HIGH SCHOOL EDITION
Journal of Student Research
Volume 11 Issue 3 (2022)

When Should Survey Reminders be Sent Out? An Investigation into Surveys Analyzing High Schoolers

Sammy Socol[1] and Maura Large[1#]

[1]Chadwick School
[#]Advisor

ABSTRACT

In the modern day, surveys often have very low response rates. This reveals a need for greater understanding of survey research, in order to enable researchers to achieve high response rates. One relevant facet of survey research is reminder timings, or the amount of time between the survey invitation and the reminder. In this study, the researcher investigated a potential reminder timing, analyzing surveys on high school students to discover the day that people stop responding to surveys. The researcher found that in their dataset, people stop responding to surveys after an average of 3 days of the survey being active. This finding may be relevant to informing survey reminder timings in the future, as effective reminders may be placed at the point people stop responding to surveys. There may be more optimal reminder timings, however. More investigation must be done into the ideal point for survey reminders to generate more solid conclusions.

Introduction

Survey research is an essential element of any researcher's toolkit; however, in recent times survey data has become more difficult to obtain. Response rates, which measure the percentage of potential survey participants who submit surveys, have plummeted from an average of more than 60% in 1975 to less than 10% on some modern-day surveys (Fincham 2009, Baruch 2008, Newell et al. 2004, Kennedy and Hartig 2020). This drop reveals major challenges for modern researchers, especially for those investigating understudied groups like high school students.

Surveys with higher response rates are more useful, for they have greater statistical power. Indeed, several published survey guidelines recommend that surveys aim to exceed minimum response rates (Klagge 2018; Fincham 2008). These high standards clash with low response rates of modern surveys, revealing that modern researchers are required to be more proactive about achieving high response rates.

Survey practices which improve response rates include monetary incentives, survey personalization, and survey reminders (Edwards et al. 2009). Relevant elements of reminders, including reminder frequency, or the number of times a reminder is sent (Blumenberg 2019), are still uncertain among researchers. Indeed, reminder timing, or the amount of time between survey contacts (Crawford, Couper, and Lamias 2001), is a relevant element of reminders which is overlooked in current research. This lack of investigation into reminder timing reveals a relevant gap of knowledge.

As will be discussed later, online survey best practices surrounding reminders are still not fully established and high school students, an important survey population, have changed over time. This reality, along with ideas revealed previously, lead to a question: What is the ideal reminder timing for surveys analyzing students at a high school in Southern California?

Literature Review

Background

In this section, key definitions will first be given. Second, the need for investigation into online surveys will be explained. Third, the importance of analyzing the population of high school students will be revealed.

At this point, several key definitions must be established. For this study's purposes, "reminders" will refer to any form of notification before or after a survey invitation has been sent out to complete a survey. "Incentives" will refer to any form of monetary compensation given with survey invitations or promised with survey completion. "Personalization" will include any personalization of survey invitations or reminders. "Mailed survey" will refer to any survey whose invitation is sent by mail. Finally, "online survey" will refer to any survey whose invitation is sent electronically.

Edwards et al.'s 2009 work put forward foundational guidelines on achieving high response rates in mailed surveys. In their piece, which has almost 2,000 citations, Edwards et al. provide a highly detailed analysis into best practices for mailed surveys, with a similar but less detailed analysis into online survey best practices (P.J. Edwards et al. 2009). While mail surveys are clearly established as a survey method, online surveys are still a new and rapidly changing method. Thus, while Edwards et al.'s findings on mailed surveys are certainly still relevant, the relative untimeliness of their study makes their findings on online surveys potentially obsolete. This reveals a need for new data on online survey best practices.

