Using POGIL techniques in an IL curriculum

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Abstract

This article presents a case study of the authors’ experience using the POGIL method in an information literacy (IL) course. We describe our approach to using POGIL and discuss both the instructor and student observations about the experience. The article concludes with recommendations for future uses of POGIL in IL.
Using POGIL techniques in an IL curriculum

Process-Oriented Guided-Inquiry Learning (POGIL) is a teaching method based on constructivist principles that enables students to learn through group interaction and problem solving. POGIL-based instruction normally uses structured exercises. These exercises present student groups with a problem and guide them through the steps necessary to solve that problem. Students then apply their understanding of the process to new problems. POGIL has typically been used in the physical sciences, where new knowledge often builds upon earlier findings.

Wake Forest University, a mid-sized private university, offers an elective, 1-credit-hour course in information literacy (LIB 100). This course is typically offered in 10-12 sections per semester, each section being taught by different librarians. While there is a general LIB 100 curriculum, with broad topics to be taught, instructors approach that curriculum with their own individual teaching style and methods. Given the technical nature of some aspects of information literacy instruction, the authors, who together taught a LIB 100 course during 2009, felt that the POGIL method might well be adapted to fit a library instruction course. This approach allowed students to have hands-on experience inside the classroom and work together to discover strengths and weaknesses of various approaches to the problems presented.

This article presents a case study of the authors’ experience using the POGIL method in an information literacy (IL) course. One typical focus of IL courses is on research question definition and research/literature review methods. POGIL appeared to be a good fit for these areas given their technical and detail-oriented nature. In this article we describe our approach to using POGIL to teach this content and discuss both the instructor and student observations about the course. The primary
goal of this article is to serve as a template from which other information literacy course content can be designed.

**Review of Literature**

Information Literacy (IL) curricula tend to be based on one or more IL models. These models often focus on information-seeking processes, the role of technology in defining IL, the role of social elements in IL, and the relationship between IL skills and information ethics and issues. Each of these models adopts a slightly different focus for discussing relevant skills, conceptual competencies, and social and legal issues. One common theme in these models is the need to connect IL with other (non-library) disciplines.

The trend in adopting IL as an interdisciplinary foundation for encouraging student learning across multiple curricula has been reported by Rollins et al. Common interdisciplinary themes include the impact of resource evaluation, information technology (IT) skills, and information-seeking processes. One of the primary challenges in IL, however, is framing these tasks and concepts in a way that is accessible and appropriate for students. This difficulty is based in part on the gap between IT and IL skills. Despite this gap, students are reportedly confident about their abilities to conduct library research. For example, 80% of students surveyed in the recent Smith, et al., study identified themselves as “highly literate” with regards to internet research. In this study, students who had a high self-efficacy rating with regards to technology were also more confident about their IL level overall. Given these attitudes, it can be difficult to create an IL curriculum that is engaging for students.

One method which has been suggested as being effective in delivering IL skills and content is the POGIL method. POGIL uses structured worksheets to take students through ‘understand/identify,’ ‘analyze,’ and ‘create’ stages of learning. These stages are parallel to Bloom's Taxonomy, which defines learning
using seven broad levels (Remembering, Understanding, Applying, Analyzing, Evaluating and Creating). The goal of both POGIL and other Bloom’s Taxonomy based approaches is to guide students through these learning stages. POGIL applies Bloom’s Taxonomy by combining content learning with process skills.

In the POGIL method, students collaborate in small groups working on structured exercises, with each student taking on a specific group role—Manager, Recorder, Technician, Reflector, or Presenter. By using classroom time on these group exercises, POGIL allows the teacher to become a facilitator for learning and to provide directed attention to students and groups on an as-needed basis. Minderhout & Loertscher assert that this facilitator role helps students to learn process skills, such as teamwork and communication, along with discipline-based content. Guided inquiry worksheets are used to structure the learning experience and include three primary sections: Model/Data/Information definition, Critical thinking, and Application. These correspond to the three phases of guided-inquiry learning: exploration, concept invention or formation, and application. While worksheets may recombine or cycle through these three phases, the intent is to scaffold the student learning experience enough to allow them to be self-directed.

