

# You Can Do It, We Can Help

Empowering Students to Be Active Scholars  
Through Library Instruction

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# Presentation Outcomes

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After this presentation, you will be able to:

1. Design a space for scholarly communications as part of an existing instruction program.
2. Recognize opportunities for undergraduate students to research, create, and publish within institutional infrastructure.
3. Plan an expanded course or workshop series on research skills and information literacy.

# Empowering Students to Be Active Scholars through Library Instruction

What does it mean?

## Library Instruction

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- Program is 15+ years old
- 4 Research Librarians w/ designated liaison areas
- Required in every first-year composition class

## Empowering Students

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Our students are:

- Hispanic (HSI; 32%)
- Minority (46%)
- First-generation
- Non-traditional
- Veteran/military
- Low income
- Undergraduates (only 8 Masters programs)

## Active Scholars

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Active scholarship at CSU-Pueblo is focused on:

- Faculty mentorship
- Student presentations and co-authorship

**Abstract:** Senate Bill 241 classifies industrial hemp as having no more than 0.3%  $\Delta^9$ -tetrahydrocannabinol (THC). This project focuses on a comparison of extraction methods on the quantity of reported cannabinoids in industrial hemp. A standard method published by the United Nations that employs ultrasonic assisted liquid extraction (UN method) was compared to a more aggressive method employing a pressurized liquid extract (PLE method). Both the PLE and UN methods can be used to extract and analyze different cannabinoids in hemp. At this point in the study, focus has been on THC and cannabidiol (CBD). The concentrations of THC and CBD are reported to have an average percent difference of 136.4% for CBD and 155.03% for THC in hemp when employing the PLE method compared to the UN method. This can be problematic from a regulatory standpoint given that standard extraction protocols have not been established, and we demonstrate two extraction methods yielding very different results for the same hemp samples. Escalating concern is that the results of the PLE method may result in a THC concentration greater than the 0.3% regulatory limit while the results of the UN method suggest the plant complies with the regulatory limit. In part, this difference may be explained when considering the acidic form of these two analytes, CBD-A and THC-A. While the extracts prepared using the UN method contained both THC-A and CBD-A, the PLE method did not contain detectable quantities of CBD-A and THC-A. This is likely a result of the elevated temperature (100 °C) at which the PLE method was carried out. The PLE method employs both high temperature (100 °C) as well as high pressure (> 10,000 kPa). At elevated temperatures THC-A and CBD-A are known to decarboxylate into their non-acidic forms, THC and CBD respectively. However, even though this is likely to have contributed to the elevated concentrations of THC and CBD following the PLE method, a mass balance of the THC-A and CBD-A present in the extracts using the UN method suggests that even complete decarboxylation of THC-A and CBD-A is insufficient to fully account for the concentrations of THC and CBD detected in the PLE method extract. This suggests that the PLE method is more efficient than the standard UN method. Ultimately, such extraction methods dependent THC concentrations and decarboxylation can cause a plant to appear to have more available THC than it does with a competing method. This has serious implications for the regulatory community especially when monitoring plants for compliance with Senate Bill 241.

## Materials and Methods:

### PLE Extraction Method

0.5 g sample ground hemp

Liquid Extraction at High Temperature and High Pressure

Liquid extract

### UN Extraction Method

0.5 g sample ground hemp

5 mL of 9:1 MeOH: chloroform

vortex sample

Sonicate samples for 15 min. vortexing every 5 min.