Shifts in American society over the past several decades have led to rapidly evolving online surveys. These changes have also led to social and cultural shifts among America's youth. High school students are employed at increasingly low rates, with employment rates among 16-19 year olds dropping from about 60% in 1979 to about 35% in 2018 (Bauer et al. 2019). This shift towards later milestones is reinforced by drops in high schoolers getting drivers' licenses, with 46.2% of 16 year olds having drivers' licenses in 1983 and 25.6% having licenses in 2018 (Statista 2020). The modern phenomenon of modern high school students experiencing delayed milestones is supported by several other studies (Shults and Williams 2013, Aaronson, Park, and Sullivan 2006). This transition suggests modern high school students are different from high school students in decades prior. High school students are well known to be an under-researched survey population, largely due to ethical constraints surrounding surveying of minors. Therefore, current information on survey best practices is essential, for this information enables researchers who are able to gain access to this population to more effectively survey it and gain more conclusive results. This information can also benefit school teachers and administrators, enabling them to improve the quality of education they provide.

Survey Fatigue

This section will investigate theories explaining survey nonresponse, first focusing on a phenomenon called survey fatigue and then explaining a relevant element of survey fatigue called reactance theory.

In the modern day, people are sometimes flooded with invitations to participate in surveys. A 2017 study noted that at one Belgian university, students received "a total of 63 invitations over a 92-day period, an average of one invitation every day and a half" (Van Mol 2016). These constant survey invitations may lead to survey nonresponse through a phenomenon called "survey fatigue."

Survey fatigue is generally defined as nonresponse to surveys resulting from being subjected to too many survey invitations. Survey fatigue results in reduced response rates (Porter, Whitcomb, and Weitzer 2004, Newell et al. 2004; Goyder 1986). A compelling explanation for the effects of survey fatigue can be found in reactance theory. Reactance theory posits that outside factors translating to a loss of freedom can lead to a desire to regain that freedom (Steindl et al. 2015). Within the context of survey fatigue, reactance theory explains how when people feel forced to

complete a survey, they may grow resistant to this pressure and refuse to complete the survey. Therefore, survey practices which produce feelings of empowerment are likely to improve response rates (Pickett et al. 2013, Biner 1988).

Increasing survey relevance may also reduce survey fatigue. This theory is supported by data from Edwards et al.'s previously discussed literature review, which found response rates on mailed surveys were potentially doubled by use of monetary incentives. Edwards et al. also found response rates were "substantially higher" with the use of reminders and that personalization also increased response rates, although to a lesser degree (P.J. Edwards et al. 2009). These practices may be effective because they substantially increase survey relevance in the eyes of the participant. By making surveys seem relevant to participants, these survey practices increase response rates.

Incentives and Personalization

This section will first investigate the effects of incentives and then look into effects of personalization. Monetary incentives are a highly effective means of improving response rates. With prepaid incentives, money is provided along with the survey invitation. With postpaid incentives, the money is provided after survey submission.

Young et al.'s 2015 study on effects of prepaid and postpaid incentives provides a relevant lens into effects of the different categories. Young et al. conducted the study on a population of 3,334 Australian general practitioners who were surveyed by mail. In their survey invitations, the control group included no incentive. The prepaid test group's invitation included a book voucher worth either $50 or $75 Australian dollars, depending on the region. The postpaid test group's invitation included information that survey completion would be rewarded by a book voucher, also worth either $50 or $75. The control group, which was not given an incentive, had a response rate of about 14%. The prepaid incentive had a response rate of about 23%. The postpaid incentive had a response rate of about 17%. The effects of both prepaid and postpaid incentives were statistically significant (Young et al. 2015).

In their study, Young et al. concluded that both forms of incentives have a significant effect on response rates, but prepaid incentives are generally even more effective (Young et al. 2015.) Both of these findings are supported by a wide body of literature on monetary incentives (Coopersmith et al. 2016; Yu et al. 2017; Brown et al. 2016; Pit, Hansen, and Ewald 2013; Göritz 2006; Aisre 2017; Pit, Vo, and Pyakurel 2014; Singer and Ye 2012; P.J. Edwards et al. 2009). This evidence reveals that monetary incentives strongly support response rates.

Personalization is another effective method for improving response rates. It is typically used in the greeting of a survey invitation or reminder, where the survey participant's name is inserted in place of a standard salutation (Joinson and Reips 2007).

