

The State of Undergraduate Research
at the College of William & Mary, 2016-2017

**A report from the Dean's Working Group on Undergraduate
Research**

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The Dean's Working Group on Undergraduate Research

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1. Summary of findings:

Faculty in all departments and programs were consulted to generate a definition of “undergraduate research” that would be broadly applicable across campus. An undergraduate research project should include the following attributes: 1) the project should be actively mentored by faculty, which can take place inside or outside of the classroom; 2) the project should be designed with the intention of generating new knowledge or interpretation; 3) the student should take ownership of the project by actively contributing to or developing the hypothesis, analysis or synthesis; and 4) the student should be able to place the project in an intellectual, scholarly, or applied context and to articulate their contribution to audiences. These attributes are quite similar to the goals of the COLL400 initiative.

To better understand student participation in research, we emailed a Qualtrix-based survey to all students and analyzed data from the 1636 undergraduate respondents (excluding freshman and recent transfers). When considering research projects carried out inside or outside of the classroom, over 85% of undergraduates participate in one or more research projects before they graduate. Including only mentored faculty-student research taking place outside of the classroom, we found that approximately 60% of students reported having participated by their senior year. Thus, a majority of William & Mary undergraduates get involved in a mentored research project with a faculty member outside of the classroom, and when we include research projects assigned as part of a class, a vast majority of undergraduates participate.

Rates of participation in mentored outside-of-the-classroom research did not differ between white and non-white students, but varied widely by major, and significantly fewer first-generation-college students participated. The most frequent reason given for not participating in research was that students did not know how to get involved. Providing explicit and accessible information to students would be an easy way to remedy this problem, and to that end, we provide a brief assessment of the varied information currently provided on websites of each department/program.

Finally, we present data on skills that students felt they obtained from undergraduate research, with respect to the definitional attributes listed above. We also summarize a representative case study of successful undergraduate research from each of arts, humanities, social sciences and natural sciences, both within and outside of the classroom. In summary, although there is room for some improvement in equity, the state of undergraduate research at the College of William & Mary is very good, and a goal of ~100% percent participation is not out of reach.

The Working Group hopes that this report will aid efforts to increase support for undergraduate research in Arts & Sciences. For instance, all departments and programs should be encouraged to offer their prospective students specific advice on their websites about the pathways to research opportunities in their fields. In addition, this report calls attention to the fact that first generation and transfer students currently under-participate in research, relative to other students at the College. We applaud the work of the QEP, the new COLL400 requirement, and the new Mellon grant, all of which can help address these deficits, but we also urge each departments and program to reach out effectively to these groups. Finally, it will remain important for the College to recognize, reward, and support faculty who incorporate students into their research and embed research experiences into their courses. This report confirms that undergraduate research experiences are a foundational element of the William & Mary education for most students.

2. Defining “Undergraduate Research”

Our first goal was to define the term ‘undergraduate research’ in a way that is consistent with current practice at the College. To determine the kinds of undergraduate research opportunities available to students in every department and program, we first contacted chairs and asked them to describe the available opportunities for undergraduate research, with no attempt on our part to define the term. To encourage respondents we sent a sample of the offerings from the English Department drafted by Prof. Brett Wilson. (Both our note and the sample can be found in [Appendix 1](#).) We eventually received responses from every department and stand-alone program with the exception of Mathematics. These we assembled into a spreadsheet that reduced the many different kinds of reported opportunities into fewer categories of research-related activities, as follows: honors, internships, independent study, capstone courses, student grants, research assistantships, study abroad, summer opportunities, and “other activities” (on-campus conferences and curation of museum shows).

Using the chair-reported student research opportunities from each department as a starting point, we set out to define “undergraduate research” so that we would be able to quantify and talk about it in a way that was meaningful across all of the different units of the college. Our next step in this definition process was to develop a questionnaire intended to determine “what constitutes undergraduate research in your department.” All members of the working group met with colleagues in their own and other departments who they considered appropriate for the task, and asked them to give their opinion on whether each of a list of attributes was critical for an activity to qualify as undergraduate research. We presented the list of attributes, in person, to a sample of 1-3 faculty members in nearly every department and a few programs (approximately 40 total faculty were consulted). An example of such a potential attribute is: “Must disseminate beyond the advisor

or classmates, i.e. available for public scrutiny.” (The rest of the attribute prompts can be found in Appendix 2.)

The working group then met to discuss the results of these survey-discussions and developed a definition of undergraduate research, with a preamble for context, that could be applied across the various units of the College. We drafted a definition and sent it out to approximately 60 faculty members for feedback, including all those who had been surveyed on the necessary attributes for an activity to qualify as undergraduate research. This is the final definition of the working group:

Undergraduate research is conducted in all academic disciplines. It requires preparation at basic skills, such as data analysis, strategies for designing studies, writing, and foreign languages, as well as familiarity with relevant literature. Courses or activities that teach these skills are a valuable component of the undergraduate research enterprise, but often do not, by themselves, constitute undergraduate research. Identifying and strengthening the pipeline of courses and activities that promote undergraduate research is essential.

An undergraduate research project should include the following attributes:

- 1) the project should be actively mentored by faculty, which can take place inside or outside of the classroom;*
- 2) the project should be designed with the intention of generating new knowledge or interpretation;*
- 3) the student should take ownership of the project by actively contributing to or developing the hypothesis, analysis or synthesis;*
- 4) the student should be able to place the project in an intellectual, scholarly, or applied context and to articulate their contribution to audiences.*

The working group proposes that this definition be used widely by the college to distinguish undergraduate research from other, similar activities in and out of the classroom. It reflects the views of a wide swath of faculty, and was met with very few suggested revisions when circulated (some of which were incorporated.) In addition, as we note below, it is similar, but not identical, to the requirements for courses that meet the COLL 400 requirement, and to the definition of “QEP-High Impact Practices” specified in the College’s most recent Quality Enhancement Plan.

3. Survey of participation in undergraduate research

To better understand the student experience with undergraduate research, we designed a survey to assess how many and which students are doing undergraduate research, whether the students’ self-reported research includes the definitional attributes described above, and whether those not doing such research had tried but failed to find opportunities.

