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AN ANALYSIS OF STUDENT PERCEPTIONS AND PERFORMANCE AT DATABASE COMPETITION NCC 2004

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ABSTRACT

This paper analyzes information collected from students who competed in the 2nd annual Database Design and Implementation competition held at the 2004 National Collegiate Conference (NCC) sponsored by the Association of Information Technology Professionals (AITP). Situational and behavioral data were collected, such as level of comfort of the environment and the computer lab. We also asked students about their perceptions of the clarity of the problem statement, the level of difficulty, and the amount of time available to complete the problem. Demographic data were also gathered to gauge the participants' level of familiarity and experience with the software, the field of database design and implementation, and their overall experience in the area of Information Systems. Lastly, the performance of each team was recorded so relationships between the different variables and the success level of each team could be examined. The paper describes the contest, presents the collected data in summary form, looks at relationships between the different variables, and draws some conclusions based on the results. The conclusions may be useful to instructors of database courses as the competitors represent a wide cross section of database students across the country. This paper may also help those students who wish to compete in the database contest in the future.

Keywords: database competition, Access competition, contest, student attitudes

INTRODUCTION AND RELATED WORK

The 2nd annual Database Design and Implementation contest was held at *National Collegiate Conference (NCC) 2004*, which is sponsored by the *Association for Information Technology Professionals (AITP)*. NCC 2004 took place in Omaha, Nebraska hosted by the Omaha AITP chapter, Creighton University, and Metropolitan Community College (http:/www.aitp.org/ncc). Participants from 85 colleges and universities from around the country participated in the conference, which included keynote speakers, break-out speakers, ICCP exams, and student competitions. Students competed in Java, COBOL, C++, Visual Basic, network design, systems analysis and design, and web design. Student papers are submitted prior to the conference to the Student Paper Competition (Graduate and Undergraduate divisions), and they could also submit an entry for the AITP web site contest.

This paper describes the Database Design and Implementation contest and its rules, an exit survey administered to the contest participants, and the results of the survey. The results of the survey include the demographics of the participants, as well as their perceptions of certain aspects of the contest, such as length of the problem, the level of difficulty. Cross tabulations are performed for some items, grouping the students into those who scored average or higher and those who scored less than the average.

The rationale for conducting the survey is to help us make a better database competition, which in turn, contributes to a successful conference. We believe that participating in the competitions provides an enhanced educational experience for the student. Most students study in preparation for the competition and often will study harder than they would study for an examination because of the competitiveness. Students can ascertain how they rank in comparison with others from around the country. The competition cuts across the entire Bloom's Taxonomy of Learning [2], addressing every stage: Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation.

There are other contests for university students, such as the *International Collegiate Programming Contest* (ICPC) [3]. This programming contest, sponsored by the Association for Computing Machinery (ACM) [1] and IBM, has winning teams advancing from local contests to regional competitions and finally to the world contest. The world contest pits teams against one another to solve several complex, real-world problems, within a five-hour time frame. The difference between the NCC and the ICPC is that the NCC contests focus on one major component, language, or skill. The ICPC requires students to determine the complexity of the problems, design the requirements, develop the software solution, and develop the test data. Thus the ICPC focuses on the entire software development life cycle.

THE CONTEST

The problem statement for the competition consisted of two components: the ***Design Component*** and the ***Implementation Component***, described below:

Design Component required students to

- draw the ER diagram (entities, relationships, cardinality, and optionality)
- specify the relational schema normalized to 3rd Normal Form, with all primary and foreign keys indicated.

After the student team submitted the design for judging, they were given the Access database which contained the relational tables. Therefore even if a team had not completed the design component correctly, they could still work on the Implementation component.

Implementation Component required students to

- perform operations on Access tables; to create various types of queries; and to develop custom forms, reports, and data access pages.
- develop macros, switchboards, and event procedures in VBA.

The judging used the following for determining each team's score: Design Component 25% and Implementation Component 75%.

THE SURVEY

The first group of questions concerned student demographics, such as their major (CIS, MIS, or Computer Science) and the number of computing classes that they have completed. The rest of the questions used a five point Likert scale, with neutral mid-point, and gathered data concerning

the level of difficulty, amount of time available, clarity of instructions, the lab environment (equipment, lighting, etc.), and the length of each component and of the overall problem.

