Wanna Take a Survey? Exploring Tools to Increase Undergraduate Student Response Rates to Real-Time Experience Surveys

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Abstract

Our study explores the student perspective on approaches to real-time data collection surveys intended to be completed during classes. Real-time data collection means in the moment, while learning is happening. In focus group sessions with undergraduate students, we used semi-structured questions to gather information about a series of proposed survey tools including social media (e.g., Facebook and Twitter), standard survey software (e.g., SurveyMonkey), and classroom technologies (e.g., such as clickers or tablet computers and interactive software). Focus groups were recorded, transcribed verbatim and coded to identify patterns in preferences and underlying reasons for these preferences with regard to structuring the survey to increase the likelihood of completion of the survey by participants. The primary outcome of this study was that students suggested pen/pencil and paper as a top choice over electronic methods, even though this approach was not among our suggested options. They preferred pen/pencil and paper because the format offers space for free expression and ease of access. They also suggested the impetus to take the survey is greater with pen/pencil and paper. We believe our study makes an important contribution to educational research methods literature by offering research-based design considerations for increasing response rates in real-time data collection.

Introduction

Students, particularly in higher education, are constantly bombarded with surveys imploring their opinions; specifically, their opinions on educational issues. For example, at many institutions, students are asked to evaluate each of their courses and instructors through online or paper surveys each semester. There are also surveys about the effectiveness of extra-curricular academic programs and surveys related to educational research. Unfortunately, response rates are typically low as is the case with surveys in general [1]. Low response rates make it challenging to draw meaningful assessment and/or research-based conclusions. Our research focuses on increasing the likelihood of students responding to surveys and in particular to surveys grounded in real-time data collection methods. Real-time data collection means gathering information about experiences within the context of the current situation. This approach is also called Experience Sampling Methods (ESM) [2]. ESM are different than standard interview and survey methods in that they aim to capture the essence of an experience while it is happening instead of the reflective state many survey and interview methods propose. Because of the desire to capture data within the moment, it is particularly important that the methods used are appropriate and sufficiently enticing to garner and immediate response for the population being studied.

This present study is part of larger study that examines the ways students develop conceptual understanding. In the current phase of the study we want to gather information about

engineering students while they are engaged in learning practices in engineering classrooms. Specifically, we want to understand student motivation and strategies for learning while learning is happening in the classroom and not through reflective measures. There are existing survey instruments to measure motivation and/or learning strategies among college students (e.g., the Motivated Strategies of Learning Questionnaire [3], the Learning and Study Strategies Inventory [4], etc.). However, these instruments are too long for (and have not been validated for) use in collecting data in a real-time format as students are learning in class. With the ultimate goal of developing a data collection tool for real-time data collection on conceptual learning, our present goal is to determine the best timing and format of such a survey. Therefore we will address the research question: *What real-time data collection tools are most likely to be successful with undergraduate engineering students and why?* Our intended outcome is to find the best method of data collection that satisfies the needs of the researcher while grabbing the attention of the student.

Literature Review

To situate our study in the current literature, we first describe existing research relative to survey response rates. We then describe the theoretical framework and research purposes from which ESM emerged. Finally we describe what is already known about best practices for ESM.

Research in Survey Response Rates

Survey researchers have been plagued with issues of low response rates for many years. In fact, based on a study looking at national survey programs between 1996 and 2010, survey response rates have shown a declining trend in response to surveys [5]. Approaches which can increase response rates to postal and email surveys include keeping them short, incorporating respondent pre-notification, engaging in follow-up contact, and communicating issue salience to intended participants [6]. Monetary incentives have also been found to be effective in raising response rates in postal and email surveys, with expected improvements in response rates ranging from 20 to 40% by simply including a $1-2 gratuity for completing the survey [7].

While there is significant research available to support increases in response rate for traditional survey methods, such as one-time postal and email surveys, there is little research on increasing response for newer survey methods, including real-time survey data collection through ESM which employ very short (3-5 questions) over multiple time intervals. Learning from lagging response rates in traditional surveys, we argue that it is important to focus on understanding how to create a real-time survey with a higher likelihood of success.

