Research in the Lived Experience of Gustavus Students

By Joseph Robbins and Barbara Fister

Abstract

In this small-scale mixed-method study conducted in the spring semester of 2018, the coauthors explored the value of research experiences for students in three majors, asking through interviews and surveys whether they felt their confidence has increased during the undergraduate years, how they felt about particular research experiences, and whether they believed those experiences offered transferrable skills for encountering and evaluating information in everyday life. Faculty in those departments were also interviewed about the development of their own identities as researchers, how they engaged students in research experiences, and whether that kind of learning had value beyond the discipline. Though there were clear distinctions among the kinds of research experiences students had in the three departments reflecting distinctive disciplinary practices and traditions, some themes emerged that have implications for how departments and the library can help students engage in formalized inquiry.

Introduction

Over the years, to inform the library's instruction efforts and improve the effectiveness of the library's programs and services, Gustavus librarians (sometimes with student co-investigators) have conducted studies to understand student experiences using a variety of methods. This mixed-methods study, funded by the Patricia Lindell Scholars program[1] with additional support from the Kendall Center for Engaged Learning, involved delving into the lived experience of Gustavus students to better understand how research, broadly defined, figures in their overall learning experience and to explore how faculty present and model research as a practice in a disciplinary context.

To explore this question the authors selected three departments in different divisions and used a variety of methods, including interviews (6 with faculty and 8 with students), an in-class survey (collecting 62 responses), a mapping exercise, and a modified photo diary exercise. Though the scope of the study is limited to a small number of students and faculty

[1] Patricia Lindell, a founder of Gustavus Library Associates, started this endowed program to involve students in research projects to benefit the library and the Gustavus community. The first project was conducted in the 1982-83 academic year. In 2003, student/faculty research projects were made biennial so that the library could introduce a research paper prize, now awarded every other year.

in three departments during a single semester (spring 2018), we were able to get a sense of how research values influence students' learning, how they perceive themselves as researchers, whether they feel what they learn through research experiences transfer to evaluating information in everyday life, how research experiences factor into the curricula of three programs, and what faculty think about the value of research at an undergraduate institution.

Literature Review

Since at least the 1980s researchers have studied students' research practices and how they use libraries. The largest of these studies is Alison Head's multi-institutional Project Information Literacy which began in 2006 and continues to explore a variety of questions from "how do undergraduates conduct research?" to "how are library spaces planned most effectively for student learning?" The project's two current studies examine how students consume news and how college course syllabi and their reading lists can be mined to create resources for lifelong learners.[2]

Most studies, however, are more modest in scope yet have been influential in academic librarianship. An early attempt at using qualitative methods to develop grounded theory in this area was Constance Mellon's study of library anxiety among students (1986). A number of studies followed that used qualitative methods to explore students' research processes. Carol Kuhlthau's process model (1988) was particularly influential, and was followed by further studies examining students' perceptions of research (e.g. Valentine 1993, Detmering & Johnson 2012). Some librarians also probed how faculty in other disciplines approached undergraduate research (Leckie 1996; Simmons 2005; Cope & Sanabria 2014). In the field of writing studies, similar questions have been raised, most often within the context of the first year composition course (e.g. Nelson & Hayes, 1988, Howard, Serviss & Rodigue, 2010). These studies strive to illuminate the feelings, behaviors, and experiences of undergraduates as they take their first steps as researchers. In many cases, they call for closer collaboration between librarians and faculty across the disciplines and a greater understanding of the students perceptions of the purpose and nature of research, especially in their first year or two of college. Methods used in these studies have included interviews, focus groups, research diaries, and examining student work.

Beginning in the 2000s, as big box bookstores and the internet began to challenge the image of libraries as a space for researchers (and as tightening budgets and the soaring

2 Three Gustavus students, including one of the authors, helped test interview questions for the first of these studies, and another of the authors will be participating in an initial review of the findings.

cost of electronic resources drove difficult decisions about library priorities) ethnographic research methods became a popular addition to the librarian research toolkit.

Anthropologist Nancy Freid Foster was particularly influential as she guided a group of librarians at the University of Rochester to explore how students do research using a wide variety of methods – exploring faculty expectations, student research processes, how they use the library and other campus locations, how they use the library's website, and how to interpret the findings. *Studying Students: The Undergraduate Research Project at the University of Rochester* (Foster & Gibbons 2007) made a strong case that librarians do more to understand the user experience and create "student centered" libraries. Though this research incorporated methods used by those who studied students research process and behaviors, a number of ethnographic methods, including mapping, photo diaries, and observation, were added.

Many studies followed that took an ethnographic turn (e.g. Gabridge, Gaskell & Stout 2008; Delcore, Mallooly & Scroggins 2009; Reglado & Smale 2015). Perhaps the most ambitious of these was the ERIAL project, a two-year study of the student research process at five Illinois institutions (Duke & Asher 2012). Ethnographic approaches have also been used to study faculty research behaviors (Lanclos 2016) and a how students and faculty use online platforms (Connaway, White, Lanclos, & Le Cornu 2013). Ethnography had become so commonly used in libraries, but often without thinking of libraries as sites of sustained fieldwork, that Donna Lanclos and Andrew Asher have described it as "Ethnographish" (2016). A limitation of much of this research is that it often focuses on how students use libraries – their buildings and their websites – but doesn't necessarily address research as part of students' overall lived experience.