Demographics

The survey was completed by 82 respondents (70 teams consisting of 1 or 2 members). 62 indicated that they are CIS/MIS majors, 15 Computer Science and 5 "other majors". 69 of the respondents indicated that they had completed 5 or more computing classes (CIS, MIS, or Computer Science), with only 13 students having completed 4 classes or less. This tells us that most of the students are majoring in a computing field and are fairly experienced, having completed 5 or more computing classes.

The students were asked to select any of the following database management systems they had utilized as part of a class: Microsoft Access, Oracle, Microsoft SQL Server, and "Other". 72 students indicated Microsoft Access; 35 Oracle, 24 SQL Server, and 15 other database systems. There has been some discussion among the organizers concerning the use of Access versus Oracle for the implementation phase of the contest. These results indicate an overwhelming number of contestants who have had experience using Access.

Results of the Study

The following table contains the results of questions concerning the overall contest and each of the two components. We have combined the first two categories together (Strongly Agree and Agree) as "Agree" and combined Disagree and Strongly Disagree as "Disagree", in order to summarize the student responses.

Table 1. Percentage "Agree," "Neutral," and "Disagree"

Overall contest:	**% Agree**	**% Neutral**	**%Disagree**
Problem statement was well organized.	72	12	16
The instructions were clear.	63	16	21
The computer equipment was adequate.	72	10	18
The room environment was good.	46	29	24
Satisfied with overall competition.	62	24	13
Design Component:			
I was able to perform most tasks in this part.	61	12	26
Length of problem was too short.	30	35	46
Length of problem was too long.	21	46	33
Implementation Component:			
I was able to perform most tasks in this part.	39	17	44
Length of problem was too short.	15	29	56
Length of problem was too long.	29	34	37

The results indicate that approximately two-thirds of the respondents felt as though the problem statement was well-organized and that the instructions were clear. Approximately three-fourths indicated that the computer equipment was satisfactory; however less than half thought that the

room environment was good. 86% indicated "Agree" or "Neutral" for satisfaction with the overall competition.

For the Design component, 61% were familiar with the modeling tasks required. The results concerning the length of this component were rather mixed. Approximately one-third said that the problem was too short, one-third neutral, and one-third said is was not too short. When asked if the modeling component was too long, almost half indicated neutral, about one-third said it was not too long, and 21% indicated that it was too long. For the Access Implementation component, only 39% indicated that they were familiar with most of the Access operations. Over half (56%) said the length of this component was not too short and 29% indicated that they felt as though it was too long.

Level of Difficulty

The final two questions of the survey asked the student to indicate their perceptions concerning the difficulty of each component of the competition (Part I Design/ER Modeling and Part II Access Implementation) using the following scale: 1-Very Easy, 2-Moderately Easy, 3-Just about right, 4-Moderately Hard, or 5-Very Hard. We felt it would be beneficial to analyze the responses based on the student's success in the competition. The scores ranged from 1 to 69 (out of 100 possible points), with 34 being the average score. 34 was also the median score. We thought it would be beneficial to investigate whether there was a difference between the response of the student who scored average or higher and the student who scored lower than the average. In this way we could determine how the "serious contenders" felt about the level of difficulty compared to those who did not perform as well.

Figures 1 and 2, shown below, examine the frequency distributions of the students' perceptions based on the score they received in the competition. The score is a dependent variable in this case and it is something that is determined after the students competed and completed the assigned project. The students had no knowledge of what score they would receive when they completed the survey at the end of the contest.

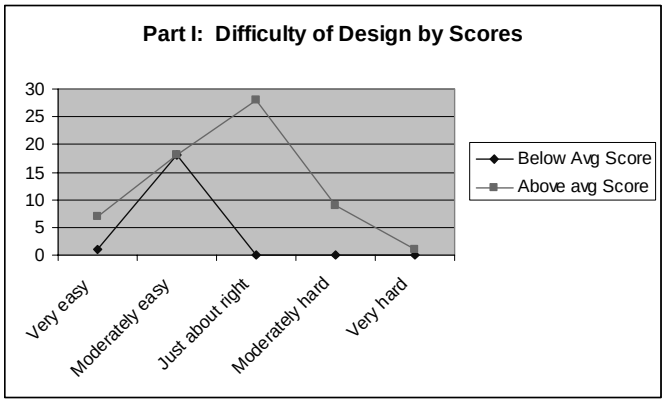

Figure 1. Difficulty of Part I Broken down by Score.

