

## **Developing 3D Visualization and Multiple Representation of Mathematical Objects Through Game-Based Learning**

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The role of representations is to facilitate the transition from concrete to abstract thinking. In the learning process, concept representations are used to help students understand and connect these concepts with others. Multiple representations offer different perspectives on the observed object, allowing the observer to analyze the object's characteristics from various viewpoints. For the acquisition of knowledge and skills in mathematics, it is necessary to develop the ability of students to transition from one concept representation to another. Achieving satisfactory results in mathematics, natural sciences, and various other sciences requires a certain level of understanding of spatial relationships. Having this in mind, a special mobile application has been created with the aim of developing 3D visualization and representation of mathematical objects through game-based learning for students. Three levels of problems have been created in the mobile application. Within the lecture, after a brief theoretical framework related to various and multiple representations of mathematical concepts, various tasks from all three levels of problems will be presented, along with providing concrete suggestions on how using the application can be effectively implemented into the teaching process.