

Teachers' Perceptions and Practices of Inquiry-Based Teaching and Learning Using CASE Curriculum

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Introduction

Background

- *Transforming Agricultural Education for a Changing World* (2009, p.16), states "Agriculture now so thoroughly combines basic and applied aspects of the traditional STEM disciplines....".
- One of the research priority areas of the American Association for Agricultural Education (AAAE) National Research Agenda (Stripling & Ricketts, 2016) focuses on effective integrated STEM education in school-based agricultural education pedagogy.
- Agriculture educators are taking actions to explore innovative teaching strategies to increase student achievement in both agriculture and STEM subjects (Wells et al., 2015).
- It is vital that the agricultural education field makes the changes necessary to keep up with the endlessly expanding field.

Perceiving the needs for more inquiry-based educational resources that aim to help students learn STEM in agriculture, food, and natural resources, the Curriculum for Agricultural Science Education (CASE) institute collaborated with several states, such as Georgia, Indiana, Iowa, Texas, to co-develop the two foundational that use inquiry-based instructions, which has expanded to ten.

Rationale

Previous studies looked at:

- CASE Teacher's science teaching efficacy (Ulmer, Velez, Lambert, Thompson, Burris, Witt, 2013)
- High school students perceptions of the yearlong curriculum (Velez, Lambert, Elliott, 2012).

No information about how teachers are using CASE once they leave the 10 day intensive training exists.

Information regarding teachers' knowledge of inquiry-based learning, which is what the curriculum is built upon is also absent in the literature. Based on the current research, we have created three research questions, to gain more information about how teachers are using CASE and inquiry-based learning and teaching.

Questions

This research study has three guiding questions:

1. What are CASE trained teachers' understanding and experiences as related to inquiry-based teaching and learning?
2. What are CASE trained teachers' perceptions of using CASE curriculum with respect to inquiry-based instruction?
3. How does CASE trained teachers use CASE curriculum to practice (implement) inquiry-based instruction?

These questions served as a guide for 3 blocks of questions created in a Qualtrics based survey.

Methods

This study was conducted using Curriculum for Agricultural Science Education (CASE) certified teachers in two different areas.

- Agriculture, Food and Natural Resources (AFNR)
- Food Science and Safety (FSS)

These two areas were selected as AFNR is an introductory or foundational level to inquiry based learning, and FSS is one of several higher, or more advanced level courses according to CASE's pathways. By selecting two varying levels, we intend to compare perceptions of inquiry-based learning and teaching between the two groups of teachers.

A list of certified teachers and access to curriculum was obtained from CASE under a confidentiality agreement.

- A pilot study was created and a survey was sent to 8 lead teachers, 4 from each area.
- Once feedback was received and modifications were made, the survey was sent to 1,300+ teachers via an online program called Qualtrics.

As a measure, the curriculum was coded twice for reliability by the researchers, using a rubric created by the National Science Teachers Association (NSTA) and information from *Defining Inquiry* (Martin-Hansen, 2002).

FIGURE 1
Essential features of classroom inquiry and their variations.

