Learning Assessment Loop Closing Activity in the Biology Department

Vivian Navas

Biology Department Assessment Coordinator

Jan 2007
Assess Student Learning in the General Biology I Course
Justification

- This course is required for all biology majors (400 students/year)
  - Teaches fundamental scientific concepts needed in advanced courses
  - Similar study conducted in Gen Biol II
Activity Summary

- A pre-test on course content was offered on the first day of class and the same exam was offered as post-test at end of semester
Objectives

- Evaluate the teaching/learning effectiveness
- Identify
  - misconceptions that students bring to course
  - persisting misconceptions
- Re-teach misconceptions and missed questions
Instrument

- 25 multiple choice questions
- Include fundamental concepts discussed in the course:
  - Chemistry of life
  - Inorganic and organic
  - Cell
  - Metabolism
    - Photosynthesis
    - Cellular Respiration
  - Mitosis, meiosis
- DNA duplication, transcription and translation
- Genetics
Loop Closing

- **Pre activity:** Pre test 3051

- **Intervention:** Lectures, laboratory exercises, course activities

- **Post activity:** Post test 3051
Results
**Impacted Population**

- **Students**
  - Pre test - 279 students
  - Post test – 174 Students
- **Two faculty members**

Diagnostic tests were offered previously but data was not shared
Contestaciones Correctas Pre y Post-Prueba

Contestaciones Correctas

# de Pregunta

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

Pre-Prueba

Post-Prueba
Pre test

- Over 50% students had knowledge on Proteins (5,6) and organization (23)
- Students had very little knowledge (failed by 80%) on:
  - functional groups, organelles, meiosis, kingdom characteristics and taxonomy
Most failed questions (by over 50% of students)- 22/25

**Misconceptions in pretest** (incorrect by more than 50% of students and same incorrect answer was chosen by more than 40%)

- 8-D - Functional groups
- 13A – Cellular respiration
- 15B - Meiosis
- 18A – Mitosis, meiosis
- 19A - Molecular
- 20C - Transcription
- 24C - Nomenclature
Post test
Results

- Test average
  - Pre 33.78%
  - Post 62.90
- Improvement in knowledge in all items but one question - (22)-
  - Question 22 apparently students confused protists and prokaryotes
- Misconceptions- most students clarified incoming misconceptions
- In some students the misconceptions persisted thus:
  - traditional teaching was not sufficient to correct them
POST TEST

- Failed questions in Post test (by more than 25% of students)- 12/25
- Most failed items: (failed by more than 65%): 5/25
- **Misconceptions in post test** (answer incorrectly and same incorrect answer was chosen by more than 40% of those who failed it)
  - 8D functional groups
  - 9-E organelle
  - 11D bacteria
  - 15B meiosis
  - 20c transcription
  - 22E protists
  - 24C nomenclature
Misconceptions that persisted (pre and post)

- 8D functional groups
- 15B meiosis
- 20C transcription
- 24C nomenclature
<table>
<thead>
<tr>
<th>Destrezas en el Uso de la Computadora</th>
<th>Poco (A)</th>
<th>Algo(B)</th>
<th>Regular ©</th>
<th>Bastante(D)</th>
<th>Mucha(E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ofrecer Presentaciones Orales</td>
<td>52</td>
<td>25</td>
<td>34</td>
<td>24</td>
<td>5</td>
</tr>
<tr>
<td>Realizar Trabajos escritos</td>
<td>40</td>
<td>36</td>
<td>43</td>
<td>21</td>
<td>6</td>
</tr>
<tr>
<td>Trabajos en Equipos</td>
<td>8</td>
<td>9</td>
<td>30</td>
<td>69</td>
<td>30</td>
</tr>
<tr>
<td>Ramas de la Biologia</td>
<td>15</td>
<td>49</td>
<td>55</td>
<td>22</td>
<td>4</td>
</tr>
<tr>
<td>Realizar Trabajos escritos</td>
<td>7</td>
<td>11</td>
<td>37</td>
<td>59</td>
<td>32</td>
</tr>
<tr>
<td>Ofrecer Presentaciones Orales</td>
<td>13</td>
<td>22</td>
<td>52</td>
<td>42</td>
<td>17</td>
</tr>
<tr>
<td>Destrezas en el Uso de la Computadora</td>
<td>7</td>
<td>11</td>
<td>28</td>
<td>66</td>
<td>34</td>
</tr>
<tr>
<td>Liderazgo</td>
<td>5</td>
<td>13</td>
<td>34</td>
<td>56</td>
<td>38</td>
</tr>
</tbody>
</table>

