Title	“I’d say it’s good progress”: an ecological momentary assessment of student research habits
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Publication date	2019-04
Original Citation	Crist, E., Leahy, S. and Carbery, A. (2019) '“I’d say it’s good progress”: an ecological momentary assessment of student research habits', Recasting the Narrative: Proceedings of the Association of College and Research Libraries 2019 Conference (ACRL 2019), Cleveland, Ohio, 10-13 April, pp. 692-701. Available at: http://www.ala.org/acrl/sites/ala.org.acrl/files/content/conferences/confsandpreconfs/2019/IdSayItsGoodProgress.pdf (Accessed: 29 April 2019)
Type of publication	Conference item
Link to publisher's version	http://www.ala.org/acrl/sites/ala.org.acrl/files/content/conferences/confsandpreconfs/2019/IdSayItsGoodProgress.pdf, https://conference.acrl.org/, http://www.ala.org/acrl/conferences/acrl2019/papers
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Download date	2025-07-31 01:51:21
Item downloaded from	https://hdl.handle.net/10468/7815

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"I'd Say It's Good Progress": An Ecological Momentary Assessment of Student Research Habits

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How can librarians recast the narrative we tell about the student research process? What evidence and assumptions inform that narrative? Attempting a more realistic assessment of student research habits, three librarians utilized a form of ecological momentary assessment to track student behavior in real time over the course of a research assignment. Knowledge gained from this study encourages librarians and teaching faculty to probe the assumptions made when communicating the research process to students and allows them to prioritize instruction around specific areas of research that best meet actual student needs.

Introduction

Significant work has documented the iterative and intertwining steps of research and writing processes. Yet, students may not necessarily conform to these steps in practice, leaving faculty without an authentic picture of their students' behaviors, struggles, and successes when approaching and completing a research assignment. We sought to undertake a more realistic assessment of student research habits and practices, in hopes of avoiding biases and inaccuracies inherent in retrospective recall of their behavior. To do so, we relied on a version of ecological momentary assessment (EMA) to study student research behavior and habits across a research project. Deploying a daily diary data collection method, we tracked student thoughts, actions, feelings, cues, barriers, and resources used in real time over the course of a research assignment, which included an annotated bibliography and a paper.

This knowledge can help librarians and faculty to probe the assumptions they make when communicating the research process to students. With a more accurate understanding of students' research processes, librarians and faculty can prioritize and build instruction around specific areas of research that may best meet student needs. It can also help illuminate the elements that prevent or provoke students to complete their work, the use of different resources and supports, and the affective feelings related to progress. With this more holistic view of student practices, faculty can more accurately design additional support, scaffolding, and targeted interventions for specific aspects of student research and writing processes.

Literature Review

Academic librarians have focused a significant amount of scholarship on better understanding student research processes. These studies employ a variety of methods for prompting and analyzing student research habits and behaviors. Approaches in these studies include analyses of narrative reflections on the research process created by student researchers,[1] interviews with students,[2] and novel prompts such as asking student to map the steps

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of their research process.[3] In an attempt to study student information-seeking behaviors outside of a controlled environment, Bloom and Deyrup used screen-recording and voice capture software to record students engaging in three 20-minute information-seeking sessions.[4] After the recordings, students received follow-up surveys measuring their feelings about the experience.

While these studies provide useful and important insight into student research habits, they rely heavily on recall and generalizations about past research behaviors. Discrepancies identified by these researchers suggest that asking students to recall past research behaviors with relatively little prompting and guidance may reveal the steps that students *think* they did, or remembered doing, but not necessarily what they *actually* did. Although much survey data relies on participant recall and self-report, research on memory reveals retrospective recall's extreme lack of dependability and potential for inadvertent bias.[5] In their examination of cognitive research on recall, memory and inferences, Bradburn, et al. reveal that respondents often are unable to accurately recall memories, either omitting salient points or accidently reporting on conflated experiences over time, rather than the experience in question.[6] As subjects attempt to reconstruct a memory, they may attempt to fill in missing pieces in multiple ways. While recall may be more accurate for exceptionally unique and memorable events, routine experiences and events prove even harder to remember.[7] Therefore, asking students to recall their academic habits retrospectively is potentially fraught with inaccuracies.