Out of approximately 6200 undergraduate students at William & Mary, 2369 responded to this survey between April 17th and June 29th, 2017. Median duration to complete survey was about 2 minutes. A total of 1833 (or 77%) of respondents completed the survey. Of these, we excluded 167 who were graduate students and 30 undergraduates who were freshman or had completed less than one year at W&M. Therefore, 1636 undergraduates are included in the final analyses. Students ranged in age from 17 to 54 years (*Mean* = 20.4 years, *SD* = 2.5), and 1093 (66.8%) were female and 17 (1%) identified as transgender or other. The racial breakdown was 204 (12.5%) Asian, 77 (4.7%) Black, 70 Hispanic (4.3%), 1119 (68%) White, and 166 (10.1%) mixed race or other. The social class breakdown was 410 freshmen (25.1%), 405 sophomores (24.8%), 383 juniors (23.4%), and 438 seniors (26.8%). 137 (8.4%) students indicated that they were transfer students and 1327 (81.1%) indicated that one or both of their parents graduated from college.

3.1. Research involvement – Students were asked whether they had conducted research during their time at William & Mary and if so, whether this research was mentored. A total of 45.7% (*n* = 749) indicated that they had engaged in research. Of these, 85.0% (*n* = 637) indicated that the research was mentored. **Thus, when considering the most widely recognized form of faculty-student research, individual mentored projects, 38.9% of William & Mary students have participated at any given snapshot in time.** Of course this number is considerably higher if only seniors are considered (58.9%). The majority indicated that their project was designed for the purpose of generating new knowledge or interpretation, 80% indicated that they made an intellectual contribution to the project, and 39% indicated that they presented the results of their project to an audience. Some students worked on multiple projects (*n* = 135).

Students were asked whether they had declared their major and if so, to identify their major(s). The majority (1187 or 72.6%) of respondents had declared their major and of these 318 (19.4%) were double majors. Table 1 shows the percentage of students in each major who indicated

that they engaged in mentored research at the College. Table 2 (see also Figure 1) shows the number of students in each social class who indicated that they engaged in research outside of the classroom.

Table 1 – Number and percentage of respondents in each major who indicated that they engaged in mentored research outside of the classroom.

Majors	Number of Respondents	Number who engaged in mentored research	Percentage who engaged in mentored research
Accounting	30	7	23.3
Africana Studies	2	2	100.0
American Studies	11	6	54.5
Anthropology	20	13	65.0
Applied Science	2	2	100.0
Art & Art History	15	4	26.7
Biology	105	71	67.6
Business Analytics	14	5	35.7
CAMS	26	18	69.2
Chemistry	59	42	71.2
Chinese	7	2	28.6
Classical Studies	13	2	15.4
Computer Science	64	19	29.7
Economics	105	33	31.4
Education	8	3	37.5
English	65	13	20.0
ENSP	23	18	78.3
Film & Media Studies	8	0	0.0
Finance	53	15	28.3
French	15	11	73.3
Geology	19	15	78.9
Global Studies	28	9	32.1
Government	97	40	41.2
GSWS	7	4	57.1
Hispanic Studies	18	7	38.9
History	66	26	39.4
International Relations	71	40	56.3
Kinesiology & Health Sciences	81	33	40.7
Linguistics	20	12	60.0
Marine Science	4	4	100.0
Marketing	32	4	12.5
Math	66	32	48.5
Music	12	4	33.3
Neuroscience	63	49	77.8

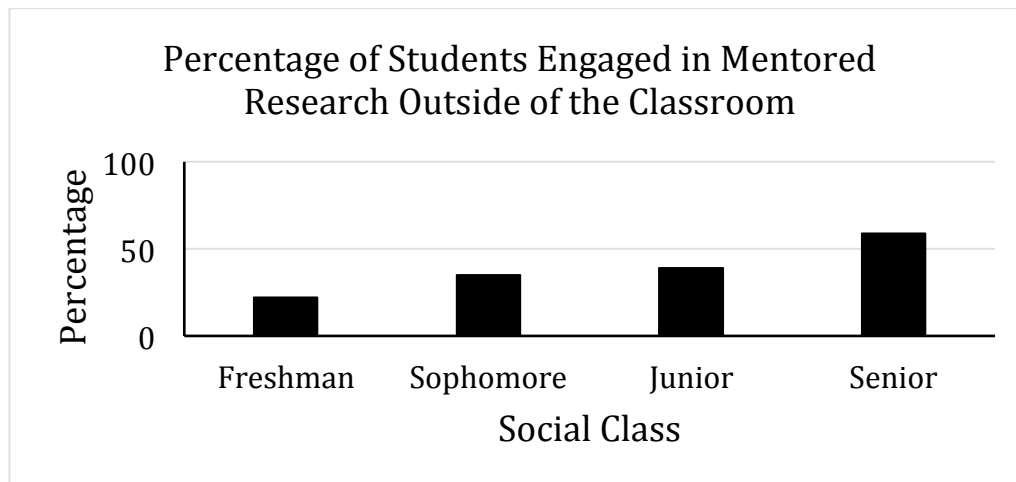
Philosophy	16	5	31.3
Physics	31	24	77.4
Psychology	122	68	55.7
Public Policy	37	16	43.2
Religious Studies	11	2	18.2
Self-designed	20	10	50.0
Sociology	29	11	37.9
Theatre Speech Dance	10	2	20.0
TOTAL*	1505**	703	

Students who were double majors and research active ($n = 66$) were counted in both of their major departments.

** Analyses included 1636 respondents minus 449 students plus 318 double majors.

Table 2 and Figure 1 – Number and percentage of respondents who engage in research outside of the classroom as a function of social class.

Social Class	# Mentored Research	% Mentored Research
Freshman	90	21.9
Sophomore	140	34.6
Junior	149	38.9
Senior	258	58.9



3.2. *Transfer, minority and first generation students* – Compared to students who entered the College as freshmen, transfer students were marginally less likely (31.6% vs. 39.5%) to indicate that they had been involved in mentored research experiences outside of the classroom ($X^2 = 3.3, p < 0.07$). Similarly, significantly fewer first generation students (30.6%) indicated that they were involved in mentored research than students whose parents graduated from university (40.8%; $X^2 =$

10.9, $p < 0.001$). There was no difference in research engagement between white and non-white students.