Conocimiento del estudiante en la Post-Prueba Global (285 estudiantes):

<table>
<thead>
<tr>
<th>Conocimiento del estudiante en la Post-Prueba Global (285 estudiantes):</th>
<th>Poco (A)</th>
<th>Algo(B)</th>
<th>Regular ©</th>
<th>Bastante(D)</th>
<th>Mucha(E)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculadora Grafica</td>
<td>83</td>
<td>47</td>
<td>95</td>
<td>45</td>
<td>15</td>
</tr>
<tr>
<td>Experiencias de Investigacion Cientifica</td>
<td>74</td>
<td>78</td>
<td>78</td>
<td>37</td>
<td>18</td>
</tr>
<tr>
<td>Trabajos en Equipos</td>
<td>13</td>
<td>22</td>
<td>52</td>
<td>120</td>
<td>78</td>
</tr>
<tr>
<td>Ramas de la Biologia</td>
<td>26</td>
<td>59</td>
<td>124</td>
<td>56</td>
<td>20</td>
</tr>
<tr>
<td>Realizar Trabajos escritos</td>
<td>11</td>
<td>23</td>
<td>70</td>
<td>114</td>
<td>67</td>
</tr>
<tr>
<td>Ofrecer Presentaciones Orales</td>
<td>19</td>
<td>40</td>
<td>86</td>
<td>94</td>
<td>46</td>
</tr>
<tr>
<td>Destrezas en el Uso de la Computadora</td>
<td>18</td>
<td>24</td>
<td>58</td>
<td>105</td>
<td>80</td>
</tr>
</tbody>
</table>
Closing the loop
Actions taken according to results
Actions

- Shared missed questions and misconceptions with faculty teaching the course for them to be aware and further discuss with students
Actions and Strategies

- In some sections post test was offered **before semester ended to allow for discussion**
- Other students took post test twice as review for final test
  - Individually
  - In groups of 4-6 students
- Incorrect concepts were discussed again to the entire group before final
- Questions asked again in final
In some sections questions were again asked and discussed at beginning of General Biology 2 this week
Group Post Test Discussion Activity

Participating students- 89 students

- 14/18 - perfect score
- 2/18 - 1 incorrect (#9)
- 1/18 - 2 incorrect (#9 and #16)
- 1/18 – 3 incorrect (#3, 4, 6)
Actions to be taken

- Further discuss results with the faculty teaching the course
  - Analyze failed questions and misconceptions
  - Develop a new diagnostic test with important concepts
Further discussion

- In some sections only the missed and misconceptions were tested individually, in groups and further discussed.
Future Strategies

- Continue to discuss missed concepts and misconceptions again before semester ends and at beginning of next semester
- Continue group discussion of posttest
Actions

- Review course content
- Modify the diagnostic test
Innovations

- The diagnostic test was used as teaching/learning tools – to improve student understanding
  - Group test discussion
- Post tests offered before semester ended-allowed for immediate action
- Reteach misconceptions and failed questions
Future studies

- Ethics in science across the curriculum
Final exam

- Water 69
- Amino 90
- organe,lle 55
- Bacteria 67
- Movement 90
- Genes in cel 75
- Transcription 88
- Meiosis 75
- Protists 78
- nomenclature 89