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Bridging the Gap between College Algebra and Agronomic Math

Introduction

In agronomy, many concepts are science-based. However, there are a few concepts that require mathematics to understand. These concepts should be understood by all agronomy students before graduation; however, many fail to understand or just are not willing to learn these concepts because they don't see the real world application. This leaves many struggling to solve agronomic math problems when they are in a full-time position. Some examples of mathematic concepts in agronomy include calculating growing degree days to determine the growth rate of a crop, converting field dimensions into acres, and determining how many pounds per acre of a nutrient a farmer will apply when using a certain fertilizer. All of these concepts and many more are used by agronomists in the industry every day. The purpose of this research was to find an effective method of teaching agronomic math to better prepare students for their future careers.

Objective

To determine the effectiveness of teaching agronomic math using videos or posters

Methods

- Five videos and nine posters were created to teach students how to solve problems in five subjects: fertilizer and pesticide application, harvest and yield estimation, growing degree days, standard calculations and unit conversion, and irrigation.
- The research was conducted during the two-week unit over agronomic math.
- Four sections of Agronomy 212 Lab: Field Application and Problem Solving in Crop Production were divided taking into account academic major, number of credits completed, and class meeting time.
- Both groups completed a prequiz and survey before beginning the unit.
- During the final week of the unit, a graded quiz and anonymous survey were given.
- The material taught and instructor were the same for both groups.

Survey Results

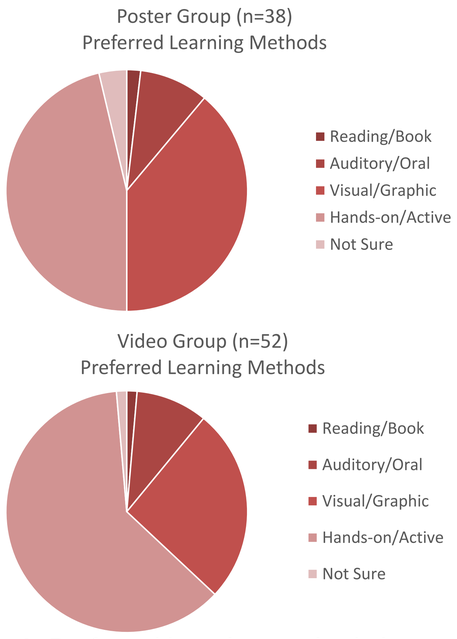

Figure 1. Preferred learning methods by group

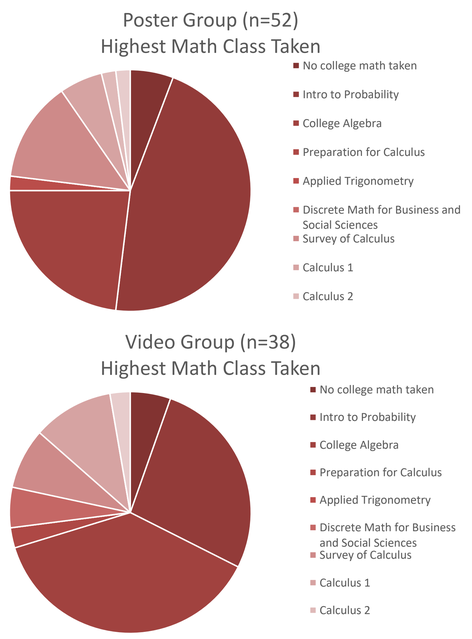

Figure 2. Highest math class taken by group

Quiz Results

Quiz Question Subject	Poster Group (n=52)	Video Group (n=38)	Δ Poster to Video	p-value
Irrigation	67.3%	55.3%	12.0%	0.1225
Volume	71.2%	65.8%	5.4%	0.2946
Growing Degree Days	76.9%	71.1%	5.9%	0.2660
Fertilizer Analysis	32.7%	44.7%	-12.0%	0.8775
Sprayer Calibration	50.0%	42.1%	7.9%	0.2281
Yield Estimation	34.6%	42.1%	-7.5%	0.7648
Student Rated Effectiveness	61.2%	70.2%	-9.0%	0.8151

Table 1. Quiz question mean comparisons between video and poster groups

Discussion

The preferred learning methods from anonymous survey results are outlined in **Figure 1**. In both groups, most students preferred to learn with a hands-on or active approach, while the next most preferred approach was visual. Both the videos and posters provided a visual approach, but the active approach in both methods was lacking. Learning with an auditory or oral approach was the third most common in both groups. The videos provided an oral approach along with the visual approach, but the posters did not.

The highest math class taken from anonymous survey results are outlined in **Figure 2**. In both groups, almost half of the students had taken college algebra prior to completing the unit. Most of the problems taught in the videos or posters referenced problem-solving methods taught in college algebra, so it is possible that not all students understood the references made. Both groups had an equal number of students who had taken math classes higher than college algebra.

When comparing the mean quiz question scores from both the video group and poster group (**table 1**), the video group scored higher for only two of six subjects: fertilizer analysis and yield estimation. There was no statistical evidence to indicate a difference between using videos or posters to teach agronomic math. However, students in the video group perceived the effectiveness of learning to be higher than those in the poster group (shown in the last line of the table).

The objective of the research was to see if there was any difference in learning between watching videos and reading posters. The null hypothesis was correct: there was no statistical difference between the two methods.

Conclusions

- There was no statistical difference between the videos and posters.
- In the future, either method should be paired with an interactive quiz to engage the students and ensure they understand the material presented.
- Several students indicated on the anonymous survey they would prefer an agronomic math lecture led by the instructor. Students could take videos home to supplement a lecture.

Acknowledgements

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