This pattern of studying students using a variety of qualitative methods is repeated in the history of research done at the Folke Bernadotte Memorial Library. Barbara Fister (1992) had begun a project of interviewing students about their research process just as Carol Kuhlthau was publishing her process model. Michelle Twait focused on students' process of source selection using interviews and a think-aloud protocol (2005); Twait and Anna Hulseberg did a deep dive into the research experiences of sophomores as they emerged from their first year introduction to college and began to choose majors (2016). A research team that included an anthropologist used ethnographic methods to study how both library spaces and the library website were used by students at Gustavus and how both could be improved (Gilbert, Hulseberg, Monson, & Gratz 2010). Most recently, Gustavus joined seven other institutions in a study led by an anthropologist. The team studied a single day in the life of over 200 students at different institutions, mapping their travels and examining their "taskscapes" – the ensemble of social activities taking place across time and space – as they

negotiated their complicated lives (Asher, Couture, Amaral, Smale, Lowe, Lanclos, Regalado & Fister, 2017).

It was this last study, one that included surveys conducted by text message, mapping of movements throughout the day, and debriefing interviews, that inspired this research project. While we learned much from that study about how students fit classes, studying, work, and personal life together across a 24-hour period and were able to learn more about students' choices of study spaces, we didn't ask about their research experiences. This study is designed to learn more about research, broadly defined, in the lived experience of Gustavus students.

Methodology

After considering various methods for filling this gap in knowledge about student research experience, we eventually focused on two primary research questions:

1) What role does the major play in the experience of undergraduate researchers?
2) How do the research experiences and attitudes of faculty members influence the experiences of undergraduate researchers?

We began by selecting three departments, Chemistry, Classics, and Communication Studies, looking for disciplines with significantly distinctive approaches to research. The chemistry department courses involve lectures and labs but the most intensive research experiences it offers are in lab settings, where students work alongside faculty on long-term experimental projects, sometimes resulting in presentations or publications. Classics is an interdisciplinary field in the humanities that values textual analysis and the examination of historical artifacts as well as thematic inquiries into the past; in that department, the major research experience is provided through the senior capstone course. The Communication Studies program at Gustavus, while technically part of the Fine Arts division (in the distant past these programs emphasized oratory, so were linked with performance arts) it takes a humanistic and critical approach to its course offerings while employing some qualitative research methods from the social sciences. Most of the research experiences available to majors occurs in the context of courses, nearly all of which involve research projects, with a signature required course involving community-based problem-solving.

We contacted the chairs of each department to describe the study and ask for their support in recruiting faculty volunteers who might be willing to be interviewed. In addition, we asked each chair to recommend junior or senior students with some form of research experience who might also be willing to be interviewed. Our most in-depth source of data came in the form of these recorded, half-hour, one-on-one interviews with student and

faculty subjects. Each interview was conducted in person in a free-response format, guided by a set of prompts. The interview questions were designed to be open-ended and conducive to follow-up questions from the interviewer. We obtained consent to record the interviews and explained that we were using a broad definition of research: "for the purposes of this study, research includes lab and field experiences, making new contributions to a body of knowledge, finding information to resolve questions, or extending your personal knowledge about a topic."

The student co-author conducted the student interviews and the faculty interviews were conducted by the faculty co-author. We hoped to take advantage of the fact that, in this case, both interviewer and interviewee were peers to some extent. By opting for a more comfortable, relaxed interview style, we hoped to generate a greater breadth of information about subjects' research experiences.

Both students and faculty were asked to list three emotions they associated with research, then were asked to describe research experiences, were asked how their research experiences developed over time, and whether they felt those experiences provided transferrable skills in understanding information encountered in everyday life. (Interview scripts are included in Appendix A and B.) In addition to discussion prompts, the students' interview incorporated a mapping activity. Subjects were provided a campus map and were asked to identify three places that they associated with their personal research process. ("An off-campus location" was included as an option on the map.) Students were also asked to complete an additional follow-up activity, in which they emailed a photo taken by themselves that represented an aspect of their research experience. Finally, to broaden our understanding of student experiences, faculty were asked to distribute an in-class survey with questions similar to the interview prompts, including the mapping exercise, in one or more upper-level classes. (This survey is included in Appendix C.)

The interviews and surveys were conducted over several weeks, from late March to late April. One limitation of the study is that survey responses were not all collected at the same time and may have been influenced by the time of semester. For example, one department had a full agenda and was not able to join the study until late April, and this may have influenced student survey responses to the questions about emotions, given higher stress levels toward the end of the term. Though the three departments were equally represented in interviews, few surveys were collected in one of the departments because they had a smaller number of majors than the other departments. An additional complication is that many of the participating students had more than one major and some were sophomores, so had less research experience than other participants. Finally, one of the upper-division Communication Studies courses surveyed had a number of students who were not majors

and were in many cases sophomores, so their responses were not necessarily reflective of disciplinary or curricular approaches to experiencing research.

Findings

We analyzed recorded interviews, survey responses, and follow-up prompts and sorted our findings into several overlapping themes.

Theme: Mixed Emotions

Nearly all subjects – including the faculty and students interviewed and students who completed the in-class survey – named both positive and negative emotions associated with research. In interviews several subjects described these as mutually dependent. Excitement (or a similar emotion) was typically paired with frustration by both students and faculty. As one faculty subject put it, ""frustration for sure, excitement, satisfaction. I think those capture two ends of the spectrum . . . we spend a lot of time being confused, frustrated when things don't go according to plan . . . the reward is the figuring-it-out part, and that's very satisfying."

The words interviewees and survey respondents provided when asked to list three emotions they associated with the process of doing research were entered into a spreadsheet. Variant forms on word choices (e.g. "interesting" and "interested") were unified by using the one most commonly named. Using Voyant's Cirrus tool,[3] we created word clouds that display the most commonly-used words by size. Though we had more student responses, so more variations, we were struck by how similar the dominant patterns were both between students and faculty and among majors.