Purpose of ESM

Although ESM are not tied to any particular theoretical framework, ESM were originally developed in studies examining Flow and Csikszentmihalyi is often given credit for the methods[8]. Flow is closely aligned with intrinsic motivation in the sense that it involves engaging in an activity out of enjoyment not for any perceived rewards. Flow is defined as "intense experiential involvement in moment-to-moment activity" (pg. 600) [9]. Flow is getting lost in the experience of the moment such that "Individuals experiencing flow are so intensely involved with a task that they may lose awareness of time and space" [10]. When experiencing flow, people function at their fullest capacity. Opportunities for flow are maximized when task challenges are not so hard as to cause anxiety but not so easy as to lead to boredom [9, 11]. Alternatively stated, flow is optimized when challenges equal skills. While Flow can be considered a desired state of learning, flow is something that cannot be measured and examined reflectively. Because flow represents a state of being, researching flow involves understanding what is happening in the moment while it is happening. Sampling at a later time, such as through surveys or interviews, is essentially too late to understand what is happening in flow.

Even if one is not specifically interested in Flow, there are a variety of reasons ESM are useful including providing a way to: understand learning in context, gather "unprocessed" experiences, and collect multiple measures of an experience. With regard to context, we argue that humans are not only impacted by their biological structure but also the cultural and contextual factors that encompass their everyday experience, i.e., the subjective experience. Studying the subjective experience provides a personally and contextually relevant perspective. We argue that this is especially the case in educational research where we need to understand how learning environments, pedagogical approaches and many other variables impact not only performance in the class but learning outcomes on an on-going basis. Historically popular methods of collecting data for educational research, e.g., one-time self-report surveys and interviews, require the participant to provide a retrospective account of the subject at hand and may not capture the context [2].

ESM also allow us to capture experiences with minimal "processing" or interpretation. Research in cognitive psychology has shown that one's attention is limited because the human brain can only process so many stimuli at one time. Therefore, we only perceive a small sample of the actual information that we experience in one day. We only process and memorize part of what we are exposed to. We make interpretations and fill in the "gaps" in our memory based on what we memorize. Due to the unreliability of these retrospective accounts, we must capture emotion, motivations, and cognitive processes through repeated samplings at the moment of occurrence [2].

Finally ESM typically use short simple data collection instruments delivered frequently allowing for multiple measures of an experience such as taking a specific college course. Through these

multiple measures, ESM allow a daily or weekly measurement in order to look at fluctuations in variables sampled over a period of time and around specific events and situations. ESM can be used to look at the activities that surround things like the optimal experience (from Flow). For instance, ESM can be used to look at the pedagogical practices that surround optimal learning gains in a classroom setting [2, 8].

Best Practices of ESM

ESM were developed in order to capture information on a participant's experiences as it occurs and therefore the data collection instruments and plan must also support this goal. Based on prior implementations of ESM [2], there are already existing lists of benefits, drawbacks and best practices. Note that ESM can be used with a variety of sample sizes. Because the data that is collected is very rich in nature, sample sizes can be as small as 5 to 10 participants. However, the data can also be simpler to collect and process such that research studies using ESM have been documented with up to 1200 participants [2]. ESM have been used in a variety of studies including within engineering education and related fields. For example, Collier had architectural engineering students wear wristwatches that would signal participants at 30 random times during each of three separate 7-day sampling events at the beginning, middle and end of the semester [12]. Additionally, electronic sampling techniques themselves have been studied and open source coding developed [13].

The primary design considerations for researchers include frequency of sampling, length of sample time, and the number of questions to ask during sampling [2, 14]. Sampling frequency depends on the purpose of the study and can include regular intervals, trigger by event or random intervals. Deciding how long to sample depends primarily on how much burden to put on the participants; researchers must balance the length of data collection with the number of times per day that participants are required to respond to signals. The number of questions for each form must also be taken into consideration as this can also be a burden to the participant. Experience in ESM dictates that forms should be designed to require only one to two minutes of a participants time to fill out. This limit of time must be balanced against what information is needed by the research team. Questions should be focused on collecting external and internal questions. External questions focus on what participants are doing, what time the participants are responding and who the participants are interacting with during the events in question. Internal questions focus on feeling, cognitions and motivations.

The researcher must also consider the medium through which to collect data. While originally predominantly collected through pen/pencil and paper means, computerized/electronic methods of ESM have emerged, e.g., [13]. For ESM, pen/pencil and paper methods typically include providing the participant a booklet and a time schedule so that the participant can record their responses to certain questions at specific times in the booklet. The booklet is collected by the

research and manually entered into a computer for analysis. Table 1 provides a comparison of the benefits and drawbacks of these methods [2].