Research suggests that personalization supports response rates. Joinson and Reips's 2007 study on personalization in response rates among surveys emailed to a population of 10,000 students enrolled in an online UK-based university. The study investigated effects of including the survey participant's name in the salutation at the beginning of survey invitations.

Figure 1

Salutation and response rates

	Salutation			
	Dear Student	Dear Open University Student	Dear John Doe	Dear John
Number of responses	311	313	366	415
Response rate (from 2500)	12.4	12.5	14.6	16.6
Response rate (adjusted for bounced e-mails)	13.38	13.47	15.75	17.86

Note: This table contrasts the response rates of surveys with personalized invitations against those of surveys with standardized invitations. From Table 1 in Joinson and Reips 2007.

As shown in the table above, Joinson and Reips found that greetings with first name ("Dear John") or both first and last name ("Dear John Doe") led to significantly greater response rates than standard salutations of "Dear Student" and "Dear Open University Student."

Joinson and Reips's findings are validated by various other studies: personalization supports response rates (Heerwegh et al. 2005; Dillman et al. 2007; Joinson and Reips 2007; Fatkin 2017; Barron and Yechiam 2002; Muñoz-Leiva et al. 2009).

As revealed in this section, both incentives and personalization are highly effective means of improving response rates. One potential explanation for this support is that both practices reduce survey fatigue. Incentives increase response rates by compensating survey participants for their time. This prospect of compensation likely reduces problems of survey fatigue by making survey completion highly relevant to survey participants. Personalization increases response rates by indicating to survey participants that their input is appreciated, increasing the likelihood that they will respond.

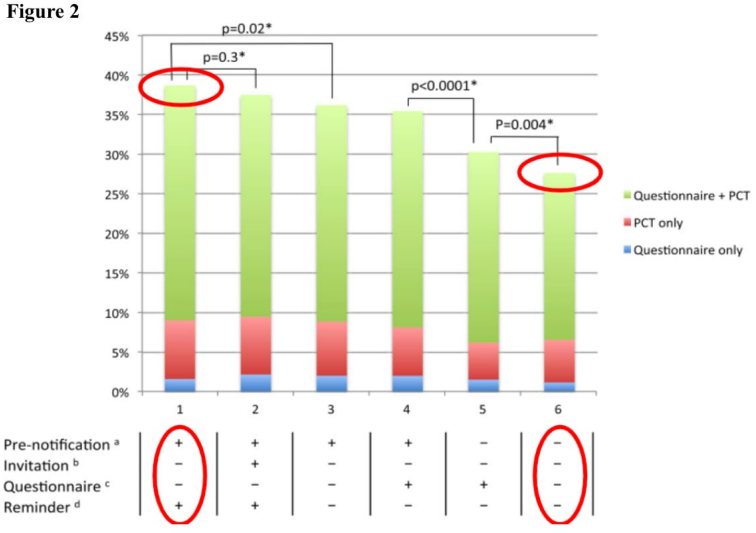
While both monetary incentives and personalization are highly effective means of improving response rates, they both have major shortcomings. Monetary incentives, while very effective, can be prohibitively expensive, making them impractical for all but the best-funded researchers. Personalization has a relatively small impact (P.J. Edwards et al. 2009), revealing it must be used in tandem with other survey practices to be highly effective. Survey reminders are not affected by problems associated with incentives and personalization: they are both cheap and highly effective. However, they have challenges which neither incentives nor personalization have. These differences reveal survey reminders to be another relevant survey practice.

Survey Reminders

Reminders are a highly effective survey practice which can be defined as any sort of notification before or after a survey invitation to complete the survey. In this section, the researcher will first reveal that reminders raise survey response rates, then discuss effects of high reminder frequency, and conclude by outlining relevant topics for research.

Research has indicated that surveys with reminders produce higher response rates than controls. Koitsalu et al.'s 2018 study investigated effects of reminders, among other factors, on response rates of a survey population of 28,134 Swedish men between the ages of 50 and 69 in a medical survey. The study concluded that prenotification and reminders have a highly relevant effect on response rates. Some of their findings can be found in Figure 2 below.

