

**Using Memory Measures as a New Approach to Operationalize Learning in Agricultural Literacy Efforts**

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### Introduction/Need for Innovation

Agricultural literacy is defined as “possessing knowledge and understanding of our food and fiber system” (Frick, Kahler, & Miller, 1991, p. 6). An agriculturally literate person is informed about agricultural products they purchase as well as the technologies and production processes behind them. Prior studies have indicated an overall low level of agricultural literacy among people who are not directly involved in the agriculture industry (Doerfert, 2011). To combat this issue, there are multiple initiatives in place in the U.S., like National Agriculture in the Classroom and the National Center for Agricultural Literacy. However, Pense and Leising (2004) found existing agricultural literacy efforts may be too limited in range and not achieving educational benchmarks. Identifying new techniques that are successful at encouraging the retention of information could improve the effectiveness of the curriculum of agricultural literacy initiatives.

Agricultural literacy levels have previously been determined by way of participant self-reporting or survey instrument. According to Doerfert (2003), many of these instruments have been created by researchers or were designed based on the 11 agricultural literacy concepts Frick et al. (1991) classified. Often, these instruments measured knowledge or perceptions of agricultural literacy (Doerfert, 2003). As agricultural literacy campaigns continue to be developed and implemented, it is time to explore new ways to measure what people learn from these efforts. The purpose of this innovative idea narrative is to present one way to do this in a more nuanced way.

### How it works

According to the Limited Capacity Model of Motivated Mediated Message Processing (LC4MP) (Lang, 2000), three subprocesses (encoding, storage, and retrieval) take place when people process information. Encoding is the process of intaking information and creating a mental representation for incoming material. In the subprocess of storage, information is either not stored, stored short-term, or stored long-term and able to be recalled later by the viewer. Retrieval is the ability of the viewer to recall information when prompted. Testing participants using free recall, cued recall, and information recognition questions will determine if participants processed and retained information (Loaiza & McCabe, 2011; Loaiza, McCabe, Youngblood, Rose, & Myerson, 2011; Popp & Serra, 2016). Prior studies that examined information retrieval using free recall, cued recall, or multiple-choice tests found retrieval ability is indicative of learning (Endres, Carpenter, Martin, & Renkl, 2017).

The specific questions for each type of recall should be developed based on the information in the content being presented to viewers. Free recall questions are open ended and measure retrieval. There is no correct answer to a free recall question and respondents can provide as little or as much information as they please. Free recall questions do not provide any context about the materials previously viewed. An example of a free recall question is: “List any information you can recall from the materials you viewed.” Free recall questions result in qualitative data, which must be analyzed for emerging statements or themes.

Cued recall questions are short answer format and measure storage. These questions provide a context clue that allow respondents to recognize what information to search for. An example of a cued recall question is: “You viewed an infographic that contained information about GMOs. What crops in the U.S. are primarily GM?”

Information recognition questions are multiple choice or true/false format and measure encoding. Recognition is the ability to identify previously experienced information. An example of an information recognition question is: “True or False? The crops in the U.S. that are primarily GM are soybeans, cotton, and corn.” Cued recall and information recognition questions can be scored using a percent correct scale from 0 to 100 like a traditional exam.

### **Results to Date/Implications**

This approach to measuring agricultural literacy was implemented in a recent experiment. In this study, participants were given either an infographic or narrative to view that contained information about GMOs. To determine knowledge gained by participants, the three memory measures were employed. Information retrieval was assessed using free recall, storage was assessed using cued recall, and encoding was assessed using information recognition (Lang, 2009). A delayed post-test questionnaire was also used to assess these three memory measures, which can be employed to affirm retention of information, also considered knowledge gain (Lyra et al., 2016). Answers to the free recall questions consisted of qualitative data. Data from the cued recall and information recognition questions were scored on a scale of 0 to 100 for the percent of correct responses.

Participants were able to recall information from the stimuli they viewed. When tested a week after exposure to stimuli, participants were still able to recall information, but scores were lower than they were immediately after stimuli exposure. Utilizing recall and recognition questions was an effective method of assessing knowledge gained from the information viewed by participants, which may indicate changes in agricultural literacy levels.

### **Future Plans/Advice to Others**

It is recommended that recall and recognition questions be utilized in future agricultural literacy research and by agricultural literacy initiatives to determine what audiences remember and learn from current curriculum. Possessing this information could lead to the reform of current curriculum that is not successfully improving agricultural literacy levels. In our initial implementation of this approach, we developed 16 questions to measure changes in agricultural literacy (one free recall, five cued recall, and 10 information recognition). It is recommended to extend the number of questions for the cued recall and recognition areas in order to provide a broader range of possible scores. These questions must be developed to assess what is learned from the materials presented to audience members.

### **Costs/Resources Needed**

There is no cost to implement this strategy to assess learning, but it does require content area expertise to develop the three levels of recall questions.

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