Table 1: Benefits and Drawbacks to Different Data Collection Methods for ESM [2]

	Benefits	**Drawbacks**
Pen/Pencil and Paper	• Inexpensive to implement	• Getting data into usable form for analysis (from paper to electronic • Need an external method of signaling
Computerized/Electronic	• Signal/Collection combined • Ability to record time of entrance and data • Can easily and directly give participants feedback • Higher documented response rate than pen/pencil and paper	• Higher Cost • Risk of theft or loss of electronic device • Human error of data entry

As suggested by these lists, there are benefits and drawbacks of either approach. From these lists and the availability of current technology, electronic means appear more promising.

Regardless of exact sampling approaches used, ESM requires a significant investment from participants [2, 14]. Consequently, it is desirable to design an approach that will increase the likelihood of response. With the number of factors that matter in ESM design, there is clearly not one best practice and the above considerations provide suggestions for what the researcher should consider in study design. Therefore, before designing our study methods, we thought it prudent to interact with a sampling of our target audience to identify what ESM approaches would work best for our overall study aims, i.e., to understand student motivation and strategies for learning while learning is happening in the classroom and not through reflective measures.

Methods

Recall our research question: *What real-time data collection tools are most likely to be successful with undergraduate engineering students and why?* To address this question, we conducted focus groups with semi-structured questions [15]. We focused on a series of proposed survey tools including social media such as Facebook and Twitter, standard survey software such as SurveyMonkey, and classroom technologies such as clickers or interactive software. We conducted two focus groups during the summer of 2013.

Participants

Our focus groups consisted of students enrolled in either a summer pre-college preparatory engineering program or participants in a summer undergraduate research experience program. It is important to note that this sample population enabled us to recruit participants from diverse educational backgrounds and not just students currently enrolled at a single university. Participants were recruited in-person by one of two study co-investigators and both of these researchers conducted each focus group together. Two focus group sessions were conducted over the course of the research study. The focus groups were of different sizes with one consisting of one participant and the other consisting of eight participants. Despite this size difference, themes were consistent across the two focus groups. The focus group discussions provide a rich description of why certain student populations may prefer one survey method over another.

Focus Group Protocol

Questions in the focus group sessions inquired about the students' prior experiences with surveys, the types of survey tools to which they are most likely to respond, and their willingness to participate in surveys given during class periods. The following semi-structured protocol was used in the focus group sessions.

1. Are you ever asked to complete a survey by a professor or friend?
    a. If yes, what types of surveys? For example: (SurveyMonkey, polls on Facebook, etc.)
2. Which types of surveys tools do you prefer to respond to? For example: (e-mail, etc.) Why one tool over the other? If it doesn't matter, then why not?
3. When you get an invitation for a survey, how do you decide whether to take the survey or not?
4. How would you feel about being asked to answer a short survey question during class? How would you feel about taking a short survey directly after class? (How would you feel about participating in a short survey during class?)
5. Scenario: If I were to ask you a question during class, which would be the best survey method to ask you? And why?

A presentation was shown to give examples of several different real-time survey tools. The presentation included screenshots and pictures of hypothetical surveys (shown in Figure 1) as well as descriptions from the interview of how these tools would be used.

