Enhancing Undergraduate Research Opportunities (EURO)
Comparing three research skills delivery methods

Support: Type II, NSF TUES Grant

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Getting undergrads involved in research as early as possible

- Participation in undergrad research has several benefits
  - Increased retention in STEM
  - Increased understanding of material
  - Feeling of "belonging" to the major

- Clearly retention increases work best when applied as early as possible

Faculty often present conflicting messages to students about UGR

- Faculty often say "I want an older/more developed/mature student" working with me on research.

- Faculty also report "The best UG researchers I had worked with me for 3 years…"

- Surveys of faculty at WSU report students become "useful" in their research groups after 50-200 hours of work/training

- So if you wait until they are seniors, low payoff for faculty

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To remove hesitation for getting students into research groups earlier, *EURO!*

- Can we, as undergraduate research programs, teach students "general" research skills and understanding that will help them
    - Build their confidence?
    - Find a faculty mentor?
    - Integrate into a lab?
    - Hone presentation skills?
    - Develop skills that make them more attractive to active research groups?
- Will this reduce faculty incubation time?

3 Existing Models of Research Skills Training programs

Week long "boot camp" (WSU)

First week after the freshmen year, voluntary for all STEM students, led by faculty

Peer mentored short course (UCF)

Majority of participants are transfer students, voluntary for credit, and led by peer mentors

Semester long seminar course (U Wisconsin)

Historically targeted at juniors at UW within a specific program, and is required by some majors

Washington State University
University of Central Florida
University of Alabama

- Teamed to evaluate and implement EURO programs early in a student's career

- Adapt each of the three models to each of the three schools

- Work within existing structures where possible
  - Note: very different OUR structure between schools

- Assess effectiveness of the programs, as well as costs and yield

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What's *Early*?

- So early means different things to different programs.

- For the EURO, *Early* means before students would usually get into a research environment.

- Depends on the student and school.

- In general, we aim to contact students about 3 semesters earlier than "normal" for a cohort research experience.

Remainder of workshop

- Common set of skills

- Describe the three programs
    - Week long, faculty led boot camp
    - Peer mentored short course
    - Semester long seminar course

- Provide our assessment of each program to date

- Highlight preliminary trends of what works between the programs so far

What Skills?

Interactive Activity…

Break up into groups of 2 or 3 and brainstorm what "general research skills" would be most important to teach in an introductory research course aimed at STEM students.

Create a list of your top 10-15 skills

Skills Common Across UGR Training programs

1. Creating a resume geared towards research
2. Identification of faculty research areas
3. Understanding the difference between popular, textbook, and peer reviewed literature
4. Selection of sources and use of library resources
5. Long term career options for research, including how federal and state funding options impact research activities
6. Improving technical writing skills
7. Discussions of intellectual property and ethics in research and scientific integrity
8. Poster presentations: What's a good poster?
9. Oral presentations: How do you give a talk?
10. Improving laboratory notebook techniques

Cougar Undergraduate Research Experience (CURE)
"Boot Camp"
Washington State University – Dave Bahr, Shelley Pressley

- Target rising sophomores, so immediately after they finish their freshman year

- Cohort size of about 20

- Led by Faculty and staff

- One week program with 9 or 10, ½ day sessions
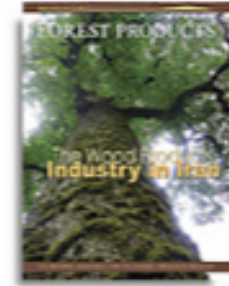
- Lecture / hands-on activity / report model

The week in review: M-T

1. Creating research-oriented resumes
2. Identifying faculty research areas
3. Differentiating between popular, textbook, and peer-reviewed literature

Tuesday - Wednesday

4. Selecting sources and using library resources

5. Exploring long-term career options for research; understanding how federal and state funding options impact research activities

6. Improving technical writing skills

Library citation race
- Start with a common paper (2002)
- In 6 steps or less find the …
  - ✓oldest possible source you can hold a copy of   in your hand that can be traced to that paper
  - ✓newest paper that cites the initial paper
- Scoring: Steps* years ago + Steps* (12 - months ago)
- JSTOR usually "wins" oldest, recently Google Books (1840's) wins out.

- Newest has been published within a week.