Figure 1: Faculty Emotion Word Associations

[3] Voyant is an open-source suite of text analysis programs developed by Canadian researchers. It is available at http://voyant-tools.org/

Figure 2: Student Emotion Word Associations

Students had a much larger range of negative emotions related to their research projects. Stress was a much more frequently cited negative aspect of the research experience than in faculty interviews, and was often coupled with emotions such as “nervousness”, “anxiety”, “confusion” and even “boredom.” Faculty were more likely than students to be frustrated by setbacks in their research, whereas students matched that difficulty with external pressures, such as meeting deadlines and understanding the demands of a particular assignment.

This becomes particularly important in light of the following observation about the sources of positive emotions. Pride, and feelings of success or achievement upon concluding a research project, was among the most cited sources of positive emotion for both students and faculty. A significant number of student and faculty interviewees related these positive emotions to the perceived challenge of a given subject, with several saying that the two were directly proportional. This adds nuance to the observation that negative emotion is intrinsically linked to one of the most frequently cited positive emotions associated with research. It would also seem to indicate that, while frustrations related to tackling a tough research question is a positive, and seemingly inevitable, aspect of the research experience, external requirements, such as deadlines, constrictions in range of possible questions governed by an assignment prompt, and anxiety about grades, are, by contrast, a negative aspect of the research experience that perhaps could be mitigated. While these requirements are present at the faculty level as well in terms of tenure expectations and the publication process, it seems that they are a much more prominent feature of student

research, and may detract from the ultimate didactic value of undergraduate research experiences by artificially increasing the negativity of the research experience while occluding healthy frustration as an intrinsic part of the undergraduate research process.

Some faculty indicated they didn't experience the continuum of emotions as undergraduates. In most cases they either had no significant research experience as undergraduates, or only had research experiences late in their undergraduate education. In one case, it came through a summer research opportunity at a research institution, since her college was small and didn't have a formal student/faculty research program; in her final semester she took two independent studies and even was invited to teach a subject to one of her professors, who encouraged her ambition to become a faculty member herself. "I was teaching myself . . . it felt like that summer research experience really launched me." Another faculty member mentioned the significance of an independent study conducted with a faculty member, providing an experience significantly deeper than the research she routinely did in her courses. Though it was challenging, hearing "you can do this" from her mentor was a pivotal moment in her undergraduate experience. In student responses to the emotions question, there appeared to be an increase in positive emotions from sophomore to senior year, though it's hard to say if it's a significant difference given our sample size.

Two students who provided three negative emotional experiences in their interviews were unique in that both associated research with course assignments rather than as projects they felt personally vested in. Yet later in their interviews they had some positive things to say about research. "I'm going to skew your results because I hated research when I first came in," one student said. "Burning passion hated is probably the best way to describe it. Someone mentioned statistics and I was out the door . . . I still don't like statistics, but I think the school is good at forcing you to understand it even if you don't want to." Another said "most of my learning I get from classes and lectures and . . . the reading assignments; not necessarily the stuff I do on my own . . . but I think the research has really helped in that I know how to take on the education on my own . . . I think it's going to be most exciting after college when I have to research things myself." Students who named more positive emotions tended to describe their research as something independent from coursework, an application of what they were learning in class or an aspect of their learning experience over which they felt they had control or ownership. This was often described in contrast to coursework, which was seen as being more rigid, rote, and prescribed.

Theme: Identity as a Researcher

When asked about research experiences, major research projects that demand significant investment from students and which generally involve more one-on-one work with faculty than is typical in the classroom were singled out as having a greater impact than smaller projects that are part of a course. FYRE (a first year research experience program for potential STEM majors), summer research programs, and capstone research projects where often mentioned as particularly meaningful for students when discussing their undergraduate education as a whole. Interestingly, so too did learning how to read and interpret material critically, a significant building block for conducting independent research and understanding research culture. Students frequently referenced learning how to read critically and getting familiar with disciplinary methods and writing conventions as primary contributors to their ability to conduct research on their own. It seems that learning to read scholarship in a discipline and understand its rhetorical moves and to critically evaluate methodological quality is important advance work for doing research. (This holds true not just in text-based analytical research but in the sciences, as several students mentioned reading primary literature as an important skill, though learning how to run experiments and troubleshoot instrumentation was also valuable.)

Several faculty and student interview subjects from different departments referenced a memorable shift in how they conceptualized their education and coursework within a given field, thanks to a specific research experience. This pivotal event was often described as the subject's first "true" research experience, early in their career (for faculty) or at some point in the undergraduate experience (for students).

In Chemistry, these experiences tended to be in laboratory settings. This experience was frequently described as a realization of the real world application of concepts: "[W]hen I've been able to do research it kind of helps connect those ideas that I learned in class, and gives a more real-world application to it," one chemistry major said. Another student participated in the FYRE program (a January term experience in which students participate in research intensively) and described it as "probably the most I've learned in a month . . . ever. . . Especially when I compare myself to, like, my peers around me who haven't had research experience, I just, I really think it's helped me develop a sense of what chemistry is like in the real world." Another chemistry major described his first experience as a research assistant at private company participating in a study that employed a specially engineered instrument, "a frankenstein-esque thing that wasn't supported by the instrument vendor, and so we had to do all our own maintenance." He reported that research experiences in general motivated him academically more than professors or the coursework itself. Though he wanted to be successful in his coursework, lab experiences were more a more tangible form of learning. He laughed, saying research is "an outlet for

why I should even bother, in a way." This love of hands-on research was also reported by a faculty member in the chemistry department who had majored in biology as an undergraduate and felt burned out after completing his undergraduate work. It wasn't until he worked in a chemistry research position in industry that he decided to attend graduate school and follow an academic career path.