The graph shown in Figure 1 indicates that most students in both groups perceived the level of difficulty for Part I to be moderately easy or just about right. We ran the Wilcox Rank Sum Test to determine whether the perceptions of the level of difficulty of the ER Component between the

two groups have a significant relationship with the score of each group. The test statistics were 3.37 with a p value <.05. This indicates that there is a statistical relationship between the average score of a group and the perception of that group of the difficulty of the ER Modeling component of the problem.

This result is rather counter-intuitive since those who scored low thought that Part I was easier than those who scored higher. One explanation may be that participants who scored low perceived the design component to be fairly easy and did not put forth the necessary effort to receive a higher grade. Another explanation may be that the low-scoring teams used up too much time on Part I and did not have enough time to complete Part II.

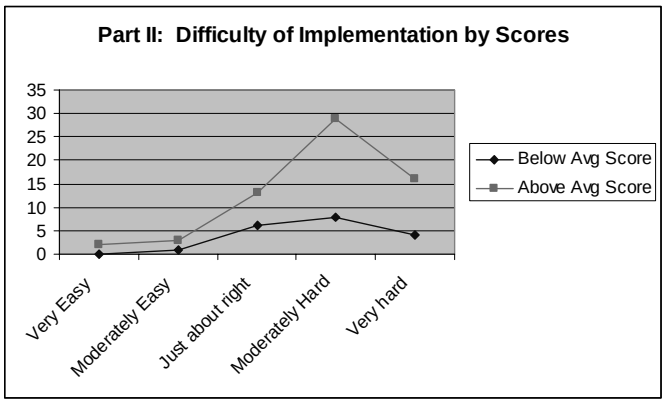

Figure 2. Difficulty of Part II Broken Down by Score

By comparing the graph in Figure 1 with the graph in Figure 2, the graph in Figure 2 is skewed to the right, indicating that more students in both groups felt that Part II had a higher level of difficulty. Statistically, is there any significant difference between the two groups for this question? Again we ran the Wilcoxon Rank Sum Test to see if there is a statistical relationship between each group's score and the perceived level of difficulty by that group. The test statistics were 0.50 with a p value > .05. Thus there is no significant difference between the two groups for this question. This result is somewhat surprising because we thought that the low scoring teams would probably indicate that the Access component had a higher level of difficulty than the higher scoring teams.

In Figures 3 and 4 below, we took an independent variable, the number of computing classes that the students had completed successfully up to that time and charted frequency distributions of their perceptions grouped by the number of courses taken. We decided to group all the students who had taken 4 or fewer courses into one group and those who had completed more than 4 courses into another group and look at their responses to our survey based on this categorization. We chose to use 4 as the break point because 4 or fewer classes would generally indicate a student who is in the first two years of study in a computing major, and 4 or more courses generally indicates students who are in their Junior and Senior years of study.

Figure 3 depicts the responses from Group 1(4 classes or less) and Group 2 (5 or more classes) for the level of difficulty of Part I (Design Component.) The graphs are skewed to the left indicating that more students in both groups felt that Part I had a lower level of difficulty.