By centering the learning in student-led groups, POGIL builds on the foundation of constructivism (student-created knowledge) and social constructivism (knowledge created in social context). These key concepts are incorporated into POGIL through group work and student-centered problem-based learning. POGIL is also argued to catalyze learning by encouraging student leadership and accountability. Farrell, et. al. cite a number of constructivist-focused views of effective teaching environments including (a)“they are actively engaged and thinking in class,” (b)“they construct knowledge and draw conclusions themselves by analyzing data and discussing ideas,” and (c)“they learn to work together to understand concepts and solve problems.”
POGIL can be assessed in a number of ways including student response surveys, student performance in the course as compared to other methods, and student retention of material into subsequent courses. Cole and Bauer suggest additional assessment techniques including student and peer-based assessment, interviews, journals, activity assessments, and a Strength, Improvement and Insight technique.

POGIL has been shown to be an effective learning method, particularly in chemistry. A study comparing POGIL-based classes to traditional lecture classes in organic chemistry at 7 universities found significantly better performance on exams. The study also found “significantly higher growth in process skills” (critical thinking, teamwork, and self-assessment) among the students in POGIL-based classes. Students have also reported a preference for the POGIL method over traditional lecture, and report that they learn better in POGIL-based classes. Daubenmire and Bunce have found, however, that variations in POGIL implementation can result in different outcomes; student performance improves when guided by more questions to extend their group discussions, and “students who must provide reasoning for their responses appear to develop more lasting conceptual understanding.”

An initial search of literature for IL courses using POGIL techniques did not return any previously documented examples. Given the positive experience with POGIL in technical environments the instructors decided to use it for the information/research skills portion of an IL course. The instructors examined the framework of structured worksheets and created three worksheets which took students through the process of defining a research question, defining their information need, and finding and evaluating resources. In each worksheet the following stages were used as a base framework:

1. Explore – provide students with data, models, or other instructional elements which employ “identify” or “understand” knowledge. Ask students to explore base models and concepts.
2. Identify, concept formation – Using progressive questioning and additional concept identification, define terms and models for students. The key objective in this phase is to provide students a framework within which they can fit their current knowledge.

3. Analyze/create/explore – Provide students with problem-based or open-ended tasks which require them to apply their knowledge in new ways.

Given the reported success of these elements and the direct fit with IL on the research and resource evaluation process, POGIL-style worksheets were used for these sections of the course. The remainder of this article presents the method as a case study and reflects on the success of the process using both instructor and student provided thoughts.

**Case study**

In designing the POGIL portion of the course, the authors built on experiences using other interactive instruction techniques. Some of those methods involved electronic survey devices (e.g. clickers, short surveys), in-class worksheets or exercises for discrete topics, and student-driven independent research projects. For this study, the instructors focused on creating a series of worksheets that students would use to learn research problem definition, resource discovery, resource evaluation, and research process management skills. The worksheets were progressive, each one building on previous content, and were designed to be used following the POGIL group structure.

In addition to the research methods portion of the course, we used two class sessions to include instruction on using technology tools (e.g., citation managers and search alerts/notifications) to manage research more effectively. There were also classes on information issues, information technology concepts, and exploration classes on the impact of popular information environments on our everyday
lives. These other units of the class used other instruction methods, including traditional lecture, group presentations, and blog-informed class discussion. These topics were not seen to be a good fit for POGIL methods given their emphasis on exploratory and non-methodical discussion. In retrospect however, it would certainly be possible to adopt a POGIL approach for some other parts of the course. The technology tools sessions in particular might feasibly be more effectively delivered as a worksheet.

The course included four assignments, two of which focused on IL skills (e.g. definition of a research question, identification and evaluation of resources). The other two assignments focused on IL conceptual competencies and included blog posting/class discussions on information issues and a group-based assignment on web-based applications (e.g. flickr, Google docs).