One alternative approach to retrospective self-report is a methodological framework known as ecological momentary assessment (EMA)[8] which centers on assessing behavior as it unfolds over time in its actual, real-world context. While multiple methodological approaches fall under the EMA umbrella, they share several important factors. EMA repeatedly samples the behaviors of participants in their natural environments, assesses these behaviors in their current state (rather than retrospectively), and collects these data points over time to reveal behavioral variation across situations and periods. Shiffman, et al. describe the benefits of this framework, including the ability to see within-subject behavioral change over time, the potential to minimize biases inherent in recall, and the opportunity to see how subjects' experiences and behaviors change over time in a real-world context.[9]

Therefore, in order to reveal a more accurate and thorough understanding of Champlain College student practices and behaviors throughout the research process, this study incorporated a version of EMA to study student research behavior and habits across a research project.-

Methodology

For this study, we used a daily diary data collection method—a version of ecological momentary assessment—where students completed nightly surveys in which they recorded and reflected on their research actions of the day in order to track their behaviors over the course of an actual research assignment.

After receiving IRB approval, we recruited students from one professor's three sections of a general education, interdisciplinary course taken by all students in the Spring semester of their first year. Forty-five students were eligible for participation. In this class, students complete an annotated bibliography followed by a research paper over the course of several weeks. As part of an embedded information literacy instructional program, the librarians visit the class and teach an information literacy session timed with the start of the annotated bibliography. The procedures, incentives and recruitment of this study were explained to the cohort on two occasions—once prior to, and once during the librarian-led instruction session. Importantly, students were guaranteed that the study had no impact on their grades; their professor did not know who chose to participate and was not informed of the anonymized results of the study until the end of the semester and after the submission of grades.

The study took place over the course of a six-week period, with data-collection spanning five weeks. The college's spring break occurred within this timeframe, and no data were collected over this week. Every evening at 7:00 pm, study participants received an email link to a Qualtrics survey where they answered brief questions about their work on the project from that day. The survey design used skip logic; therefore, certain responses, such as confirming work on the project that day, prompted additional questions. The nightly link expired the next day at 1:00 pm to ensure that students could not complete multiple daily surveys retrospectively. The survey (see Appendix 1) asked students whether they had worked on their research paper that day, what prompted or prevented them from working, what research steps they completed, how difficult they found each step, how prepared they felt, if they sought help at that stage, and if they felt like they had made progress. When selecting the research steps that they worked on each day, students could choose from the following list: defining my topic or task, locating and/or accessing information, considering and/or evaluating possible sources, selecting sources, interpreting or using the information in my project, or citing my sources. Participants also had the option to select 'other' and describe the activity in their own words.

As the study took place over multiple weeks, it required an incentive program that encouraged repeated, lasting participation. In the attempt to minimize missing data over time, we chose to incentivize both daily participation as well as ongoing participation. Therefore, students received $1 a day for each day of participation, and if they completed one week of full participation (7 days in a row), they were entered into a weekly $15 raffle. All incentives were paid in the form of a gift card at the end of the study period. A total of 53% (n=24) of all eligible students participated in the study by completing at least one nightly survey. More than half of participants (54%) completed 80% or more of all nightly surveys sent over the five-week period. Of all study participants, 25% (n=6) completed 100% of the nightly surveys.

After the five-week data collection period, all participants also had the option to complete a follow-up interview. Six students participated in this second research phase. In the interviews, we asked students additional questions about their research experience, their attitudes towards the annotated bibliography project, and additional issues related to the research process.