Thursday - Friday

7. Discussing intellectual property and ethics in research, and scientific integrity

8. Poster presentations: "What's a good poster?"

9. Improving laboratory notebook techniques

Boot Camp Assessment

- WSU has run this since 2007

- UCF ran this for the first time in 2012

- Alabama ran it for the first time last week 2013

- So reporting so far will be only WSU participants

Boot camp participants

- 94 students 2007-2012

- 44% women, 56% men
  - WSU Engineering 13-18% F , 14% URM

- Starting majors: all engineering majors (90%), plus neuroscience, math, zoology, a few ag-related, psychology.

- Starting GPA: 3.32
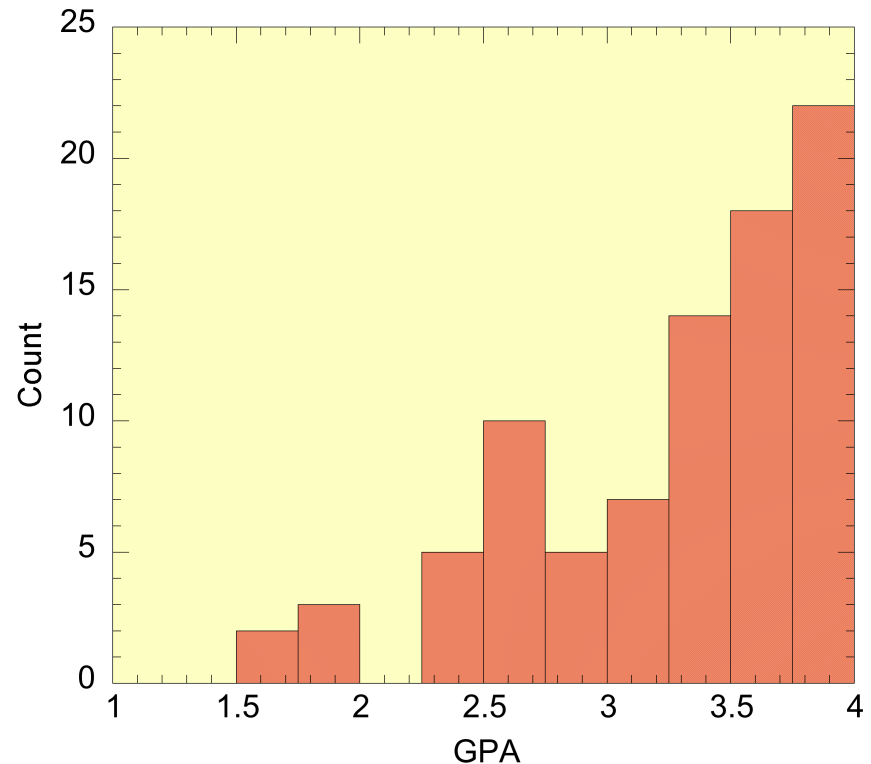 - Note, we do not filter on GPA for admission, this also is very close to our freshmen engineering 2nd semester GPA.

GPA for Boot camp program 2007-2012

- Starting GPA reflects WSU engineering population after first year

Does it work?

- 61% of WSU Boot camp participants found an advisor after1 year.

- Reasons for not finding an advisor …

- *"Can't spend the time" and "Haven't found a match"*

  - *Seems to build maturity, realizing "can't do everything"*

  - About 15% are still looking (in 2010 and 11), this is increased from the beginning.

- Non-uniform start dates, from 1 week after the program to 1 year later

- Since 2010 more are reporting "found an industrial internship instead"

Research doesn't alter your GPA

- No statistical difference in GPA if you do research or not

- Doing research doesn't hurt or help your GPA

GPA change: 1 year after Boot camp

Legend:
- Did not do research (red circles)
- Did research (purple triangles)

