Research-based learning from the start: Developing undergraduate researchers

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Research-Based Learning from the Start: Developing Undergraduate Researchers

Jen Fabbi, Special Assistant to the Dean of Libraries
Anne Zald, Head, Instruction Department

University of Nevada Las Vegas Libraries
http://www.library.unlv.edu/faculty/institute

November 12, 2010
This presentation will:

- Describe the Faculty Institute for Research-Based Learning in High Impact Classes at UNLV
  - Goals and curriculum
  - Examples of impact to date
- Rough assessment of need to intentionally integrate research skills into curriculum at your institutions
- Action plan focusing on potential collaborators at your institutions
Background

- Fall 2009: 22,708 undergraduate students; 72% were full-time; 3217 new freshmen with a 73% first-yr retention rate; 39.4% six-year graduation rate
- Budget-induced movement to large-enrollment classes
- General Education Reform developments
  - Articulation of University Undergraduate Learning Outcomes, especially Inquiry and Critical Thinking
  - New general education requirements extending vertically throughout the curriculum
- Focus on enhancing the first-year experience for incoming students
Inquiry & Critical Thinking

1. Analyze problems, articulate questions or hypotheses, and determine the need for information
2. Access and collect the needed information from appropriate primary and secondary sources
3. Use quantitative and qualitative methods, including the ability to recognize assumptions, draw inferences, make deductions, and interpret information to analyze problems in context and draw conclusions
4. Recognize complexity of problems and identify different perspectives from which problems and questions can be viewed
5. Evaluate and report on conclusions, use results to make judgments and guide actions, and identify areas where further inquiry is needed
6. Identify, analyze, and evaluate reasoning and construct and defend reasonable arguments and explanations
First year experience

2nd-year experience

Milestone experience

Culminating experience

Option: Linked to ENG course

High-impact practices link to major outcomes

NSHE Core remains intact

Color code:
- University
- Univ/Major
- Major
Faculty Institute for Research-Based Learning in High Impact Courses

Focused on faculty who were:

• Teaching a large-enrollment, lower-division course or coordinating a multi-section, high-impact, lower-division course in Fall 2010
• Seeking ways to enrich their courses and engage their students
• Committed to including substantive research and critical thinking components that utilize the Libraries’ collections in their courses
• Interested in exchanging teaching ideas with colleagues from across the UNLV campus
• Eager to explore creative and effective ways to work with University partners to bring research into the classroom
• Interested in utilizing technology to create active learning environments in large classes
Faculty Institute for Research-Based Learning in High Impact Courses

- University Libraries partnered with the Teaching and Learning Center, Offices of Information Technology, Academic Assessment, and the Provost
- Funded by donors to the Libraries
- Targeted courses and faculty
- Provided faculty librarians to partner in assignment redesign
- Included stipends, a three-day Institute, and a year-long cohort experience for all participating faculty
- Faculty implementing their redesigned assignments this semester
# Targeting of Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Student Count Sp 09</th>
<th>Student Count Fall 09</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anthropology 101</td>
<td>432</td>
<td>591</td>
<td>1023</td>
</tr>
<tr>
<td>Business 101 (103)</td>
<td>518</td>
<td>724</td>
<td>1242</td>
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<tr>
<td>English 102</td>
<td>1406</td>
<td>1294</td>
<td>2700</td>
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<td>History 100</td>
<td>143</td>
<td>416</td>
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<td>History 102</td>
<td>403</td>
<td>397</td>
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<td>Music 125</td>
<td>656</td>
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<td>1509</td>
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<tr>
<td>Philosophy 101</td>
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<td>579</td>
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<td>Philosophy 102</td>
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<td>1217</td>
<td>2747</td>
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<tr>
<td>Psych 101</td>
<td>884</td>
<td>1158</td>
<td>2042</td>
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<tr>
<td>Science 101</td>
<td>173</td>
<td>328</td>
<td>501</td>
</tr>
<tr>
<td>TOTAL</td>
<td>6426</td>
<td>7276</td>
<td>13,702</td>
</tr>
</tbody>
</table>
Institute Curriculum

What is Research-Based Learning?
• Student-centered
• Process-centered
• All students (or as many as possible)
• Curriculum-based