The POGIL-focused classes were conducted in the middle of the semester, and although they were not consecutive, the worksheets presented the information sequentially. A total of four class sessions were used for the exercises. As suggested by the POGIL handbook, the instructors briefly introduced the methods that the class would be using for the POGIL sessions. We reviewed the worksheets in general, discussed the roles that each group member would adopt, and asked students to form groups.

The instructors attempted to follow the progression of task complexity in the worksheets and find appropriate stopping points during each class but found that the exercises took longer than expected and it was unrealistic for students to complete each worksheet during class. This proved to be a learning experience in facilitation for the instructors as it seemed important to discuss the key questions for major sections during the class in which they were covered. While the worksheets were modified slightly based on class experience, the structure is still likely to break over multiple classes. The worksheets for the course are included as Appendix A, B, and C and comprise the following topics:
Research topic identification and exploration

In this worksheet, groups use the same broad topic, “cell phone safety,” and are guided through an initial exploration of resources to help identify possible research avenues. Each student in the group is given a specific resource to search for background information (e.g. New York Times, Google, CQ Researcher) and is asked to answer questions about what they found. Key questions in the initial section ask the group to compare resources and identify common themes in their topic. In the second portion of this worksheet the group is asked to diagram their topic as a “topic map.” Students are guided through an identification process with an example map (e.g. “what are the main topics,” “what are the sub topics,” “which sub-topics are related?”) and then are asked to form their own research map after selecting and reading an in-depth article from their resource. The final key questions ask groups to analyze their findings, to create a research or thesis statement, and to reflect on the content of their statement.

Topic outline and resource identification

In this worksheet, groups are asked to start with the research question from their previous worksheet and write out an initial outline for how they would answer their question. They are again taken through the identify-formulate-create phases by analyzing an existing outline and then creating one based on their previous research. Students review the information timeline concept by identifying the timeliness and indexed location for a list of different resource types (e.g. newspapers, books, journals, blogs, news websites). Groups are then asked to review the outline they created in the first exercise and identify which resource types are likely to fill their information need for each portion of the outline. Following the identification of resources, students are asked to think about the resources that fit their topic and consider how changing their topic would change their resource needs. Next, students are introduced to a number of databases and are tasked with searching a database for information on the previously-
identified information need. During this process, students are introduced to searching and browsing concepts and are asked to identify the presence of these features in the selected database. The students are asked to reflect as a group on the resources they found and the appropriateness of the database they searched.

**Resource evaluation**

For the final worksheet, students are tasked with evaluating resources in depth. The resource evaluation was framed within the context of a research question that was similar in scope and structure to those created by the students in previous worksheets. In this worksheet all groups are presented with an identical research question. Each group was assigned a different article to read and was asked to assess the resource using four metrics—authority, topical accuracy, content accuracy/bias, and publisher perspective. Key questions in this section asked students to think about what role the resource played in answering the research question and asked them to suggest what other information they would need. These two questions were specifically intended to encourage students to think about the research management process and to discuss the process of monitoring research need.

**Observations**

Following the four sessions, the instructors discussed with students some background information about POGIL and the structure of the four classes. As was seen in other case studies, students showed overall positive attitudes towards POGIL during in-class reflection. Students observed that working in group environments was made more enjoyable because class assessment was based on individual work, thus taking pressure off of the group interaction. Second, students indicated that the active nature of learning these concepts and skills was preferable to other methods.
It was interesting to note, however, that students were ready to move on to other class interaction styles. When asked if they would like a course that was entirely based on this method they were skeptical, indicating that a mix of techniques would be preferable. This discussion thread signaled to the instructors that while POGIL was an excellent fit for the technical portions of the class (e.g. constructing a research question, finding and evaluating literature), it was not necessarily the best approach for discussion or issue-centered topics (e.g. information ethics, history of the web). Perhaps given the small number of students in the course (9), we found it easier to have students engage in class discussions as a whole. This would not scale up in a larger setting and perhaps in that environment a POGIL-based group technique might prove to be more effective.