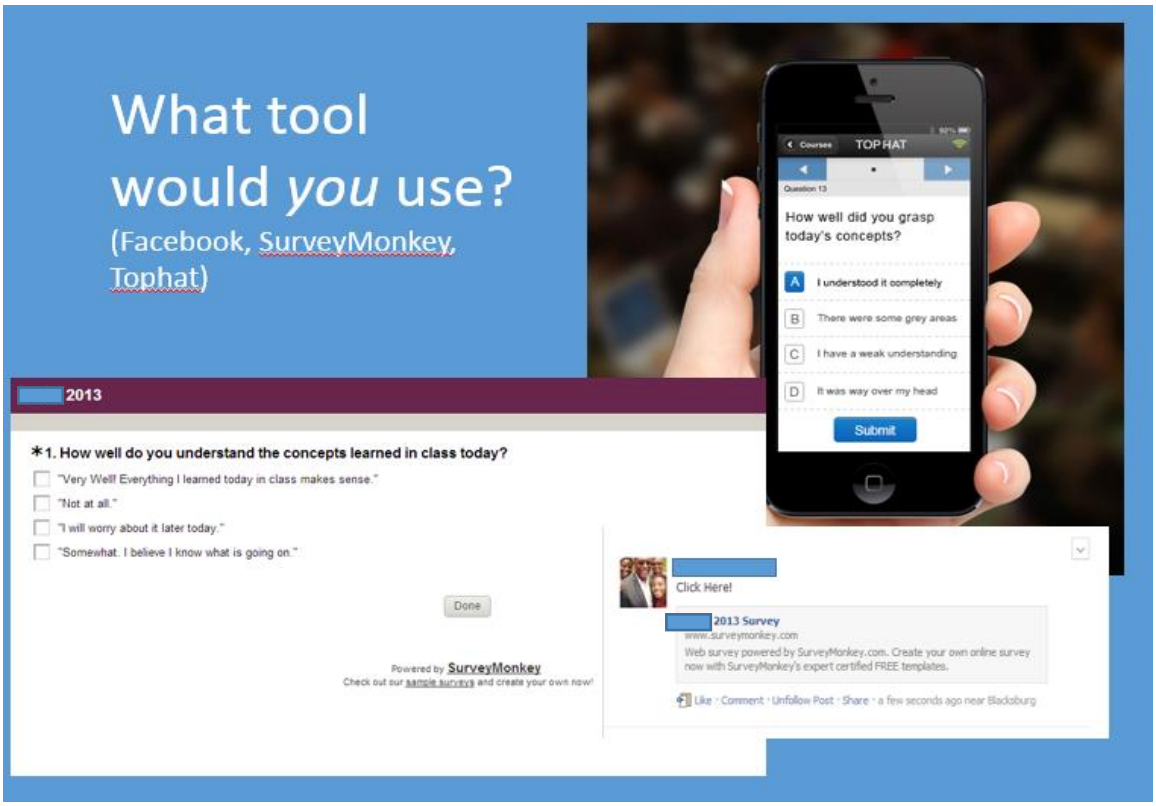

Figure 1: Visual representation of example surveys used in focus group sessions [16]

Analysis

Focus group interviews were recorded, transcribed *verbatim* and analyzed using open coding [17]. The interviews were reviewed (audio recordings and transcriptions) until a finalized set of codes emerged. The researchers discussed the coding and final codes finding that they consisted of two main ideas: format and impetus. *Format* described the proposed survey tool while *Impetus* gave the reason for a student completing the survey in class. These coding categories are consistent with important design factors considerations outlined in existing literature for ESM [2]. The final codes are shown in Table 2:

Table 2: Coding Strategy for Focus Group Transcripts

Code	*Sub-Code*	*Reason for Preferences*
Format	Pen and Paper	Space for free expression
		Ease of access
	Computerized/Electronic	Short and simple
Impetus	Personal Incentives	Personal utility
		Useful to Instructor
		Researcher presence

Results

Our results demonstrate that students prefer pen/pencil and paper for real-time data collection in classroom settings. This was evident through reasons related to both format and impetus for taking the survey. Note that pen/pencil and paper emerged as preferred in both groups even though it had not been originally offered as an option. Also, recall that the focus groups had semi-structured questions and examples around a series of proposed survey tools including social media such as Facebook and Twitter, standard survey software such as SurveyMonkey, and classroom technologies such as clickers or interactive software.

With regard to format, participants preferred pen/pencil and paper for two primary reasons: having a space for free expression and ease of access. With regard to free expression, participants desired the ability to add comments in the margins if the stated questions missed key points. One participant said:

> I would prefer on pen and paper because through them, even though if there's no comment section you're able to write notes on that paper and the teacher would be able to read those compared to if it was online, there's really nowhere to write it.

Another said,

> Yeah, and basically write whatever you want on it that is relevant to the questions, or what wasn't put on the questions you could write on it, so...

With regard to ease of access, participants pointed out many challenges associated with electronic tools that are not an issue with pen/pencil and paper. For example, participants noted that not all students have smart phones or bring computers to class. A participant also suggested that using Facebook or Twitter during class might raise the temptation to engage in those social media for non-academic purposes.