Purpose  Research-Based Learning Outcomes

Scaffolding

Process  Reflection and Feedback
Strategies for Scaling

Product  Redesigned Assignment
# Alberts’ Model

<table>
<thead>
<tr>
<th>K-12 Researcher</th>
<th>Undergraduate Researcher</th>
<th>Graduate Student Researcher</th>
<th>Faculty Researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selects among questions</td>
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<td>Identifies/poses unique question</td>
<td>Poses unique question(s)</td>
</tr>
<tr>
<td>Learn techniques / methods – components of methodology</td>
<td>Guided construction of methodology through application of methods / techniques</td>
<td>Selects from established methodologies</td>
<td>Determines or creates methodology for investigation</td>
</tr>
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<td>Guided in methods of primary data/source collection</td>
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<td>Sustained generation or collection of primary data/sources</td>
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<td>Data manipulation and analysis / Analysis and interpretation of evidence</td>
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<tr>
<td>Introduced to secondary and popular literature</td>
<td>Directed toward scholarly sources of knowledge</td>
<td>Conducts comprehensive secondary literature review</td>
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<td>Coached in disciplinary modes of communication</td>
<td>Coached in disseminating results to peers</td>
<td>Disseminates results for peers</td>
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Science 101

SCI 101 (First Year and Transfer Science Major Orientation)

• More intentional **scaffolding** of an existing assignment, which culminates in the creation of a digital poster and presentation on research ethics.

• The new component of this assignment focuses on critical reading of a scientific abstract and later, writing their own abstract to describe their poster.

• The assignment integrates team work with a peer, finding and analyzing an article, writing skills, and a new and improved grading rubric.

• Students in each section visit the library twice.
Animal Testing

Question

Is the practice of animal testing acceptable?

Abstract

Animal research is most obviously beneficial and acceptable due to its ability to improve the quality of life of humans and ultimately save lives. Modern day treatments were developed and researched extensively with animals before humans in order to maximize the safety of modern medicine and practices. Such treatments include antibiotics, chemotherapy, and vaccinations but extend far beyond these three. The aim of doing this is to cure disease and to control pain currently relies on the information that can only be obtained through experimental animals. Animal experimentation is acceptable because there are strict guidelines that must be used in order to conduct such research. The Animal Welfare Act (AWA) is the most notable regulation of animal treatment. This act regulates the ways in which scientists can house and treat the animals that they study for research. Also, in order for an experiment to be performed on an animal, the scientists are required to use any other methods that would yield the same results as using an animal for the experimentation. This act proves very important because it is the standard for determining the federal grants and funding received by institutions for their research. Most research is funded by these grants and this emphasizes the welfare and humane treatment of animals used for research. The institutions that receive funding are inspected to insure that standards are upheld according to the AWA.It is further acceptable to conduct animal research because animals serve as good subjects for testing. The animals used for testing react similarly to humans yet the lifespan of the animals is much smaller than that of humans and allows scientists to study the progression of diseases as well as treatments. Scientists’ capabilities to genetically engineer rodents such as mice make the animals even more useful for study. Scientists are able to manipulate the variables in an experiment to study the effects and gain a greater understanding of the implications they hold for humans. Two types that are commonly used for research are transgenic mice, which have added genes compared to genetically unmodified mice, and knockout mice, which have disabled or less genes compared to genetically unmodified mice.

Background Information

Using animals to study the human anatomy or human disease, and how it can react to certain chemicals and medicines, is a centuries-old practice. Animal testing has been one of the fundamental elements in research to create various drugs that help benefit humans without using or taking a human life. However, animal testing is not only used to chemically or physically put pain onto an animal, but they are also used for humans to study and observe.