A similar, albeit less pronounced trend was also evident in the Classics interviews. Subjects from the chemistry department tended to characterize their research experiences in terms of helping them realize the significance of scientific discovery and helped them grasp more fully their role in that discovery. Classics subjects were more likely to speak about their research experiences in terms of helping them to conceptualize the importance of using research to interact with the world morally. One faculty member went so far as to state "part of me thinks research is not all that relevant." He went on to argue that classroom discussions are more valuable than research assignments, and that learning how to make connections between literature and the world; learning how to respect and appreciate different perspectives constitute more important skills than doing research in Classics, though he also observed that students come to college feeling pressured to seek out research experiences to include in their resumes. Another member of the Classics faculty spoke of conducting research that represented her as a "civically engaged person." She reported that she did not have much research experience as an undergraduate and was only exposed to actual research as a graduate student. She valued including research experiences in undergraduate Classics courses because research tends to make students more fully appreciate the nuance of narrative and to develop both ethical and practical skills.

Classics majors by and large characterized research in similar ways: "The work we are given in college demands us to have more of a voice," one said. Another described the culmination of Classics as producing research and scholarship: "It's not like business, where there are applications that aren't research . . . I think Classics is important just, like, because of the classical themes in our society, so it can be beneficial even if you're not doing research, but if you're going into Classics that's what you're doing." Another student discussed the morals and principles that can be conveyed through myth. His senior thesis involved research but was written in the form of historical fiction. Interestingly, both he and the faculty members who were interviewed questioned the impact humanities research in its most scholarly form could have. For the student, reaching an audience through the medium of popular fiction had the potential to convey important historical material about slavery in the ancient world that had both accuracy and impact. A standard research paper written for an academic audience would not, he felt, convey as much meaning. His department supported him in using an unconventional genre for his thesis. One of the faculty members expressed satisfaction that research that seemed arcane turned

out to be of deep interest to high school teachers who he worked with in a seminar setting. The other described how powerful an experience it was for her to bring her specialized knowledge as a classicist to a broader audience through a public humanities publication that seeks to tie classics research to contemporary issues.

For Communication Studies students and faculty, the relevance of their disciplinary research to public discourse was both obvious and celebrated as both a core purpose of the discipline and a deliberate direction the department was taking as they designed courses and assignments that would prepare students to deal with information in any format or circumstance. The methods used in this department described both by students and faculty were deliberately varied to provide experiences that engaged students in mixed research methods and different rhetorical situations, practicing communication in different genres such as writing conversations and filmmaking. One student described a number of research projects she had completed for different courses using a vareity of research methods. She valued the ways she was able to connect her research with the kinds of situations she expected to encounter in life after college, but she also valued the way it enabled her to be more objective and analytical, able to stand back and examine an emotional subject from all sides. This was echoed by a faculty member, who said "Reflexivity matters, to be able to stand back and see context and think about variables at play" rather than simply making judgments based on an emotional response. "Being able and willing to question all assumptions including one's own, that's an important transferable skill." Another faculty member described ways she created assignments designed to give students practice expressing themselves in a wide variety of rhetorical situations and understand that evidence matters in all kinds of discourse, not just in academic writing.

There were distinct differences in how faculty and students in the three departments described research methods, but in interviews students all expressed both a clear understanding of the value of certain methods to their disciplines and a striking level of identification with the discipline itself and its contribution to knowledge. Of the three disciplines, students in chemistry were most likely to be firmly identified with their disciplines (comfortable referring to themselves as scientists), but all were articulate about why certain methods were used in their disciplines and how those methods made sense for the context of their field. Given a number of student participants were double majors and all had a broad general education, their ability to compare and contrast disciplines is perhaps not surprising, though it was impressive. Given student interview subjects were for the most part recommended by faculty they were not representative of all majors in those departments, but generally they were both excited to describe their research projects and were remarkably sophisticated in explaining them in disciplinary terms.

A mapping exercise and photo follow-up rounded out our sense of how students expressed their identity as a researcher. Students were asked to circle three locations they associated with research. Nobel Hall was strongly identified with research by chemistry majors, with some students circling it three times to emphasize its primacy. Some chemistry majors also included Olin Hall and, to a lesser extent, the library. Communication Studies majors tended to identify both Beck Hall and the library as sites associated with research, but several also included residence halls. (One respondent said "mainly just my dorms – I procrastinate too much to use the library.") The library was commonly chosen by Classics majors, as well as Old Main. One mentioned a location that wasn't on the map but rather "up in the cloud. I love ILL [interlibrary loan] so much, it's just like magical to me that I can request it over the internet and get it in, like, two days."