Figure 2

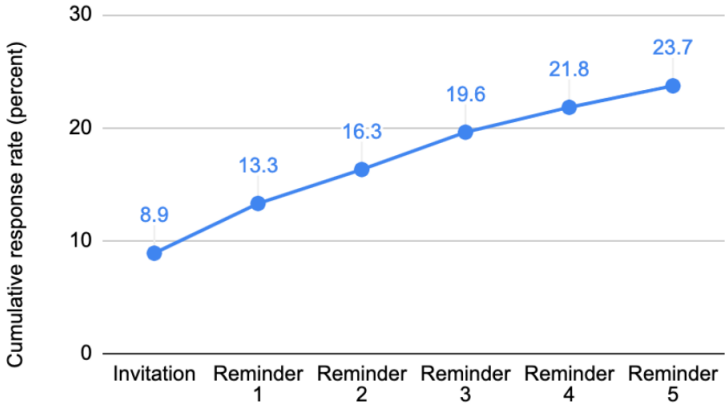


Note: The red circles in this table indicate relevant data. "-" in invitation and questionnaire does not indicate the absence of either. From Figure 1 in Koitsalu et al. 2018.

Koitsalu et al. found that no prenotification or reminders, as shown in the far right column on Figure 2, produced a response rate between 25 and 30 percent, while the addition of a prenotification prior to the survey and a reminder after the survey was sent out resulted in a response rate between 35 and 40 percent (Koitsalu et al. 2018). In this study, Koitsalu et al. reveal that survey reminders, including prenotification, are a highly effective means of improving response rates, a conclusion validated by other research (Barnhart, Reddy, and Arnold 2021, Sahlqvist et al. 2011, Van Mol 2016, L. Edwards et al. 2016; Muñoz-levia et al. 2009). However, while researchers agree that reminders improve response rates, they disagree about the most effective reminder frequency.

Barnhart, Reddy, and Arnold's 2021 study provided a relevant insight into effects of reminder timing and varying reminder frequencies. In their study, Barnhart, Reddy, and Arnold sent 5 reminders, with a reminder timing of one reminder per week, to survey participants. They tested this reminder frequency on eleven surveys investigating American physicians. In Figure 3 below, the researcher visualized Barnhart, Reddy, and Arnold's findings. The indicated response rates are an average of the response rates of all eleven surveys at the indicated point in survey administration.

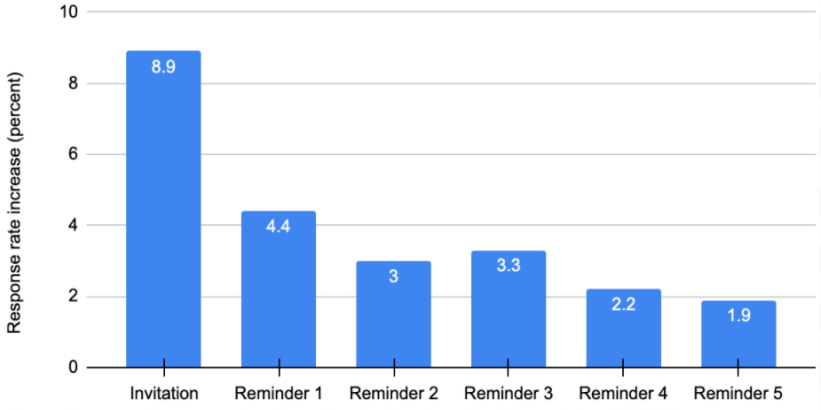
Figure 3



Note: Generated by the researcher from data in Barnhart, Reddy, and Arnold 2021.

