Effectiveness of Brainwriting as an Alternative to Idea Generation in Agricultural Education

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Introduction

"The educational foundations of our society are presently being eroded by a rising tide of mediocrity that threatens our very future as a Nation and a people. What was unimaginable a generation ago has begun to occur—others are matching and surpassing our educational attainments" (Frye, 2015, p. 493). The austere statement described what we hoped would be a one-time concern, but according to the 2009 and 2012 PISA reports (Program for International Student Assessment), the United States' performance in reading, science, and mathematics has continued to decline (Frye, 2015).

Moussa-Inaty, Atallah, and Causapin (2019) identified that students will vary in their preferred learning styles and may experience different levels of success dependent upon the different instructional techniques to which they are exposed. Learning styles can be defined as a "set of cognitive, affective and physiological traits that a learner exhibits as he or she interacts in the classroom environment and determines how he or she will solve problems" (Orlich et al., p. 351). Students' preferences of primary learning styles include visual, auditory, and tactile kinesthetic (Moussa-Inaty, Atallah, & Causapin, 2019). Learning styles are concepts that do "not change throughout life but changes the individual's life" (Baltaoğlu, & Güven, 2019, p. 2).

Learning styles are often referenced as certain cognitive traits, learners' exhibit in problem solving through interaction with the learning environment (Orlich, Harder, Trevisan, Brown, & Miller, 2017). Often referred to dichotomous learning styles, research indicates this is incorrect (Kirshner & van Merrinëboer, 2013), as "most people do not fit in one particular [learning] style" (p. 173). Dewey (1986) stated that ". . . an intimate and necessary relation between the processes of actual experience and education" (p. 20) should be emphasized, creating social environments where real-life circumstances could be experienced, contributing to the learning process. One such social learning opportunity is in the use of brainstorming. By definition, "brainstorming is a technique to promote idea generation that may also promote cohesiveness in idea generating groups" (Henningsen & Henningsen, 2018, p. 103). The brainstorming process was intended to increase originality of responses as a result of increased ideas generated (Henningsen & Henningsen, 2018). Group work also has the potential for increased idea quality and holds the potential to enhance the learning process (Heslin, 2009). One such process is known as brainwriting. Using silent reflection on provided prompts in group settings, brainwriting "involves a group of people silently writing and sharing their written ideas" (Heslin, 2009, p. 130). Research (Gryskiewic, 1981; Paulus & Yang, 2000; Thompson, 2003) indicates that superior ideas are generated through the brainwriting process.

Theoretical Framework

This study was viewed through the lens of the Cognitive Model of Brainstorming (CMB) (Nijstad & Stroebe, 2006; Paulus & Brown, 2007). Theoretically, the cognitive model of brainstorming suggests that "when an idea is activated in memory, ideas semantically related to the activated idea will get activated first" (Baruah & Paulus. 2016, p. 334). What is more, this process leads to additional related ideas resulting from the process. Additionally, as similar ideas

become exhausted, more exceptional ideas occur, resulting in greater originality of ideas. (Baruah & Paulus, 2016).

Methodology

The population consisted of all students enrolled in an introductory Agricultural Economics course at a regional university. Students were divided into equal groups to complete a prompt as designated by the instructor of the course in which half of the students responded to the prompt in a traditional brainstorming activity, while the other half completed the prompt through brainwriting activities. Both groups participated at the same time, covering a 10-minute timespan. Responses were evaluated by a faculty expert for feasibility, rigor, and originality using a 5-point Likert scale (ranging from 1–Strongly Disagree with Quality to 5–Strongly Agree with Quality). Quality measures were defined as: *feasibility*–degree to which the response could be implemented, *rigor*–resulting response represented an academically challenging concept; and *originality* – degree to which the idea generated was novel or unusual in comparison to peers.

Results

Of the participating groups participating, the brainwriting groups performed significantly better in overall quantity, feasibility, rigor, and originality of responses generated in comparison to those participating in the traditional brainstorming groups (Table 1). The aggregate number of responses generated was not found to be statistically significant between brainstorming and brainwriting, although brainwriting yielded slightly more responses (*p=0.7204)*. The aggregate measure was used as an equal number of participants were in the control (brainstorming) and treatment (brainwriting groups). All three factors addressing the quality of responses favored brainwriting as the superior method. The average feasibility of responses in the brainwriting treatment was 3.41 out of a 5-point Likert scale; whereas, the control's average was 2.67, a significant increase of 0.74 points (*p=0.0011).* Rigor of responses in brainwriting (3.29) were 0.84 points significantly higher (*p=0.0001)* than the brainstorming (2.67) group. Furthermore, originality of responses by the brainwriting group were 0.81 points significantly higher (*p=0.0000)* than that of brainstorming measured at 3.22 and 2.41, respectively for each group.

Table 1. Summary Statistics by Group[1]

Variable	Brainwriting	Brainstorming	Difference	t-value[2]	p-value
Number of Responses	99	92	7	0.411	0.7204
	(5.65)	(10.61)			
Feasibility	3.41	2.67	0.74	3.117	0.0011
	(1.64)	(1.63)			
Rigor	3.29	2.45	0.84	3.938	0.0001
	(1.56)	(1.42)			
Originality	3.22	2.41	0.81	4.098	0.0000
	(1.35)	(1.37)			

[1]: Feasibility, Rigor, and Originality measured on a 1-5 Likert scale
[2]: H_A - diff (Brainwriting - Brainstorming) > 0; (standard deviation)

Implications and Recommendations

The study's results provide insight into the effectiveness of brainwriting as a valuable tool for engaging agricultural students of diverse backgrounds to generate discipline-specific ideas. The use of brainwriting in comparison to traditional brainstorming leads to more and better ideas surrounding agricultural topics. To better understand the generalizability of brainwriting across all disciplines within agriculture, the study should be examined across all agricultural disciplines. However, this pilot study indicates brainwriting has potential to be an effective tool for idea generation within the agricultural classroom.

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