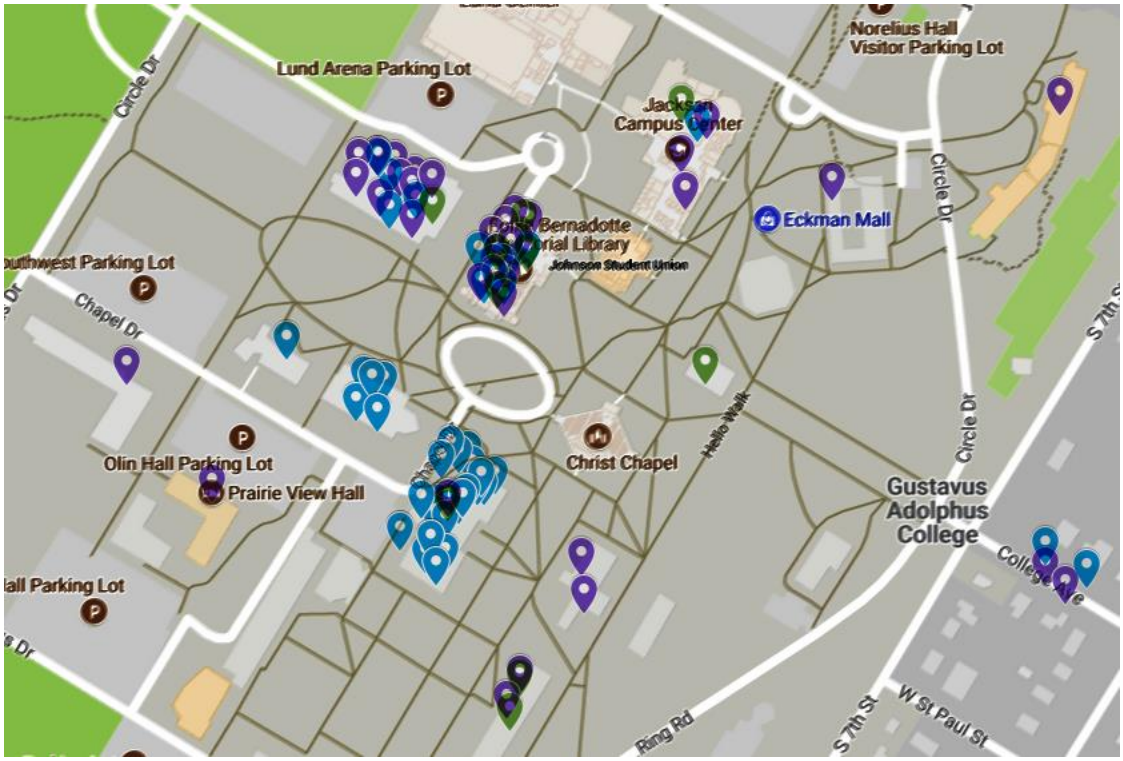


Figure 3: Locations associated with research. Blue pins represent chemistry majors, purple represent Communication Studies majors, and green represent Classics majors. All off-campus locations are grouped together below the circle road.

Photos students submitted in a follow-up to the interviews provided mixed messages. A chemistry major submitted a photo of a lab notebook, writing "this lab notebook was the first one that I got to use for research, instead of simply following a procedure in a teaching lab. Some of the pages ended up being completely crossed out, as is the nature of research

at times, and yet it represents the experience of trial and error with the occasional exciting success that is research." A Communication Studies major who double-majored in Psychology provided a photo of an experimental setting, depicting the process of designing an experiment and gathering data as research. A chemistry major submitted a self-portrait of her presenting her research at "my first ever poster session, which was a great opportunity!" For her, sharing results formally in public represented research. Two students took photos of a laptop surrounded by sources they were consulting (books in the case of a Classics major, printouts of articles and drafts of writing in the case of Communication Studies major). In the latter case a note was appended: "I hope you can kinda see the million tabs I have open haha." In these cases process was represented by a gathering, sorting, and responding to information sources (including those in multiple tabs in a browser) with a personal laptop occupying the center.

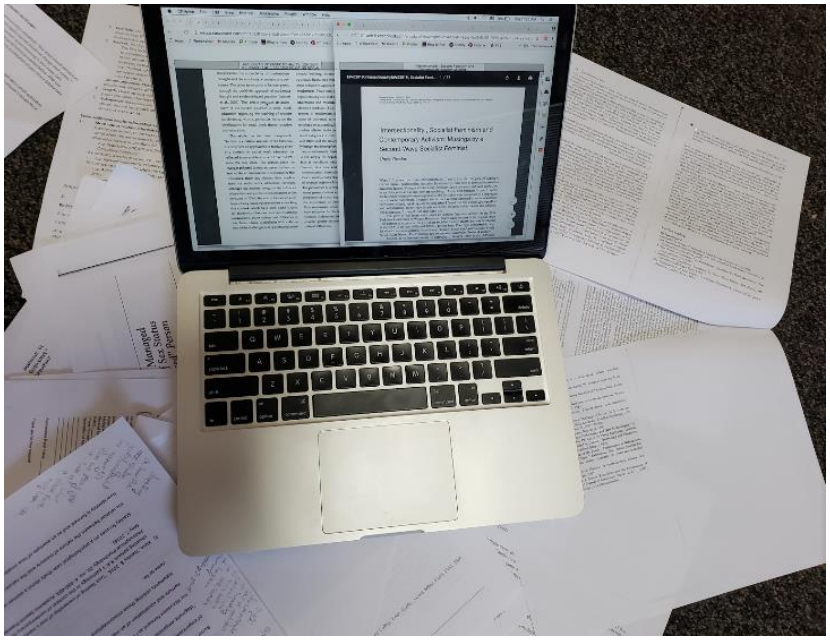


Figure 4: Example of a photo follow-up sent by a Communication Studies student.

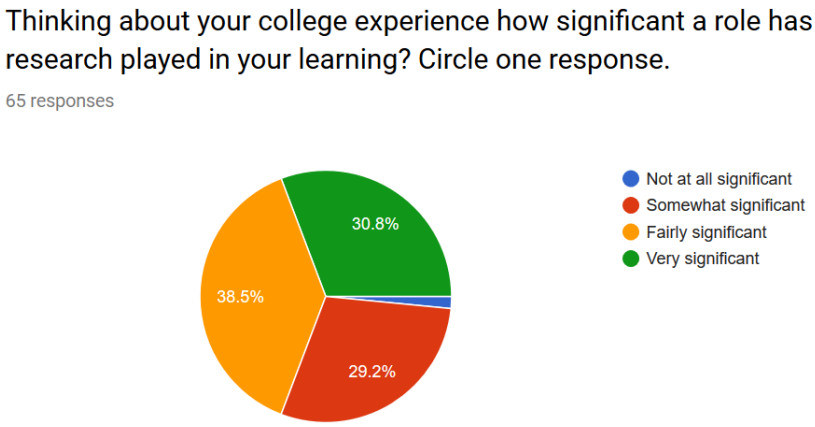
Theme: Participating in the Conversation

