troductory plant breeding course (AG420) after six weeks of use. To judge the effectivenes of the CARE system, the students were asked if they strongly agreed, agreed, were neutral, disagreed, or strongly disagreed with each of 10 statements.

Results and Discussion

Table 1 provides the results of the evaluation. All but one of the students felt that feedback was desirable for effective instruction and learning. Twenty-four of the students agreed that the use of the computer system was less intimidating than raising their hand to answer a question. Confidence in the accuracy of the system was rated high among 27 of the 30 students. The speed with which the computer summarizes results for 30 students was chosen as a valuable aid to instruction by 27 of the students. Student responses were variable in the reaction to the limitations imposed by multiple choice or true-false questions. These types of questions are not the usual types used by this instructor, and with improved construction, should probably be less of a limitation.

Students provided mixed reactions to timing of the feedback quizzes. Less than half of the students indicated that the CARE system should be used for grading of quizzes for credit toward a course letter grade. During the six-week trial period, CARE was not used for recording grades, only for providing feedback. As the instructor and students become more confident and familiar with the system, the use of CARE could be expanded to include both feedback and grading. Overall, 25 of the students who used CARE agreed or strongly agreed that it improved learning and instruction.

The CARE system greatly reduces or eliminates most limitations to effective feedback.

1. The cost of equipment is low.
2. Portable computers can be carried in a small briefcase.
3. Intimidation is greatly reduced.
4. Classes up to 150 students can use the system.

A 10-question quiz can be given in less than 5 minutes, the results discussed, and a printed summary immediately posted for student review. The system provides individual contact via computer between the teacher and student.

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TEACHING METHOD REPORT

Teaching the Construction of Dichotomous Keys

Joseph Laferriers

Teaching high school students and college freshmen to construct dichotomous keys for the identification of plant or animal species is often one of the most difficult and challenging tasks an instructor has to face. Students often have had limited exposure to this type of keys, and have not experienced the types of difficulties which the user of a poorly constructed key is likely to face. Students' first attempts at construction of keys are apt to fall short of the mark in several respects: first, the keys often utilize comparative terms like "big" or "small;" second, they frequently contain ambiguous or poorly defined qualifiers, or qualifiers failing to give proper contrast between opposing legs of the key; and third, many students fail to grasp the dichotomous nature of the standard key format. Even graduate students have been known to err along these same lines.

Some instructors use practice sets of "species" as examples to illustrate the methodology inherent in the construction of keys, such as having the students construct a key to various types of screws (Walters 1977). This method is useful in impressing on the students the necessary procedures involved in key formation. The variation proposed here, a key to the first ten letters of the alphabet, has several advantages, namely that it requires no advance preparation time or acquisition of materials, and involves symbols with which the students are already familiar. It also provides the opportunity for illustrating some of the features of good key construction. For example, if the students suggest contrasting consonants with vowels, this offers an ideal occasion for explaining the need to include criteria for deciding between taxonomic categories rather than basing the decision on extraneous information. If the "J" is written without the seraph, this can give rise to a discussion of the need for proper identification of ambiguous terminology, since some people may interpret the letter as consisting of a single stroke, partially curved and partially straight, while others may consider the letter as two separate strokes. It is, of course, better to avoid such ambiguities altogether or at least to write the description clearly enough so as to avoid confusion.

After students in my freshman biology class had been introduced to the techniques of using dichotomous keys, a key to the first ten letters of the alphabet was constructed on the chalkboard during the laboratory period according to suggestions made by the class. The students were then asked to construct keys to a set of ten herbarium specimens as a homework assignment, with excellent results. Most of the papers submitted showed a satisfactory grasp of the techniques of key construction.