3.3. Skills students obtained from research – As shown in Table 3, for those who engaged in mentored research, a majority reported that they gained critical thinking and synthesis skills, more than half reported that they gained data analyses skills and fewer than half reported that they gained writing and presentation skills. For those who indicated that they engaged in a second project, the percentages who indicated that they gained each of these skills were similar. Other research skills mentioned included collaboration, computer programming, and time management and organization.

Table 3: Number and percentage of students who indicated that their mentored research experience provided them with important research skills.

Skills	Number of Students	Percentage of Students*
Critical Thinking	477	75.0%
Synthesis	518	81.4%
Writing	263	41.4%
Data Analyses	417	65.6%
Presentation Skills	247	38.8%

*Out of a total of 637 students who indicated that they engaged in mentored research.

3.4. Reasons for not engaging in research – As shown in Table 4, about a quarter of those who did not engage in mentored research indicated that they planned to get involved at a later time. (As shown in Table 5, 87.4% of the students who chose this option were freshmen or sophomores). Close to 40% indicated that they were unsure about how to get involved in research. (61.1% of the students who chose this option were freshmen or sophomores.) Additional reasons listed by students included a belief that their department was too “understaffed to support research”, they did not think their major was conducive to research, and by the time they decided to do research, it was “too late.”

Table 4: Reasons why students did not get involved in research outside of the classroom.

Reason	Number of students	Percentage of Students*
Too busy	217	21.7
Not interested	146	14.6
Not sure how to get involved	389	39.0
Tried and failed	63	6.3
GPA	103	10.3
Plan to get involved later	254	25.5
Not aware	114	11.4

*Out of a total of 999 who indicated that they did not engage in mentored research.

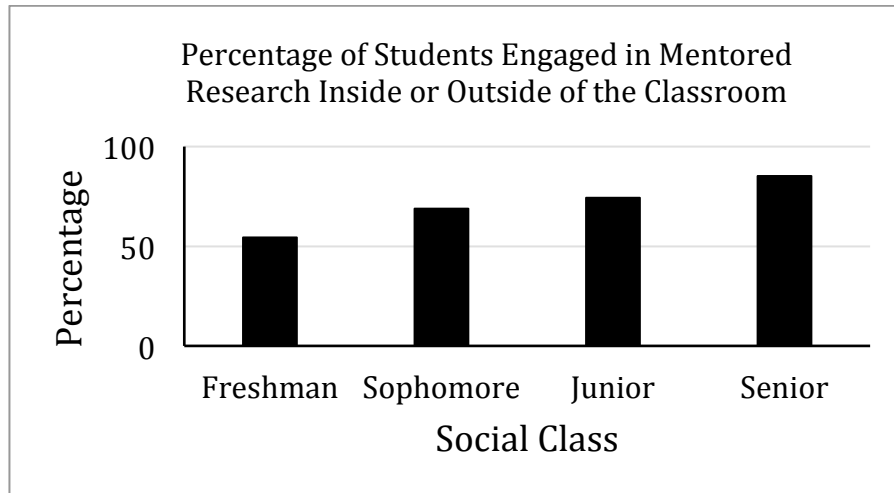
Table 5: Breakdown of reasons why students did not get involved in research according to social class

Reason	Freshmen	Sophomores	Juniors	Seniors	Total
Too busy	53	53	61	50	217
Not interested	28	28	39	51	146
Not sure how to get involved	125	113	96	55	389
Tried and failed	14	17	21	11	63
GPA	26	32	23	22	103
Plan to get involved later	148	74	27	5	254
Not aware	32	32	30	20	114

3.5. *Research in the classroom* – When asked whether they had engaged in research in their classes, 917 students (56.1%) indicated that they had. Of these students, 539 students had not been involved in research outside of the classroom. **Therefore, of the 1636 undergraduates who responded to the survey, a total of 1176 (or 71.9%) indicated that they were involved in research either inside or outside of the classroom.** This is broken down by social class in Table 6 (see Figure 2 also). One of the inspirations for this working group was the oft-repeated claim that “70% of William and Mary students participate in research” and this survey suggests that the statement is accurate as a snapshot across the College. However, as shown in Table 6 and Figure 2, **by the time they have graduated, more than 85% of William & Mary student have participated in research either inside or outside of the classroom.**

Table 6 and Figure 2 – Number and percentage of respondents who have engaged in research inside or outside of the classroom as a function of social class.

Social Class	Number of Students	Percentage of Students
Freshman	223	54.3
Sophomore	279	68.9
Junior	285	74.4
Senior	373	85.1



3.6. *Skills students obtained from classroom research* – Of the 917 students who indicated that they had engaged in classroom research, 645 (or 70.3) indicated that the project was designed for the purpose of generating new knowledge or interpretation and 330 (or 36.0%) indicated that they had presented the results of their research. As shown in Table 7, for those who engaged in classroom research, a majority reported that they gained critical thinking and synthesis skills, more than half reported that they gained data analyses and writing skills, and fewer than half gained presentation skills.

Table 7: Number and percentage of students who indicated that their classroom research experience provided them with important research skills.

Skills	Number of Students	Percentage of Students*
Critical Thinking	573	62.5
Synthesis	639	69.7
Writing	468	51.0
Data Analyses	475	51.8
Presentation Skills	379	41.3

4. Implications for COLL 400

The working group was interested in whether credit-bearing activities that qualify as undergraduate research would be appropriate for fulfilling the COLL 400 requirement. The website description of COLL 400 is:

“The COLL 400 capstone experience will require students to take initiative in synthesis and critical analysis, to solve problems in an applied and/or academic setting, to create original material or original scholarship, and to communicate effectively with a diversity of audiences. Students can fulfill this requirement through upper-level seminars, independent study and research projects, and Honors projects, as deemed appropriate by departments, programs, or schools. COLL 400 may but need not have an interdisciplinary focus as students can synthesize material within as well as across disciplines. COLL 400 capstone experiences must be at least 3 credits, and normally be taken in the senior year.”