Pros

Animal research is most obviously beneficial and acceptable due to its ability to improve the quality of life of humans and ultimately save lives. Modern day treatments were developed and researched extensively with animals before humans in order to maximize the safety of modern medicine and practices. Such treatments include antibiotics, chemotherapy, and vaccinations but extend far beyond these three. The aim of doing this is to cure disease and to control pain currently relies on the information that can only be obtained through experimental animals. Animal experimentation is acceptable because there are strict guidelines that must be used in order to conduct such research. The Animal Welfare Act (AWA) is the most notable regulation of animal treatment. This act regulates the ways in which scientists can house and treat the animals that they study for research. Also, in order for an experiment to be performed on an animal, the scientists are required to use any other methods that would yield the same results as using an animal for the experimentation. This act proves very important because it is the standard for determining the federal grants and funding received by institutions for their research. Most research is funded by these grants and this emphasizes the welfare and humane treatment of animals used for research. The institutions that receive funding are inspected to insure that standards are upheld according to the AWA.It is further acceptable to conduct animal research because animals serve as good subjects for testing. The animals used for testing react similarly to humans yet the lifespan of the animals is much smaller than that of humans and allows scientists to study the progression of diseases as well as treatments. Scientists’ capabilities to genetically engineer rodents such as mice make the animals even more useful for study. Scientists are able to manipulate the variables in an experiment to study the effects and gain a greater understanding of the implications they hold for humans. Two types that are commonly used for research are transgenic mice, which have added genes compared to genetically unmodified mice, and knockout mice, which have disabled or less genes compared to genetically unmodified mice.

Cons

The cons of animal testing are limited to a degree. However, the seriousness of the downfall to animal testing is an impact. Why should animal testing be stopped? Most Animal Rights Activists focus on arguments such as the fact that animal testing is not reliable, many of the animals die for no reason, and it is a costly procedure. Reliability on animal testing can lead to false conclusions because of many reasons. Animals and humans share some similarities in their anatomy; however, the way we both physiologically and behaviorally react to our surroundings can be different. The animal body differs from that of the human that it might not be able to reveal anything about human health or illness. For example, Aspirin is toxic to rats, but it is not toxic to people. 20 million animals are killed annually due to experimentation. Three-fourths of those animals are tested for medical use, and the other quarter for research purposes. About 8 million of those animals suffer painful experiments, and are not retrieved with painkillers. Many times when the experiments fail, there is complete loss of animal life. From the animal testing facts, it is also said that most of these animals die due to human errors, which occur either in the concentration of the drug or the amount. This again is considered as wastage of life. They also say that some animal experimentation is performed out of mere curiosity, and has little or no scientific merit. They just do it in hopes to find something that might reflect on human benefits. Scientists also believe that animal testing is okay because in some cases it doesn’t inflict pain on the animal. “The nervous system of a lobster is very simple, and is in fact most similar to the nervous system of the grasshopper. It is decentralized with no brain. There is no cerebral cortex, which in humans is the area of the brain that gives the experience of pain.” Because of these reasons some scientists in renowned institutes use these animals very liberally. The cost in order to do all of this experimentation is high. Expenses are spent on the animals by feeding them, housing them, and treating them with drugs. Prices add up especially if the experimenting occurs more than once over the course of time. Companies also invest in breeding a specific animal just to test on them.

Conclusion

Though it seem to be unethical to test on animals, we believe that it is necessary to test on them. In order to find ways to benefit us humans, and find answers to things we don’t know experimentation is needed. It is obvious that it is better to test on an animal and lose a life, than to test on a human and lose a life. However, we believe animal testing should only be done for a legitimate reason and should only go beyond a certain extent. Scientist should still practice replacement, reduction, and refinement when testing on animals if there is always a way. Replacing is to prefer use of non-animal methods over animal methods whenever it is possible to achieve the same scientific aim. Reduction refers to methods that enable researchers to obtain comparable levels of information from fewer animals, or to obtain more information from the same number of animals. Refinement refers to methods that alleviate or minimize potential pain, suffering or distress, and enhance animal welfare for the animals still used.

Literature Cited


Further Information

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An Ethical View on Weapons of Mass Destruction

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College of Sciences, University of Las Vegas, Nevada

Abstract

The poster explains some of the ethical questions often encountered when the topic of Nuclear, Chemical, and Biological weapons comes up. For example, is it ethical to use Weapons of Mass Destruction to kill human beings? We conducted a broad examination on the topic, and incorporated that into the poster. We mostly gathered information off the internet in the form of online journals and popular websites. The motivation for this research is simply a concern for the well-being of man. The ethical question of these destructive weapons is always going to be an important issue to the world as long as these weapons exist. There is always going to be two sides to any topic, and previous research has shown us that in regards to this issue. There is always going to be people that are in favor of using weapons for global domination, but there is more research showing that these weapons have no purpose other than greed. The conclusion that we reached from our research and our own personal opinion is that Weapons of Mass Destruction are wrong in any circumstance. Wars are fought for power, land, and greed; using weapons that can annihilate thousands of people, is the definition of wrong.