x-axis: Starting GPA (1.5 to 4.5)
y-axis: Change in GPA (-1 to 1.5)
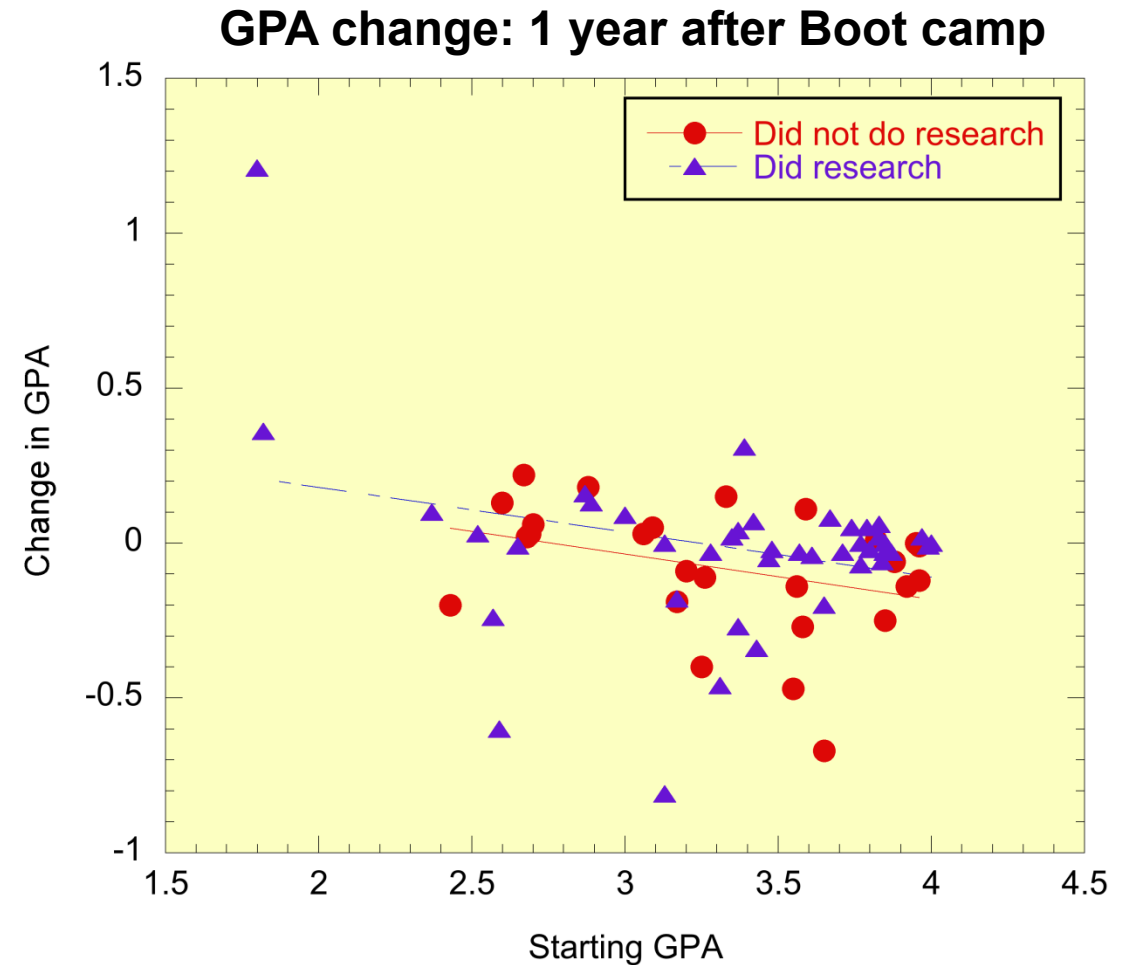
Retention has been excellent

- Standard WSU Engineering retention: 48% to graduation.

- 42 WSU boot camp students "should have" graduated
  - Of those, 34 graduated in STEM, 1 in psych, 2 in business, 2 still enrolled in STEM, and 3 dropped out.
  - **81%+ retention in STEM to graduation!**

- Total retention: of 78 students (2011 and earlier), 3 are non STEM, 2 are on academic probation, 3 dropped out, and 70 are still STEM or graduated: **90% retention**

Boot camp costs

- Up front, need money for faculty to buy in for development.

- Once the leaders have done their segments, operating costs have been $100 per student. Faculty report no need for salary (1/2 day is fine, access is +)

- 2007-2011 we provided a $500 stipend to the students. We surveyed students and asked how much would be a minimum stipend, $238.

- 2012-2013: We used a $275 stipend. Still had full enrollment.

