**An investigation on the use of a Virtual Reality Learning Environment to teach Solid Geometry concepts**

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The study took place at a public junior secondary school in Guyana. A sample size of nineteen (19) students were utilized. These students were randomly subdivided to form two groups, the Treatment group and the Control group. Both groups were taught the Properties of the Cube and the Volume of a Cube. However, the Treatment group was taught with the use of the Solid Geometry software while the Control group was taught the traditional way, the chalk and talk approach. Each group was evaluated with a written test. The following results were obtained (see upper right):

**Evaluation Results**

The traditional pedagogy employed in the teaching of Solid Geometry concepts is said to be insufficient and to some extent not very effective. One of the main problems that students encounter in this subject area, is the ability to visualize its concepts. In the traditional Mathematics classroom, Solid Geometry is taught with the use of textual descriptions and plane representations of solid objects. Students are said to have difficulties understanding the two dimensional figures, which are supposed to be conceptualized from a three dimensional perspective, as such students sometimes misread drawings and cannot identify whether the drawings represent 2D or 3D objects. This form of learning environment is said to lack the opportunities for exploration and manipulation of the objects under study. These are necessary to help students make meaningful connections of the concepts being taught.

It has been suggested that Mathematics Teachers integrate appropriate pedagogical tools that would have students involve in interactive and exploratory activities to aid in the conceptual learning of Solid Geometry concepts. One such tool is the use of technology. A Virtual Reality Learning Environment is said to have tremendous potential in the teaching and learning of Solid Geometry concepts. This is due to its ability to properly represent three dimensional objects. This technology has the ability to do the following:

- Provide a visual 3D representation of Solid Geometry concepts.
- Provide means for the exploration and investigation of solid objects.
- Offer a high degree of interactivity and feedback that will help students to form meaningful connections of the concepts.

**Evaluation Results Cont’d**

The results obtained have revealed that a Virtual Reality Learning Environment has the ability to aid in the conceptual learning of Solid Geometry concepts, since the Treatment group scored higher on the conceptual questions.

**Abstract**

Learning Solid Geometry concepts gives students a sense of: spatial awareness, geometrical intuition and the ability to visualise. Solid Geometry is the foundational study for areas such as: Architecture, Astronomy, Computer Graphics and Engineering. Cognitive skills such as visualisation are pertinent in these areas of study. However, research done on the teaching and learning of Solid Geometry profess that one of the major problems that many students encounter, is the ability to visualise. This deficit that students possess in Solid Geometry education has been linked to the pedagogy employed in the teaching of its concepts. The traditional Mathematics learning environment is said to heavily focus on the applications of mathematical formulas and utilises 2D diagrams and textual descriptions to represent solid objects, which are supposed to be conceptualised from a 3D perspective. Mathematics philosophers suggest the integration of technology in the teaching and learning of Geometry. The use of technology is said to have the ability to engage students in the exploratory learning of Solid Geometry, thus affording students the opportunity to acquire Conceptual knowledge of its concepts.

This paper experimented with a developing technology in Mathematics education, Virtual Reality Learning Environment (VRLE) and its ability to help students acquire Conceptual knowledge of Solid Geometry. Special emphasis was placed on its impact on students’ performance and ability to create interest in the learning of Solid Geometry concepts. According to the results obtained, the Treatment group acquired a higher mean score than the Control group who were taught the traditional way, the chalk and talk approach.

**Keywords:** Conceptual Knowledge, Virtual Reality Learning Environment, exploratory learning, pedagogy, traditional Mathematics learning environment.