Improving Learning Skills In Anatomy: The Evolution

Audra Schaefer, PhD, Indiana University-Evansville
Melissa Taylor, MS, Indiana University-Bloomington
Anatomy A215: Basic Human Anatomy (A215)

• 1-semester basic human anatomy
• Large enrollment (400+) lecture with lab
  • Primarily pre-nursing, pre-allied health students
• 4 lecture and 4 laboratory exams
• Withdrawal rate between 8%-13% (O’Loughlin, 2002)
• Remediation rate ~11% (Schutte, 2016)
MSCI M100: Improving Learning Skills in Anatomy (M100)

• Developed by graduate students in 2010
  • It’s still being taught! 😊

• 1 credit-hour

• Concurrent enrollment with anatomy

• Study skills taught in the context of anatomy
  • Promote metacognitive awareness and develop metacognitive skills
Why the need for supplemental courses?

• Anatomy serves as prerequisite for health care professional programs
  • Need to earn minimum grade for acceptance
  • Challenging course

• Several factors affecting academic success
  • Inadequate study habits
  • Poor initial preparation
  • Lack of confidence in abilities

• Metacognition: knowledge of cognition and regulation of cognitive processes
  (Bransford, 2000; Flavell, 1981)
  • “thinking about thinking”
  • Several components which have been shown to be positively correlated with academic success
Why the need?

• Increasing need for remediation
  • Placement exams and standardized exams to place in math & English
  • Students who remediate successfully have high academic success
    • Small percentage of students remediate successfully (Bahr, 2008)
  • Anatomy remediation

• Supplemental Instruction to support students in “high-risk” classes (Blanc & Martin, 1994)
  • Peer-led study sessions
  • Voluntary participation
  • Students who participate perform better than students who do not
Research Questions

• Are there particular students who are more likely to remediate A215?
  • Major
  • School
  • Gender
  • Age
  • Ethnicity
  • SAT scores

• How do remediating students’ exam scores and final course grades compare to non-remediating students?

• How do remediating students’ exam scores and final course grades from their second A215 enrollment compare to their scores and final grade from their first enrollment in A215?

• Is the length of time between the first and second time enrolled in A215 related to success of remediating students?
Remediation in Anatomy A215

• Student data (n=4622) from instructors and Registrar for Spring 2004-Spring 2010
  • A215 lecture exam scores
  • lab exam scores
  • total points earned and final letter grades
  • age
  • ethnicity
  • school
  • major of study
  • SAT verbal, math and composite scores
Table 1. Anatomy A215 Student Characteristics from Spring 2004 through Spring 2010

<table>
<thead>
<tr>
<th>Demographic Characteristic</th>
<th>A215 general population n=4622</th>
<th>Remediators n=511</th>
<th>Non-remediators n=4111</th>
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<tbody>
<tr>
<td>Gender</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Male</td>
<td>24.9</td>
<td>20.1</td>
<td>25.5</td>
</tr>
<tr>
<td>Female</td>
<td>75.1</td>
<td>79.9</td>
<td>74.5</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Caucasian</td>
<td>86.3</td>
<td>81.3</td>
<td>86.9</td>
</tr>
<tr>
<td>African-American</td>
<td>5.3</td>
<td>10.4</td>
<td>4.7</td>
</tr>
<tr>
<td>School</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>University Division</td>
<td>43</td>
<td>59.1</td>
<td>41.0</td>
</tr>
<tr>
<td>(pre-allied health, pre-nursing)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPER (exercise science, athletic training, etc.)</td>
<td>29.3</td>
<td>29.4</td>
<td>29.2</td>
</tr>
<tr>
<td>Major</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Exercise Science</td>
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<td>19.5</td>
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<tr>
<td>Biology</td>
<td>13.8</td>
<td>7.2</td>
<td>14.6</td>
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<tr>
<td>Nursing</td>
<td>22.6</td>
<td>37.2</td>
<td>20.8</td>
</tr>
</tbody>
</table>
Figure 1.
Results

• Most likely to remediate:
  • Female
  • UD
  • Nursing majors

• Non-remediators’ mean exam scores significantly higher
  • EXCEPT remediators’ mean score for lab exam 1 & 2 during second enrollment

• Significant improvement on exams and course grades during second enrollment for remediators