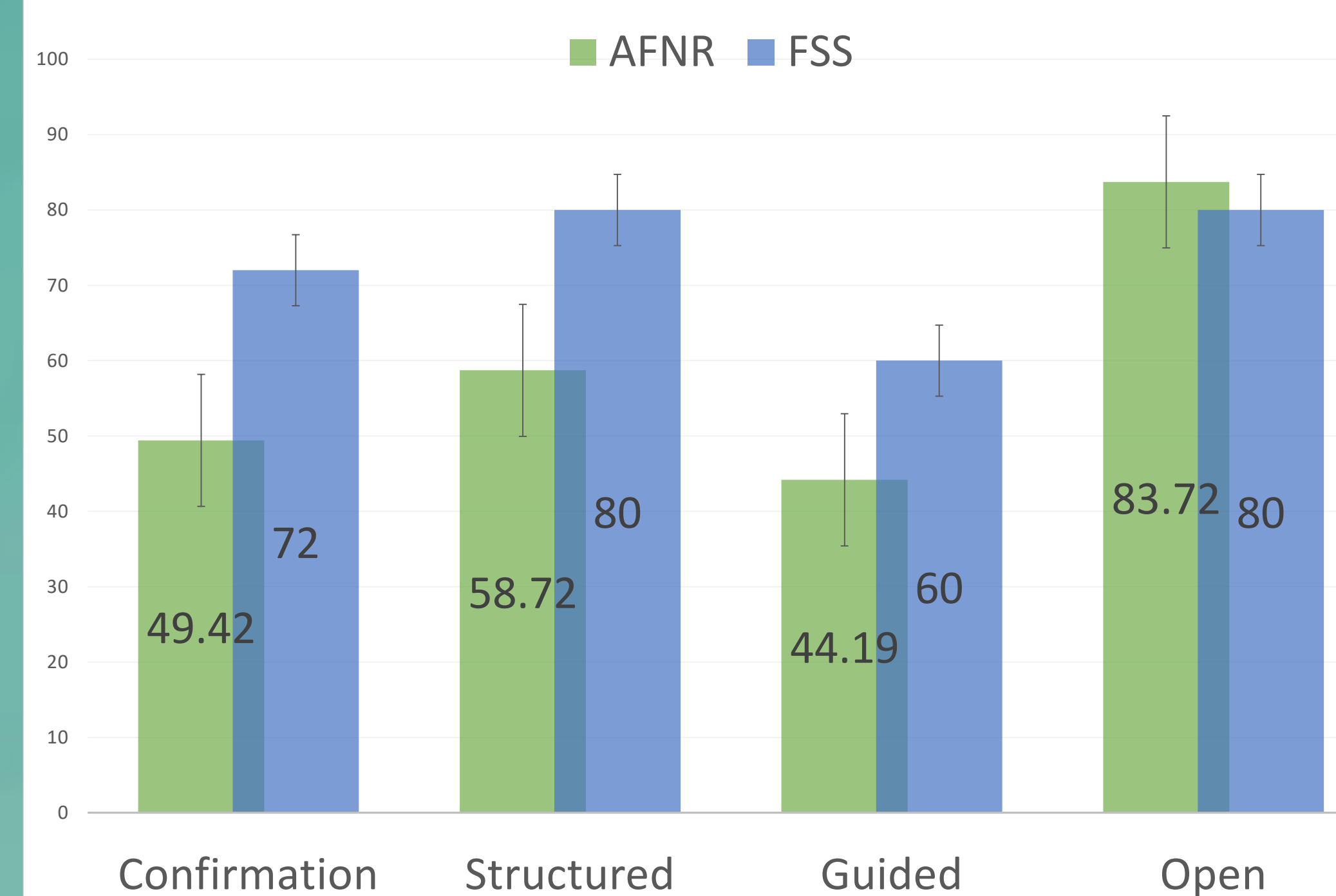
| Essential feature | Variations | | | |
|---|--|---|--|--|
| 1. Learner engages in scientifically oriented questions | Learner poses a question | Learner selects among questions, poses new questions | Learner sharpens or clarifies question provided by teacher, materials, or other source | Learner engages in questions provided by teacher or other source |
| 2. Learner gives evidence priority in responding to questions | Learner determines what constitutes evidence and collects it | Learner directed to collect certain data | Learner given data and asked to analyze | Learner given data and told how to analyze |
| 3. Learner formulates explanations from evidence | Learner formulates explanation after summarizing evidence | Learner guided in formulating explanations from evidence | Learner given possible ways to use evidence to formulate explanation | Learner provided with evidence |
| 4. Learner connects explanations to scientific knowledge | Learner independently examines other resources and forms the links to explanations | Learner directed toward areas and sources of scientific knowledge | Learner given possible connections | |
| 5. Learner communicates and justifies explanations | Learner forms reasonable and logical argument to communicate explanations | Learner coached in development of communication | Learner provided broad guidelines to use sharpened communication | Learner given steps and procedures for communication |

More ----- Amount of learner self-direction ----- Less
Less ----- Amount of direction from teacher or material ----- More

This rubric is commonly used in agricultural education and science education, serves as the foundation of CASE's APP (activities, projects, problems) model. The purpose was to see teachers views of inquiry, based on how they coded various lessons of their choosing. One being a lesson they felt was successful at using inquiry, one they felt was unsuccessful, and one that was their favorite.