From the text we isolated four attributes of a COLL 400 experience (underlining above is ours):

- 1) take initiative in synthesis and critical analysis
- 2) to solve problems in an applied and/or academic setting
- 3) to create original material or original scholarship
- 4) to communicate effectively with a diversity of audiences

The working group’s definition shows broad similarity, although it was derived without consideration of the COLL 400 attributes:

COLL 400 attribute 1) “take initiative in synthesis and critical analysis”

is very similar to:

Working Group definition 3) “the student should **take ownership** of the project by actively contributing to or developing the hypothesis, **analysis or synthesis**”

COLL 400 attribute 2) “to **solve problems in an applied and/or academic setting**”

overlaps broadly with:

Working Group definition 4) “the student should be able to **place the project in an intellectual, scholarly, or applied context** and to articulate their contribution to an audience.”

COLL 400 attribute 3) “to **create original material** or original scholarship”

is very similar to:

Working Group definition 2) “the project should be designed with the intention of **generating new knowledge** or interpretation”

COLL 400 attribute 4) “to **communicate effectively with a diversity of audiences**”

shares a key component of:

Working Group definition 4) “the student should be able to place the project in an intellectual, scholarly, or applied context and to **articulate their contribution to audiences**”

(It should be noted that the working group definition may differ in this final attribute from the intent of COLL400 in emphasizing that the student can place their research within the context of the larger liberal arts, i.e., a “diversity of audiences” is difference from “audiences”.) The working group definition of an undergraduate research project broadly overlaps with the attributes of a COLL 400 experience. One component of the working group’s definition that is not explicitly addressed in the material on COLL 400 is:

“1. the project should be actively mentored by faculty, which may take place inside or outside of the classroom.” This may be implicit for a COLL 400 experience because it is credit bearing (whereas some undergraduate research projects are not). The working group is confident that anything that meets our definition of undergraduate research would meet the expectations of COLL 400, as long as sufficient academic credit was associated with the research project.

5. Undergraduate research inside the classroom

One topic of discussion among the members of the working group, as well as with faculty correspondents from various departments/programs, was whether research projects assigned as part of a class can qualify as undergraduate research.

One way to approach this issue is to think of faculty scholarship as being on a functional continuum, with one end being “Student learns things new to them” and the other being “Generates new knowledge for society.” As shown by the schematic in Appendix 3, a traditional lecture class falls at one end of this spectrum (student learns a lot, no new knowledge is generated), while a faculty member writing and publishing a solo book would be at the other end (new knowledge for society but students learn nothing). Neither activity is an example of undergraduate research. This conceptual framework can be helpful in comparing potential undergraduate research activities that occur inside versus outside the classroom. As shown in Appendix 3, various student-faculty interactions can be placed on this spectrum and those that fall in the middle are often the richest undergraduate research experiences because they combine an emphasis on student learning with a potential for real discovery of new knowledge. Faculty-driven research activities towards the right of the diagram represent research, but the intellectual contribution of students may be minimal. At the opposite end, in the traditional classroom, research is not occurring because there is no potential for generating new knowledge.

Projects assigned in the classroom may qualify as undergraduate research if they are designed carefully. According to the working group's definition, such projects should be mentored by the instructor and the student should take ownership and be able to place their work in an appropriate intellectual context and communicate about it to audiences. These three attributes are likely present in many class-assigned projects, including some, such as term papers, that do not qualify as undergraduate research. The remaining attribute, possessing the potential to generate new knowledge, is less frequently present in classroom project-based learning. However, there are excellent examples on campus where students delve seriously into questions with the potential to generate new knowledge for society (one full assignment is provided in [Appendix 4](#)).

5.1. Case study from a Humanities class. One of the faculty members in Classical Studies (Prof. William Hutton) is managing a collaborative online project to translate and annotate the *Suda* lexicon, a Byzantine encyclopedia that is a major source of information for classical times. Students in advanced Greek classes have been assigned entries from the *Suda* to translate and annotate under the mentorship of the instructor. To do this they must first understand the entry, which often involves arcane technical language, and identify the problems with it that require annotation. The act of annotation itself often requires extensive research into the text's sources and parallels, as well as pertinent modern scholarship. In the end, the students' translations and annotations are peer-reviewed by the editors of the project and become a citable publication for their CVs. In some cases the students' in-class work on the *Suda* has also developed, through further out-of-class research, into conference papers and honors theses.

5.2. Case study from an Arts class. Working with his 300-level *Color & Digital Photography* class, Prof. Eliot Dudik has engaged in independent undergraduate research here at the college. As an example of how photographs can speak one to the other and how artistic bodies of work develop, Prof. Dudik showed his class the website [anewnothing.com](#). On the website, pairs of photographic artists create ongoing visual conversations by posting an image and then responding to the image by posting another. The "conversations" between images on [anewnothing.com](#) are linear in structure. Seeing the website inspired Prof. Dudik's class to develop their own site. An undergraduate wrote code from scratch to establish [wmphoto.github.io](#). On the site, students in the class, Prof. Dudik, and his graduate assistant post photographs that respond one to the other, except on this site the conversations are going in all directions, not strictly linear. Multiple conversations are evolving simultaneously as the students add their own photographs. The shape of the overall page morphs and grows according to the development of the conversation. The site allows the visitor to zoom in and out so they can see the form of the conversation up close, individual images or the entirety of the conversation. Currently the project allows students to use the site as inspiration for their own "zine," an efficiently produced book that can be cheaply and/or easily made and distributed, a form of the photobook that has become very popular in contemporary photography. By next year the intention is to secure funding to allow for a printed version of the zine to be made each year, distributed around campus, and archived in Swem Library. What students are learning here is how to think independently while at the same time being part of a larger collaborative effort. The *Color & Digital* students took an existing idea, dissected it, put it back together in a new form, and created an interactive site from scratch to allow for the conversations to develop as well as be read. The development of the individual conversations allows students to understand their own work in the context of the world at large, and to develop their own independent voice within a larger conversation. The final printed component of the project, the zine, will interact with the campus at large.