- So good estimate of steady state costs: $375 per student

Summer Research Academy (SRA) "Peer Mentor Short Course"

University of Central Florida
Kimberly Schneider and Neyda VanBennekom

- Students apply online in April

- Program runs between UCF's summer A and summer B sessions (late June)

- 2 ½ day event

- 100 students each year with 15 peer mentors

- Students receive 1 free credit (pass/fail)

SRA History

- 2003 program developed for transfer students
    UCF has high transfer rate (10,000/year)

- 2005 opened to rising sophomores and juniors

- 2007 became a 1 credit pass/fail course

- Currently accept 100 total students each year
  - 50% transfer, 50% current
  - 50% STEM
  - 2013 had ~200 applications

SRA Course Content
Mixed faculty led and peer mentor led

- What is Research?

- Writing and Expanding Your Resume

- UCF Undergraduate Research Opportunities

- Research Etiquette 101: Working with Faculty

- Finding a Faculty Mentor

- Information Fluency (discipline specific)
  - In the library, with reference librarians

- Research Ethics

SRA Course Content (Con't)

- Graduate School

- Research Review (highlight)
  - Discipline specific visits to labs and research sites, meetings with faculty and graduate students
  - Student Poster Showcase (~30 research posters)

- Mini-workshops (highlight)
  - Students choose 4 out of 15 short workshops
  - Topic examples include:
    - Summer off-campus opportunities
    - Careers in academia
    - I found a mentor…what's next?
    - Intellectual property

Peer Mentors

- Current researchers with 2+ semesters of research

- Often SRA graduates

- Compensated

- Training sessions prior to event

- Role:
  - Each mentor works with a group of up to 9 students
  - Lead group of SRA Scholars before, during, and after the Academy.
  - Share experiences about research with the SRA Scholars.
  - Prepare and lead workshops, give assignments to group.
  - Collect and grade assignments from participants.

SRA Class Assignments

- Pass/fail 1 credit course

- Pre-Assignments (15%)
  - Identify three faculty mentors and write about their research

- Academy (60%)
  - Reflective assignments
  - Worksheets
  - Attendance/Participation

- Post-Assignments (25%)
  - Information fluency
  - Mini literature review

SRA Assessment

- One year and two year later survey (N=74)

- 60% moved into research
  - 30% had spent 4+ semesters involved in research
  - Many winners at on-campus showcase, grand awardees, national conferences

- 40% were not involved 1+ years after event
  - 30% realized they were not interested
  - 45% still plan to get involved
  - 25% had trouble finding a mentor, didn't understand the process ⟶ 10% unsuccessful impact of SRA

SRA Costs

- One credit: $0
  - Provided at no cost through our continuing education department
  - Many students might be willing to pay the one credit

- Peer Mentors: $350 x 12 = $4200

- Food: $2000*

- Bus Rental: $600*

- Publicity: $200

- Housing: $500*

- $7,500 or $75/student

*Optional Expenses

Pros and Cons of Model

- Cons
  - Hard to incorporate discipline specific content
  - Cost
  - Must promote year round to get applicants
  - Need support from entire campus
  - Student do not start research projects during course

- Pros
  - Students learn about academic research early in career
  - Peer mentors gain experience in teaching and mentoring
  - Structured dissemination of research information
  - Short but intense experience works well for non-traditional students

Semester Long Seminar (SLS) Course Content

- Modeled after University of Wisconsin course

- One class per week, graded 1 credit

- Topics: Scientific method, finding a mentor, research opportunities (REU), resume building, library skills, how to read/write articles, research ethics, communicating results (posters), literature review

- Common assignments (mock email, resume, library scavenger hunt, analyzing an article, literature review)

- Spring 2012, SLS was implemented at the three collaborating institutions

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Logistics

- Recruitment/enrollment:
  - UA sent program details by email to COE students, Physics, Chemistry, Biology, Math. 15 students (2012); a mix of all class levels with several freshmen; all from Eng/CS. 12 students (2013).
  - UCF recruited through transfer services, freshmen advising, and through the Office of Undergraduate Research
    - ~135 applications for 30 positions (both years), wide variety of STEM disciplines
  - WSU recruited through ads and CAMP program, 27 students in 2012, 5 students in 2013

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Observations of SLS

- Most students secured a mentored research project (either summer or fall) due to mock email assignment/ awareness of REU programs, etc.

- In SLS, the literature review was a focus area because it emphasized several topics. Have students identify a topic of interest to them early in the semester, do the lit review in stages ("super" outlining) so that you can provide feedback.

- Students thought a seminar course would not require so much outside work.

- Suggest more active learning techniques in the future to engage students. Classes were rather passive.