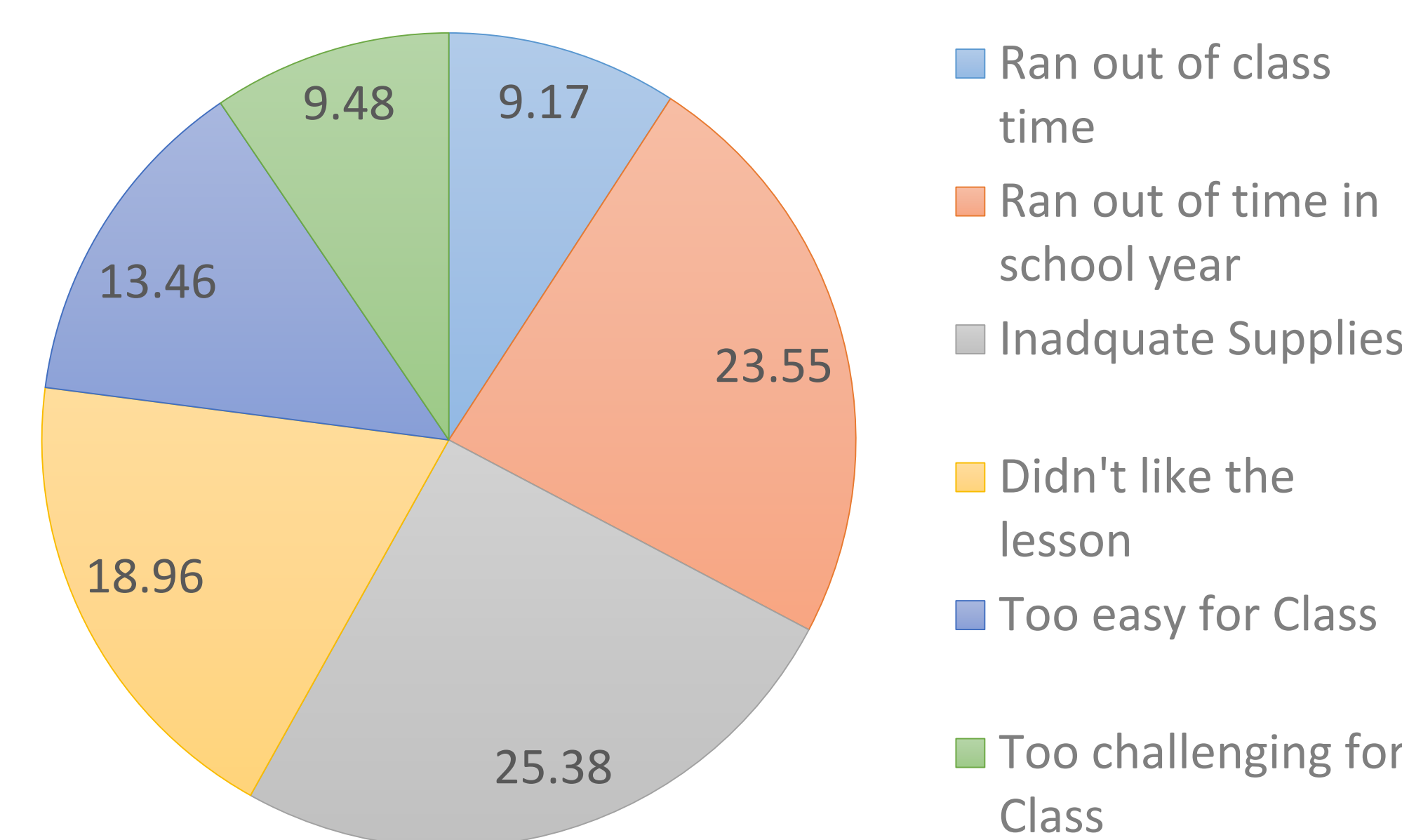
Results

Using Colburn's (2004) definitions for the different levels of inquiry, participants were asked to identify the different levels based on a definition. Although there were teachers that could identify the levels some did not know there were even different levels of inquiry citing "Never thought that there were different types of inquiry" and "I have never really seen the different types of inquiry before...I would like to look at it more closely after the survey".



The survey also provided insight as to how teachers were using the curriculum. Between both AFNR and FSS:

- 6% of teachers taught all lessons
- 94% of teachers skip or replace lessons, segments and even whole units.



Teachers cited that reasons for modifying, removing parts, or skipping entirely included: lessons were too easy for age range, lessons were too hard for age range, unable to get supplies for the class, lesson was not as complex or in-depth as it should have been, lesson was boring for the class.

Conclusions

Based on the results, appeared to be confused about what the different levels were, with the exception of open inquiry. This was resonated with responses from teachers who stated they were unaware of the different levels of inquiry.

- Based on these findings, this would explain why when asked to rate a lesson, teachers would tend to rate lessons as being open or guided when they were usually structured.
- Since the teachers are unaware of the characteristics of the different levels, it also explains teachers' selection when asked about which type of lesson they used most in their classroom, they would respond with guided or confirmation yet code a lesson as open.
- There is a disconnect between what different levels of inquiry are, and what they look like as teachers understand inquiry-based learning as an umbrella term, rather than the tiered system.
- Of the 91 total lessons for AFNR, 71 lessons were coded as structured inquiry, 19 were guided and only 1 was open inquiry. For FSS, there were 57 total lessons, 47 of which are structured, 8 are guided and again only 1 being open inquiry. This follows CASE's APP model in terms of more lessons being activities or lower level inquiry, and projects and problems being higher inquiry. In contrast the end of each unit has a problem lesson plan, meaning there should be closer to six or seven open inquiry lessons, as opposed to only one.

Additionally:

- Teachers are modifying lessons and units frequently, 63.49% of teachers report teaching the lesson over one year, as compared to 22.22% over 1 semester, over 3.97% over a term/quarter, and 10.32% over other variations like trimesters, summer programs, and rotations. While over 50% of teachers are instructing CASE according to recommendations, this is only two of ten curricula. Additional research will be require to examine all CASE teachers. This could potentially lead to CASE expanding to quarter or semester style classes in the future.
- Teachers that became CASE certified for reasons other than being interested, stated that either their school required and paid for it, or they wanted a science tie-in.

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