5.3. Case study from a Social Sciences class. An interesting example of research done as part of a class is the multi-semester Sharpe Community Scholars program. Freshmen take one of several COLL150 courses along with two semesters of College & Community, a one-credit short course. During the second semester, students work in groups to

apply their knowledge to research topics in a variety of fields, mostly related to the social sciences (e.g., economics, educational disparities, environmental justice). Some students continue these projects in future semesters or summers with funding from the Sharpe program. A recent Sharpe Scholar, Neha Agrawal, described her experience this way for the W&M News: “As someone who came from a high school whose curriculum revolved around STEM subjects, I had had very limited exposure to any research done in the social sciences. Coming into the Sharpe program, I was very naïve regarding what community-based research was and the extent to which I could do such research. My perspective completely transformed after taking the Sharpe seminar "Communities and Neighborhoods: Class, Space, and Race" with Professor David Aday. I was introduced to different types of research in the social sciences, particularly Community-Based Participatory Research (CBPR), a form of research in which the investigator collaborates with community members, involving them throughout the research process, to thoroughly understand a problem in the community and then develop an intervention directed towards social change. Learning about CBPR not only changed the way I thought about community-based research, but also about solutions to some of the major social problems in the world today.” Neha plans to study the practice of child marriage in rural India.

5.4. Case study from a Natural Sciences class. Students in Geology 340 with Prof. Hancock do final projects that include original research with the potential to produce new knowledge. They are told that: “Good research is driven by clear questions and/or hypotheses, the answers to which will help advance our understanding of some topic of interest. Formulating good questions and/or hypotheses is perhaps the most challenging aspect of doing research. To do so, you will need to review previous work on your topic, and decide what questions/hypotheses are the logical next steps. Those questions will then guide you in developing a methodology that will provide the data necessary to answer your questions. This is followed by data collection, and interpretation of that data in light of the questions you are asking. From this interpretation, you will develop conclusions or answers to our questions based on what our data reveals.” Hancock’s students conduct these investigations in groups of two to four students. Individually they attempt to identify a topic that is of interest to them, and he matches like-minded individuals. The investigation of the topic that each group then chooses includes both a review of literature on that topic, and collection of some original data about the topic. This data collection is generally simple, and might include things like measuring relevant terrain profiles, a field visit to the landscape to make observations, and/or a simple experiment, either numerical or analog. Professor Hancock meets with groups several times during the course of the semester to discuss progress and address questions along the way. For full details see [Appendix 5](#).

6. The Banner “research” attribute

The working group asked the registrar to remove the “research” attribute that has appeared, for many years, on Banner beside courses that were designated such by their departments. It is not clear what criteria were used in establishing these designations, and they serve no formal purpose in the current curriculum. At some future date it may be appropriate to designate certain courses as “research” experiences, but only at such time as the relationship between COLL400 and credit-bearing research experiences has been clarified. At present, it is not clear what the function of such a designation would be.

7. Accessibility of information on undergraduate research to students

By far the most common explanation given by survey participants as to why they had not participated in research at William & Mary was that they did not know how to get involved. Compared to signing up for classes, getting involved in research can be an opaque and intimidating process, especially for students who do not come to college with this expectation. A common way to make undergraduate research more accessible to students is for departments and programs to provide prominent information on their websites designed to inform aspiring student researchers. The working group surveyed all websites to determine whether students could easily find information on how to get involved in undergraduate research. We surveyed the websites of the 45 departments, programs, and sub-programs (e.g., Arabic Studies), and found that over two-thirds (33) mentioned undergraduate research, student research projects or a related topic. However, of these, only approximately half (15) made the link visible from the home page. Three departments, Kinesiology, Biology and Chemistry, call attention to undergraduate research with a graphic widget on the home page (although Chemistry's does not lead to further information, just photos of students doing research). Three departments (Psychological Sciences, Biology, Government) provide a downloadable guide for students on how to find mentors and get started on research (although the document from Psychological Sciences is dated 2006 and is not highly instructive). Many departments/programs provide information that is not easily found, requiring 3-4 clicks of the mouse. Units that provide no information related to undergraduate research on their websites are: Africana Studies, American Studies, Applied Science, Computer Science, English, Film & Media Studies, all units of Global Studies with the exception of Russian-Post Soviet, Arabic and Italian Studies, and the Speech sub-unit of Theatre Speech & Dance.

The working group suggests that a goal of Arts and Sciences should be to increase accessibility to undergraduate research for first-generation, transfer, and other groups of students

who may be least prepared to find faculty research mentors on their own. One easy and inexpensive way to do this would be to incentivize departments and programs to provide more visible information on their websites that promotes the benefits of doing undergraduate research in that unit, and instructs clearly on how to get started. Currently, only one department has an enticing portal on its home page that leads directly to information on how to get involved by finding a mentor. More commonly, students are informed on the home page that research with faculty is important, then are directed to generic options for funding through the Charles Center, and nowhere receive specific encouragement or advice on how to get started. More information on departments/program websites can be found in [Appendix 5](#).

8. Case studies of undergraduate research outside of the classroom

8.1. Case study from the Humanities. In one case a student took a research topic that she developed in an advanced seminar on Greek vase painting and continued her research over the course of summer study in Greece, where she gained the opportunity to inspect the artifacts she was studying first-hand and consult with experts in the field. Upon return to William & Mary she worked with her mentor, John Oakley (the former instructor of her vase-painting seminar), in a for-credit independent study project which ultimately produced an article that was accepted for publication in one of the leading journals of ancient Greek art and archaeology.

8.2. Case study from the Arts. Senior Art major Katie Fee, working with Prof. Mike Jabbur, completed an Honors thesis in ceramics. It included a 20-page paper on theory and process, and approximately 20 finished ceramics pieces. The abstract of the paper (available online from Swem Library) makes clear what the student put into the project and what she got out of it: “An inherent web of relationships exists between form, surface, and prescribed function for any given vessel. In this thesis project, the form and surface of a pot are examined through process as each piece is made. Subsequent relationships, including those between interior/exterior, smooth/rough, geometric/organic, and part/whole, emerge from the initial examination. These relationships are also explored, attempting to reach a resolved product. The process of exploration includes two and three-dimensional sketches, design blueprints, historical research, technological research, other media, active making, and a great deal of experimentation in all areas. As the exploration goes on, the halves of each material relationship naturally require adjustment in coordination with each other. The balance between parts is constantly shifting, so that some relationships deepen while others dissipate. This shifting balance drives and is driven by my research.”