Note that a few participants did prefer electronic means but they consistently stressed that the surveys would need to be short in order for them to take them during class. One participant said:,

> I think I've done it a couple times during when the teacher's teaching, but he or she is just starting, so it's real easy to fill it out. It's a real quick survey usually, so that's why sometimes I do it while the teacher's teaching; just because it's really quick. But if it was longer, I'd probably want to wait a little bit before actually doing it. But, I'd read over the questions and think about them while the teacher's teaching and then I'd answer them.

Under the *Impetus* category, the main sub-codes consisted of two types of incentives including personal incentives and researcher incentives. Personal incentives included direct personal utility and an indirect means through the researcher. As an example of direct personal utility, one participant describes a need for a break during a two hour long lecture:

> [I] cannot go through, like, an entire two hour long thing of lecture. So, I guess after that 15 minute interval where your attention just, like, clicks out, that might be an ideal place to place a survey so that my mind goes off somewhere and then I can go back to the topic. So the entire time I'm in class I could be useful.

For this student, taking the survey during the lecture would serve as an attention refresher so that the student could refocus on the material after completing the survey. As an indirect means of personal utility, another participant mentions that taking a survey would be a useful means for the instructor to anonymously gage comprehension of the class:

> Just as a way for the teacher to check it and make sure you understand what they're saying because sometimes they'll just continue and have no idea that like, half the class doesn't understand. And it's also a more anonymous way of sort of expressing like, "I don't know what's going on at all" without like, raising your hand. And like, maybe you're the only person in the class who doesn't understand.

This would be helpful if a student in not fully understanding what is happening in class, but is too nervous to speak out about their concerns. With regard to researcher incentives, participants simply stated that presence of the researcher is a physical reminder to do the survey and that this is more likely to happen with pen/pencil and paper distribution.

Note that some participants did prefer computerized/electronic survey means. These participants argued for the ease of use, availability, and portability of technology.

Discussion, Conclusions and Implications

In preparing to use ESM for educational research, we set about with the idea that we needed to find the right technology to appeal to students and maximize response rates to data collection tools used within the classroom context. Our initial assumption that students would choose a survey tool related to technology (because of the current generation's integration of technology) was found to be untrue. We were surprised to find that students preferred pen/pencil and paper surveys because they would be the most effective in format and impetus in getting students to take the survey. The participants also believed this would be the least disruptive to class learning as students would not be tempted to use electronic media beyond the survey for social networking and internet searching during class. Above all, it was important that the survey be short and easy and allow for freedom of expression of ideas.

Although our overall study is not grounded in Flow, we believe our findings tie back to the idea of Flow, i.e., being caught up in the moment [9, 11], on which ESM are grounded. It seems that pen/pencil and paper modes might be least disruptive to Flow and might even be more consistent with achieving Flow [9, 11] for our participants. For example, participants are not bound to the questions being asked as they would be in electronic format. Instead, they have free expression and can write in what matters to them in that moment even if what matters to them is not what is being asked about directly on the survey. The use of pen/pencil and paper methods also keeps the participants in Flow because they do not introduce the distraction of technology when it is not directly related to or in support of student learning.

Based on the outcomes from our focus groups, we have several recommendations for others wishing to use ESM in engineering classrooms. First, do not discount pen/pencil and paper methods. Students might actually prefer such approaches but it will depend on the exact context of the study. Second, although quantitative-type questions facilitate compilation and analysis of data, be sure to leave adequate space for free responses as this was important to focus group participants. However, we recognize that implementation of the pen/pencil and paper method in real-time could be a complex task even though it is low technology. For example, the decision of when to pass out the tools during class and alerting the students of when to answer the question will depend on the lecture structure of the class, the professor's teaching style, and the layout of the classroom. Third, consider a partnership with course instructors (if the researcher is not also the instructor). Based on our focus groups, relating research directly to course improvement matters for raising the impetus for student responses. Although we clearly explained to focus group participants that we were talking about data collection for research purposes, the idea of giving feedback to the instructors repeatedly emerged throughout the focus groups. This finding is consistent with the advice provided by ESM developers stating that the promise of feedback may be the most influential recruitment tool for any educational study [2]. In order to effectively recruit student participants and to get teachers on board, it is critical for the research team to develop ways to provide feedback to teachers and students for the purpose of improving their own classroom experience.

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