Promoting Student Learning via Automated Individualized Feedback

Abstract # 95

Daniel H. Poole\textsuperscript{1*}, Carrie L. Pickworth\textsuperscript{1} and Henry E. Schaffer\textsuperscript{2}

\textsuperscript{1}Department of Animal Science, College of Agriculture and Life Sciences
\textsuperscript{2}Department of Biological Sciences, College of Sciences
Introduction:

• All students benefit from individually tailored feedback about their performance to increase their success.

• As class size increases, the instructor can lose touch with individual students.

• It can be challenging for instructors of large courses to provide each individual student with detailed feedback and guidance on improvement strategies.
Our Goal is to develop the analytic tools to digitally capture student performance and provide immediate feedback to the student and instructor.

Development of the SCHOLAR program (Student Course Help On Line And Reporting)

Implementation of this technology provides a means for instructors to successfully monitor individual student progress to facilitate student learning and comprehension of the course information in a more direct manner, regardless of the class size.
SCHOLAR Program

• A computer program that creates automatic feedback for student and faculty.

  – For students, missed questions are linked to relevant core course concepts and well as a Bloom's profile of missed concepts

  – For instructors, this provides a tool to easily track individual student lapses, as well as review progress and problems in the class as a whole.

• Analyze quiz results (for each student) to find deficiencies in performance on a concept by concept level of the learning trajectory
SCHOLAR Program Setup

1. Development of Core Course Concepts

   Ovary
   Resource Page(s): 24-26
   Relevant Predecessor Concept(s): Female reproductive anatomy; Endocrine; Estrogen; Progesterone

   Steroid Hormone Synthesis
   Resource Page(s): 112
   Relevant Predecessor Concept(s): Steroid Hormones; Ovary; Testicles

2. Develop question bank
   - Ranked each question according to Bloom’s Cognitive Levels of Learning
Implementation of **SCHOLAR**

- Reproductive Physiology course in Fall 2014 and Fall 2015
  - n=117 students (21% male : 79% female)

- Weekly online quizzes (13/semester) were administered
  - Each quiz was worth 10 points

- Quizzes were available for 36 hrs
  - Students had 20 minutes and 1 attempt to complete each quiz

- Single answer multiple choice
  - Ranked as either Low, Med, or High according to Bloom’s Taxonomy
Methods:

- Following the completion of each quiz:
  - Students immediately learned their score
  - Students received an email with their individual SCHOLAR report
  - Instructor received summary SCHOLAR report

- Student progress was correlated to the quiz outcome and student performance based on cognitive level of understanding.

- Data was analyzed using Proc GLM and Proc Mixed of SAS 9.2 (SAS Inst. Inc., Cary, NC)
  - Significant differences were determined by $p<0.05$, and $0.05>p>0.1$ was declared a statistical tendency
Example of SCHOLAR output

Quiz 1 : Student 1: 8 totally correct  80%
Bloom's profile of missed concepts  1L  0M  1H

# missed       concept
  1      Neural anatomy and function
  1      Anterior Pituitary function

Quiz 1 : Student 3 : 10 totally correct  100%
You aced this quiz! Good work!

Quiz 1 : Student 2: 5 totally correct  50%
Bloom's profile of missed concepts  1L  2M  2H

# missed       concept
  1      Neural anatomy and function
  2      Anterior Pituitary function
  1      Uterus
  1      Posterior Pituitary function
  2      Hypothalamic function *
  1      Neuroendocrine
  1      Female Secondary organs*
  2      Female reproductive anatomy
Student usage of the SCHOLAR program

• In 2015:
  – Following each quiz, Students received a SCHOLAR report
  – If questions were missed, students had the opportunity to answer a “concept question”

  – “Concept question” responses:
    • Responses had to be received via email within 5 days of receiving the SCHOLAR report.
    • Answers were limited to 50 - 100 words
    • Students received 0.25 points for each correct response to the concept questions.
Results

- Overall, students missed significantly more upper level of cognition questions.

- Student participation on these quizzes ranged from 73 to 95% over the course of these 2 semesters.
As the semester progressed, students improved their ability to successfully answer the higher level of cognition questions.
Effect of Academic Rank

**Sophomores:**
- No Change throughout the semester

**Juniors:**
- Continual improvement to answer the higher level of cognition questions

**Seniors:**
- Greatest improvement to successfully answer the higher level of cognition questions
Outcome in Course

Student earning an A in course

Student earning an B in course

Student earning an C in course

Student earning an D in course
Student usage of the SCHOLAR program

- Student participation in the follow up concept questions ranged from 12.5 to 35% over the course of the semesters.

- 63% of those who responded to the concept questions were earning an 80% or better on the quizzes.
Summary

- Students struggle with upper level of cognition questions
- Students improved their ability to successfully answer the higher level of cognition questions
- The ability to successfully answer the higher level of cognition questions occurred more quickly in upper classmen and those who earned a higher grade in the course.
- Approximately 23% of the students responded to the concept questions
  - ~63% of students who responded to the concept questions were earning an 80% or better on the quizzes
Conclusions

• Incorporation of the SCHOLAR program improved the instructor ability to monitor the classes progress on learning core concepts in the course.

• We were able to capture individual student progress and comprehension of the course information with the SCHOLAR program.

• While designed to track individual student progress and coach individuals with deficiencies, incorporation of this learning tool was limited among the students.
Thank You!

Daniel H. Poole
dhpoole@ncsu.edu