Centrifuge sample

Pull off extract

MeOH:chloroform extract

### Qualitative and Quantitative Analysis

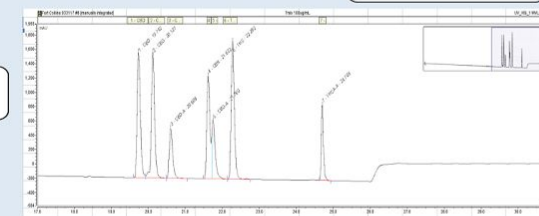
Extract Dilution

Instrument: Thermo Ultimate 3000 UHPLC

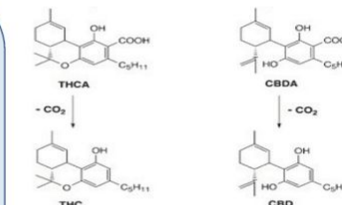
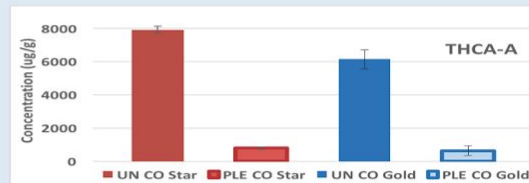
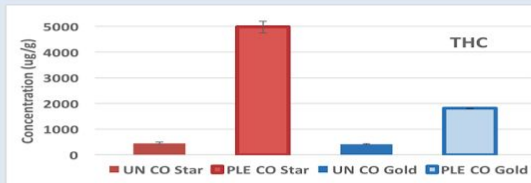
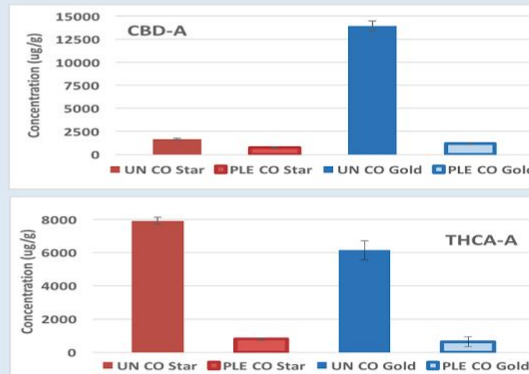
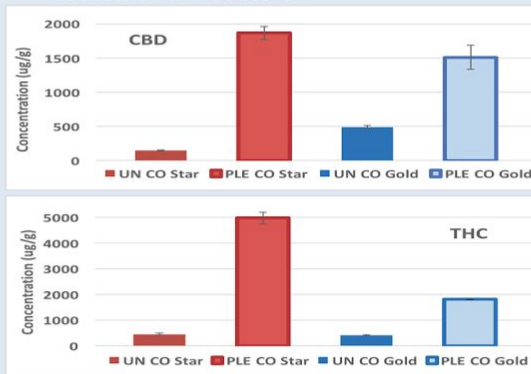
Liquid Chromatography

Diode Array Detector @ 210 nm

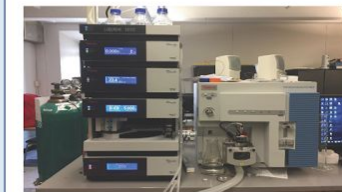
HPLC Column: Reverse Phase C18 Particle 2.6 $\mu$ m 100x2.1mm



## Results and Discussion:



Chemical structures of THCA-A, THC, CBD-A, and CBD.



Thermo Ultimate 3000 UHPLC

### Discussion:

Note: error bars on all figures are  $\pm 1s$

- The PLE method is more efficient in extracting both THC and CBD in comparison to the UN method.
  - Higher concentrations of the non-acidic forms of CBD and THC could be due to the high temperatures employed during PLE
- CBD and CBD-A:**
- CBD-A is in higher concentration in extracts using the UN method compared to the PLE method
  - CBD-A is reported to decarboxylate to CBD at the high temperatures
  - There is a corresponding increase in the CBD concentration in the PLE extracts

### THC and THCA-A:

- THC-A is in higher concentration in extracts using the UN method compared to the PLE method
- THCA-A is reported to decarboxylate at the high temperature
- There is a corresponding increase in the THC concentration in the PLE extracts.

### Conclusions:

- Extraction method can produce substantially different results for the quantity of cannabinoids in hemp
- This may reflect differences in both extraction efficiencies as well as transformation of cannabinoids
- In the absence of standard methods this can create some regulatory challenges

### References:

- Recommended methods for the identification and analysis of cannabis and cannabis products, United Nations Office on Drugs and Crime (UNODC), 2009
- Montesano, C., Simeoni, M.C., Vannutelli, G., Gregori, A., Ripani, L., Sergi, M., Compagnone, D., Curini, R. 2015. Pressurized liquid extraction for the determination of cannabinoids and metabolites in hair: Detection of cut-oo values by high performance liquid chromatography-high resolution tandem mass spectrometry. *Journal of Chromatography A*. 1406:192-200.