Each Qualtrics survey response had a unique identifier (Response ID: student * day) that we used to count unique responses when analyzing the survey data. We used Tableau Data Prep software to create variables for difficulty and preparedness for each of the tasks for each Response ID. We re-shaped the data to create columnar data identifying the task and its associated difficulty and preparedness ratings. We assigned descriptive ratings a number used in calculations for subsequent analyses. Two researchers inductively coded open-ended survey responses and student interviews.

Results

What Students Worked on

The nightly survey asked students whether or not they worked on their project that day, and to select the particular tasks they worked on when they responded in the affirmative. Throughout the study, the participants noted that they worked on a variety of tasks on 408 separate occurrences, with "Interpreting and using the information in my project" accounting for the largest share of responses (n=107; 26%). Students not only noted they were interpreting and using information more frequently than the five other defined tasks, but they participated in these tasks over a greater number of days than any other. While we might have expected this to be a central component of the tasks students performed as they were preparing their papers to turn in (which the survey results do confirm), we noted that students interpreted and used information at the very beginning of the survey, as well. This may be due to the scaffolded structure of the assignment, but it

also shows that the interpretation of information goes hand in hand with other tasks, such as locating and evaluating information.

The defined task that accounted for the least number of tasks noted by respondents was "Defining my topic" (n=26; 6%). As additional results show, this also proved to be the task for which students felt least prepared. Although it was the least frequently cited task, "Defining my topic" was not limited to the beginning of the research process. Of the 14 students who chose "Defining my topic" at some point during their research process, only 5 confined work on their topic to the beginning of the project. The remaining students either returned to defining their topic towards the end of the project or periodically refined their topic throughout.

Returning to tasks over time, as well as performing multiple tasks in a single day, was common for all participants. A pattern of steps did not emerge in the responses, suggesting that students did not proceed linearly from one step to the next but instead will return to steps throughout, particularly as deadlines approach.

Difficulty and Preparedness

The survey asked students to not only note what tasks they accomplished in a twenty-four hour period but also to rate those tasks on scales of difficulty and preparedness. For each task, students responded on a likert scale of 4 options. To gauge difficulty, the survey asked students to rate each task they engaged in on a particular day according to the following criteria: Easy (1), Somewhat Easy (2), Somewhat Difficult (3), and Difficult (4). To rate preparedness, students rated each task along similar criteria: Unprepared (1), Somewhat Prepared (2), Prepared (3), Very Prepared (4).

The results of the survey showed that most tasks clustered between "Somewhat Easy" and "Somewhat Difficult." Students described "Considering/Evaluating possible sources" (n=70; Difficulty: 2.4) and "Selecting sources" (n=55; Difficulty: 2.42) as the two most difficult tasks, while "Citing sources" (n=63; Difficulty: 1.73) was noted as the easiest. Citing sources also accounted for the task that students felt the most prepared for (n=63; Preparedness: 2.98). Students noted they felt least prepared overall for "Defining my topic or task" (n=26; Preparedness: 2.42), although "Locating and/or accessing information" accounted for the highest percentage of students selecting "Unprepared" for a particular activity (13%, or 8 out of 61 responses).

Cues and Barriers to Working

Over the course of five weeks, students responded to the survey a total of 567 times. 374 of these responses reflected non-work days and 193 reflected work days. To ascertain the barriers and cues to working, the survey asked what prevented them from working, or what prompted them to begin.

Not surprisingly, students' greatest barrier to working on this project involved feeling that they lacked time. Overwhelmingly, the most commonly mentioned time conflict resulted from other academic work. Students described having full days of classes, working towards other due dates, and realizing that other work took priority at that time. Students also mentioned personal time commitments, such as scheduled obligations, as well as a general lack of time without further explanation. Student affect also appeared in their references to emotional barriers that prevented them from working. For example, students mentioned feeling overwhelmed, lazy, stressed, and lacking motivation. While time and emotions impacted students, they also occasionally demonstrated more proactive decisions to take purposeful breaks from working. At times, students shared their activities such as watching the sunset, taking a day off to relax, or spending time with family. Mentions of social barriers to working were surprisingly few, however students occasionally reported instances such as needing to support a friend, or a personal break-up.