Figure 3 paints a compelling picture for the power of extra reminders. Each additional reminder led to an increase in response rates, with the response rate jumping from 8.9% the week after survey invitations were sent out to 25.1% after the fifth reminder was sent out. This increase reveals that increased reminder frequency improves survey response rates, a finding validated by various other studies (Muñoz-Levia et al. 2009; Beebe et al. 2018; Van Mol 2016). However, a relevant item to note is that after the first reminder, each reminder had less effect on response rates than previous ones.

Figure 4



Note: Generated by researcher from data in Barnhart, Reddy, and Arnold 2021.

As shown in Figure 4, which the researcher generated from Barnhart, Reddy and Arnold's results, the response rate bump per reminder diminished over time, initially falling sharply from the first reminder to the second reminder, then beginning to level out at around 2.2% (Barnhart, Reddy, and Arnold 2021). This concept of reminder rate bumps decreasing over time is supported by several other studies (Muñoz-Levia et al. 2009; Beebe et al. 2018). Later reminders had less power, likely because by the time they were sent out, remaining nonresponders had no interest in completing the survey. Too many reminders likely also contributed to survey fatigue by adding to the number of survey invitations or reminders that survey participants were exposed to, making them potentially counterproductive. This problem reveals that an ideal reminder frequency is most likely in a range where each reminder still has relevant impacts on response rates but does not contribute to survey fatigue.

Another relevant factor in survey reminders is timing. There may be certain amounts of time after surveys when it is optimal to use survey reminders. Reminder frequency may be dependent on reminder timing: a few reminders spaced close together may trigger reactance theory more than a lot spread far apart. However, there is very little recent research conducted on this factor and past research is both scarce and inconclusive (Muñoz-Levia et al. 2009; Deutskens et al. 2004).

This information reveals reminder timing to be an element of survey best practices which is currently very uncertain, exposing it as a relevant topic of investigation.

Methods

Study Context

The primary objective of this study was to find the average amount of time after survey invitations that surveys stopped receiving responses. By finding the average day of final response, the researcher hoped to establish a relevant potential reminder timing for future survey conductors.The survey's secondary objective was to investigate other factors which impacted survey response rates. The population tested was a collection of opinion surveys sent out by students and school administrators investigating student attitudes at an ethnically diverse independent Southern California high school with a 2021-2022 enrollment of 357 students. Test surveys were sent out in 2020, 2021, and 2022.

Survey Recruitment

To recruit sample surveys, the researcher sent an email to their high school's student body. This email included a two question interest form and emphasized ease of completing the form, which contained two questions. The first question asked if survey respondents had sent out a survey in the past two years. The second question asked if survey respondents would be willing to take ten minutes to participate in the study.

The researcher sent out a reminder to complete this interest form three days after the initial survey invitation. The form got a total of 65 responses, with a total of 14 people (survey conductors) indicating that they both had sent out surveys recently and were willing to participate in the study.

The researcher then sent a personalized follow-up email to each of these survey conductors (see Appendix 1 for the email). This email included instructions for how to share their survey responses with the researcher and a more detailed questionnaire about various relevant factors in their survey. It also invited survey conductors to anonymize their results if they felt a need for participant privacy.

The researcher used oral reminders to ensure that each survey conductor who fit all criteria sent their surveys to the researcher. In total, the researcher gathered 39 potential surveys.

Data Management

After receiving a survey spreadsheet, the researcher first renamed the spreadsheet "[survey conductor name], [survey name]." All surveys were organized into a common folder to ease access to all results. All survey information was stored on a password protected laptop.

For a survey to be included in the study, it had to meet certain qualification criteria. First, its population must have included high schoolers (grades 9-12) at the researcher's school. Second, it had to have more than thirty responses. Third, non-anonymized surveys with more than five responses from the same person were not included. Fourth, surveys which required parental consent were not included.

Surveys which fit all other qualifying criteria but included unexplained, abnormal spikes in answers were modified so that these spikes were eliminated, then included in the data.

Survey acquisition was an active process continuing throughout the time the study was conducted.