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SLS Focus Group

UA: 6 participants

• Mock email and resume writing assignments were valuable

• Learning was enhanced by instructor presentations and assignments requiring them to search, read and analyze research papers.

• Did not enjoy guest lecturers, not specific enough to their major.

• Students wanted more help in writing the literature review, liked the step by step approach, but wanted even more steps and feedback at each step.

• Students wanted more career information, help in picking a research topic, more team-based activities in class, and visits to a laboratory.

• Would have met multiple times per week to get more out of the class.

SLS Focus Group

UCF: 15 participants

- High levels of satisfaction

- Six pursuing undergraduate research already or soon, one determined not for them

- Useful course

- Assignments and experiences most valuable: guest speakers, how research is funded, how to contact a professor, resume writing, and graduate school applications and funding.

- Weaknesses: Some of the library work

SLS Focus Group

WSU: 10 participants

- Motivation similar to other programs (want to see what it's like)

- Saw a disconnect between lecture/activities and assignments.

- Positive: how to interact with faculty

- Negative: lab notebooks

- Wanted lab tours, job shadowing

- Mixed results on workload (too much and too little)

- 5 going to labs, 2 internships, other looking for openings

SLS Recommendations

- Consider breaking the literature review assignment into smaller tasks to provide more guidance and feedback as students are completing each step.

- Clarify the course's purpose and student learning outcomes - what the course will focus on and what it will not focus on. Possibly by providing the syllabus for prospective students so that their expectations are in line with content.

- Provide lab tours or shadowing experiences.

Pre/post Testing

Each institution used a multiple choice test to assess understanding of concepts important in conducting research.

Normalized change in score as a function of normalized pre-test score from SLS and FLBC students.

Pre/post Testing

Generally, the lower a student's pre-test score is, the higher the difference between pre- and post-test scores.

Student views: Boot Camp vs. SLS

- We asked students in the Boot Camp if they liked the 1 week format.
  - Overwhelming yes (80%). Those that didn't thought they needed more time for topics to sink in
  - SLS students had strong reporting in surveys that it was too much work for a 1 credit class, and there were comments that they were "too busy" with other classes to get the work done

- This suggests that expectations for workload need to be VERY clear, freshmen often didn't expect to work that hard

Open ended feedback from all students

- CURE students often didn't realize you had to approach professors.

- Many SLS students thought the "how to email a professor" was the best thing we did

- They were generally surprised how much research occurs on campus in all programs

Conclusions 1

- Yield to research appears similar between boot camp and peer mentored programs

- Semester long seminar probably easiest if you don't have an UGR office

- Intensive courses do not appear to have the issue of mixed expectations in content and workload

- SLS probably will max at 30 for one instructor

- The activities for the week long course do not always translate well into take-home assignments, some things need that block of time with faculty

Conclusions 2

- Costs are probably very similar (if you work out faculty time, UGR director time, etc.). Between $200 - $500 per student to get these running.

- So far we have not been bold enough to try a pay for access model

- Clearly there is student interest in all three models.

- Continued tracking on effectiveness

	Faculty Led Boot Camp (FLBC)	Peer Mentor Short Course (PMSC)	Semester Long Seminar (SLS)
Originally Developed	Washington State (since 2007)	University of Central Florida (since 2004)	University of Wisconsin-Madison
Description	• 40 hours in one week • Workshop style	• 2.5 days, 20 hours • Held during summer • Roundtable style	• Faculty led seminar • 1 credit hour • Meets weekly • Classroom style
Unique features	• Very close group • Create a research poster • Mock interviews • Invited speakers • Research presentations	• Includes Lab tours • Students attend a research poster session • Work closely with a peer mentor	• Students choose a topic and create a literature review through a step by step process • Students attend research seminars around campus
Who teaches it?	Faculty with guest speakers	A combination of guest speakers and peer mentors working with small groups in an interactive style	Faculty with guest speakers
# of Students	About 20	75-100	20-30 (gets harder with > 30)
PI Comments	• Week after spring classes or week before fall classes seems ideal • Makes for a busy week but over quickly	• Ideal for transfer and non-traditional students • Big undertaking to organize • Able to accommodate a large number of students	• Fits into traditional schedules • Easiest to implement with no centralized research office • Less community feel for students
Student participant focus group comments	Overall high levels of satisfaction with their learning experience		
	• Days were long	• Enjoy lab tours and meeting student researchers • Like working with peer mentors	• High work load for one credit

Could you implement one of these on your campus?