Introduction

The Nuclear bomb was developed by the United States during World War II, under the code name the Manhattan Project. It employed many of the era’s best physicists and engineers. It was used to force Japan into an unconditional surrender to end the second world war (1). We live in a country that allows us to speak our mind, and because of that ethical questions exist. But is there ever a side that is always a hundred percent right about the issue. Our argument is only one side of the story that makes the most sense to us.

Biological Weapons

Biological weapons include any organism or toxin found in nature that can be used to kill or injure people. During the French and Indian War in the 18th century, British forces under the direction of Sir Jeffrey Amherst gave blankets that had been used by smallpox victims to the Native Americans in a plan to spread the disease (2). In 1979, an accidental release of anthrax from a weapons facility in Sverdlovsk, USSR, killed at least 66 people (2). This is just a perfect example on how Weapons of Mass Destruction can be accidently released.

Chemical Weapons

Chemical warfare involves using the toxic properties of chemical substances as weapons to kill, injure or incapacitate an enemy. These agents, like most weapons of mass destruction, are indiscriminate killers, meaning they kill friend, foe, and innocent alike. The use of chemical agents in WWI caused an estimated 1,300,000 casualties, including 90,000 deaths (3). In WWI chlorine and mustard gas were developed and most extensively used by the Germans. As time progressed chemical agents became even more potent and some of these are nearly undetectable, an example is the V series nerve agents developed in the 1950s, during the Cold War (1).

Conclusion

So should scientists be involved in the development of Weapons of mass destruction? The answer is simply “No!” If it weren’t for scientists to develop these kinds of weapons, there wouldn’t have been any deaths attributed to them. These weapons should be for the betterment of mankind and the preservation of humanity as a whole, and we see that these weapons will never do either one.

I do not believe that civilization will be wiped out in a war fought with the atomic bomb. Perhaps two-thirds of the people of the earth will be killed. A very few people will live as victims of the war, and future generations will have to live with this as their past.

Nuclear Weapons

A nuclear weapon is an explosive device that derives its destructive force from nuclear reactions, (e.g. the Atomic Bomb). It was estimated that around 200,000 people died in result of the atomic bombing of Hiroshima, and the estimated number is not including the second atomic bombing in the city of Nagasaki (6). Several physicists among the many scientist refugees from Nazi-occupied Europe left the Manhattan project and started their anti-nuclear weapon political work as soon as Nazism was defeated. They realized that even a democratic system could not provide any guaranty against the use of such weapons of mass destruction but their influence was too weak to prevent their use by the political and military elite in power against civilians (6). Nuclear explosions produce both immediate and delayed destructive effects. Immediate effects (blast, thermal radiation, prompt ionizing radiation) are produced and cause significant destruction within seconds or minutes of a nuclear detonation. The delayed effects (radioactive fallout and other possible environmental effects) inflict damage over an extended period ranging from hours to centuries, and can cause adverse effects in locations very distant from the explosion.

Fig. 1. Photograph of Atomic bombing on Nagasaki, Japan, 1945

Table of Nuclear Weapons per Country

<table>
<thead>
<tr>
<th>Country</th>
<th># of nuclear weapons</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>10,300</td>
</tr>
<tr>
<td>Russia</td>
<td>16,000</td>
</tr>
<tr>
<td>China</td>
<td>410</td>
</tr>
<tr>
<td>France</td>
<td>350</td>
</tr>
<tr>
<td>UK</td>
<td>200</td>
</tr>
<tr>
<td>Israel</td>
<td>100</td>
</tr>
<tr>
<td>India</td>
<td>90</td>
</tr>
<tr>
<td>Pakistan</td>
<td>85</td>
</tr>
</tbody>
</table>

Questions

1. Weapons of Mass Destruction, Should scientists be involved in their development?
2. Are Weapons of destruction ethical to kill thousands of people to prevent the death of thousands of people?

