Second Language Acquisition in a Blended Learning of programming languages (SLA-aBLE): Students respond to new materials
Paula Sanjuan Espejo, Undergraduate Research Assistant. Aerospace Engineering Department

Implementations by Term

**Fall 2015**
- **Graded Discussion Board:** Weekly topics. Possible comments: questions, answers, examples, resources.
- Open-ended questions in quizzes.
- Videos followed SLA-aBLE methods: Concepts broken into smaller sections. Parts: Syntax, Keywords, Examples, etc.
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Demographics: Fall 2015 - Spring 2016

<table>
<thead>
<tr>
<th>Language</th>
<th>Not at all fluent (%)</th>
<th>Not very fluent (%)</th>
<th>Moderately fluent (%)</th>
<th>Somewhat fluent (%)</th>
<th>Very fluent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>0</td>
<td>2.41</td>
<td>1.2</td>
<td>9.64</td>
<td>77.11</td>
</tr>
<tr>
<td>Chinese</td>
<td>25</td>
<td>3.85</td>
<td>0</td>
<td>0</td>
<td>76.93</td>
</tr>
<tr>
<td>German</td>
<td>31.75</td>
<td>6.35</td>
<td>4.76</td>
<td>1.59</td>
<td>3.17</td>
</tr>
<tr>
<td>Spanish</td>
<td>11.7</td>
<td>25.53</td>
<td>24.47</td>
<td>4.26</td>
<td>11.70</td>
</tr>
<tr>
<td>Vietnamese</td>
<td>27.45</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>French</td>
<td>22.73</td>
<td>15.15</td>
<td>10.61</td>
<td>4.55</td>
<td>6.06</td>
</tr>
<tr>
<td>Arabic</td>
<td>25.93</td>
<td>0</td>
<td>1.85</td>
<td>0</td>
<td>5.56</td>
</tr>
<tr>
<td>Korean</td>
<td>32</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Portuguese</td>
<td>26.83</td>
<td>7.69</td>
<td>1.92</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>19.12</td>
<td>11.76</td>
<td>2.94</td>
<td>2.94</td>
<td>14.71</td>
</tr>
</tbody>
</table>

- 49.75% have experience learning a second language.
- Student of Korean ascendance:
  - Saw relation between programming languages and a second language.
  - Final grade: 79.75%.
  - SLA-aBLE tests: 93%, 88.21%.

- One third of the students have been exposed to programming before.
  - Prefer new-video format; consider changing all topics to SLA-aBLE format.
  - 27.87% of students learned MATLAB to some extent before taking the course.

Grades: Fall 2016 and Fall/Spring 2016

- Frequency count of grades in SLA-aBLE and non-SLA-aBLE courses in three semesters

- Comparison of students’ final grades in the SLA-aBLE and non-SLA-aBLE sections for three semesters – Fall 2016, Spring 2016, Fall 2016

Programming Language Demographics

<table>
<thead>
<tr>
<th>Programming language</th>
<th>Low skill (%)</th>
<th>Moderately low skill (%)</th>
<th>Moderate skill (%)</th>
<th>Moderately high skill (%)</th>
<th>High skill (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATLAB</td>
<td>48.84</td>
<td>20.93</td>
<td>23.26</td>
<td>4.65</td>
<td>2.33</td>
</tr>
<tr>
<td>Fortran</td>
<td>96</td>
<td>0</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Java</td>
<td>53.66</td>
<td>17.07</td>
<td>17.07</td>
<td>9.76</td>
<td>2.44</td>
</tr>
<tr>
<td>C/C++</td>
<td>73.53</td>
<td>11.76</td>
<td>14.71</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Python</td>
<td>58.14</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Visual Basic</td>
<td>80</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>70</td>
<td>10</td>
<td>13.33</td>
<td>3.33</td>
<td>3.33</td>
</tr>
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K-12, Outreach

- Flash-drive with SLA-aBLE contents distributed to professors at Digifest in Embry-Riddle.
  - Included: Readme file with instructions, quizzes, Think-Pair-Share, Discussion Board prompts, SLA videos, and publications.

- K-12 Contact Information:
  - Email: matlab.sla.able@gmail.com
  - Website: www.i-m.mx/sla/slaable/

- Contact information:
  - Email: sanjuan.p@my.erau.edu
  - Website: www.i-m.mx/sla/slaable/

SLA-aBLE started in 2014. The researchers have been implementing second language acquisition methods, frameworks, and cognitive skills to the learning process of programming languages in Introduction to Computing for Engineers (MATLAB) courses at Embry-Riddle Aeronautical University for four terms. The new materials are focused on developing problem-solving skills and include: new slides and videos with embedded quizzes to keep students engaged, open-ended programming quiz questions, discussion boards online and think-pair-share in-class activities. Surveys and one-on-one interviews were conducted to obtain feedback from students, which was used to improve the materials.

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