Data Analysis Strategies

To generate graphs for data analysis, the researcher initially attempted to generate graphs within Google Sheets. This was done by creating a collective Google Sheet which included response rates over time for each survey. The plan was to generate a line graph which included response rates over time for each test survey, having each test survey as its own line. However, this proved to be highly inefficient, so the researcher switched to using Desmos, an online graphing calculator, for their data analysis.

To use Desmos as the primary data analysis tool, the researcher first generated an individual response rate versus timetable for each test survey in Google Sheets. They then imported these tables to Desmos, where a graph was generated. The x-axis was in units of hours after the start of the day of the survey invitation, while the y-axis depicted the number of responses to the survey.

All surveys were placed on the same time scale to produce a standardized graph. To eliminate chronological outliers, the researcher removed the final three responses from each survey's data.

After transferring data onto Desmos, the researcher started quantitative data analysis to find elapsed time to (adjusted) final response. This was accomplished by finding the number of days that each survey was active before its fourth-to-last response was submitted. The researcher used the fourth-to-last response rather than the last one to reduce incidence of outliers which would hurt validity of data used.

Second, the researcher tested the effects of various other qualitative and quantitative factors on survey response rates. These factors included time of day that the survey invitation was sent out, grade of survey conductor, number of questions, and if surveys utilized reminders or not. With each factor, the researcher found the average number of responses for all relevant surveys and compared that to the average number of responses for all surveys tested.

Results and Data Analysis

Additional Definitions

To aid comprehension of this section and those following, several terms must be defined. First, for the purposes of this study, "reminders" are defined as an email or other communication sent to the full survey population after initial survey invitations. Second, "response #" or "number of responses" refers to the number of people who submitted the survey of interest back to survey conductors. Third, the terms "Test Surveys" or "Surveys" refers to various spread-

sheets of survey data the researcher obtained from survey conductors at their school. Fourth, "mixed-mode" or "multiple-mode" refers to the use of several modes to disseminate a survey invitation or reminder. For example, a survey which relies on both emailed invitations and telephone reminders is considered mixed-mode.

Finally, "elapsed time to (adjusted) final response" refers to the amount of time between initial survey invitation and fourth-to-last response, measured in days. The researcher used fourth-to-last response rather than final response to reduce the effect of outliers on this element of the data. The day the survey invitation was sent out is counted as day 1. For example, if a survey's invitation is sent out on a Monday and the fourth-to-last response occurs on a Friday, then the elapsed time to (adjusted) final response is 5 days.

