented reality on developing the skills of producing digital educational games and technological acceptance among students of educational technology?
3. Measuring the effect of the level of mental capacity (low) in the augmented reality environment on developing the skills of producing digital educational games and technological acceptance among educational technology students?
4. Measuring the effect of the level of mental capacity (medium) in the augmented reality environment on developing the skills of producing digital educational games and technological acceptance among educational technology students?
5. Measuring the effect of the level of mental capacity (high) in the augmented reality environment on developing the skills of producing digital educational games and technological acceptance among educational technology students?
6. Measuring the effect of the interaction between the (discrete) information display style in augmented reality and the (low) level of mental capacity on developing the skills of producing digital educational games and technological acceptance among educational technology students?
7. Measuring the effect of the interaction between the (discrete) information display style in augmented reality and the (medium) level of mental capacity on developing the skills of producing digital educational games and technological acceptance among educational technology students?
8. Measuring the effect of the interaction between the (discrete) information display pattern in augmented reality and the (high) level of mental capacity on developing the skills of producing digital educational games and technological acceptance among educational technology students?

9. Measuring the effect of the interaction between the (discrete) information display style in augmented reality and the (low) level of mental capacity on developing the skills of producing digital educational games and technological acceptance among educational technology students?

10. Measuring the interaction between the information display style (integrated) in augmented reality and the level of mental capacity (medium) on developing the skills of producing digital educational games and technological acceptance among students of educational technology?

11. Measuring the effect of the interaction between the (integrated) information display style in augmented reality and the (high) level of mental capacity on developing the skills of producing digital educational games and technological acceptance among educational technology students?

The importance of the study :

1-It deals with the variable of displaying layers of information display in augmented reality (discrete-integrated), which was rarely addressed in previous research and studies, which adds new results.

2-It seeks to achieve the most appropriate pattern of displaying layers of information display in augmented reality with students of different mental capacity, as within the limits of the researcher's knowledge, studies have not been conducted in this regard before.

3-Integration of the results of the current study with the results of other studies to benefit the use of augmented reality technology in the teaching process.

4-Providing those in charge of educational design of augmented reality environments with scientific research results related to the design style of activities and the appropriate timing for their submission.

Limitations of the study:

This study is limited to the following limits:

(1) Two modes of displaying layers of augmented reality information display (discrete-integrated), as it is limited to three levels of high capacity (high- medium - low).

(2) Two dependent variables are the skills of producing digital educational games and technological acceptance.

(3) Third year (2021-2022) students of the Department of Educational Technology, The Multimedia Course.

The methodology of the study:

The present study follows the descriptive analytical approach with regard to the study of literature review and previous studies that dealt with augmented reality, the style of displaying layers of information, and the level of mental capacity. The study also follows the quasi-experimental approach with regard to a typical experiment of displaying layers of information in augmented reality according to levels of mental capacity, comparing the experimental groups, and measuring the effect of the interaction between the style of displaying layers of information in augmented reality and mental capacity on the development of educational games production skills and technological acceptance among students of educational technology.

The Experimental design of the study
The research group consists of the educational technology students, Faculty of Specific Education, Fayoum University, and it will be selected and distributed randomly, where the 2×3 factorial design is used, with the application of the following pre and post measurement tools:

Pre- Measuring Tools:
1. The achievement test of the cognitive aspect of the skills of producing digital educational games. (Prepared by the researcher)
2. An observation card to measure the skills of producing digital educational games. (Prepared by the researcher)
3. A graded evaluation card to measure the quality of digital educational games. (Prepared by the researcher)
4. The Mental Capacity Scale to determine the levels of mental capacity of students (Jean Pascaloni, 1970) translated by (Esaad Al-Banna, Hamdi Al-Banna, 1990)

Post-Measurement Tools:
1. The achievement test of the cognitive aspect of the skills of producing digital educational games. (Prepared by the researcher)
2. An observation card to measure the skills of producing digital educational games. (Prepared by the researcher)
3. A graded evaluation card to measure the quality of digital educational games. (Prepared by the researcher)
4. Technology Acceptance scale. (Shaimaa Samir, 2018)

The experimental groups are distributed, as illustrated by the following experimental design:

Post-Measurement Tools	Experimental Processing Application	Pre-Measuring Tools:
√	**mental capacity level**	√

high	medium	low		
Group 3	Group2	Group 1	**discrete**	**the Display Style of Information Layers in the Augmented Reality**
Group 6	Group 5	Group 4	**integrated**	

The hypotheses of the study

First, the hypotheses which is related to the skills of producing educational games:

1. There are no statistically significant differences between the mean scores of the experimental groups in the post-application of the achievement test for the cognitive aspect of the skills of producing digital educational games due to the difference in the style of displaying layers of information in augmented reality (discrete-integrated).

2. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the achievement test for the cognitive aspect of the skills of producing digital educational games due to the difference in the level of mental capacity (low - medium- high).

3. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the achievement test for the cognitive aspect of the skills of producing digital educational games due to the interaction between the style of displaying layers of information in augmented reality (discrete-integrated) and the level of mental capacity (low-medium-high).

4. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the observation card for the skills of producing digital educational games due to the different style of displaying layers of information in augmented reality (discrete-integrated).

5. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the observation card for the skills of producing digital educational games due to the difference in the level of mental capacity (low - medium - high).

6. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the observation card for the skills of producing digital educational games due to the interaction, the pattern of displaying layers of information in augmented reality

(discrete - integrated) and the level of mental capacity (low - medium - high).

7. There are no statistically significant differences between the average scores of the experimental groups in the post application of the digital educational games product evaluation card due to the difference in the style of displaying layers of information in augmented reality (discrete-integrated).

8. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the digital educational games product evaluation card due to the difference in the level of mental capacity (low - medium - high).

9. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the digital educational games product evaluation card due to the pattern of displaying layers of information in augmented reality (discrete - integrated) and the level of mental capacity (low - medium - high).

Second: hypotheses related to the technological acceptance:

10. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the technological acceptance scale due to the difference in the display style of the layers of information in the augmented reality (discrete-integrated).

11. There are no statistically significant differences between the average scores of the experimental groups in the post-application of the technological acceptance scale due to the difference in the level of mental capacity (low - medium - high).

12. There are no statistically significant differences between the average scores of the experimental groups in the post application of the technological acceptance scale due to the interaction, the style of displaying layers of information in augmented reality (discrete - integrated) and the level of mental capacity (low - medium - high).

The variables of the study

First, the independent variables

The style of displaying layers of information in augmented reality, which is divided into:

• Discrete   • Integrated

Second: Classification Variables

The level of mental capacity is divided into:

• Low.
• Medium.
• High.

Third: Dependent Variables:
- Production of digital educational games.
- Technology acceptance.

The tools of the study
    First: Tools used to collect data
- A list of digital educational games production skills.
- List of educational and technical standards for the augmented reality environment.

    Second: Measuring tools
- The achievement test for the cognitive aspect of the skills of producing digital educational games. (prepared by the researcher)
- An observation card to measure the skills of producing digital educational games. (prepared by the researcher)
- A graded evaluation card to measure the quality of digital educational games. (prepared by the researcher)
- A measure of technological acceptance. The researcher adopted a scale (Shaima Samir, 2018)

    Third: The tools used to divide the sample members:
- Mental capacity scale to determine the levels of mental capacity for students. The researcher adopted a scale (Jean Pascaloni, 1970) translated by (Esaad Al-Banna, Hamdi Al-Banna, 1990).

    Fourth: Experimental treatment material:
- An augmented reality environment based on displaying discrete layers of information for the skills of producing digital educational games. (Designed by researcher)
- An augmented reality environment based on displaying layers of integrated information to produce digital educational games. (Designed by researcher)

The findings of the study:
Among the most important findings of the research: The mental capacity of the students (high-intermediate) who studied with the integrated information display style outperformed their fellows who studied with the discrete information display style in the cognitive aspect, the performance aspect, and the evaluation of the product, and they were more receptive to the augmented reality environment, while Low mental capacity students who studied in the discrete information display style outperformed their fellows who studied in the combined information display style the cognitive aspect, the performance aspect, and the product evaluation, and they were more receptive to the augmented reality environment.

The recommendations

From the previously presented results, the research recommendations came as follows:

- Using the augmented reality environment in performing courses, especially universities.
- Applying the current study criteria in the production of augmented reality environments.
- The necessity of taking into account the mental capacity of teachers and designing reality in its light.
- Relying on the integrated information display style with students with high and medium mental capacity.
- Relying on a discrete information display style with students with low mental capacity.
- The need to take into account the extent of students' acceptance of the new technology.
- Inclusion in educational technology courses how to design and produce augmented reality environments.
- The necessity of educating faculty members about the importance of the augmented reality environment and training on it.

Further Studies:

In light of the current study, and previous studies, the researcher recommends the further studies:

- The relationship between the information display style (discrete-integrated) in augmented reality and the level of thinking (analytical, total) on the development of some relevant learning outcomes.
- The relationship between the intensity of stimuli and mental capacity in a learning environment based on augmented reality on visual thinking and cognitive load.
- The relationship between the integrated -discrete information display style in an augmented reality environment based on learning analytics on developing augmented reality production skills and usability.
- The relationship between style of information display patterns in augmented reality and the pattern of navigation on cognitive load and technological acceptance.
- The relationship between information presentation style and its design style on cognitive achievement and academic integration.