Gaining practice in reading and evaluating disciplinary literature was an important aspect of the development of student researchers, and in interviews students were able to articulate what they looked for in terms of quality as well as an appreciation for the ways research results were shared and, cumulatively, how these publications advanced knowledge in the discipline. In three instances, skepticism was expressed by students in surveys, the most blunt observation being "Academia is pedantic, circular, and boring. Researchers will do anything to publish and stroke each other's egos in an ivory tower." However most students felt research had been an important part of their education, that

they had improved their research skills during their time in college, and that they would be able to apply their skills when evaluating information in daily life. Open comments from surveys emphasized the themes of increasing their capacity for questioning (or being skeptical), evaluating the validity of sources, and to a lesser extent expressed confidence in being able to make sound judgments about information. Some examples:

> "My research experience has changed how I look @ everything and makes me critically think about what is in front of me."
>
> "You start noticing and judging the validity of most information you are given."
>
> "Knowing the difference between what happens in theory vs. what happens in practice has led me to think about how information is gathered and processed."
>
> "I am much more doubtful of articles I find online."
>
> "I question more."

Nearly all student interviewees and survey respondents said that their ability to interpret claims and evaluate supporting data had increased during their undergraduate career, and an equally overwhelming majority said that research had played a significant role in developing these skills.



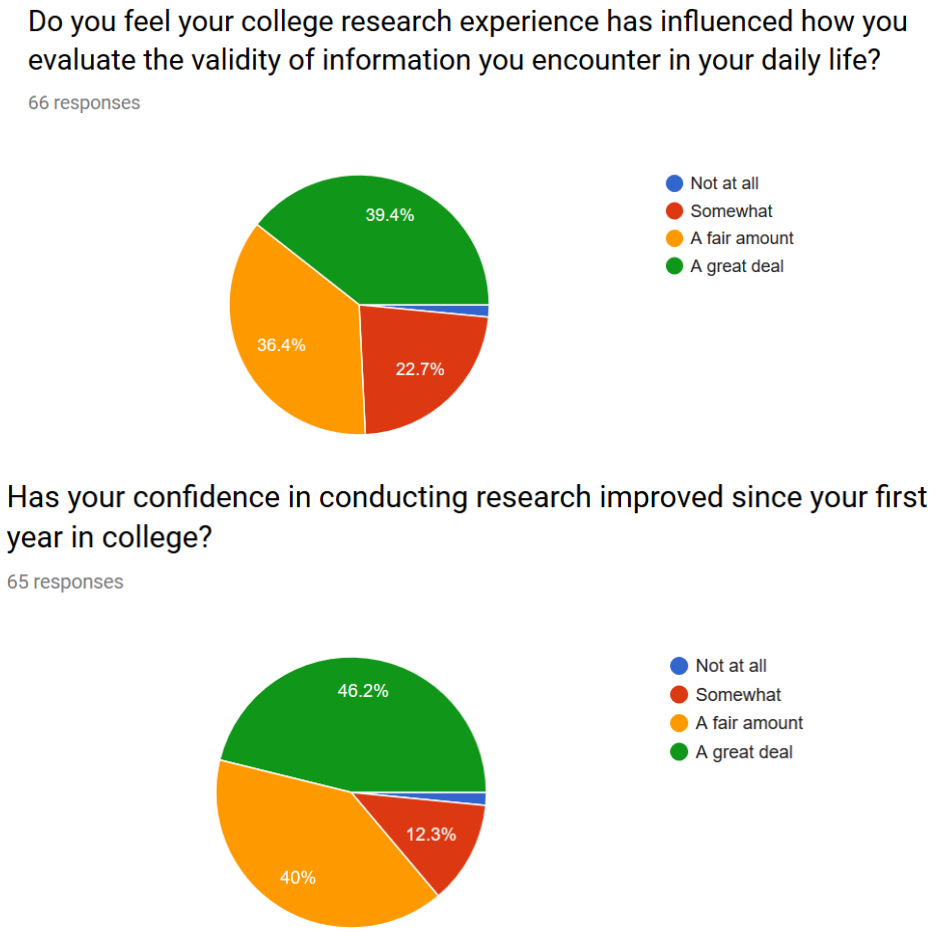


Figure 5: Results from In-Class Survey of Students in Three Majors

It's unclear, however, if student confidence (particularly as indicated on the in-class survey responses) is matched by student capability to make judgments in terms of news and social media. It seems likely from interview responses that many subjects considered these transferable skills in terms of judging validity of arguments made in long-form sources, rather than on-the-fly judgments in everyday life, including situations in which there may be an abundance of dis- or misinformation found on frequently-used social media channels. (Though one study found Americans rank social media low in terms of trustworthiness, another found social media channels are frequently used as source of news; Harrigan 2017; Shearer and Gottrfried 2017.)

Student interviewees were asked to describe their data evaluation strategies, and most described strategies that involved limiting sources to peer-reviewed journals, and interpreting the data being presented, rather than more general evaluation of bias and possible alternative motivations behind the production of information. Though in many

cases students demonstrated sophistication in reading and evaluating methods and arguments used in scholarly and scientific publications, students may be unaware of how business models influence what they see online. They may be unprepared for confirmation bias or for evaluating emotional cues used in news stories and internet memes. Some respondents indicated they had learned to be skeptical or had been taught how to determine validity of sources in high school; many more said they learned it while in college. This skepticism seemed to involve a general attitude of distrust towards unfamiliar sources of information, rather than strategies for evaluating claims on a case-by-case basis. There seemed to exist a general, metaphysical idea about the sources of information; that there were "good" sources and "bad" sources, and that once these had been established, information from "good" sources just needed to be properly interpreted, while information from "bad" sources was disregarded. The methods of determining "good" sources was described in simple terms, generally determined by whether information had been officially published in some way, or produced by a corporation or organization that was large and easily recognizable by name. Further research would need to be done to assess whether student confidence in evaluating all kinds of sources is matched by actual performance of evaluation.