8.3. Case study from the Social Sciences. (From the departmental website) The Project on International Peace and Security (PIPS) is an undergraduate think tank designed to bridge the gap between the academic and foreign policy communities in the area of undergraduate education. PIPS is premised on two core beliefs: (1) rigorous policy-relevant research is a valuable component of a student’s education; and (2) undergraduates, when guided by faculty and policymakers, can make meaningful contributions to national security debates — their creativity and energy are untapped resources. To this end, PIPS each year selects six research fellows (juniors and seniors) and six research interns (freshmen and sophomores). Research fellows identify an emerging international security challenge and develop original and carefully researched policy recommendations. Research interns support the work of the fellows and learn the craft of conducting policy research and writing briefs. The briefs written by PIPS research fellows and interns form the basis of published articles and honors theses. In addition, PIPS fellows have the opportunity to present their work to policy officials and scholars at a year-end symposium in Washington, D.C. Fellows and interns also receive assistance

in presenting their papers at academic and policy conferences and attaining internships. (Professors Dennis Smith and Amy Oakes serve as mentors.)

8.4. Case study from the Natural Sciences. In 2005, Prof. Dan Cristol rented an off-season lodge at Massanutten ski resort to serve as a field station and summer residence for two biology undergraduates and two Masters students. By the end of the summer this small crew had sampled the mercury levels of a thousand birds and erected hundreds of nestboxes along the polluted Shenandoah River, in which to study whether the mercury was affecting avian reproductive success. Over the next decade, more than 50 William & Mary students rotated through the research project, carrying out experiments on and off campus, discussing their results with experts at quarterly meetings of the “South River Science Team” stakeholders, and eventually presenting them at national and international professional conferences as posters and talks. To date, 48 papers have been published from this project in peer-reviewed journals, which have already been cited hundreds of times by other scientists in subsequent studies. A legal settlement for \$50 million was reached between the government and the polluters, based largely on the data gathered by the students. The high level of intellectual-contribution and ownership by undergraduates is evident through their prominent role as frequent co-authors on the published papers: 31 undergraduate co-authors including 13 lead-authors (who played the most important role in conceiving, executing and writing-up their studies). The project was collaborative and integrative, engaging approximately ten other William & Mary faculty in the Biology and Chemistry departments. Many of the students have gone on to work in related fields, some specifically using the experience and networking that occurred during their undergraduate research. Besides being an excellent vehicle for training the next generation of environmental scientists to do real research that matters, this project also generated well over a million dollars of external grant funding for faculty, and tens of thousands of dollars of external small grants awarded to the students for their own project proposals. The entire effort was recently the subject of a lengthy [feature article](http://www.audubon.org/magazine/fall-2017/how-much-should-major-polluters-pay-dupont) in *Audubon* magazine (<http://www.audubon.org/magazine/fall-2017/how-much-should-major-polluters-pay-dupont>).

Appendix 1: Letter sent to department/program chairs to solicit information

Along with Joel Schwartz, Christine Nemacheck, Bill Hutton, Catherine Forestell and Elizabeth Mead, I will be working this year to define and describe the abundance of undergraduate research that goes on at William & Mary. We are interested in identifying successful models for others to follow and any roadblocks to success that faculty are experiencing in providing meaningful research opportunities to undergraduates interested in research. We are collaborating with the QEP and CLA (particularly with respect to COLL 400), and looking across the natural and social sciences, arts, and humanities. Our first step is to ask each chair to **provide a list of opportunities within their unit**. All we want is a simple list of the ways in which undergraduates can get involved in research in your department or program. More important than making your list 100% complete is that you send it to me in a timely manner (1 week if possible), as this is just a starting point for us and you will have many opportunities to provide feedback down the road. I provide a sample from English that may serve as a jumping off point for you. Please take a look below to jog your memory and then, while this email is still fresh in your mind, email me a list of ways in which undergraduates can get involved in research (as defined by you). This set of lists will help the working group plan for the year. Thank you very much - if you suspect that this email will drift down to the bottom of your inbox, just let me know that you don't have time to reply so I can seek out the information from someone else. On behalf of the working group, Dan Cristol

EXAMPLE OF ENGLISH DEPARTMENT (courtesy of Brett Wilson, excerpted from more comprehensive document)

“Most student research in English is self-directed: the student essentially creates her own course. She identifies a set of texts to explore or a work of imagination to create, justifies the project in a proposal narrative, and locates an advisor with expert knowledge in a related historical

period, a literary genre, or a theoretical approach. With a willing advisor and a spark of inspiration, an English major can take on a unique project in research and/or writing that culminates in a piece of original scholarship or artistic achievement.

Independent Study

Independent Study in English (ENGL 480, 1-3 credits) and Independent Study in Creative Writing (CRWR 482, 1-3 credits) give accomplished students the opportunity to undertake a semester-long tutorial on a topic agreed upon by the student and instructor and approved in advance by the departmental Undergraduate Program Committee.

Summer Research Scholarships

The Jack and Ann Willis Scholarship (\$2,500) is a merit-based scholarship awarded to a rising junior or a rising senior English major to support the student's academic enrichment through experiences such as honors research, archival travel, and study abroad. A 200-word proposal is due in early April. Willis winners have traveled to Hawaii and Tel Aviv for original honors thesis research.

The Concord Traveling Fellowship for Creative Writers (\$3,000) is a summer travel-and-writing scholarship. Students submit up to 5 pages of poetry or up to 10 pages of fiction and a one-page proposal explaining their travel and writing plans. The recipient gives a reading of her or his finished work during the following fall semester. The most recent Concord winner traveled to Nepal to write poetry.

The James Monroe Scholar Program and various Charles Center Summer Scholarships are open to English majors, either by invitation or by application. Additionally, the Student Research Grants Program pools funds from the Office of the Vice Provost for Research (any subject), the Reves Center (research abroad), and the Lemon Project (race and racism at William & Mary). Deadlines

and procedures for these programs are administered through the Roy R. Charles Center for Academic Excellence.

Honors Thesis

Honors in English gives outstanding students the opportunity to undertake an intensive year-long project in the study and/or practice of literature under the close direction of a faculty advisor.