Interactive Activity…

What would work at your institution? Do you already have something similar to this?

What would it take to implement one of these programs on your campus?

What barriers do you foresee?

For more information about the EURO programs

Washington State University	University of Alabama	University of Central Florida
Shelley Pressley spressley@wsu.edu	Susan Burkett sburkett@eng.ua.edu	Kimberly Schneider KRS@ucf.edu
David Bahr dbahr@wsu.edu dfbahr@purdue.edu	John Lusth lusth@cs.ua.edu	
http://undergraduateResearch.wsu.edu		http://www.SRA.ucf.edu

We'll be looking for partners for national expansion in the next few years, please contact one of the investigators if you are interested in participating.

Questions?

Extra Slides

Programs Summary

	Faculty led boot camp	Peer mentored short course	Semester long seminar
Description	Faculty led week long program, 40 hours in one week	Peer mentor led short course, 2.5 days, 15-20 hours	Faculty or staff led 1 credit seminar, 15 meetings once a week
Who teaches it?	One faculty / staff per session	Peer mentors that stick with one group of 8-10	One or two faculty or staff for an entire semester
How many students does it serve	About 20 per section	Up to 100, depends on mentor cohort	Gets harder above 30
Comments	Week after classes seems good	During the summer, great for transfer students	Fits into schedule well, easiest to implement with no centralized office

Monday 9:00 – 12:00	CUE 502	
Introduction/Welcome	9:00 – 9:30	Dr. Shelley Pressley
Research Presentations	9:30 – 9:50	Dr. Jonel Saludes
	9:50 – 10:10	Dr. Anita Vasavada
	10:10 – 10:30	Dr. Kris Johnson
	10:45 – 11:05	Dr. Ursula Mazur
	11:05 – 11:25	Dr. Alla Kostyukova
	11:25 – 11:45	Dr. Nehal Abu-Lail
Monday 1:00 – 4:00	CUE 502	
Making a resume and mock interviews		Dr. Shelley Pressley
Tuesday 9:00 – 12:00	Owen Library 319D	
Library Skills Game		Prof. Galbraith
Tuesday 1:00 – 4:00	CUE 502	
Types of literatures and Sources		Liza Bornasal
Wednesday 9:00 – 12:00	CUE 502	
Laboratory Notebooks		Dr. Shelley Pressley
Wednesday 1:00 – 4:00		
Career Panel	Location TBD	
Thursday 9:00 – 12:00	CUE 502	
Patents and Intellectual Property		Travis Woodland
Thursday 1:00 – 4:00	CUE 502	
Writing a technical abstract		Dr. Brian Lamb
Friday 9:00 – 12:00	CUE 502	
How to make a research poster		Dr. Laura Lavine

SUMMER RESEARCH ACADEMY 2013

SCHEDULE

Thursday, June 13, 2013 (Ferrell Commons Auditorium)

2:00pm - 2:30pm	Academy Check-In
2:40pm - 3:00pm	**Introductory Remarks & Academic Overview** *Dr. Kimberly Schneider,* Director, Office of Undergraduate Research *Dr. Elliot Vittes,* Interim Vice Provost and Dean, Undergraduate Studies
3:00pm - 4:20pm	**Workshop #1: What is Academic Research? Exploring Research Within and Between Disciplines** *Dr. Kimberly Schneider and Peer Research Mentors*
4:20pm - 4:30pm	Break
4:30pm - 5:10pm	**Workshop #2: Preparing for Research - Writing and Expanding Your Resume** *Ms. Neyda VanBennekom*
5:10pm - 6:00pm	**Panel #1: UCF Undergraduate Research Opportunities** *Dr. Tison Pugh, Michael Aldarondo-Jeffries, Kelly Astro, Denise Crisafi, Dr. Kimberly Schneider* Honors in the Major, Research and Mentoring Program, McNair Scholars, Undergraduate Research Journal, Grants, Travel Awards, and more
6:00pm - 6:30pm	Pizza Dinner
6:30pm - 7:15pm	**Workshop #3: Research Etiquette - Working with Faculty** *Dr. Erin Saitta, Assistant Director, Faculty Center for Teaching and Learning*
7:15pm - 8:00pm	**Workshop #4: Finding a Faculty Mentor** *Ms. Amy Bickel and Peer Research Mentors*

