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POSTER/DEMONSTRATION:

THE USE OF RELATIONAL BLOCKS IN TEACHING RELATIONAL DATABASE CONCEPTS

LINDA MERILLAT
Department of Education
Washburn University
1700 College
Topeka, KS 66621
(913) 221-4063 voice
lindam@inf-o.com

DR. ANNE DAUGHERTY
Department of Education
Washburn University
1700 College
Topeka, KS 66621
(785) 231-1010 x1431
zzadaugh@washburn.edu

Abstract

This demonstration will give conference participants an opportunity to see, work with and experience these newly designed manipulative tools, or relational blocks. A quasi-experimental study explored the effects of using these relational blocks to better teach pre-certification teachers basic relational database concepts. The three-week study was conducted with two classes and included a total of 37 students. One class used relational blocks while the other class used note cards. The remaining database concept material was the same for the two different classes. Class A, the control group, had an average pre-test score of 9.9 out of 50 and a post-test score of 27.7. Class B, the experimental group, had an average pre-test score of 16.4 and a post-test score of 34.3. Using ANCOVA, an F value of 28.7 was obtained which is significant at the .01 level.

The Use of Relational Blocks in Teaching Relational Database Concepts

"Mathematics is essentially a mental operation. Pencil and paper can be an aid, especially at more complex levels, but a grasp of basic mathematical concepts is not dependent on symbols or symbolic rendition. Rather, it involves sensory perception and personal reaction." (Rudolph, 1984)

Beginning as young children, human beings strive to put order into their chaotic existence by continually organizing, generalizing, sorting, and categorizing the things in their world. Mathematics is one tool we use to help organize this information. With technology, databases are another practical tool we use to help maintain this same order. The underlying principles of a relational database are very abstract, mathematical constructs.

In many cases, children begin to use mathematical concepts intuitively. "They can generalize by touch and physical perception long before they know the words for the generalizations they form." (Rudolph, 1984) A child understands "round" versus "triangle" versus "square" before they can name those shapes. The benefit of using manipulative objects in teaching abstract mathematical concepts has been documented for several years. Cuisinaire rods, and other manipulatives, are very popular in many school districts and are included in many of those district's educational standards. (JCPS, 2002; GASD, 2002; SCCROE) The use of manipulatives is not limited to just pre-literate students, either. The standards that use Cuisinaire rods in these school districts cover a range of age groups from kindergarten through elementary school. Would introducing the abstract concepts of relational databases to children or individuals at this same level allow for the student to develop or form intuitive understandings of these abstract mathematical concepts at a non-verbal level? In doing so, would the student be better able to apply these concepts in practical ways?

Traditionally, relational database concepts are taught in a very formalized, blackboard approach. The emphasis is on the process, rather than on the underlying abstract concepts. This approach works for many, but not everybody has the same learning style. "Most people are somewhere in between the Analyst and the Visualiser and will have some of the characteristics of both. There is evidence that successful mathematics students are those who can see the patterns and then follow through the procedures when solving a problem. Teaching that responds to the needs of the learner would allow for people with a range of learning styles to learn in the way they learn best." (BDA, 2001)

Relational blocks provide a visual, concrete way for students to access these abstract concepts. Recognizing and changing our classroom environments to respond to a child's multiple intelligences is one of our contemporary challenges. One strategy for providing a richer experience in the classroom is to create "learning centers". "Learning Centers, also called 'Learning Stations', are situations round the classroom that at teacher sets up for students to work in either small group or individual activities. Each of these centers has supplies and materials that work well together and give students the tools to complete activities and mini-project – either in groups of two or three students or individually." (Gardner, 2002) A math center that included puzzles, games, maps, math manipulatives, and a computer could also

include relational blocks; or the relational blocks could be integrated into the core curriculum in other ways.

A quasi-experimental study was conducted to test the usefulness of relational blocks. The participants in this study were pre-certification teachers enrolled in the two different Tues/Thur afternoon sections of ED 250, Educational Technology at Washburn University, Topeka, KS, taught by Dr. Anne Daugherty. The two sections were selected because of their access, their availability to participate in the study, and the close correlation between materials being taught in both classes. The experimental group was selected at random from the two sections.

