Visual Calculus
In an Alternative Educational Setting

Introduction: A BRIEF HISTORY
The Visual Calculus project started in the summer of 2001 supported with funding from The Eisenhower Grant and NASA. The pilot class designed activities for use in local schools. The participants worked in teams and tried one Visual Calculus activity out in local classrooms. As the class continued through the Fall and Spring academic year, the participants refined their activities and designed action research projects which they implemented in local middle schools. During the summer of 2001, the Visual Calculus participants field tested their curriculum with two groups of the Texas PreFreshman Engineering Program (TexPREP) at the University of Texas at El Paso.

Purpose: ALTERNATIVE EDUCATION SETTING
The purpose driving my research is to investigate and conclude if students with behavior problems and in the Alternative Education Program at Magoffin Middle School are capable of performing and learning Calculus concepts through the following:
- Hands-on conceptual learning
- Collaborative group work

Research Approach: Data Collection
The following items were developed and implemented for the purpose of this action research and for the purpose of collecting data:

Parent Permission Notice: Allowing students to participate and be taken video/pictures of during the span of this research project.

Questionnaire: Concerning students’ previous and present math experiences, teachers’ role, and classroom environment.

Current Finding and Recommendation:
The results for this on going research project indicate that middle school students participating in the Alternative Education Program are capable of performing and learning Calculus concepts through visualization illustrative of abstract reasoning. The implications of this study are far reaching in the mathematics educational community. This research indicates that younger students could develop Calculus concepts in the middle school years and enter high school ready to begin their Calculus studies. Further research is needed to refine the curriculum and data.

Theory: Can They Do It?
We believe that young children are capable of developing a strong understanding of calculus concepts if they have been provided a sequence of experiences that clearly build visual understanding or abstract reasoning.

The Visual Calculus Project was initially intended to serve the following:
- TexPREP students (summer engineering camp for local middle and high school students)
- Selected participating middle school students in local school districts.
- Future implementation and practice in local and school districts nation wide.
- Presently, students in the Alternative Education Program

Calculus Pre-test: Concerning a variety of Calculus concepts.
Concept Pre-test: Provided to test students’ knowledge in respect to a specific Calculus concept prior to the performance of activities revolving around that same Calculus concept.
Concept Activities: Revolving around the Calculus concept being studied at any given time.
Concept Post-Test: Provided to test students’ knowledge and understanding of the Calculus concept stressed in the activities.
Calculus Post-Test: Concerning all Calculus concepts studied.

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