• Remediators who did not withdraw during first enrollment had greater success during second enrollment

• Students who waited 3-4 semesters to re-enroll had better outcomes than students who immediately re-enrolled
Developing & Assessing M100
Course Development

• Course Goals:
  • Improve ability to recognize and implement most effective study methods
  • Explain and differentiate major body systems
  • Apply anatomical knowledge

• Approved by Medical Sciences Undergraduate Education Committee

• Pilot course in summer 2010
  • 5 students
  • Positive experience overall
<table>
<thead>
<tr>
<th>Goal</th>
<th>Core Competency</th>
<th>Assessment</th>
</tr>
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</table>
| • Recognize different ways you learn effectively and introduce these methods into your studying regimen | • Effectively analyze your exam performance  
• Utilize multiple study methods  
• Recognize when methods are not successful | • Blogs  
• Survey about study habits |
| • Explain and differentiate most major body systems | • Compare and contrast the functions of each body system  
• Describe how these major body systems interact with one another | • Final grade  
• In class and out of class activities |
| • Implement anatomical knowledge in clinical situations | • Connecting various symptoms and pathologies to the body systems affected | • Problem based learning exercises |
• Prior to Each Class Session
  • Blogs - Blogs will be primarily used for your personal evaluation of your own study strategies. A topic of discussion for each blog will be posted by the instructor.
  • Outline – Prior to most class sessions you are expected to create an outline of the material covered in A215 during that week. These outlines should be organized in a manner which is meaningful to you (i.e. not just copy and pasting the notes directly from lecture).

• Participation

• Problem Based Learning Exercises (PBL)

• Study Logs – These logs will be given before lecture and lab exams. You will be responsible for recording where and when you studied, along with how productive you felt you were during that study time.
  • One set of study logs will include 3 total logs, one completed each day for three days prior to lecture exams.

• Study Exercises

• Histology Slides - Before each set of A215 exams you will be asked to create and submit five histology questions to via Oncourse which will be compiled into a quiz which will be taken in class for points.

• Histology Quizzes (15 pts each) – As described above, the histology slides you submit will be compiled into a 15 point quiz which will be given in class.
Research Questions

• Do students enrolled in MSCI M100 achieve higher exam scores and final course grades in A215 than students not enrolled in MSCI M100?
• Do MSCI M100 students demonstrate improved metacognitive awareness after completion of the course?
• Do M100 students’ study habits change throughout and after completion of the course?
Analysis of MSCI M100

• Taught in Spring 2011 (n=27), Fall 2011 (n=40), Spring 2012 (n=41)

• Methods
  • Grade Comparisons
  • Survey to address comfort with various aspects of learning & frequency of use of resources
    • Modified from Hopper (2011)
    • Administered on first day of class and again on last day of semester

• Course Assignments
  • Study Logs
  • Blogs
Study Logs

Directions: (1) Enter any block of thirty minutes or more you spent studying anatomy today on the form below. If you started at 2 P.M. and ended at 2:40, use the lines next to 2:00 only. (2) Make a note of where you were studying. (3) Make sure to rate the productivity of each half-hour segment in the appropriate column, using the following scale:

1 = Nonproductive
2 = Low productivity
3 = Average Productivity
4 = High Productivity

- Learning nothing or extremely little
- Learning something but not much
- Learning a fair amount
- Learning a great deal

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<thead>
<tr>
<th>Productivity</th>
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<th>Place</th>
<th>Productivity</th>
<th>Time</th>
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<td>5:30 P.M.</td>
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<td></td>
<td>6:00</td>
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<td>9:00</td>
<td>9:30</td>
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</tr>
<tr>
<td>11:00</td>
<td>2</td>
<td>Doctor's appointment</td>
<td>2</td>
<td>10:00</td>
<td>Home</td>
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<td>11:30</td>
<td>2</td>
<td>campus</td>
<td>3</td>
<td>10:30</td>
<td>Home</td>
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<td>Jordan Library</td>
<td>3</td>
<td>10:30</td>
<td>Home</td>
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<tr>
<td>12:30</td>
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<td>Math Class</td>
<td>4</td>
<td>11:00</td>
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<td></td>
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<td>12:00 A.M.</td>
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<tr>
<td>2:00</td>
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<td>4</td>
<td>1:30</td>
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<td>4</td>
<td>2:30</td>
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<td>Jordan Library</td>
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<tr>
<td>5:00</td>
<td></td>
<td></td>
<td>4</td>
<td>4:30</td>
<td></td>
</tr>
</tbody>
</table>