Discussion

Can you think of a good reason to use a weapon that has the potential to kill thousands of people? Whether it’s a chemical, biological, or nuclear weapon, the end result is always the same. Where would America be if early settlers never killed off Indian tribes with biological warfare, where would the country be if it had never dropped the atomic bomb on Japan. Obviously the world would be a lot different then what it is now, and there’s no way of going back in time, the past is the past. But the world has the chance now to stop the use of weapons with these devastating effects. We as human beings all deserve the right to live our lives to the fullest. Why is there a need for conflict when we are all the same?

Analysis

Many major countries posses nuclear warheads. In 1968 China, France, Russia, United Kingdom, and the United States negotiated the nuclear Nonproliferation Treaty to prevent future countries from developing nuclear warheads. India, Israel, and Pakistan have never signed the treaty and possess nuclear arsenals. Iraq initiated a secret nuclear program under Saddam Hussein before the 1991 Persian Gulf War. North Korea announced its withdrawal from the NPT in January 2003 and has tested nuclear devices since that time. Iran and Libya have pursued secret nuclear activities in violation of the treaty’s terms, and Syria is suspected of doing the same (5). Do we know for sure that these countries will never release these weapons on other countries? Chances are that with so many weapons in a countries possession, some ones bound to release a weapon that will kill thousands of innocent people. Global nuclear war seems an almost inevitable future for humanity, although as a symbolic gesture of good when the dooms day clock was set back another minute, seven minutes until midnight. It symbolically says we are moving away from total nuclear war (4). But the clock is always going back and forth, and who knows what tomorrow can bring. Until those weapons are eradicated, nuclear war seems unavoidable. Plain and simple, weapons of mass destruction are used for the sole purpose of death. Where in the world is “killing” a legal act? What gives someone the right to take some ones life? Killing is unethical under any circumstance. So our conclusion to question number two can be answered with another question. Why even be put into a win situation? In the end human beings will die, whether it’s the people from the country who chose not to drop the bomb, or the country who chose to keep fighting. Someone needs to be the one to set an example of a war free world, why not America?

Sources

Music 125

MUS 125 (History of Rock Music)

- Students are asked to take on the persona of manager of a solo artist or band and promote their artists through the creation of promotional “PR” packets.
- Students use a “recommended resources” guide co-created by the course coordinator and librarian to locate credible information and synthesize it into a press packet template.
- The assignment was created from scratch and includes five steps scaffolded over ten weeks.
- This assignment makes use of graduate assistants as “booking agents” for grading the assignment and utilizes a web form for students to submit each piece of the assignment.
- There is a common syllabus across 6 sections (950 students this fall).
History 102

HIST 102 (United States Since 1877)

• Students working on a research project with both individual and group contributions, focusing on particular aspects of Nevada history, which relate to the larger study of U.S history from 1877 to the present.

• Individually, students are required to keep, and submit periodically for feedback, a research log, which requires them to note details about the origin and purpose of the primary and secondary sources they select.

• Students must “think like a historian” by being cognizant of the context of their sources.

• As a group, students submit an annotated bibliography of sources.

• This group project is all done within a distance learning environment.

• There is a focus in this project on scaffolding, student reflection, and instructor feedback.
Add new Log sheets with each new source searched.

**Search topic** (write in the form of a question and circle major concepts):

How did Las Vegas develop and what was the role of railroads in this development?

**Keywords to search** (synonyms for the concepts circled above; think of both broader & narrower terms):

Development of Las Vegas; Railroads and Las Vegas; History of Las Vegas

**Information Source used** (e.g. Library Catalogue, Journal Index or Database, Internet):

JSTOR from UNLV’s online database

**Access point(s)** (how did you find the source? e.g. keyword=, subject heading=, author= etc.):

Keywords = Las Vegas; Railroad

**Library Location**: UNLV’s online database

**Call # __________________ Status ________________

**Complete Citation for item found** (see The Chicago Manual of Style, 15th Edition)

(University of Chicago Press, 2003) guide for help:

Lyman, Edward Leo, “From the City of Angels to the City of Saints: The Struggle to Build a Railroad from Los Angeles to Salt Lake City,” California Historical Society 70 (1991): 76-99.