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## Instruction program

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- Department restructured in 2016, new positions inc. scholarly communications
- Student Learning Outcomes (SLOs) map to university SLOs and Library strategic plan
- SLOs revised this year to align with ACRL framework

## Core modules

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- Analyzing and Navigating Scholarly Articles
- Comparing Scholarly and Popular Writing
- Key Library Services
- Searching Across Multiple Databases

## New initiatives

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### **Modules:**

- Research and data management for graduate students
- Process of academic publishing
- Open Access

### **Central service point:**

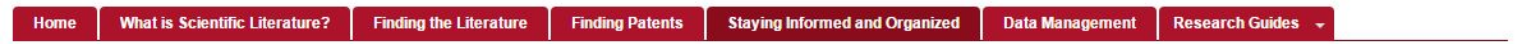
- Funnel student scholarship into IR
- For-credit library research skills course
- Workshops



# Making space for scholarly communications

- Revised existing modules (e.g., *Analyzing and Navigating Scholarly Articles*) to include thoughtful discussion on academic publishing process
- Revised course-specific LibGuides to reflect current trends & best practices

**Make small changes!**



### Citation Managers


EndNote Web   Zotero   Mendeley   **Son of Citation Machine**

**Citation Machine™**  
a Chegg service

- Son of Citation Machine  
Free online product that generates MLA and APA citations to copy/paste, but it does not save or store them for you.

### For next class

Data Sharing and Management Snafu in 3 Short Acts



- Lurking in the Lab: Analysis of Data from Molecular Biology Laboratory Instruments  
Ferguson, Jen. 2012. "Lurking in the Lab: Analysis of Data from Molecular Biology Laboratory Instruments." *Journal of eScience Librarianship* 1(3): e1019. <http://dx.doi.org/10.7191/jeslib.2012.1019>

### Researcher Identification Options

Identify yourself in the scholarly community by creating ResearcherID and Orcid accounts.

**RESEARCHERID** ResearcherID  
ResearcherID.com is a freely available resource for the global, multi-disciplinary scholarly research community. After registering, you are assigned an individual ID number that stays with you over the course of your career, regardless of name changes or change in institution affiliation.  
*more...*

**ORCID** ORCID  
ORCID provides a persistent digital identifier that distinguishes you from every other researcher and, through integration in key research workflows such as manuscript and grant submission, supports automated linkages between you and your professional activities ensuring that your work is recognized.

# Identifying opportunities for undergraduates

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<b>Opportunity</b>	<b>Limitations</b>
Student Symposium	Heavily slanted toward certain disciplines
Undergraduate Research Journal	Still in production of first issue; multiple leadership changes
Honors Program	Small % of student population
Digital Repository	Requires faculty approval; backlogged