Figure 5

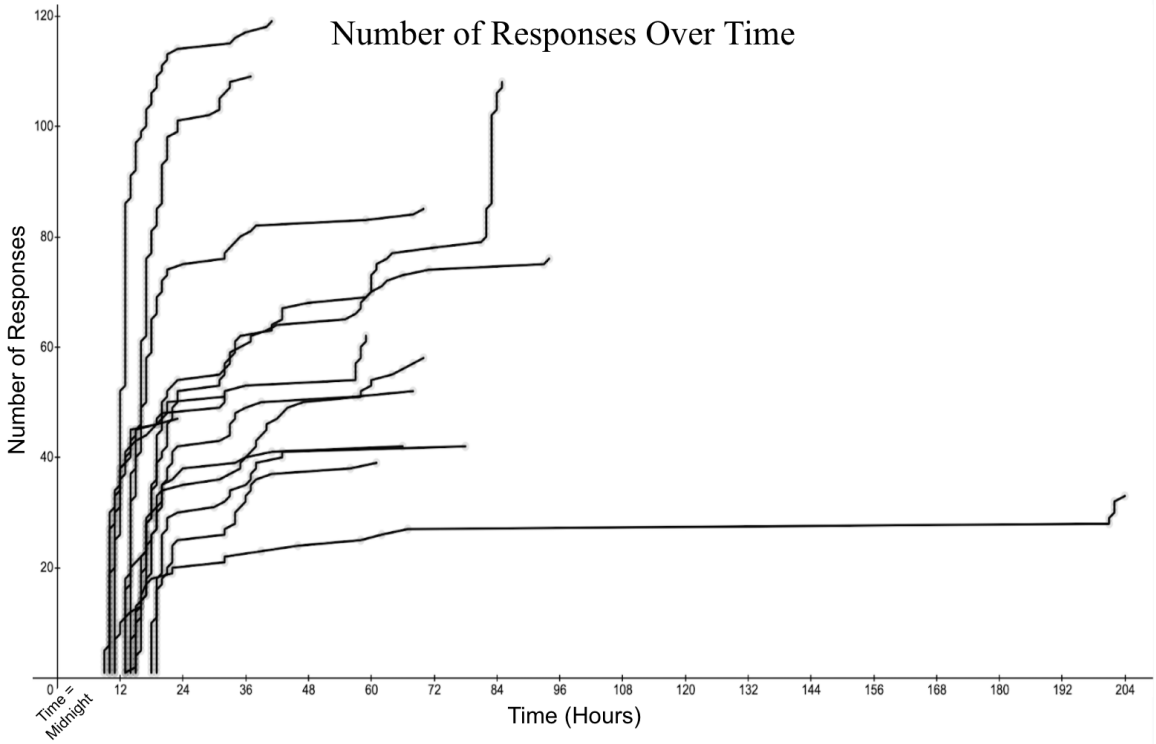


Figure Note: Generated by the researcher from data collected. Each line included represents an individual survey. The slope of each line corresponds with the rate at which survey responses are coming in. The final three responses from each survey were removed to reduce outliers.

Figure 6

Survey Data

			Elapsed Time to (Adjusted)		(At Time of Sending)			
Survey Number	Grades Sent to	Response #	Final Response	# of Questions	# of Reminders	Sender Grade	Sent Before 1PM?	Year of Sending
1	High School	112	2	1	0	11	No	2021
2	High School	61	3	2	0	11	Yes	2021
3	Tenth	50	1	2	0	10	Yes	2020
4	High School	111	4	2	1	11	No	2022
5	High School	79	4	2	0	12	No	2021
6	High School	65	3	2	1	11	Yes	2022
7	High School	88	3	Unknown	0	10	No	2020
8	Eleventh	54	2	Unknown	Unknown	11	Yes	2021
9	High School	45	4	Unknown	Unknown	12	No	2021
10	High School	42	3	Unknown	Unknown	12	No	2021
11	High School	45	3	1	0	Teacher	No	2021
12	High School	122	2	2	0	11	Yes	2021
13	Tenth	36	9	3	1	10	No	2020
14	High School	55	2	4	0	12	No	2022

Table Note: Generated by researcher from the data collected. See the subsection titled "Additional Definitions" for an explanation of elapsed time to (adjusted) final response and various other definitions.