One challenge we found was that by limiting our POGIL-based interaction to four class sessions, we failed to create the group dynamics that are documented as being key to an effective POGIL-based classroom. For example, student absences made it difficult for groups to have cohesiveness over the short time period and students did not think of the groups as persisting between classes. As a result, students did not cement into an inter-dependent group as they might if the entire course had focused on this structure. The instructors did observe that while students seemed initially hesitant about forming groups, they very quickly settled into working through the worksheets; following the first class which involved the worksheets, class time was almost completely spent working through the exercises and class discussion. Students appeared to already be equipped with the skills required to work in groups and learn through interactive worksheets.

One key technique used throughout the exercises was to have students in each group complete variations of the same task using similar resources. For example in the “resource identification” exercise, each student in the group was given a different database to work with. This naturally set up groups to have a common framework but different experiences to discuss. This enabled the group as a whole to
investigate an IL concept in more detail and to see the outcomes of different approaches. This granular understanding and discussion appeared to be much more detailed than lecture-based content could have produced.

While the course did not gather any quantitative data regarding student learning, overall performance in the course was good. Students as a whole performed well on assignments related to the POGIL-based content, indicating that at the very least they had a common conception of assignment expectations and had a detailed framework from which they could approach their assignments. Students also revealed that they had used the exercise worksheets while later conducting their individual research. Of note, students in the course tended away from print resources and overall seemed to have a fuzzy picture of the elements of a scholarly resource. Future versions of the exercises will need to address this shortcoming.

**Conclusions and next steps**

The POGIL approach includes a wide range of pedagogical and assessment techniques. This course attempted to implement only a very limited set of these techniques, including progressive worksheets and student-driven group work as opposed to lecture. Ongoing assessment such as homework based on the worksheets, weekly quizzes, and other ongoing assessments would help a comparative assessment of POGIL approaches in relation to other techniques.

The limited use of POGIL in this course did reduce its impact, but it is expected that future applications of the worksheets and POGIL methodology in IL courses could mitigate this effect. Some key concerns that should be addressed in future courses are the lack of group cohesiveness and revision of worksheets to address limitations of previous implementation. Further, POGIL techniques could be extended to other relevant content areas.
Overall the POGIL experience in this course was a positive one. It allowed the instructors to employ a mix of pedagogical techniques and provided students with documented frameworks which they could use outside of the class. Students appeared to be happy with the use of group work in class but individual grading for assignments, and they were much more interactive in the POGIL portions of the course than in other sections.
Appendix A – Framing the research question worksheet

Exercise overview
This exercise is intended to give you an understanding of how to start with a broad idea and focus it into a research question or thesis appropriate for a research paper. The exercise takes you through the process of completing initial research on a broad topic, identifying related ideas, creating an outline of information needed for a thesis/research statement, and the creation of the thesis statement.

Instructions
Working in groups of 3, complete the worksheet. Appoint one person to record the group answers on the worksheet, one person to read the questions and assignments to the group, and one person who is responsible for reporting back. All three members of the group should participate in discussion and reading.

Problem Exploration (Approx 20 min)
The broad topic that your group will start out with is “Cell phone safety.”
As a group, brainstorm some thinks you know about your broad topic. Have the recorder write those ideas down below.

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Instructions: Using these ideas, have each of your members search for these terms/ideas in the following databases. Have each group member pick one database and search it. Have the person who chooses CQ Researcher also search the New York Times. For each of the databases answer each question. The person who searches both CQ Researcher and the New York Times only has to select one article to read from the two databases.

1. Google (http://www.google.com)
   a. Scan the results of your searches. What did the first page of results look like (topically, resource type, date, etc).______________________________________________________
      __________________________________________________________________________
      __________________________________________________________________________
   b. Try multiple searches with different terms. Which terms did you like best and why?
      __________________________________________________________________________
      __________________________________________________________________________
   c. Select an article to read. Skim it quickly to make sure it is on topic. The article should be at least 3 pages in length (estimate). It should also have links to other articles or ideas.

a. Scan the results of your searches. What did the first page of results look like (topically, resource type, date, etc).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

b. Try multiple searches with different terms. Which terms did you like best and why?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

3. NyTimes (http://nytimes.com)
   a. Scan the results of your searches. What did the first page of results look like (topically, resource type, date, etc).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

b. Try multiple searches with different terms. Which terms did you like best and why?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

c. Select an article to read. Skim it quickly to make sure it is on topic. The article should be at least 3 pages in length (estimate). It should also have links to other articles or ideas.