Theme: Ownership and Self-Direction

In interviews, most students described one or more research projects in detail, demonstrating both familiarity with their particular subject and a sense of deep engagement with their research. We identified a sense of "ownership" or "agency" as a common correlate to student passion about the research they described to us. One student described a Communication Studies assignment that involved writing a hypothetical conversation between two people about an issue. She saw it as practice for life: "this is something that could totally empower me." She felt committed to writing and doing research, and said "when I can write about what I want, I'm so much more passionate" and "I'm a total nerd . . . I would do this as a hobby." A Classics major said "I don't necessarily get to, like . . ." She paused in thought. "If I were a professor doing my own research, I wouldn't be doing what I'm doing in my Writ D [writing in the disciplines] classes, but if I find something personally interesting it makes it a lot easier and lot more enjoyable." A chemistry major who began working in a lab in his first year through the FYRE program said "research is what has motivated me academically, it's not the classes."

For another student, mentoring a first year student in the FYRE program was particularly motivating for two reasons. "I had the greatest ownership of a project and that was super cool. I felt a lot more motivated . . . helping her learn the material helped me learn it even deeper." A Classics major whose senior capstone research project was a work of historical

fiction also saw teaching others as a rewarding form of self-expression. “If I can make something in a sort of medium that's entertaining, where people are learning something but don't even know it, that's perfect.”

In some ways that is reflected in comments several faculty members made. In addition to being very thoughtful about how (and why and whether) to involve students in research experiences, they discussed the links between their research and student learning and sought ways to direct their own research in useful and novel directions, whether in developing methods and instruments that could be used in different discipline that lacked appropriate tools or by linking academic research to contemporary political issues through a public forum. Research and engaging in scholarly work was consistently described as providing transferrable skills for students. One Classics professor was unsure that his department could prove the work his students did in their major prepared them to deal with information in other settings, but as a student he loved the way classics enables seeing connections and hopes students will likewise see connections and ways to reconcile different perspectives. A Chemistry professor said "I find myself saying a lot these days that really what my role here is is to train problem-solvers. At the core, the most valuable thing they can do is solve a problem, whatever that is, because that's really what the world needs right now."

There is also joy in research for students and faculty. As another Chemistry faculty member said, "I love being in the lab . . . having students that are counting on me gives me the motivation to get back to the lab and back to that stuff I enjoy."

Conclusions and recommendations

Though this study was small in scale, it rounded out previous research by giving us a glimpse of how upper division students majoring in three disciplines that have distinctively different approaches to research experience research, broadly defined, as a part of their undergraduate education. We inquired into students’ feelings about research, what role it played in their learning, and whether they felt it provided them with the skills to deal with information they encounter in other contexts. We also interviewed faculty in the three departments to learn about the development of their own identity as researchers, how they involve students in research, and whether they believe these discipline-focused experiences provide students with transferrable skills post-graduation.

Given that librarians see information literacy as an important learning goal for graduates, and that these skills are primarily experienced by undergraduates in disciplinary contexts within their major, we wanted to see how research experiences are shaped by faculty and explore how those experiences might prepare students for life-long learning regardless of

whether they continue to graduate school or professional work in those disciplines. We came away with several impressions.

- Students in the study (both those interviewed and those who were surveyed) feel research is an important part of their education, that their skills improve over time, and that they feel confident that they are able to use their ability to analyze and evaluate information in other situations. That third point, in particular, deserves further research, as students in previous studies (e.g. Stanford History Education Group, 2016) were unable to evaluate claims in online sources, which suggests our students may be overconfident.
- Most students who were interviewed described gaining experience in analyzing the literature of the field and learning research methods as essential building blocks for more self-directed research experiences.
- In interviews, students described varying levels of research experiences. In some cases their research experiences began in their first year through the FYRE program; in others, discussion, reading, and language study preceded research projects that mostly occurred in the capstone or in upper-division writing-intensive courses. One chemistry major expressed a desire for more research opportunities, while others said research was crucial to their learning and their post-graduate plans. Many Communication Studies students told us research was part of every course they took in the major and their assignments asked them to use a wide variety of research methods.
- These experiences appear to be extremely valuable for student development, and the faculty we interviewed were intentional and thoughtful about the role research experiences play in their programs. However, they are resource-intensive, and that may limit the college's ability to provide these experiences without additional staff and funding. One student, speaking about her second major (Psychological Sciences) praised the college for the way it prepared students to do research but expressed concern that students didn't always know how to seek out opportunities to do research with faculty and recognized that keeping lab equipment up to date was a challenge.

Our findings suggest further directions for research and teaching.

- Students who are enthusiastic about research understand that frustration is a natural and necessary part of research, that they are not simply being inefficient or wasting valuable time but are working through a challenging process that will likely bring rewards eventually. This has implications for preparing students to do research and for librarians who are advising them. Sometimes the frustration that

comes from wrestling with difficult material or experiencing setbacks is mingled with anxiety about time management, balancing academic and other commitments, and grades. If those different causes for frustration can be disentangled and unpacked, students may gain a clearer sense of the difference between what Bethany Nowviskie (quoting William Morris) has called "resistance in the materials" and external conditions that may make work stressful and need a different kind of management. Procrastination, for example, may be a response to external stressors that interferes with tolerance for the ambiguity, setbacks, and dead-ends that are an intrinsic part of research.