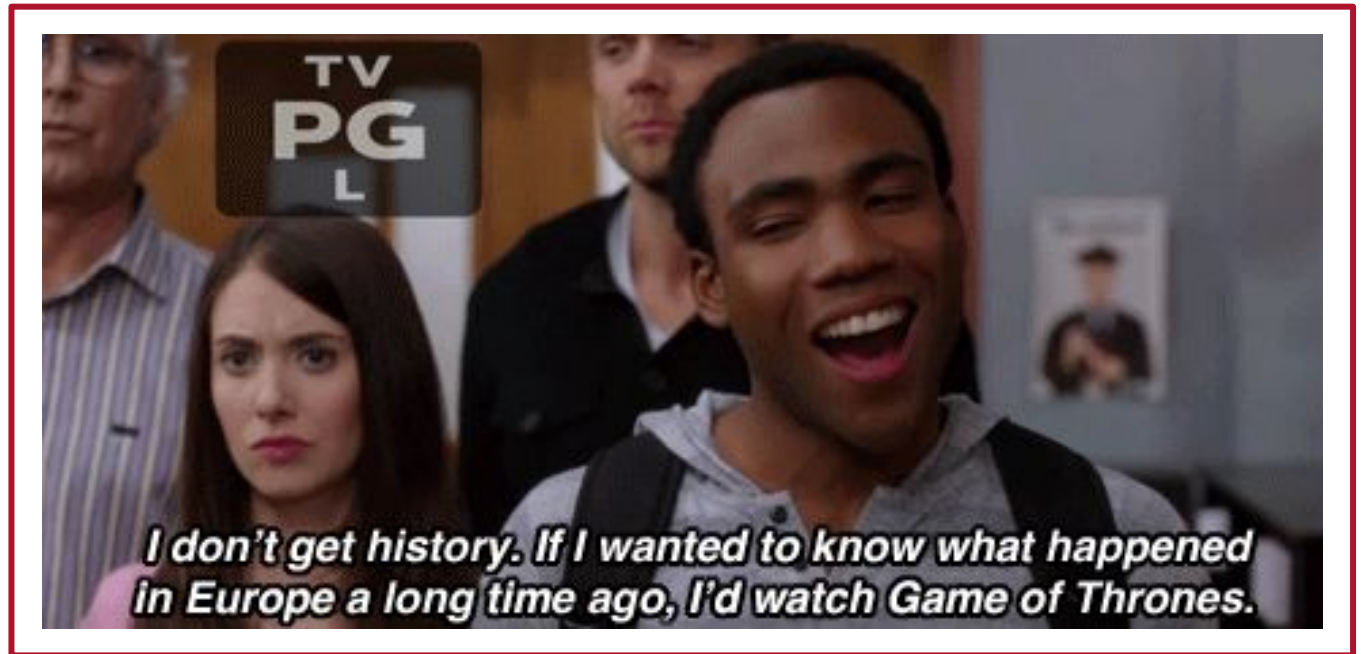
# Increasing our presence

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Student Symposium	Schol comm librarian joined planning committee this year; nursing liaison will also join next year
Undergraduate Research Journal	Evaluated and established workflows this year, ongoing discussions about 'library as publisher'
Honors Program	Liaison to honors program + workshops with students on submitting work to repository
Digital Repository	Marketing plan for target audiences, streamlined processes with student symposium committee

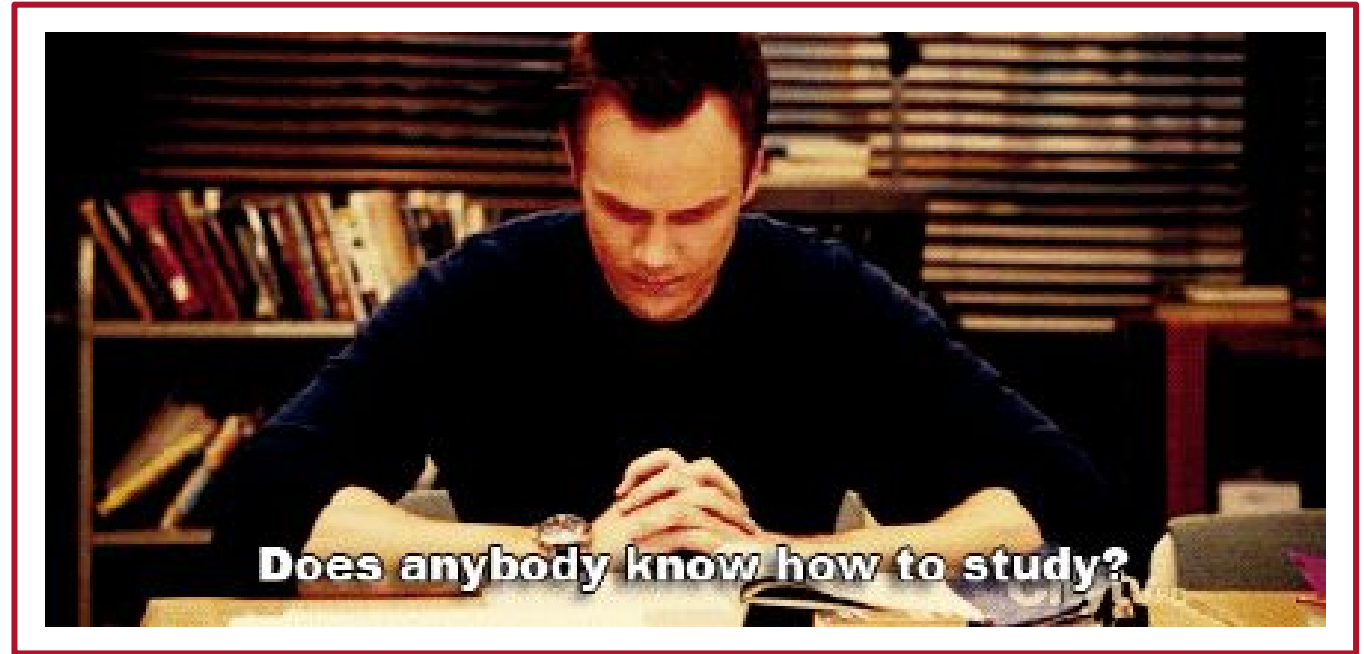
# Reality Check

Turning students into active scholars starts with library instruction



# Mastering Library Research

A for-credit course in  
development



# Library Research Skills Course

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## Course Objectives

Students will be able to:

- Formulate original research questions
- Manage research process
- Determine and evaluate appropriate resources
- Construct and use complex search queries

## Assignments

The course culminates in a final class portfolio of graded assignments:

- Weekly reading summary (10 pts)
- Concept table (25 pts)
- Research plan (25 pts)
- Reflection papers (30 pts)
- Participation (10 pts)

[Course documents under development](#) (opens in Google Drive)

# Library Research Skills Course

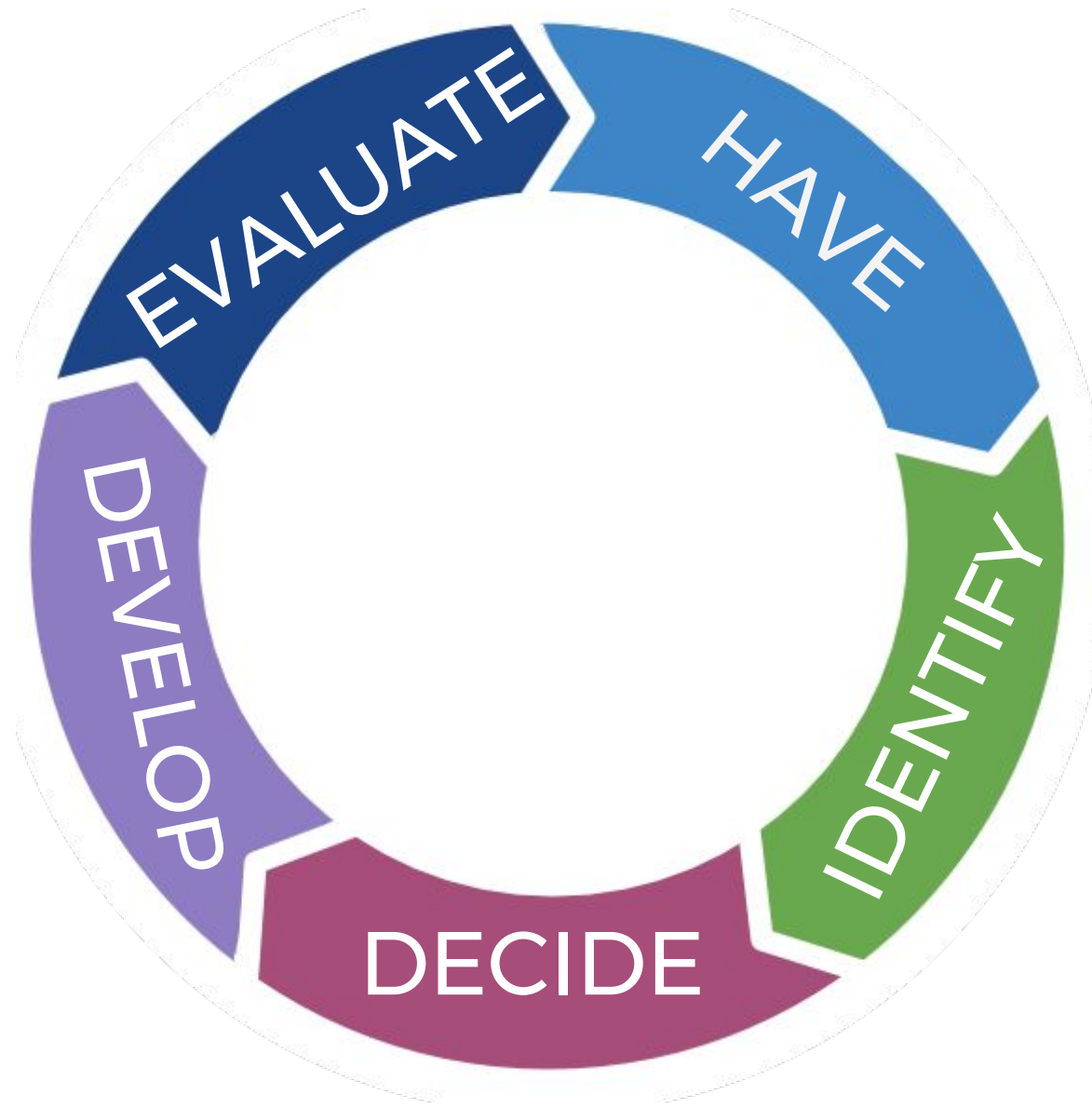
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## Benefits:

- Reach students at real point of need (upper division courses)
- Focus on our resources and services
- Build skills and experience over time
- Develop skills outside of a single assignment
- Leverages our relationships w/ liaison areas into faculty mentorships

## Our process:

- Conducted literature review of similar efforts at other institutions
- Analyzed instruction stats and reference transactions to identify core topics
- Identified potential campus partners in establishing course and attracting students
- Began developing syllabus around assignments and assessment



## Course Planning Cycle

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### Have

What does your library already do?

### Identify

Who will benefit from this course?

### Decide

What will this course look like?

### Develop

What activities and assignments will work best for this course?

### Evaluate

What do you need to do differently in the future?





- Strategic plan**
- Annual assessment of instruction program, qualitative and quantitative
- Instruction program**
- Pedagogy
  - Learning outcomes

- Campus partners**
- Instructional Technology
  - Center for Teaching and Learning
  - Office of sponsored programs
  - Provost's office
  - Experiential education
  - Departments and colleges
- Potential students**
- Student symposium
  - Honors program

- Course designation and approval process**
- Course structure**
- Intersession/ Summer session
  - Semester
  - Half-semester
- Course format**
- Online
  - Hybrid
  - Classroom

- Course learning outcomes**
- Assignments and overall structure**
- Annotated bibliography
  - Literature review
  - Portfolio
  - Group or individual research project
  - Blog posts/online discussions
  - Grading and assessment
  - Readings
  - In-class activities

- New partnerships**
- Modify course structure**
- Modify activities and assignments**
- Reporting for strategic plan**

# Open Discussion

Analyze your campus: where do you stand in transforming research skills into research products?



# Our goals

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## Course Objectives

Students will be able to:

- Formulate original **research questions**
- Manage the **research process**
- Determine and evaluate appropriate **resources**
- Construct and use complex **search queries**

# Our Progress



Course Schedule (14 total sessions, 1 hr. each)				
PART ONE: Introduction	Formulate original <b>research question</b>	Strategize a plan for managing <b>research process</b>	Determine appropriate <b>resources</b>	Construct complex <b>search queries</b>
PART TWO: Application	Use complex <b>search queries</b>	Find and access <b>resources</b>	Modify <b>research question</b> based on evidence	Manage <b>research process</b>
PART THREE: Formation	Assess <b>research process</b> in context of information as process	Reframe <b>research question</b> as part of scholarly conversation	Expand <b>search queries</b> in context of searching as strategic exploration	Evaluate <b>resources</b> , considering authority is constructed and contextual

# Next Steps

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## **Finalize syllabus**

- Adapt existing instruction worksheets for grading
- Identify readings for key topics

## **Test modules**

- Appeal to departments/liaison areas for faculty support in recruiting students

## **Pursue LIB course designation**

- Submit to CAP board (2 year process)

## **Alt-credit option for honors theses**

- Fits into existing undergrad program w/o increasing tuition for students

## **Partner with faculty mentors**

- Show how the library course can support original research projects

# You Can Do It, We Can Help

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## Identify where opportunities live

- Department/college research expos
  - Join planning/review committees
  - Attend student sessions
- Promote the institutional repository
  - Showcase faculty and student works to administration
- Related campus initiatives (e.g., OERs, open textbooks)
  - Find faculty dedicated to student success
- University governance
  - Formalize institutional support

## Expand existing instruction program

- Fine-tune program SLOs
- Adjust in-class activities by reframing concepts/changing vocabulary
- Develop more in-depth modules on select topics
- Increase contact hours (courses, workshop series, etc.)