Students who complete the thesis receive 3 credits in ENGL 495 (Honors, Fall) and 3 in ENGL 496 (Honors, Spring).

Research Assistantships and Internships

Internship in English (ENGL 498, 1-3 credits) is a way for English majors to get course credit for unpaid external internships. Internships tend to confer practical experience and build résumés, as opposed to being research-oriented. Some English faculty members enlist students as paid research assistants for ongoing projects (for instance, developing a new course or doing research on a new book).”

Appendix 2: Questionnaire given to sample of faculty to help identify generally accepted attributes of undergraduate research: **Attributes of undergrad research (as opposed to undergrad learning or faculty research)**

Check any that are defining factors in your opinion–

- Faculty mentored – cannot be done by student alone without robust faculty input
- Addresses or advances a novel thesis, interpretation or artistic creation
- Must disseminate beyond the advisor or classmates, i.e. available for public scrutiny
- Addresses a question/issue/concept that has not been answered before
- Primary goal is to generate new knowledge/art that can be disseminated
- Student is the driving force in leading the project, cannot be proposed by mentor
- Student must collect data or engage in creative activity using methods/ evidence/ sources particular to the discipline
- Student must answer a novel question or describe/create something new
- Student must disseminate (including perform/exhibit) the “results” of the research
- There must be a chance that new knowledge, interpretation, or art could be advanced
- Student must be thinking independently – cannot be simply taking orders from faculty
- Student does what professionals in the field are doing – creating, interpreting, or dealing with primary evidence
- Students must receive a significant learning experience while advancing knowledge or generating a new interpretation or artistic creation

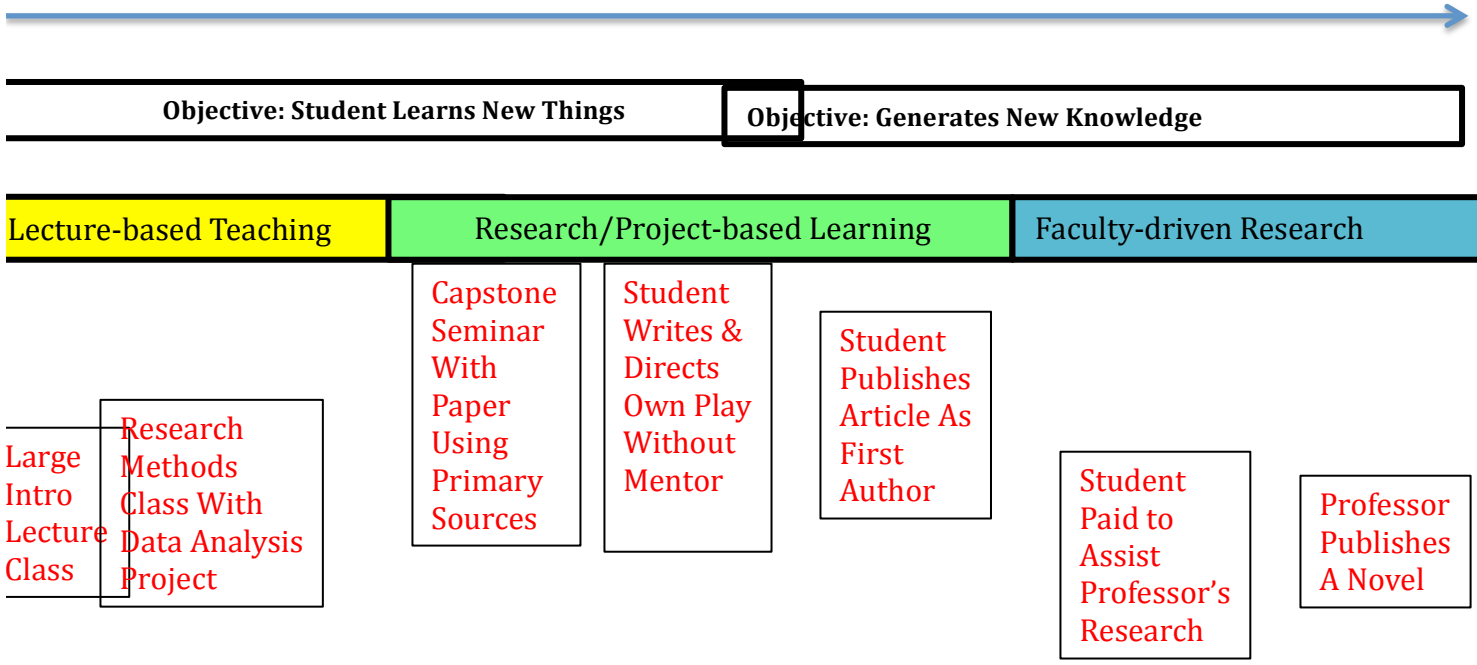
Add your own defining requirements!

Check any that DO NOT fall within your definition of research

- Student learns to critique primary sources at advanced level, in a capstone class

- __Student learns critical methodology (e.g., study design, choreography, writing)
in a research methods or statistics class
- __Student processes data for a faculty research project or works side-by-side with faculty
on faculty-member's research project
- __Student presents project in public, at student conference/ show, or student journal
- __Student synthesizes/summarizes/explains current state of knowledge on specific topic,
in an advanced term paper for an upper-level class
- __Any project granted "honors" credit automatically qualifies
- __Any activity done for departmental research credit automatically qualifies

Appendix 3. Teaching-Research Continuum



Appendix 4. Complete version of assignment for in-class research project in Geology 320

The final research project is intended to provide you with an opportunity to investigate intensively and become an expert on some aspect of fluvial or hillslope form and evolution. Our primary tool for this research project will be RiverTools.

What is research?

Good research is driven by clear questions and/or hypotheses, the answers to which will help advance our understanding of some topic of interest. Formulating good questions and/or hypotheses is perhaps the most challenging aspect of doing research. To do so, we need to review previous work on your topic, and decide what questions/hypotheses are the logical next steps. Those questions then guide us in developing a methodology that will provide the data necessary to answer our questions. This is followed by data collection, and interpretation of that data in light of the questions we are asking. From this interpretation, we develop conclusions or answers to our questions based on what our data reveals.

What will we do?