- Students linked practice in reading and critically evaluating published work with their ability to conduct research themselves. The three departments we studied have varying levels of sequence in their curriculum. (Chemistry is a highly-sequenced major; Classics students must achieve a certain level of language proficiency before attempting independent research; Communication Studies offers a much more flexible path through the courses for the major and includes some forms of analysis and research in most if not all of their courses.) In all cases, faculty were aware that reading and critical analysis were part of developing research skills. It may be worthwhile for some departments to work together on curriculum mapping to consciously provide scaffolding to give students practice reading the discipline and its methods in advance of more intensive research experiences for juniors and seniors. However, the ability to structure these experiences as a continuum will vary depending on the ways students can complete requirements for the major.
- As one of the co-authors discovered in an study published in the early 1990s, students who have reached a level of comfort with research are eager to talk about their ideas and seem excited to have that opportunity. The Celebration of Creative Inquiry was launched in part to provide the campus with a sense of what kinds of research and creative work was going on throughout the curriculum and to give students an opportunity to share their work. Students seem thirsty for opportunities to share their ideas, which suggests it is important to provide multiple opportunities for reflection, informal sharing, and public engagement with student work.
- Students' ability to evaluate information in any context needs to be further explored. It would be worthwhile to use the kinds of tests developed by the Stanford History Education Group and Mike Caulfield's "four moves" fact-checking exercises to see if student confidence is matched by competence. This might be a direction for future research by library faculty.
- This study (as well as some earlier studies) focused on students who were willing to talk about their research experiences in part because they were recommended by faculty who had worked with them and because they felt they were successful. It would be valuable to design a more representative study that sampled subjects to look at a broader cross-section of the entire student body.

- While the library faculty is committed to information literacy across the curriculum, the primary drivers of developing intellectual curiosity and critical thinking are clearly the faculty in the disciplines, particularly within the major. At a campus-wide level, we need to consider how we can provide significant research experiences for as many students as possible with limited resources. The traditional means for librarians to be involved in instruction is to introduce students to library resources in one or two course-related class sessions, a practice that is both ubiquitous in academic libraries and universally considered inadequate. As we develop a new general education curriculum which (at this point) will de-emphasize research assignments in the first year in favor of developing a deeper set of writing and reasoning skills and will include a general education capstone that will be interdisciplinary and project-based, the library faculty will need to assess what contributions we can make and how best to provide an intellectual infrastructure to support research in many different contexts while also advocating for information literacy as an essential component of lifelong learning and civic engagement. As departments engage more students in research activities, whether lab- or community-based, public-facing or in the form of researched writing, librarians will need to evaluate what we can contribute to support this form of learning and how to communicate our potential contributions. Being able to find information is not, apparently, a significant challenge for students. Rather, knowing how to winnow and sift it, how to recognize what information to trust, how to apply the critical habits they practice in their major to novel situations, and how to persist through frustration and nourish curiosity as they engage in sustained work are more significant challenges.

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Appendix A: Interview questions for students

We are exploring the research practices and experiences of students in different majors and the role research plays in students' lives. This interview should take no more than thirty minutes. [Hand out consent form and explain that participants won't be identified and they do not have to participate or complete the interview. Ask if it is okay if they interview is recorded.]

For the purposes of this study "research" includes: lab and field experiences, making new contributions to a body of knowledge, finding information to resolve questions, or extending your personal knowledge about a topic.

1. Please list three emotions you associate with the process of doing research.

2. Briefly describe a research experience you've had in connection with your major.

3. Thinking about your college experience, how significant a role has research played in your learning? Not at all significant? Very significant?

4. Has your confidence in conducting research improved since your first year in college? Can you talk a bit about the experiences you've had and what part they have played in your overall learning?

5. Do you feel your college research experiences have influenced how you evaluate the validity of information you encounter in your daily life? Can you give some examples?

6. Conduct the map exercise, asking students to identify three significant places they associate with research; explain that we will send out a follow-up email prompt in a week or two.

Appendix B: Interview questions for faculty members

We are exploring the research practices and experiences of students in different majors and the role research plays in students' lives. This interview should take no more than

thirty minutes. [Hand out consent form and explain that participants won't be identified and they do not have to participate or complete the interview. Ask if it is okay if they interview is recorded.]

For the purposes of this study "research" includes: lab and field experiences, making new contributions to a body of knowledge, finding information to resolve questions, or extending your personal knowledge about a topic.

1. Please list three emotions you associate with the process of doing research.

2. Briefly describe a research experience that helped form your identity as a [scientist or scholar].

3. Thinking about your undergraduate education, how significant a role did research play in your learning? When did you first fully identify yourself as a [chemist, classicist]?

4. Do you feel your training and experience in [discipline] has influenced how you evaluate the validity of information you encounter in your daily life?

5. Given many if not most of our students end up working in professions other than their major and will encounter information in daily life that they have to evaluate, what transferable skills or habits of mind can undergraduate research experiences provide, if any?

Appendix C: In-class Student Survey

We are exploring the research practices and experiences of students in different majors and the role research plays in students' lives. This survey should take no more than three minutes to fill out. Results are anonymous and you are not required to complete this survey.

For the purposes of this study "research" includes: lab and field experiences, making new contributions to a body of knowledge, finding information to resolve questions, or extending your personal knowledge about a topic. Questions can be addressed to Joe

Robbins (jrobbins@gustavus.edu) [A campus map was included on the reverse of this one-page survey.]

1. Please list three emotions you associate with the process of doing research.

2. Briefly describe a research experience you've had in connection with your major.

3. Thinking about your college experience, how significant a role has research played in your learning? (please underline or circle one response)

Not at all significant Somewhat significant Fairly significant Very significant

Please briefly explain your answer.

4. Has your confidence in conducting research improved since your first year in college?

Not at all Somewhat A fair amount A great deal

5. Do you feel your college research experience has influenced how you evaluate the validity of information you encounter in your daily life?

Not at all Somewhat A fair amount A great deal

Please briefly explain your response.

On the reverse of this survey, please circle the three places on the campus map that you associate most closely with your research experiences.

I am a (check one) ___Sophomore _____Junior _____Senior

My major is _____