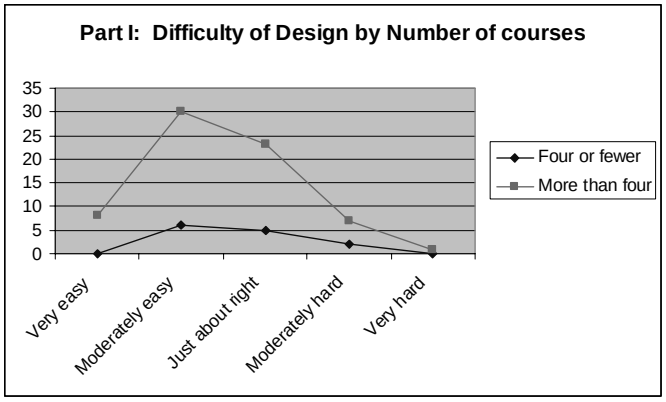

Figure 3. Difficulty Part I Broken Down by Number of Courses

Running the Wilcoxon Sum Test. the test statistics were .62 with a p value of > .05. This indicates that there is no relationship between the number of courses a participant had taken and the perception of level of difficulty of the ER Modeling component. Thus statistically there is no significant difference between the responses of the two groups for this question.

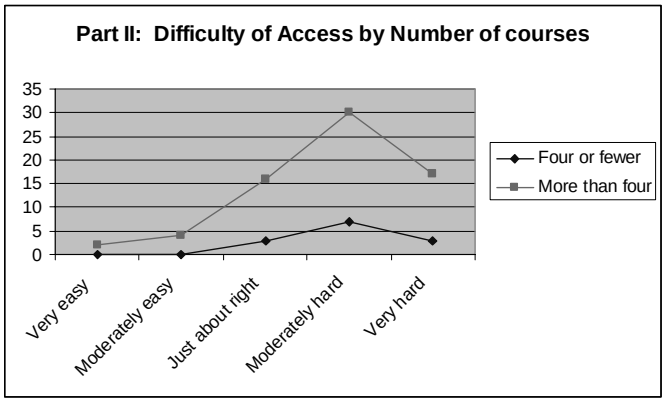

Figure 4. Difficulty Part II Broken Down by Number of Courses

Again we performed the Wilcoxon Rank Sum Test to determine whether the number of courses taken, had a relationship with the perceived levels of difficulty of the Implementation component. The test statistics were .45 with a p value > 0.05. Surprisingly, there is no significant difference between the responses of the two groups concerning the level of difficulty of Part II.

CONCLUSION

The 2nd annual Database Design and Implementation competition was held at the AITP National Collegiate Conference 2004 in Omaha. As organizers of the competition, we received several favorable comments from faculty, sponsors, and students. However, to help us improve the contest for next year, we conducted a survey of the contest participants to determine their perceptions concerning various aspects of the contest. The results of this survey have been presented.

There has been some discussion among the contest organizers concerning the use of Oracle versus Access in the Implementation phase. The results of this survey indicate that an

overwhelming number of students are using Access as part of one or more database courses. However, the contest had been advertised as utilizing Access, so students who only know Oracle or SQL Server may have decided not to compete. Our survey was administered only to those students who participated in the database contest, and would not give us any data to support that theory. Based on the results of the survey, the contest organizers have decided to use Access again for the 2005 Database contest to be held in April 2005 in Atlanta, Georgia.

The survey showed that while most contestants perceived the computer equipment to be adequate, they generally were not satisfied with the room accommodations. A similar survey was administered at the first Database contest held in 2003 and those participants also felt there were problems concerning the accommodations [4]. This is a factor which we may or may not be able to control, but we plan to ask more detail concerning the room accommodations to determine whether we need better temperature control, more seating room, etc.

A large number of students felt that the Access Implementation component was too long and that they did not have adequate time to complete most of the tasks. If this were a typical examination for a database class, then there is no doubt that the exam should be shortened. However, this is a national contest whose purpose is to determine which team can perform the most tasks correctly in a short amount of time. A few of the teams managed to perform some work for all of the tasks; therefore we do not plan to shorten the length of the problem significantly for the 2005 contest.

When we grouped the students by scores and looked at their perceptions concerning the level of difficulty, we found that that there is no relationship between the group's score and the perceived level of difficulty for Part II (Access Implementation). There was significant difference between the responses of the two groups for Part I; the low scoring group perceived Part I to be easier than the high scoring group.

We also wanted to determine if there was a difference between the responses of students who had completed four or fewer computing classes and those that had completed five or more. We thought that the less experienced student may perceive the contest to be more difficult than the more experienced students. However, the statistics did not bear this out and we found no significant difference between the responses of the two groups.

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