**Evaluation of material** (how/what will it contribute to your paper or support your argument? How does it relate to the other information that you’ve found?):

This paper discusses the history and the process of development of the railroad between Los Angeles and Salt Lake City. It reveals the information that Las Vegas was not a city that was planned, like many others. In fact, it began as a byproduct of development in the region, specifically, of the Western cities of Salt Lake City and Los Angeles. To some degree, Las Vegas was formed without regards to the development of the state of Nevada, but was, more importantly, developed because of a regional interest in developing other cities in the West. It also discusses the role of William A. Clark, and the importance of Las Vegas as a source of water in the desert.

**Paraphrased ideas or “direct quotes”** to use in paper (record the page numbers where the quote is found): (see the Plagiarism guide for help with paraphrasing and summarizing.)

“Coincidentally, much of the decision-making on the final grade across Nevada was left to Henry M. McCartney, who had surveyed the region at least twice before for earlier railroad ventures. On occasion, he was actually able to drive survey stakes right next to still-existing markers he had placed years before. The desert took its toll in lives of men and livestock and challenged the ingenuity of seekers of both temporary and permanent supplies of water. But all was accomplished with sufficient dispatch to earn William A. Clark a local reputation as one able to accomplish almost anything. The final spike was driven without much ceremony south of the burgeoning railroad town of Las Vegas, Nevada, in closer proximity to present-day Jean, on January 30, 1905.” (91)
Faculty Feedback

- Realization of “need for the earliest possible interventions in students' university careers to move them in the direction of greater skills and competence”
- Breaking down the research assignment into smaller pieces (scaffolding) so that students can learn and practice these basic skills
- More concrete examples (and have more time to explore these) of research-based assignments
- More time for the free flowing exchange of ideas between faculty members
- Mix of appreciation for pedagogical training
- Challenge of meeting the varying needs of multiple section courses AND large enrollment courses
- Overwhelming agreement that the collaboration with the library liaison was beneficial, and even “one of the best things about the entire Institute”
Your First Research Experience

With a partner, describe what you consider to be your first significant research experience.
Select a single word to describe it.

Intense
Overwhelming
Cross cultural
Bad
Relevant
Directedness
Exciting
Apprenticeship
Open ended
Technique
Tutorial

Transformative
Frustrating
Fun
Primary source
Insufficient
Different
Stressful
High pressure
Consequential
Consuming
Exhilarating
Alberts’ Model

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Undergraduate Research at your Institution

Where does undergraduate research occur in your department/program? Choose a marker and place the following symbols on the timeline:

- **X**  Students currently demonstrate all steps of research process
- **O**  Students currently prepared to demonstrate all steps of research process
- ★ Optimal placement for student preparation for undergraduate research
Our Ideal Partnership: History

- Students are introduced to research methods at 100 level.
- Librarians collaborate with faculty on research assignments in HIST 251 (Introduction to Historical Methods).
- Librarians provide one-on-one support to History students working on their History capstone projects.
- Many of these students have gone on to win the Libraries’ Award for Undergraduate Research.
- The Doctoral History Graduate Student Award is a collaborative effort between the Libraries’ Special Collections department and the History Department.
- The Libraries sponsor graduate fellowships for history students to develop research assignments that use library collections.
- Digital Projects, such as the Nevada Test Site Oral History Project, are major collaborations between history scholars and the Libraries’ Web and Digitization Services Department.
Potential Partners

As generated by session participants:

- **English department**—integrating information from sources and draw conclusions
- **Grants office**—for increasing funds for faculty development
- **Library**
- **Local historical society**
- **Digital Media Center**
- **City/county offices for accessing information/data**
- **Community members who might be experiencing problems**
- **Go out and work with teachers in training (pre-service and inservice)**
- **Undergraduate peer mentors**
Jen Fabbi, Special Assistant to the Dean of Libraries

jennifer.fabbi@unlv.edu

Anne Zald, Head, Instruction Department

anne.zald@unlv.edu

http://www.library.unlv.edu/faculty/institute