4. CQ Researcher (http://library.cqpress.com/)
   a. Scan the results of your searches. What did the first page of results look like (topically, resource type, date, etc).

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

b. Try multiple searches with different terms. Which terms did you like best and why?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

c. Select an article to read. Skim it quickly to make sure it is on topic. The article should be at least 3 pages in length (estimate). It should also have links to other articles or ideas.

Key questions
Instructions: As a group discuss your experience and answer the following questions. Have the recorder jot down the decision or observations of the group.
1. Was there a database that returned better results than the others? If so, why?
Problem Evaluation (Approx 20 min)

Instructions: Problem diagramming is a way of reading articles that help you identify main and sub topics, issues related to the sub-topics, and related or tangential ideas. Look over the following topical diagram and answer the following questions.

1. What is the main topic in the article? __________________________________________

2. What are two of the primary sub-topics in the article? ___________________________  
   __________________________________________________________

3. Can you identify common groups or individuals to your sub-topics?

2. Which search terms worked best in your database? Were they similar for everyone?
Article exploration

Instructions: Each member of the group should read the article they selected. As you read, take notes on sub-topics (e.g. topics related to the broad topic but more limited in scope), issues related to those sub-topics (e.g. a topic debate, unknown aspects, or unresolved conflicts), and sub-topic perspectives (e.g. a pro/con stance, elements surrounding the unknown issue, people or groups behind the conflicts).

Article 1

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Article 2

______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Article 3

______________________________________________________________________________
______________________________________________________________________________

Key questions

Instructions: As a group discuss your experience and answer the following questions. Have the recorder jot down the decision or observations of the group.

1. Map out the sub-topics related to your primary topic. Connect the sub topics to one another and to the main topic. Write down pro/con type issues or unknown facets of each sub-topic. Write down interested groups or persons.

2. What were the common issues related to the sub-topics?

3. Were there any groups or individuals related to the sub-topics? Did any relate to multiple sub-topics?
Plan your research question / thesis (Approx 10 min)

Instructions: As a group, identify a single sub-topic, issue, or perspective and answer each of the following questions.

1. List relevant sub-topics of your selected sub-topic.

Write your thesis statement / research question

Instructions: As a group, review your outline and form a thesis statement / research question. A well-formed question / statement should:

- Not be answerable as a yes/no question
- States a broad topic and refines the idea
- Addresses assumptions embedded in the topic
- Addresses any inherent bias in the topic/issue or in the way the question is asked
- States a direction or perspective for your research topic
- Points to an obvious avenue of research to answer the question or address the thesis statement

An example of a good research question is: Although the publishers have been vocal on their position regarding how google will compensate them when people purchase books, other organizations such as the Internet Archive have an equal stance in this agreement and are not currently included. How can an agreement be structured to allow these organizations to be equal players and what impact will this agreement have on the use of digitized books?

Thesis statement / research question

_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________
_________________________________________________________________________________

Key questions

As a group, think about your research question / thesis statement. Did it answer all of the key points of a good question? If not, modify your question to fit.

As a group, brainstorm the types of resources you would need to answer your question. List up to five resource types / or resource content that would help you answer your question.

1. ____________________________________________________________________________
2. ____________________________________________________________________________
3. ____________________________________________________________________________
4. 

5. 

Appendix B – Finding resources to answer your research question worksheet

Exercise overview
This exercise is intended to give you an understanding of how to take your research question / thesis statement and find resources in order to answer it. The exercise takes you through the process of defining the types of resources you need to find, searching databases to find these resources, and evaluating the resources you find within the context of your research need.

Instructions
Working in groups of 3, complete the worksheet. Appoint one person to record the group answers on the worksheet, one person to read the questions and assignments to the group, and one person who is responsible for reporting back. All three members of the group should participate in discussion and reading.

