Action Research Program 2006
Proposal

An Analysis of Interactive Learning
using “Clickers”

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Introduction and Background

A 2005 Grassroots TEK Initiative project was undertaken using a Personal Response System (“clickers”) in combination with a peer instruction teaching strategy. The strategy was based on the use of probing questions to elicit student discussion in order to promote knowledge synthesis.

Literature has focused on evaluating the use of the technology from the standpoint of various stakeholders (Crouch & Mazur (2001), Nicol & Boyle (2003) and others). The effectiveness, or learning improvement, of peer instruction has also been studied most notably in a compelling review by Hake (1998). A qualitative assessment of student perceptions over the past year confirms these findings.

The proposed research is unique from the literature because the focus will be on the instructional questioning technique. Specifically, the strategy will be analyzed and modified based on an evaluation of the questions used for student engagement, an assessment of the quality of student responses, and the impact of an external motivator on this interaction.

This particular research study is important because it builds upon initial Grassroots experience for the instructor and provides an opportunity to inform the BCIT community of improved instructional practice in the area of peer instruction and “clicker” technology.

Problem Statement

Previous studies have demonstrated that “clickers”, and peer instruction, have a positive impact on participation and learning. Experience using the “clickers” revealed that student preparation for these sessions impacted quality of engagement. It also revealed the important role that good, conceptual questions have in challenging learners to understand the concept under study and to stimulate interaction. Not all questions elicited the same level of cognition. Meaningful student participation and learning appears impacted by both student preparation and the level of discernment provided by the questions; both of these aspects warrant further investigation.

Research Questions

Q1. Based on a statistical analysis of student responses to “clicker” questions, which questions used in the “clicker” sessions proved most useful in challenging students and stimulating deeper thought?

Q2. Does a statistical analysis of student response data reveal a correlation between student preparation activities before the “clicker” sessions and the quality of student performance during the “clicker” sessions?

Q3. What common attributes link the most effective item response questions? What common attributes link the most ineffective item response questions?
Methodology
This study is based on a quantitative analysis of three separate cohorts where peer instructional techniques featuring “clicker” technology was used to assess student learning.

The critical, quantitative statistical evaluation of the existing database of questions and related data collected in the first two implementations of the “clicker”-based peer instruction will form the basis for the research. The data will be analyzed in the context of both classical theory of test and item response theory.

A framework will be developed with the objective of identifying optimum questions for employing peer instruction using “clickers”. Characteristics of the “best” and “worst” questions will be identified and generalized into guidelines for designing “clicker” questions for the peer instruction technique. The statistical data and the instructor’s experience, as participant-observer, will be used together to determine whether or not different student preparation activities impacted the quality of student responses in the “clicker” sessions, and if possible, identify which preparation activities are most effective. The following table outlines the variables (data), tests and results to be used to address each of the research questions presented above.

<table>
<thead>
<tr>
<th>Research Question #</th>
<th>Variables / Data</th>
<th>Test</th>
<th>Result(s)</th>
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<tbody>
<tr>
<td>Q1</td>
<td>Student responses to “clicker” questions</td>
<td>Item Response Theory</td>
<td>Identify the level of difficulty and discrimination of “clicker” questions</td>
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<tr>
<td>Q1</td>
<td>Student responses to “clicker” questions</td>
<td>Classical Theory of Test</td>
<td>Identify the level of difficulty and discrimination of the “clicker” questions</td>
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<td>Q2</td>
<td>Student responses to “clicker” questions</td>
<td>ANOVA (Analysis of variance)</td>
<td>Compare various treatments and the effect on student responses</td>
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<td>Q3</td>
<td>Results from the Classical Theory of Test and the Item Response Theory tests</td>
<td>Comparison and analysis</td>
<td>Identify question attributes and design framework for guiding question development</td>
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References


### Signatures

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<tr>
<th>Principal Investigator</th>
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