Integrating Bibliographic Management Tools in Chemical Information Literacy Instruction

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Main features of the literacy information instruction model

• Introduces students to finding, filtering, and selecting scientific literature and chemical property information
• Helps students understand the different document types (research vs review paper)
• Trains students how to efficiently use a bibliographic management program to export, organize, and share insert citations in Word documents
• Includes assessment of student learning outcomes
• Gathers students feedback on the usefulness of resources, format of instruction, and Evaluating student learning, needs, and preferences
• Adjusting the model to different courses and disciplines
Skills that students learned from the instruction

• Differentiating document types (research paper vs review article)
• Finding chemical property information
• Searching literature databases and exporting references to a bibliographic management program, EndNote Basic (EN)
• Organizing, sharing, and managing citations using EN
• Selecting suitable literature and chemical property information resources
• Inserting citations from EN into Word documents
Instruction components and formats

- Face-to-face sessions
  - Small courses (25-100 students): performed by the librarian
  - Large courses (300-450 students): performed by TAs trained by the librarian
- LibGuide page created for each course
- Online tutorials posted on the LibGuide page for the course
- Online assignment in SurveyMonkey (posted on the LibGuide)
- Grading of assignments (grades included in the total course grade)
  - Small courses (performed by the librarian)
  - Large courses (performed by TAs)
Finding literature and chemical property information

Literature databases
- Google Scholar
- PubMed
- SciFinder
- Scopus
- Web of Science

Chemical property databases
- ChemSpider
- PubChem
- Reaxys
- SciFinder
- The Merck Index Online
A LibGuide page was created for each course
All students have to submit an online assignment in SurveyMonkey
Implementation of the instruction model

- **Undergraduate courses**: 21; Course size: 20-450 students
  - Animal science
  - Cell Biology/Molecular Genetics
  - Chemistry
  - College Park Scholars (honors program)
  - Entomology
  - Gemstone (honors program)
  - Integrated life sciences (honors program)
  - Microbiology
  - Nutrition & food science
  - Professional Writing Program

- **Graduate courses (Chemistry & Biochemistry)**: 4 (25-50 students)
- **Total number of students trained**: > 5,000
### Undergraduate Chemistry Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Course size</th>
<th>Semesters</th>
<th>Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 272&lt;sup&gt;a&lt;/sup&gt;</td>
<td>General Bioanalytical Chemistry Laboratory for non-majors</td>
<td>380-460</td>
<td>3</td>
<td>1,379</td>
</tr>
<tr>
<td>CHEM 277&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Fundamentals of Analytical and Bioanalytical Chemistry Laboratory (chemistry and biochemistry majors)</td>
<td>40-50</td>
<td>7</td>
<td>329</td>
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<tr>
<td>CHEM 425</td>
<td>Instrumental Methods of Analysis</td>
<td>50</td>
<td>10</td>
<td>1,042</td>
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<tr>
<td>CHEM 237</td>
<td>Principles of Organic Chemistry I</td>
<td>47</td>
<td>1</td>
<td>47</td>
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<tr>
<td>CHEM 395</td>
<td>Professional Issues in Chemistry and Biochemistry</td>
<td>100-120</td>
<td>5</td>
<td>513</td>
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<td>CHEM 484</td>
<td>Physical Chemistry Laboratory II</td>
<td>40-50</td>
<td>2</td>
<td>90</td>
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</table>

Total number of students: 3,400

<sup>a</sup>Course discussed in this paper
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Course size</th>
<th>Semesters</th>
<th>Students</th>
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<tbody>
<tr>
<td>BCHM 674</td>
<td>Nucleic Acids</td>
<td>81</td>
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<tr>
<td>BCHM 677</td>
<td>Computational Tools in Biochemistry</td>
<td>10-20</td>
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<td>24</td>
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<tr>
<td>CHEM 611</td>
<td>Professional Skills for New Graduate Students</td>
<td>20-40</td>
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<td>344</td>
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</tbody>
</table>

**All students** 449
Assignment question about EndNote features

References exported from databases to EndNote Online are found in a group (folder) called

Answered: 48  Skipped: 0
Assignment question about SciFinder

- 27 references were found containing "enzyme inhibitors and cholesterol" as entered.
- 10596 references were found containing both of the concepts "enzyme inhibitors" and "cholesterol".
- 1032428 references were found containing either the concept "enzyme inhibitors" or the concept "cholesterol".
- 493791 references were found containing the concept "enzyme inhibitors".
- 549233 references were found containing the concept "cholesterol".
Grading of online assignments
Undergraduate chemistry course (CHEM 272)

<table>
<thead>
<tr>
<th></th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D+F</th>
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<tbody>
<tr>
<td>2014 Spr</td>
<td>332</td>
<td>32</td>
<td>5</td>
<td>4</td>
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<tr>
<td>2014 Fall</td>
<td>306</td>
<td>55</td>
<td>25</td>
<td>9</td>
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<tr>
<td>2015 Spr</td>
<td>311</td>
<td>61</td>
<td>50</td>
<td>9</td>
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</table>
Feedback from students: Ranking of resources
Undergraduate chemistry course /chemistry majors (CHEM 277)

The majority of students ranked EndNote as #1 (most useful) resource.
Course size: 48
2015 Spring
Feedback from students: Preferences for the format of the instruction

If you could choose the format of this instruction, which of the following would you prefer:

- Face-to-Face instruction...
- Online, only

Answered: 48  Skipped: 0

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
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</thead>
<tbody>
<tr>
<td>Face-to-Face instruction plus online tutorials (like this class)</td>
<td>75.00% 36</td>
</tr>
<tr>
<td>Online, only</td>
<td>25.00% 12</td>
</tr>
<tr>
<td>Total</td>
<td>48</td>
</tr>
</tbody>
</table>
Usage statistics: LibGuide

Peaks in the usage of the LibGuide coincided with peaks in the usage of the LibGuide page for a large chemistry course (CHEM 272) and with the times of instruction.
Building enthusiasm for learning

36 students (75%) in a chemistry course for chemistry majors (CHEM277) submitted their online assignments in the first 3 days after the instruction took place (the deadline to submit it was 2 weeks). Course size: 48 students.
The book covers the following topics:

• New models of scientific publishing and peer review
• Information literacy instruction
• Unique author identifiers (ORCID and ResearcherID)
• eScience and academic libraries
• Electronic Laboratory Notebooks
• Social media and Altmetrics
• Bibliographic management tools
• Analysis of research impact metrics
Conclusions

• Efficient model for introducing students at the same time to
  • finding, filtering, and selecting scientific information
  • using a bibliographic management program to manage, share, and insert citations in papers

• Close collaboration between a librarian and a course instructor was essential for the success of the instruction model

• The model was successfully introduced in both undergraduate and graduate chemistry courses