The basis for evaluation for the students in the study was a pre-test and a post-test. The tests covered the essential concepts presented on relational databases. The test was developed by the researcher specifically for this study and is provided in Appendix 1. The total number of points possible on the test was 50.

The key operational variable is the use of relational blocks. Relational blocks are specially designed blocks that can be manually manipulated by a student or groups of students. The relational blocks provide tactile representations to the abstract database concepts of a database table, a row, an attribute, and the relationships between these objects.

When it was determined that two sections of the ED 250 class were available to participate in the study, one class section was selected at random to be the experimental section.

The study included three weeks of instruction on basic concepts of relational databases. On the first day of class, the students were administered a pre-test. The control group performed several exercises using note cards, while the experimental group used the relational blocks. The instruction for the remaining five class sessions was essentially the same for the two different sections. During the sixth class period, the students were administered a post-test. The pre-test and the post-test were identifical.

During the initial introductory class, the experimental group completed three exercises using the relational blocks. The first one was a simple, abstract exercise; the second one was a conceptual exercise, and the third one was a technically complete exercise.

An analysis of the pre-test and the post-test scores revealed these results

Source	SSadj	df	Msadj	F
Adj	183.0	1	183.026	28.7
Adj Within	351	27	6.4	
Total	534.2			

The obtained F value of 28.7 exceeds 7.72; consequently, we can conclude that the post-test score results were significant at the .01 level.

In summary, the results of the study were encouraging. The results of the post-test were significant and simple observation would indicate that using the relational blocks were beneficial in laying a conceptual framework for the students before introducing the abstract concepts of relational databases. However, because of the small sample size, and because of the vastly different temperaments of the two class sections, more research is needed before firmly establishing the benefit of using relational blocks in teaching the concepts of relational databases.

Poster/Demonstration

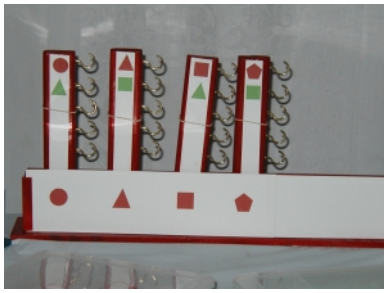
Participants

The target participants for this poster/demonstration activity are educators in corporate, government, or higher education environments that must either teach relational database concepts, or other participants who must use relational databases within their jobs.

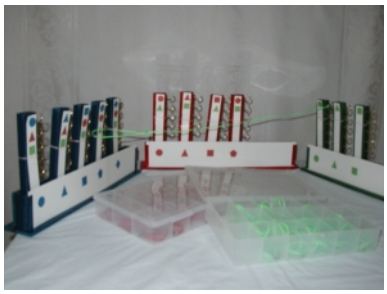
Materials

The primary focus for this poster/demonstration is the relational blocks. Relational blocks are specially designed blocks that can be manually manipulated by a student or groups of students. The relational blocks provide tactile representations to the abstract database concepts of a database table, a row, an attribute, and the relationships between these objects.

A database table is represented by a rectangular shaped open box. Each row within a table is represented by a block that is stood upright within the table, or box. The boxes and blocks, or tables and rows, and color coded. Each block or row has several hooks attached to it. These hooks represent attributes or columns within the row. The table and each row are identified with a label that fits within slots on the front of the box. The attributes or columns within a row are identified with additional labels that are affixed to the block with a rubber band.



Relationships between the data within the tables and rows are illustrated by connecting the hook from one data value to the corresponding data value in another table by using a plastic string with two washers attached to the ends.



The use of relational blocks consists of performing a series of exercises designed to show how data in a relational database is stored and manipulated.

Conference participants will be invited to work through the relational blocks exercises either individually or in small groups. Each exercise takes between 7 and 15 minutes and several groups can be doing exercises at the same time.