Subtotal A: Hours of anatomy study rated at Level 1 = 0
Subtotal B: Hours of anatomy study rated at Level 2 = 2
Subtotal C: Hours of anatomy study rated at Level 3 = 1.5
Subtotal D: Hours of statistics study rated at Level 4 = 2
Total hours spent studying anatomy today = 9.5
Study Logs

• Significantly more time spent at average or high productivity (ratings of 3 or 4) than non-productive or low productivity (ratings of 1 or 2) ($p < .05$)

• Increase in percentage of time at high productivity over the first 3 exams

• Increase of nonproductive time for 4th exam

• Student Reflections
  • Logs raised awareness of habits
Student Comments

• “I actually thought the study logs were interesting because it really did show me what environment worked best with me. I was surprised at how many hours I did study for the exam on Thursday, no wonder my brain was fried, haha.”

• “I can say that I sat in my room for 6 hours and studied, but until I rated how well I was studying, it really only came down to about 3 hours of highly productive studying.”

• “I was surprised on how much better I studied at the library or the Union than I do at my house in my room.”
M100 Blogs Assessment

• Blogs
  • Weekly assignment completed through Oncourse
  • Topic provided by instructor typically revolving around:
    • Assessing study methods
    • Planning and time management
    • Exam reflection
M100 Blogs Assessment

• Inductive analysis
• Codebook developed from data
  • Read and reread blogs to find themes
  • Develop mutually exclusive subthemes to be used for coding
  • Cohen’s Kappa=.743
<table>
<thead>
<tr>
<th>Theme</th>
<th>Subtheme</th>
<th>Post-Exam 1</th>
<th>Post-Exam 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-Awareness of Learning</td>
<td>Success of study methods</td>
<td>15.8</td>
<td>19.6</td>
</tr>
<tr>
<td></td>
<td>Unsuccessful study methods</td>
<td>4.4</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>New Study Method</td>
<td>7.9</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>Not confident about how to prepare</td>
<td>1.8</td>
<td>3.1</td>
</tr>
<tr>
<td></td>
<td>Confident and performs well</td>
<td>Confident and performs poorly</td>
<td>Not confident and performs well</td>
</tr>
<tr>
<td>--------------------------</td>
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</tr>
<tr>
<td><strong>Self-Efficacy</strong></td>
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<td>6.1</td>
<td>14</td>
<td>1.8</td>
</tr>
<tr>
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<td>10.3</td>
<td>16.5</td>
<td>1</td>
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<td><strong>Time Management</strong></td>
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<tr>
<td>Effective time management</td>
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<td>6.2</td>
<td></td>
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<tr>
<td>Unspecific time management</td>
<td>3.5</td>
<td>16.5</td>
<td></td>
</tr>
<tr>
<td>Ineffective time management</td>
<td>4.4</td>
<td>2.1</td>
<td></td>
</tr>
</tbody>
</table>
Student Comments

• Time Management:
  • “I plan to study smarter, not harder/longer.”
  • “I don't think I studied enough and I believe I could benefit highly from more time put into my studying.”

• Study Methods:
  • “I know the biggest factor in receiving a higher grade was dividing up the material...and was confident in that material.”

• Self-Efficacy:
  • “As for lecture, I thought I blew it out of the water. I was confident, thought it went so much better than lab, definitely A or B material and got a C-. I couldn't believe it.”
Discussion

• Greater percentage of student comments discussing:
  • Successful use of study methods
  • Feeling confident & performing well on exams
    • More aware of learning process
  • Feeling confident but not performing well
  • Time management
Discussion continued

• Useful for instructor to evaluate areas in which students need help
  • “I feel really overwhelmed in lab already—I’m not sure how to approach it or remember what nerve, vein, and artery runs with what.”

• Activities in M100 have been helpful to raise students’ awareness of own habits and teach new study methods
  • Also shows that many students lack awareness, supporting the need for courses like M100

• Methods used in M100 would be useful to implement in regular courses