When students did work on their research, they most often did so because of an imminent due date. In fact, this accounted for approximately half of students' self-described motivators for working. Students also made

several references to planning and mapping out their papers, a potentially impactful point of note for scaffolding within assignment design. For instance, students reported that they started working due to specific benchmarks they set for themselves, such as wanting to write a certain number of words a day, or having a section done in time for another student to peer review. Often these benchmarks detailed specific tasks, such as needing to write, research, read, plan, or cite. Of these tasks, writing was most frequently mentioned. Less frequently, but still of note, a few students were prompted to work based on faculty feedback, a social occurrence such as seeing peers work on their projects, or having a formal peer review in class.

Progress

If students reported working on their research project, they were asked if they felt they made progress. Overwhelmingly, they reported feelings of progress, answering affirmatively 161 out of 189 times (89%). In an attempt to better understand how students define assignment progress, we asked them to explain their responses. Students most frequently reported feeling that they had progressed based upon concrete, visible output. The most common task mentioned referred to writing that they had started (n=68; 31%), completed (n=24; 11%), or revised (n=18, 8%). Together, these three types of writing accounted for exactly half of all responses explaining progress. Other definitions of progress revolved around selecting sources (n=25, 11%), completing or revising citations (n=13, 6%), and reading or consuming their potential resources (n=7, 3%).

To our students, explanation of progress most frequently appeared in a measurable, definable form. Students often quantified their progress in number of words or pages written. For example, one student explained, "I wrote one and a half pages, and I'm going to continue working tonight. I had one sentence earlier today, so I'd say it's good progress." Less frequently, but of note, several responses did indicate that students felt they had progressed as they developed a clearer vision of the final product. One student noted, "I'm really starting to bridge together my different sources and can adequately say what I'm using each source for specifically."

The few times that students worked but did not feel like they had made progress often were defined by a lack of work completed. They reported not being able to write, not finding good sources, or not feeling like the work that they did do was up to par. Several students mentioned procrastinating. An affective element frequently appeared in these descriptions as well, with students mentioning a lack of confidence in their abilities or an inability to move forward. For example, one student explained, "This paper, honestly, is a bit intimidating. I know about my topic, but I just feel worried about how big the paper should be and how slowly I'm working. I have basically made no progress."

Only ten students reported days when they worked without feeling like they progressed. However, the data revealed that generally students felt a combination of progress and lack of progress, depending on the day. Furthermore, feelings of progress did not appear to be task-specific. A student may work on locating and accessing information one day with great progress and another day with no progress. This furthers the notion that students may not view cyclical research and writing processes as progress, but rather look to linear evidence of advancement through a project.

Student Interviews

After the completion of the research project, six students elected to participate in follow-up interviews. In these interviews, they reflected on the research process, elaborated on the difficulty and preparation for different research steps, and described what it was like to receive a nightly survey for five weeks.

When asked to reflect on the research project, students often described elements of the project that they found particularly difficult, time-consuming, or confusing. Many of them discussed topic development and

described the challenges of settling on a specific topic and finding a suitable amount of information to use in the paper. However, 'defining my topic' was the step least reported by students throughout the five-week study period. This finding reflects the research on memory and recall in that students commented on the more exceptional parts of the process—the parts that they found particularly challenging or memorable—rather than the more normative, routine processes that occurred over the five weeks. In the words of Participant 21, "It's hard for me to judge how difficult something is for me to do because of the way I do work, where I'll do work for a long time, and it kind of blurs together at a certain point, and I'll forget if I really had trouble with certain things, so it's usually hard for me to keep track of what was actually easy."

