

Identifying the Taxonomy of Questions Used by Experienced Agriculture Educators

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Introduction

Questioning is vital for critical thinking, active engagement, and curiosity. It helps assess understanding, encourages collaboration, and personalizes learning. Effective questioning encourages students to actively engage with the material, rather than passively receiving information (Lewis & Smith, 1993; Shanmugavelu, 2020). Additionally, questions in the learning process can lead to retention of the content, develop communication skills, and prepare students for real world challenges (Corley & Rauscher, 2013). Teachers can gauge students' comprehension levels using questioning as assessment or a measurement tool allowing them to identify areas where students may be struggling and adjust their teaching accordingly. (Krathwohl, 2002; Lewis & Smith, 1993; Wilen, 1991). Questioning also provides teachers insight into students' misconceptions, enabling them to provide timely feedback and address misunderstandings. Moreover, it also encourages students to reflect on their own learning processes. These assessment pieces can be formative or summative in nature but require prior planning by the teacher.

Well-crafted questions can spark meaningful discussions among students, allowing them to share their perspectives, debate ideas, and collaborate with their peers (Wilen, 1991). Using thoughtful questioning helps students to think critically about materials, analyze concepts, and make connections to previous knowledge or experiences. If questions are intentionally created as a part of the learning process, students will be able to critically think and become better independent learners. This research examines and categorizes the type of questioning used by experienced agriculture educators through the taxonomy of questions.

Theoretical and Conceptual Framework

Tofade et al. (2013) proposed a taxonomy of questions building on the prior works of Bloom (1956) and Anderson and Krathwohl (2001). The taxonomy of questions served as the conceptual framework for this study. The questions were quantified first by convergent or divergent categories and then by focal, brainstorm, shotgun, and funnel categories. Convergent questions are closed and do not offer many answer options. They also converge on a narrow list of "best" answers and encourage focused, succinct responses. Divergent questions are open and could have multiple answers which permits the exploration of diverse perspectives and encourages dialogs. Students must justify a position in focal questions including a why or why not in their answers. Questions that generate lists of ideas or viewpoints are brainstorming questions. Questions that contain several content areas with no link are shotgun questions. Multiple questions in a row that start broadly and lead to more focused inquiry are funnel questions. These definitions question types were provided by Tofade et al. (2013).

Methodology

This study used a quantitative approach for examining the classroom practices of experienced teachers. Classroom observations were analyzed as part of a larger study of experienced teachers. Four Florida teachers were selected to participate in this study. The teachers' experience in the classroom was: Teacher 1, 8 years; Teacher 2, 4 years; Teacher 3, 13 years; and Teacher 4, 7 years. These teachers were identified as effective teachers. Three individuals not involved with the study, but with a working relationship with the teachers (state

staff, teacher educators, department of education consultants) were asked to develop a list of teachers they considered effective. The lists were triangulated, and teachers appeared on multiple lists and were selected to participate. Since the teachers were selected for this study using non-probability sampling procedures, this study cannot be generalized to a larger population. Data was collected through video of classroom instruction as part of a larger study. The videos were analyzed, and questions asked were recorded for each class period. The questions were sorted using a priori coding based on the recommendations of Tofade et al. (2013), types of nonhierarchical questions used as teaching tools. An additional category was added to the question categories labeled routine which includes questions pertaining to how the classroom functions but does not have to be related to content, such as checks for understanding and/or classroom management.

Results/Findings

There were 16 hours and 42 minutes of recorded observations and 439 questions coded. Teacher 1 asked 142 total questions, 91 were convergent and 51 were divergent. Teacher 2 asked 128 total questions, 99 were convergent and 29 were divergent. Teacher 3 asked 97 total questions, 86 were convergent and 11 were divergent. Teacher 4 asked 103 total questions, 87 were convergent and 16 were divergent.

Table 1

Frequency and percentage of questions asked during observation

	Total Questions	Focal <i>f</i> (%)	Brainstorming <i>f</i> (%)	Shotgun <i>f</i> (%)	Funnel <i>f</i> (%)	Routine <i>f</i> (%)
Teacher 1	91	15	39	35	48	5
Teacher 2	128	18	23	39	38	10
Teacher 3	97	6	13	9	39	30
Teacher 4	103	9	22	22	41	9

Conclusions/Implications/Recommendations/Impact

This study provides insight into the breakdown of questions experienced agriculture teachers asked in their classes. These results are not generalizable, but the analysis provides an overview of how SBAE teachers use questions in their instruction. The teachers asked more convergent than divergent questions, however there was a range in ratio of these question distribution. All four teachers had more convergent questions than divergent questions. These questions ranged from yes or no answers to definition and terminology questions. This observational data supports that teachers use lower-order questions more often than higher-order questions. The additional category of routine was added to include questions that were more classroom management in nature. A limitation of this study was the number of teachers observed. Teachers' questions were also impacted by delivering different content utilizing different methods. To investigate questioning more thoroughly, longer observation time of a more diverse set of teaching methods would be appropriate.

Teachers can integrate higher-order thinking questions into their lessons if they understand the taxonomy of questions. Including questions that are at a higher level will not only engage learners better but will increase understanding, knowledge retention, and will help teachers identify misunderstandings. A recommendation for future research would be to examine teacher planning materials to determine how questions are developed and guided through planning. The impact of this study highlights the necessity of questioning in classroom lessons

and the intentionality of teachers including these moments for students to actively reflect and engage in their learning.

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