

ACT In Algebra: Conceptual Understanding

Robert Mayes

University of Northern Colorado

Department of Mathematical Sciences

Greeley, CO 80639

rmayes@bentley.unco.edu

Abstract

ACT in Algebra is a reform curriculum for College Algebra which has been published in a preliminary edition by WCB McGraw-Hill. ACT represents applications as a central focus, Conceptual understanding as a learning outcome, and Technology as a tool for student exploration and discovery of mathematics. The objective of this presentation will be two fold:

1. *Pedagogical*: To discuss the use of a CAS (Derive or the TI-92) in teaching College Algebra from a modeling perspective.
2. *Research*: To share both quantitative and qualitative research on the effect of using a CAS on students' affect and cognition.

Pedagogical Issues

Students are failing or withdrawing from College Algebra at an average rate of 50% or higher. The traditional lecture format reduces active student participation, resulting in passive and often apathetic student involvement. The focus on manipulation and computation skills further reduces a student's motivation since the mathematics appears to lack application and continuity. The end result of this approach is rote learning. The long term outcomes of rote learning are:

- (1) poor retention of the manipulative and computation skills, since the student lacks the conceptual knowledge to reconstruct the rule once it is forgotten;
- (2) a lack of ability to apply the skills to solve related problems;
- (3) a disconnected view of mathematics as isolated procedures or algorithms;
- (4) a view of mathematics as consisting of memorizing algorithms, definitions and theorems, rather than mathematics as problem solving; and
- (5) a failure to see the utility of mathematics as a tool for modeling problem situations.

ACT in Algebra integrates the use of a CAS in student modeling of real world applications. The goal is to eliminate or at least reduce the five factors stated above. The application of a CAS in the constructiveness pedagogy employed in the text will be discussed.

Research Issues

Research on the effects of using a CAS on students' affect and cognition has been conducted since 1994. Current results of this research will be reported in this presentation, including data collected in the Spring of 1998. Specific research questions which will be discussed are:

Hypothesis 1: How does the ACT Curriculum enhance the student's concept of function?

Hypothesis 2: How does the ACT Curriculum enhance the student's mathematical modeling skills?

Hypothesis 3: How does the ACT Curriculum improve student's emotions, beliefs and attitudes towards mathematics?

Both quantitative and qualitative findings will be presented in this presentation. The results are under analysis at the time of the writing of this paper and will be presented to the audience at the conference. Copies of the results are available from the author at the above e-mail address.