However, the qualitative affordances of these interviews provided the opportunity for students to reflect on their responses from the survey, something that was especially useful in having them explain different answers, such as why they found particular research steps difficult. For example, when describing their struggles in finding and interpreting information for use in the project, students clearly described significant problems for engaging with multiple academic texts. One student described the difficulty finding evidence for a topic spread throughout multiple texts. Another mentioned her struggles to understand scholarly jargon and wasting time reading half of a paper that had a misleading title and did not actually apply to her topic. Students commented on the usefulness of scaffolding throughout the project, such as check-ins, built in reviews, and having an annotated bibliography due prior to the research paper itself. However, this also proved a sticking point for some students who described moving from sources in the bibliography to incorporating them into a paper as a very difficult, confusing task. This detail helps to further illuminate where teaching faculty and librarians can collaborate to focus attention and learning support.

In the interviews, students were also asked about the effect of receiving a nightly survey over the course of their project. Though this method of data collection was not intended to act as an intervention in any way, students strongly reported the positive influence it had on their behavior. They reported feeling "guilty" after reporting several days of not working, feeling more aware of their workflow and time management, and setting goals for themselves based on their answers to the questions. As Participant 9 noted, "I think, I mean it's like a psychological thing, but getting emails, I wanted to be able to say that I worked on it. So I was working more on it, I think, because of that." Similarly, Participant 1 described its effect on her procrastination. She noted that it "keeps you in check. So, when you're doing your research, and like putting it into your paper, you would know that you would get the question [about progress], so you would be conscious of what you're doing and how it is improving… so that was also a check, somehow."

Discussion

Implications

Trends emerged in the data that may have implications both for information literacy instruction and for assignment design. As expected, student activity clustered around the two primary due dates for the annotated bibliography and the research paper, respectively. Our results indicate that a scaffolded assignment with built-in touch points—including faculty feedback and structured peer review—led to increased engagement with the assignment throughout.

In terms of information literacy instruction, we believe that topic formulation is an area for increased emphasis. For example, our information literacy instruction could stress the importance of and strategies for revisiting and revising topics throughout the research process. In fact, this may be happening, but students may not recognize this activity as such. Or students may believe that this is not the "correct" way to research. However, the data do suggest that some students are returning to topic formulation up until final days of the project, and

alerting students to this may help them to better conceptualize how formulating a topic should be iterative and continuous. Additionally, we could work with faculty to build topic revision into their assignment scaffolding.

Challenges

Because this was the pilot phase of our project, we noted the unexpected challenges we encountered throughout the process. As expected, there were numerous contingencies we did not anticipate or could not foresee. The adjustments that follow from these should enrich our data collection for the next phase of the project, though they will inevitably likely open up new challenges and contingencies to which we'll continue to refine our project going forward.

Interview materials

At the time of the interviews, we had not collated, reviewed, or visualized any of the survey data, which meant that we were unable to link our interview questions to concrete results provided by the interviewees during the survey phase. Without the additional context that the survey results would have provided, the students tended toward more general reflections on the research process rather than speaking more specifically to how they understood the question or articulated their response during the actual survey. The insights from our interviews, though fruitful, would gain in specificity if we had the opportunity to probe during the interviews on certain responses from earlier data.

Scheduling conflicts

Surveying three sections taught by the same professor made the scheduling of the survey straightforward and consistent. That said, details of the scheduling process were liable to change or were oversights by us in the planning stages. One area that we did not address in the planning or recruiting phase was the presence of spring break in the middle of the project. Initially, we determined to survey through spring break; however, as we reviewed survey data prior to spring break, we learned that a major stage of the project (the annotated bibliography) would be due just as spring break was getting underway. We surmised this would create a natural break (and down period) in the student research process, making our data during spring break largely uninteresting or useless. Therefore, we decided to not survey during that period of time, notified the participants in a timely manner, and did not see any major changes in the participation rate following the break. Going forward, we know to be more considerate of the scheduling conflicts that may naturally impact students' research habits, allowing us to notify participants well in advance that the spring break will be a downtime for the survey.

