

ECE231

Fall 2008

Knowledge Probe Analysis

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ABET Outcomes probed: A, B, C

Relevant pre- and co-requisite classes: ECE 131

1. Probe instruction

The knowledge probe (KP) quiz is consisted of five questions. To encourage the students participate in the assessment, this quiz is given to the students and counted as part of their grades in the class. The students were given 20 minutes to answer the questions in class at the last week of the semester. The KPs returned by the students are attached.

2. Probe purposes

Question 1

This question was meant to address outcome A. This question was meant to determine if students have a very basic knowledge of counting technique in probability theory. It is useful here to use a tree diagram when studying probabilities of events. I expected 95% of the students to answer this question correctly.

Question 2

This question was meant to address outcome A. The knowledge necessary to answer the question is the basic combinatory and probability of an event, and I expected 85% of the students to get both parts of this question correct.

Question 3

The first part of this question was meant to address outcomes B and C. This question asked the students to write an algorithm that computed a simple statistic associated with a data set and I expected that 80% of the students could perform this task successfully. The second part of this question asked the students to analyze the running time of the algorithm, this was meant to address outcome A. I expected 70% of the students to correctly answer this question.

Question 4

The first part of this question was meant to address outcomes B and C. The knowledge necessary to answer the question is recursion; they should have been gained it in the current course. I expected 90% of the students to correctly answer this question. The second part of this question asked the students to analyze the running time of the

algorithm, this was meant to address outcome A. I expected 70% of the students to correctly answer this question.

Question 5

This question was meant to address outcomes A. The knowledge necessary to answer the question is abstract data type, data structure and their close relations. They should have been gained it in the current course. I expected 80% of the students to correctly answer this question.

3. Probe results

Totally sixteen students (twenty students are registered in the class) took the knowledge probe quiz. The results for each question are outlined as follows:

Question 1

Only nine of the students answered the question correctly. Five others tried to count all the possible choices, but did not arrive at the correct answer. Two students did not know how to solve it.

Question 2

Five of the student gave the correct answer for part one in this question and eight of them answered the second part correctly. Four of the students wrote down the correct equation $\binom{5}{2}$ for part one, but they could not arrive at the correct result. Seven students did this whole question wrong. They could not use the basic math and probability knowledge to solve this question.

Question 3

Eight students could write an algorithm that computed the statistic for a data set and get the correct running time for the algorithm, but five others could not give a correct solution. And seven students don't know how to analyze the running time of their algorithm. Three students could not finish their answer.

Question 4

Only five students can use recursion correctly to solve the problem and show the algorithm, but none of them can solve the running time of the recurrence correctly and get the close form of running time.

Question 5

Only three students answer the question correctly, most students did it wrong or did not have a clue to solve it.

4. Analysis

- 1) The mathematics preparation of the students did not match my expectations. In particular, knowledge of basic probability theory does not seem to be sufficient.

- 2) The understanding of ADTs and their implementation with specific data structure and their differences are difficult for students to understand. Especially, some students did not have sufficient basic programming skills. About half students in the class think they did not get enough preparation from ECE131. They have a big difficulty to understand of the object-oriented concept and design in C++.
- 3) The students' ability to use asymptotic analysis is weak. Especially to derive the running of a recursion algorithm. Some of this maybe due to the fact that this topic is taught at the end of semester, and the students did not have time to get practice in homework exercises. This part will be emphasized in ECE331.

5. Suggestions

- The basic programming skills should be probed at the beginning of the semester. For example, primitive data types, arrays, pointers, control flow, structured programming, function calls and parameter passing etc. The instructor can then detect the knowledge status of the students to adjust or change course material to give students a smoother transition
- In order to improve student learning, instructors could identify concepts that are difficult for students to understand. eg, ADT, recursion etc. and search effective teaching methods and more insight to help students understanding