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interactive Fundamental Agricultural Resource Materials (iFARM)

Background

A few academic programs in applied agricultural disciplines have incorporated critical thinking into their curriculum. Even though it is challenging to stimulate interests in the subject matters for information-driven introductory courses, our experience has shown that it is indispensable to improve a critical-thinking skill of undergraduate agricultural students. However, innovative approaches that foster learner’s critical thinking in agricultural engineering education are rarely found in practice.

Developing well-designed learning materials improves both teaching and learning in an online environment. In addition, rich media would help overcome the students’ physical distance from a classroom. According to the study of Howard, Ellis, and Rasmussen who conducted pre/post-tests to find out the significance in learning with multimedia, the effective use of multimedia improves students’ performance. As Stemler stated, learning with multimedia “becomes active, not passive, and it ensures that users are doing, not simply watching.” The dual coding approach supports the effectiveness of the interactive multimedia delivery that enables contextual concepts to be visualized with auditory aids. Kolodner also addressed analogous scenarios promote deep learning by giving learners an opportunity to apply conceptual understanding in real world situations.

Design and Development of iFARM

iFARM (interactive Fundamental Agricultural Resource Modules) is web-based interactive modules that demonstrate ways to deal with complex agronomical problems. It focuses on achieving two pedagogical objectives:

- **Scientific Principles**: Demonstrations of scientific methods will be utilized in order for students to identify problems, formulate hypothesis tests, conduct and analyze data and derive conclusions
- **Critical Thinking**: Students will be exposed to complex problems based on evidence-based information throughout each module.

The 13 main topics that cover fundamentals in agronomy including calibration, crop region, germination, IPM, plant breeding, precision farming, reproduction, residues, roots, seeds, soil, stems & leaves, and weather were deliberated in the iFARM modules.
As shown in Figure 1 through 13, the iFARM modules are conveyed in the interactive multimedia format with certain scenarios corresponding to the designated topics. It is intended for learners to achieve the desired learning goals by direct experiment and active participation devised in the learning process. In each module, learners are facing the situation presuming that they serve as a consultant who is hired to solve the agronomical problems placed in a certain context. The fictional characters, Matt and Katie, are the clients who request consulting to deal with serious problems in their farms. The learning process is designed to be close to a field trip experience that students in an introductory agronomy course commonly schedule to participate during a face-to-face class as part of the coursework. It is common that a field trip activity is conducted by passive observation. iFARM, on the other hands, gives students an opportunity to actively engage in their learning and employ their critical-thinking skill for solving the given problems. At the end of each module, students submit a complete report to their clients which template is provided at the beginning of each module.

**Lessons Learned**

The authors wanted to assure that the interactive learning activities through iFARM modules promote students’ learning experiences. According to the students’ comments from the course evaluation that has been conducted at the end of every semester starting from the Fall 2008 semester, students seemed positive about their learning with iFARM. Even though some students commented that some modules seemed childish, overall comments about their learning experience through iFARM were encouraging consistently over the course of past semesters.

The instructional resources in agricultural engineering education that demonstrate critical-thinking practices are rarely found. The innovate application that advance students’ learning experience is still a challenge. This study hopefully suggests best practices of designing and developing interactive learning resources that help students learn better in more practical matters.
References