SUMMER RESEARCH ACADEMY 2013

SCHEDULE

Friday, June 14, 2013 *(Ferrell Commons Auditorium and Cape Florida Ballroom 316)*

9:00am - 10:15am	**Workshop #5: Research Literacy - Reading and Writing as a Researcher** (Ferrell Commons Auditorium) *Dr. Stacey Pigg, Assistant Professor, Writing and Rhetoric*
10:15am - 12:30pm	**Library Tour/Site Visits - PART I** (around campus)
12:30pm - 1:00pm	Lunch (not provided, packed lunch recommended)
1:00pm - 3:45pm	**Library Tour/Site Visits - PART II** (around campus)
3:45pm – 4:45pm	**Student Research Poster Showcase and Reception** (Student Union, Cape Florida Ballroom)
4:45pm - 5:00pm	Check-out with your Peer Mentor

SUMMER RESEARCH ACADEMY 2013

SCHEDULE

Saturday, June 15, 2013 (Student Union, Key West Ballroom 218)

9:30am - 10:30am	**Workshop #6: Research Ethics** *Peer Research Mentors*
10:30am – 10:40am	Break
10:40am - 11:10am	**Mini-Workshops Part I** *Ms. Andrea Adkins and Mr. John Minor,* Technology Transfer *(SU 221)* *Ms. Joanne Muratori,* Institutional Review Board *(SU 224)*
11:10am- 11:30am	**Seminar #1: Graduate School 411** *Mr. Leben Goldman,* Graduate Studies
11:30am - 12:30pm	**Panel #2: It's Never Too Early to Think About Graduate School** *Dr. Stephen Kuebler, Dr. Tison Pugh, Michael Aldarondo-Jeffries, Leben Goldman, Lilian Milanes, Neyda VanBennekom*
12:30pm – 1:00pm	Lunch (provided)
1:00pm – 2:30pm	**Mini-Workshops Part II** (e.g., Fellowships, Off-Campus Research, Writing a Thesis)
2:30pm - 2:40pm	Break
2:40pm - 3:10pm	**Workshop #7: Balancing Faculty and Student Expectations** *Peer Research Mentors and Dr. Kimberly Schneider*
3:10pm - 3:30pm	Overview of Post-Academy Assignment
3:30pm - 4:00pm	Question and Answer Session with Peer Research Mentors

WEEK	Topic	Assignment
1 Jan. 9	Overview of Class/ Pre-class assessment	Homework #1: Research Seminars Optional: Attend informational session on summer opportunities.
2 Jan. 16	What is science and academic research? On- and off-campus research opportunities	Homework #2: Write a one paragraph summary of a research project in your discipline
3 Jan. 23	Library skills – Finding literature, types of literature Guest Speaker	Homework #3: Six Degrees of separation
4 Jan. 30	How to find a mentor How to create an academic resume	Homework #4: Email and resume Homework #5: Profile potential Mentors
5 Feb. 6	Working with faculty and laboratory etiquette	Homework #6: Literature review topic
6 Feb. 13	Reading a journal article	
7 Feb. 20	Lab notebooks: Data collection and responsibilities	Homework #7: Lab Notebooks
8 Feb. 27	Technical writing skills, literature reviews	Homework #8: Super Outlining (due March 20)
9 March 6	Research literacy (Abstracts, literature reviews, proposals)	Homework #9 : Literature review peer draft (due March 27)
March 13	Spring Break – No Class	
10 March 20	Communicating research Oral and poster presentation skills	
11 March 27	Peer Review	Class Assignment # 1: Peer review Homework #10: Attend SURCA (March 29) Homework #11: Literature review second draft (due April 10)
12 April 3	Research ethics Part 1: Publication, authorship, plagiarism, data collection	
13 April 10	Research ethics Part 2: Intellectual property and patents - Guest Speaker	
14 April 17	Graduate School and Research careers	Homework # 12: Literature review final draft (due April 24)
15 April 24	Resume revisited and wrap-up	
Final April 29	Final exam and post assessment	

UCF SLS Syllabi:

https://sra.ucf.edu/documents/Intro%20to%20Research%20Syllabus%202013_SRA.pdf
http://our.ucf.edu/docs/stem%20research%20academy%20syllabus%20spring%202013.pdf