Creating a plan for your research (Approx 15 min)
Take the research question / thesis statement from exercise 1 and copy it below:

Thesis statement / research question
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________
_____________________________________________________________________________________

Instructions: Often it can be helpful to create a brief outline of a sub-topic before writing it up as a research question. This outline can contain a definition of the broad topic, a list of relevant sub-topics, discussion of the issues, perspectives, or groups relevant to each sub-topic. For example. With regards to the broad topic “Google Books settlement” a brief outline might be:

1. The google books settlement is an ongoing legal battle between google, the US Justice Department, and several publishers and organizations who are concerned about the impact of the google books digitization project.
   a. Related topic – Publisher rights
      i. Issue – what rights do publishers have for out of print books?
      ii. Issue – How does the agreement that google is working out impact other digitizers (such as the Internet Archive)?
      iii. Question – What does this mean for public access?
      iv. Unknown information – Are there other interested parties?
      v. Unknown information –What is the current state of the agreement?

Instructions: Come up with a broad outline of how you would approach conducting research on your topic. This outline might include a definition of the broad idea, exploration of the sub-topic, list of unknown items, etc.
Information timeline (approx 10 min)

**Instructions:** Recall the information timeline from earlier in the semester. The information timeline refers to the sequence in which information is published about an event or topic. Understanding the information timeline is useful in figuring out where to look for information. Working as a group, fill out the table below indicating the timeliness of each of the listed resource types and where you would expect to find these resources indexed for searching. Your group can use the information in the following lists to help populate the table.

**Database types:**
- Google
- Google Scholar
- Library licensed resources (e.g. Academic Search Premier, Proquest)
- Resource specific indexes (e.g. the New York Times index)
- Library catalog / Google Books

<table>
<thead>
<tr>
<th>Resource type</th>
<th>Timeliness</th>
<th>Database where information is indexed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Television / radio</td>
<td>Real-time</td>
<td>Google, television websites</td>
</tr>
<tr>
<td>Newspapers</td>
<td></td>
<td></td>
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<tr>
<td>Blogs / WWW sites</td>
<td></td>
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<tr>
<td>Magazines</td>
<td></td>
<td></td>
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<tr>
<td>Scholarly journals / research studies</td>
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<tr>
<td>Books</td>
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<tr>
<td>Encyclopedias</td>
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<td>Textbooks</td>
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<tr>
<td>Conference papers</td>
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**Instructions:** As a group, take a look at the outline that you completed during the first exercise. Discuss how the issues, topics, and questions represented in your outline contribute to answering your research question. Discuss how each of those outline items can be addressed with a specific type of resource. As a group, fill out the following table indicating the element from your outline and the resource type that is needed to answer it:
Key Questions
1. Which resource types seem to be most relevant for your research? Why?

Database searching (approx 20 min)
Instructions: As a group, examine the topics and resource types identified in the topic/resource table. Have each member of the group select an issue/topic and resource from the table above and a database from the table below. Have each group member select only one database. As individuals you will explore your database by searching for resources that match your resource need.

Table 1. List of databases to consult

<table>
<thead>
<tr>
<th>Database name</th>
<th>Resource type</th>
<th>Group member</th>
</tr>
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<tbody>
<tr>
<td>Academic Search Premier</td>
<td>General – newspapers, magazines, periodicals</td>
<td></td>
</tr>
<tr>
<td>Proquest direct</td>
<td>General – focus on business publications and newspapers</td>
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</tr>
<tr>
<td>Online Catalog</td>
<td>Books</td>
<td></td>
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<tr>
<td>Google Scholar</td>
<td>Wide range of publications, conference proceedings</td>
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<tr>
<td>Google</td>
<td>Web-sites, blogs, wikis</td>
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<tr>
<td>Sociological Abstracts</td>
<td>Scholarly publications on sociology</td>
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<tr>
<td>LexisNexis Academic</td>
<td>News and business</td>
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Instructions: Once you have selected your database, each group member should go to http://databases.zsr.wfu.edu and locate their database. Once you are in your database, complete the following questions individually:

Database selected: __________________________

Individual instructions:
1. Reflect on the search terms your group has used so far. Using these search terms try to find relevant resources in the database. As you search, look for the following features and answer the questions:

   a. Subject headings – Subject headings are associated with each resource. Subject headings can be used to find related records on your topic
b. **Resource type** – Resource types (e.g. Newspapers, scholarly journals, books, magazines). You can often find ways to limit to these resource types.

c. **Searchable fields** – All databases allow you to search specific fields (e.g. Title, author, publication date, subject, keywords, full text).

d. **Advanced Search** – Advanced searching allows you to search multiple indexes, do complex combinations of terms, etc.

e. **Truncation** – truncation allows you to use a character (often *) to search for words with multiple endings (e.g. bicy* will return bicycle, bicycling, bicycles).

As you search, identify the most relevant subject headings. Write down the headings that best match your topic.

Subject headings:

_____________________________________________________________________________________

_____________________________________________________________________________________

Do a search with your subject headings - were the articles that were returned more or less relevant than your keyword searches?

_____________________________________________________________________________________

How were the subject headings different from your keywords?

How many subject headings were required to describe your topic?

What search features did your database support?

**Key questions**

**Instructions:** As a group discuss your experience and answer the following questions. Have the recorder jot down the decision or observations of the group.

Did you find good results in your database? How successful did you feel?

What features did your databases have in common (e.g. advanced searching, resource type limits, wildcard searching)

What subject headings worked best in your databases? Were there common headings across the databases?
Appendix C – Evaluating resources worksheet

Exercise overview
In this exercise we will focus on evaluating resources in depth. In order to do this each group will read and evaluate a single article. As a whole, the class will discuss the relevance of each article read to the research question and make a decision about how well the articles overall address the research question.

Instructions
Working in groups of 3, complete the worksheet. Appoint one person to record the group answers on the worksheet, one person to read the questions and assignments to the group, and one person who is responsible for reporting back. All three members of the group should participate in discussion and reading.

Instructions: As a class we are going to evaluate resources selected to answer a research question. Two people will evaluate a resource, answering the following questions using our resource evaluation framework:

The topic: Health care reform
Research question: The “Public Option” has been a hotly debated portion of health care reform now before the senate. While support for the public option varies from individual to individual, understanding the overall perspective of certain interested groups enables us to examine the pro/con perspectives of this issue more objectively. For the purpose of this research, the following groups will be investigated: Physicians, Pro-“public option” government officials, Anti-“public option” government officials, private citizens, and political pundits. How are the views of these groups similar? How are they different? Given this analysis of this research, is there any room for compromise?


Evaluative metrics:

Authority: Who wrote the article, what can you find out about them (hint, look around the article, try their name out in Google)

Topical Accuracy: How relevant is this resource to the research question. Exactly which piece of the research question does it address?

Content Accuracy / Bias: Is the based in fact or opinion? Does the resource have a particular bias or perspective? What kind of article is it (e.g Editorial, research article, news article, etc)?

Publisher perspective: Who published this article? What can you find out about the publisher and their perspective on this topic (i.e. do they have a stake in representing the topic a certain way)? Hint – try googling the publisher name, journal name or use alexa (http://www.alexa.com/) to find out about a website.
Key questions

1. What role do you think that this article would play in helping answer the research question?

2. What other resources or information would you need to fully answer the research question?
Notes and references


14 Hanson, “POGIL | POGIL Instructor's Guide.”

15 Farrell, Moog, and Spencer, “A Guided-Inquiry General Chemistry Course.”


17 Ibid.

18 Hanson, “POGIL | POGIL Instructor's Guide.”


21 Farrell, Moog, and Spencer, “A Guided-Inquiry General Chemistry Course.”

22 Suzanne M. Ruder and Sally S. Hunnicutt, “POGIL in Chemistry Courses at a Large Urban University: A Case Study,” in *Process Oriented guided Inquiry Learning (POGIL)*, ACS Symposium Series 994
(Washington, DC: American Chemical Society, 2008), 133-147,


25 Ruder and Hunnicutt, “POGIL in Chemistry Courses at a Large Urban University: A Case Study.”
