An Examination of the Questioning Habits of Pre-Service Teachers when Planning for Student Learning

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Introduction/need for research

Questions used by teachers in the classroom to facilitate learning can influence the way students engage with the content and how well they learn the material (Chin, 2004). Cotton found teachers spend between 35-50% of their time in the classroom questioning their students (2001). With such a significant amount of time being devoted to questioning, it's important teachers utilize questioning strategies effectively. While controversy exists over the exact definition of a question as a teaching method, Sanders defines a question as any task requiring cognitive action that necessitates the student produces an answer and is not necessarily worded in the form of a statement followed by a question mark (Sanders, 1966). Most researchers agree higher-order, divergent questioning strategies yields higher student achievement (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Higher-order questioning can be defined as requiring students to transform data in order to craft a response and be able to justify it (Redfield & Rousseau, 1981).

Conceptual Framework

High-order, divergent questioning strategies are the most successful questioning techniques for increasing student learning (Croom & Stair, 2005; Ornstein & Lasley, 2004; Lustick, 2010). Pre-service teachers have been shown to be more efficient and accurate at categorizing and utilizing questions at a higher level after instruction on Bloom's *Taxonomy of Educational Objectives* (Newton, 1969). Additionally, studies revealed pre-service teachers exposed to microteaching and peer teaching methods during training utilized higher order questions more frequently than their peers who were exposed to observation and peer-lecture-discussion groups throughout their student teaching experience (Sounders et al., 1976). The conceptual framework of this study utilizes the question structure founded in Gallagher & Ascher (1963). The structure separates questions into four main categories: cognitive memory, convergent thinking, divergent thinking, and evaluative thinking. They refer to questions causing students to process given information in some way and range from very close-ended questions to very-open-ended questions.

Methodology

This study analyzed the lesson plans of 18 pre-service teachers in an ex-post-facto pre-post design. Of the 18 students enrolled in Methods and Materials in Teaching Agriculture, 78% were female and 67% were seniors with 33% as juniors. All participants were exposed to the same conditions over the course of the semester long class. Each micro-teaching lesson plan focused on one of the seven teaching methods; demonstration, lecture, questioning, discussion, cooperative learning, inquiry, and individual application (Roberts, Stripling, & Estepp, 2010). The plans were then placed into three categories based on the specific instruction received by the pre-service teachers at the time of teaching: pre-instruction, during instruction, and post-instruction. 'Pre-instruction' included lessons one and two which occurred before any specific instruction on questioning. Lesson three was categorized as 'during' because the lesson was aimed at focusing on questioning as a teaching method. Lessons four through seven were categorized as 'post-instruction' because students had received instruction on questioning prior

to the development of these lesson plans. Any question posed by the participant in their lesson plan was highlighted and coded using a literature based flow chart into at least one of the 5 questioning categories (cognitive memory, convergent thinking, divergent thinking, evaluative thinking, procedural, yes/no questions, or rhetorical).

Findings

The first objective was to describe the types of questions posed by the preservice teachers in their lesson plans. Pre-instruction the average number of questions was 6.3 (L1=4.5, L2=8.1), during instruction the average number of questions was 13.4, while post instruction the average decreased to 6.1 (L4=7.6, L5=5.2, L6=6.0, L7=5.7).

To help describe the specific types of questions asked the totals of each type of questions were analyzed. Rhetorical and procedural questions were omitted because they are not focused on student learning. Cognitive–memory questions showed little change over the course of the semester in terms of the percentage of questions asked. Beginning with 26.7% during pre-instruction, cognitive-memory questions increased to 28.9% during instruction, and decreased to 24.2% post-instruction. Convergent thinking began at 15.1% pre-instruction, increased to 21.9% during instruction, and decreased to 14.8% post-instruction. Divergent thinking questions showed a significant increase throughout the study. Pre-instruction, pre-service teachers utilized divergent thinking questions 22.6% of the time, compared to 29.3% during instruction, and 33.8% following instruction. Evaluative thinking was utilized the least out of all the questioning categories. Pre-instructions lessons were evaluative 2.7% of the time, during instruction, 3.7% of total questions and 9.0% during post-instruction lessons. Yes/No type questions decreased in use throughout the study, beginning with 16.4% pre-instruction. During instruction, yes/no questions decreased to 9.9% and 9.3% post-instruction.

There was a significant change in the number and type of questions between all three matched pairs of lessons. Overall the number of questions planned by pre-service teachers post instruction changed from before the instruction; $t(89)=2.84$, $p=.029$. While it also changed between Pre and during ($t(89)=3.82$, $p=.007$) and between during and post-instruction ($t(89)=3.46$, $p=0.011$). See Table 2 for detailed differences between groups.

Conclusions and Implications

The most significant findings from this study are in the area of divergent questioning habits and total questions compared to quality of questions asked by pre-service teachers. Divergent questioning increased significantly with instruction and experience over time. Overall, there is an increase in utilization of higher-order questions (divergent) compared to lower-order questions (cognitive-memory and convergent thinking). It is also notable that questioning ability continued to increase after initial instruction, suggesting experience benefits pre-service teachers in the development of efficient questioning habits. Pre-service teachers increased their use of questions when told to focus on questioning as a teaching method. This trend when compared to the improvement in quality of questions indicates students improve the effectiveness of their questioning habits over time with instruction and experience.

The largest limitation to this study is that questioning classification is subjective, especially when questions are analyzed out of context. This limitation was minimized by reading the entire lesson plan and using a flowchart to determine questioning classification. Classification can also be complicated by a large degree of variance in the student population.

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