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The key constructed by my class is as follows:

1. Letter containing no curved strokes...2
1a. Letter containing at least one curved stroke...6
2. Uppermost portion of letter consisting of a horizontal stroke...3
2a. Uppermost portion of letter consisting of vertical or diagonal strokes...5
3. Letter containing three horizontal strokes...E
3a. Letter containing two horizontal strokes...4
4. Lowermost part of letter a horizontal stroke...I
4a. Lowermost part of letter a vertical stroke...F
5. Uppermost portion of letter consisting of two vertical, parallel strokes...H
5a. Uppermost portion of letter consisting of two diagonal, intersecting strokes...A
6. Letter completely surrounding one or more spaces...7
6a. Letter not completely surrounding a space, all interior portions of letter being continuous with surrounding area...8
7. One curved stroke and one vertical stroke enclosing one interior space...D
7a. Two curved strokes and one vertical stroke enclosing two interior spaces...B
8. Open part of letter facing to the right; each stroke either entirely straight or entirely curved...9
8a. Open part of the letter facing to the upper left; a single stroke partially curved and partially straight...J
9. A single curved stroke...C
9a. A curved stroke combined with two straight strokes...G

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TEACHING METHOD REPORT

Improving Swine Farrowing Instruction

Roger D. Walker

Introduction

The farrowing process in swine is vitally important to the profit-loss picture in a swine operation. It is certainly worthwhile to save as many pigs as possible at farrowing, and agricultural educators who deal with the subject must convey the proper procedures in handling the sow and litter during this crucial period.

Students should be instructed in methods of handling the baby pigs at birth, such as, resuscitation, delivery assistance, treating the navel, cross-fostering, providing heat and making sure that the pigs receive colostrum and establish a teat order. In addition, proper handling of the sow must be covered.

Few would argue that the best way to teach swine farrowing practices is to allow a hands-on approach. Many post-secondary schools follow this approach and attest to the value of allowing students to observe and take part in the farrowing process.

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Previous Farrowing Instruction Method

We at the University of Minnesota Technical College, Waseca, also follow the hands-on approach to teaching farrowing techniques, however, the method of instruction has recently been altered to improve its efficiency. Students in swine production at UMW are divided into groups and each group is assigned the responsibility of caring for a sow and her litter. Their charge is to prepare the farrowing room, clean the sow for entry into the farrowing crate, feed the sow, clean the crate daily and watch for evidence of impending parturition. When parturition is imminent, students are to be prepared to assist the sow during farrowing.

Previously, if a group was lucky, its sow farrowed during the daytime and most group members could attend, however, more than likely, the sow would farrow at night and into the wee hours of the morning and bleary eyed students would assist her in shifts, not all of them seeing what was going on. Educational efficiency was lacking, but there was nothing that could be done to change the course of natural farrowing.

Prostaglandins

The legalization of prostaglandins for swine has allowed us much greater freedom in the scheduling of farrowing. Prostaglandins are naturally occurring substances that provide for several vital functions in animals. One prostaglandin, F_2-alpha, has a luteolytic effect on female reproduction and is used in several species to synchronize estrous. This allows several females to be bred at the same time and provides for better utilization of time and facilities at parturition. Prostaglandin F_2-alpha is commercially marketed under the name Lutalyse® by Upjohn.

The use of Lutalyse® for estrous synchronization in swine has not been very effective. However, the drug has proven to be extremely reliable in the termination of pregnancy in swine when injected at day 110 or later in the approximately 114 day gestation period. This allows swine producers with good breeding records to effectively group farrowings, thus providing for better efficiency in building use, time management, cross-fostering capabilities, reducing baby pig mortality, more uniform litters and ultimately in rebreeding the sows because they are on a more uniform reproduction cycle.

All of this is very worthwhile to most swine producers and provides for some graphic examples in an educational setting. However, the foremost benefit to education is that students can more readily attend farrowings when Lutalyse® is used. Hence, a more efficient and effective setting is produced for the classroom.

Prostaglandin Based Instruction Method

With the availability of Lutalyse® for swine, the swine farrowing laboratory at UMW is much better organized. Farrowing is not left to chance, more students are able to attend and certain procedures are explained better because there are more baby pigs