We will conduct these investigations in groups of two to four students. You should attempt to first identify a topic that is of interest to you, and I will match like-minded individuals. I have included some ideas below that may be topics you would like to choose. The investigation of the topic that you choose should include both a review of literature on that topic, AND collection of some original data about the topic. This data collection should be simple, and might include things like measuring relevant profiles, a field visit to the landscape to make observations, and/or a simple experiment, either numerical or analog. I highly recommend having your group meet with me several times during the course of the semester to discuss progress and address questions along the way. All of the projects should involve the use of DEMs and potentially geologic and topographic maps. You can do field work, too!

Timeline:

Choice of Research Topic: email by Thursday 10/6, 8 pm (top three choices, ranked)

Project proposal: email by Friday 10/21, 5 pm: two questions/hypotheses your group will address, short paragraph describing your methods, two relevant references - papers, geologic maps, but not Internet sources (you should use lab time on 10/18-19 to work on this assignment).

Lab Sessions for research and assistance from me: in lab 11/2-3, 11/15-17

Final Poster Presentation: in lab 11/30-12/1

Final Poster Presentation: In the last lab session, you and your partners will display a poster reviewing your research findings during the Seventh Annual Surface Processes Poster Session. This poster will consist of one panel with clear figures and graphics. I will provide more information on good poster preparation later. During the session, a portion of the class will have their posters on display, and the remainder of the class will have an opportunity to look and ask questions about

your work. I will also be there, asking questions. You should prepare to be able to talk through your poster efficiently, within a time span of no more than 3 minutes.

Evaluation: The evaluation of your research will be based on two broad categories. Roughly 25% of your grade will be based on your literature review and questions developed; 50% on the quality of the research completed, the interpretation of the data, and the conclusions drawn from that data; and 25% on your presentation in the poster session.

Project ideas

1. Origins of knickpoints in the Crabtree Falls area, Virginia: Crabtree Falls is one of the tallest waterfalls west of the Mississippi. What is the origin of these falls and others in the area? It has been suggested that these falls are retreating, cutting into an ancient plateau of low relief.
2. Escarpment Retreat and Capture Along the South Fork Roanoke River, Virginia. The S. Fork Roanoke is an anomaly in Virginia - very rugged topography, likely eroding quickly, and steep slopes and river profiles that are eating away at the drainage divide with the New River. How different are tributaries to the Roanoke vs. those that flow to the New River? Is there evidence for drainage capture?
3. The Blue Ridge Escarpment around the Dan River headwaters: Morphology, fluvial characteristics, and origins: The Blue Ridge escarpment of southwestern Virginia is one of the most prominent geomorphic features in the state. What is the morphology of the escarpment? How different are rivers and watersheds draining the escarpment face from those on the plateau above the escarpment? Do rivers show evidence of transient behavior?
4. Longitudinal profiles and knickzones around the New River Gorge, West Virginia: Do the longitudinal profiles and valley characteristics of the New River and tributaries around the New River Gorge preserve evidence for the origins of the New River Gorge? Is the Gorge lithologically controlled, or does it represent erosion associated with a base level change?
5. Asymmetric hillslopes: evidence and causes: Are hillslopes asymmetric in the Coastal Plain? Is there a preferred direction of asymmetry? What are the origins of hillslope asymmetry?
6. Hillslope convexity and diffusional processes: Processes identified in College Woods were predominately diffusional - do hillslopes show convexity consistent with that observation? What do hillslopes suggest about hillslope diffusivity? Is there evidence for angle of repose hillslopes?
7. Scarps in the Coastal Plain: Origins and ages: What is the morphology and origin of scarps in the Coastal Plain? How high are scarps, and how diffused are these scarps? Can we date them based on diffusion calculations? Can they be related to past sea level?

Appendix 5. Summary of ease of access to information about undergraduate research on department and program websites

	Undergrad research mentioned	Ease of access (#clicks required)	Comments
Africana Studies	No		
American studies	No		
Anthropology	Yes	Low (3-4)	Says “ <i>reach out on your own</i> ”
Applied Science	No		
Art & Art History	Yes	Medium (2-3)	No mentorship
Biology	Yes	High (1)	Widget link
C.A.M.S.	Yes	Low (3)	No mentorship
Chemistry	Yes	High (1-2)	Picture widget
Classical Studies	Yes	Medium (3)	Comprehensive
Computer Science	No		
Economics	Yes	Medium (2-3)	No mentorship
English	No		A draft exists
Environ. Science and Policy	Yes	High (1)	Comprehensive
Film and Media Studies	No		
Gender Sexuality Women	Yes	Low (4)	
Geology	Yes	Medium (3)	Required
<i>Global Studies</i>	<i>Yes</i>	<i>Medium (2-3)</i>	<i>Minimal</i>
Asian Middle East	No		
European Studies	No		
Latin American	No		
Russian Post-Soviet	Yes	Medium (2)	Student projects
Government	Yes	High (2)	“ <i>Guide to learning outside class</i> ”
History	Yes	Medium (3)	
Interdisciplinary Studies	Yes	High (2)	No mentoring
International Relations	Yes	Medium (2)	Out of date
Kinesiology Health Sciences	Yes	High (1)	Widget examples
Linguistics	Yes	Medium (2-3)	Out of date
Mathematics	Yes	High (1)	Out of date
Medieval Renaissance	Yes	High (1)	No mentoring
<i>Modern Lang. & Literatures</i>	<i>No</i>		
Arabic	No		
Chinese	Yes	Medium (2)	Student work
French	Yes	High (1)	Study abroad only
German	Yes	High (1)	Student work
Italian	No		
Japanese	Yes	Medium (2)	Student work
Russian	Yes	High? (1)	Link is dead
Music	Yes	High (1)	Lists ensembles
Neuroscience	Yes	Medium (1)	No mentoring
Philosophy	Yes	High (1)	Very minimal
Physics	Yes	Medium (3)	
Psychological Sciences	Yes	High (1-2)	Needs updating

Religious Studies	Yes	Medium (2)	Minimal
Sociology	Yes	Medium (3)	No mentoring
<i>Theatre Speech Dance</i>	<i>No</i>		
Dance	Yes	Medium (2)	Productions
Speech	No		
Theatre	Yes	High (1)	Productions