Additionally, when there were modifications to the assignment or to deadlines, we were not informed directly by participants or by the instructor. However, because we periodically reviewed results as they came in, we were able to surmise that the due date had been extended. Therefore, we would have to adjust the length of our survey. In order to do that, we had to ensure we had enough funds to reward participants, notify participants of the additional week they would have to be involved, and confirm with the IRB that extending the survey by a week was permissible. Going forward, we will increase communication lines with our faculty partners, and we will know to be alert to the telltale signs of a new due date while also ensuring that these sort of changes—a perfectly common practice by professors—become an aspect of the instructor recruiting process.

Next Steps

Beginning in February 2019, we will conduct our survey for a second time with funding from the ALA's Carroll Preston Baber Research Grant. The study's survey method allows us to easily scale up our efforts and expand

the number of participants. We will be recruiting from twice as many course sections hoping to meet the target of fifty survey participants and an increase in the number of interviewees following the survey. The survey will contain the same set of questions, but the schedule for administering the daily survey will be tailored to the individual course and project schedules.

As noted above, we conducted interviews with participants before we had fully reviewed the data from the survey. While the interviews yielded additional insights not captured in the surveys, we believe there is an opportunity to learn more about the choices students make while conducting research if we can ask them to reflect on their own responses to the survey as well as share with them the anonymized results of their peers. Going forward, we intend to prepare individualized survey results that will allow our interview subjects to not only draw upon the general reflections on the experience that we would still like to know, but also would allow them to revisit, respond directly to, or elaborate upon actual data they provided.

Conclusion

In an attempt to undertake a more realistic assessment of student research habits and practices, and to avoid biases and inaccuracies inherent in retrospective recall of behavior, this pilot study used a form of ecological momentary assessment—the daily diary data collection method—to track student thoughts, actions, feelings, cues, barriers, and resources used over the course of a research assignment. This method of data collection remains underutilized in the research on student research habits and this study has revealed its strong potential to uncover a more accurate picture of student behavior over time. The EMA method also resulted in consistently high response rates over the entire study period. Results reveal how students move through a project, what motivates or deters them from working, what steps they find difficult and unprepared for, and how they measure and articulate progress. Teaching faculty and librarians can use these findings to inform curriculum design, assignment scaffolding, and targeted interventions.

Appendix 1

Survey Questions

Question 1: Did you work on your research today? (Work can include anything from thinking about your project, talking about your project, actively working on your project, etc.) *(Yes/No)*

- *If no, Question 2.*
- *If yes, Question 3, 4, 5, 6*

Question 2: What prevented you from working today? *[End of survey.]*

Question 3: What prompted you to begin working today?

Question 4: What steps did you work on today?

- Defining my topic or task
- Locating and/or accessing information
- Considering and/or evaluating possible sources
- Selecting sources
- Interpreting or using the information in my project
- Citing my sources
- Other, please describe

For each step listed, answer questions 4a and 4b:

Question 4a: Rate the step(s) from easy to difficult *(Likert scale)*

- Easy
- Somewhat easy
- Somewhat difficult
- Difficult

Question 4b: Rate your preparedness for the step(s) from least to most prepared *(Likert scale)*

- Unprepared
- Somewhat prepared
- Prepared
- Very prepared

Question 5: What tools did you use if any? (Google, library database, website, etc.)

Question 6: Did you seek help at this stage?

- *If yes, question 7*
- *If no, skip to question 8*

Question 7: from whom/where?

Question 8: How much time did your work take today?

Question 9: Do you feel like you made progress today?

- *If yes, question 10*
- *If no, question 11*

Question 10: How do you feel that you progressed?

Question 11: Why do you feel that you didn't progress?

[End of survey.]

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