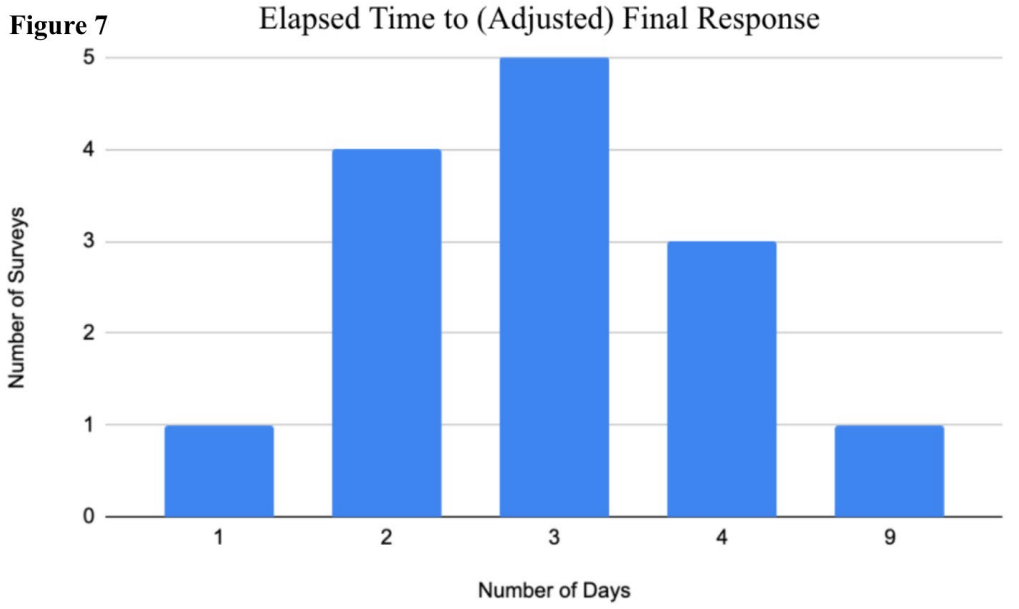
General Overview of Test Surveys

All surveys included were either sent out to the full high school student body or a single high school grade. Surveys were generally sent out in 2021 (n = 8), although the population also included surveys from 2020 (n = 3) and surveys from 2022 (n = 3). Surveys were generally sent by high school juniors (n = 6), although sophomore (n = 3) and senior (n = 4) surveys were also represented. One survey was sent out by a teacher. The dataset did not include any surveys sent by students in the ninth grade. Survey conductors were predominantly male (n = 12). Surveys had an average of 2 questions. The survey population for surveys sent to the full high school (Table 1) was between 350 and 400 students, with variation year-by-year. Surveys sent to individual grades (Table 1) had a survey population of around 90 students, with variation by grade.

Findings

Test surveys which were sent to the full high school had an average of 75 responses. The average elapsed time to (adjusted) final response for all test surveys occurred on day 3 after survey release. Figure 6 visualizes the distribution of days of final response. This information suggests that reminders would be best placed at day 3 of surveys being open, for this is when responses generally stop.

Figure 7



Note: Generated by the researcher from collected data. Refer to the subsection titled "Additional Definitions" for a definition of elapsed time to (adjusted) final response.

Three out of the fourteen test surveys were known to include reminders. Surveys with reminders had an average of 71 responses, while surveys known to not have reminders (n = 8) had an average of 77 responses. This finding contradicts previous research finding reminders to have a positive effect on survey response rate (Barnhart, Reddy, and Arnold 2021). However, the small sample size of the reminder group makes these findings irrelevant.

Surveys sent before 1PM (n = 5) had an average of 76 responses, while surveys sent after 1PM (n = 9) had an average of 68 responses. This information suggests that sending surveys earlier in the day is tied with greater response rates, likely because people have more time to react to the survey. This finding presents a topic for future investigation.

Surveys sent to individual grade levels (n = 3) had an average of 47 responses. While this average makes it appear as though these surveys were less effective, it must be considered that the population for each survey sent to individual grades was about a quarter of that of surveys sent to the full high school. This reveals that surveys sent only to a certain grade received a higher response rate than surveys sent to the full high school, a phenomenon which can likely be explained in part by the relative personalization of surveys sent only to a single grade rather than to the full high school. This form of group-level personalization has previously been shown to be effective by Dillman et al. (2007).

Surveys 8 and 9 were sent out by the 2021-2022 high school student body president during their term. These surveys had an average of 44 responses. Survey 11 was the sole survey to be sent out by a teacher. It had 45 responses. These surveys all had fewer responses than the average rate of 75 responses, suggesting that authoritative senders may be met with lower numbers of responses. This contradicts Joinson and Reips's finding that sender authority had a small positive impact on survey response rates (2007). However, this data's small sample size prevents any firm conclusions from being reached.

Case Studies/Surveys of Interest

Two surveys of interest merit special analysis. The first corresponds with Survey #4 in Table 1, and the second is a survey which did not meet qualification criteria to be considered in the rest of the study but still yields relevant findings. Although these case studies cannot be used to make concrete conclusions, they do provide relevant insights which invite further investigation. Figure 7 visualizes their response rates over time.

Figure 8 Number of Responses Over Time for Survey #4 and the Starburst Survey

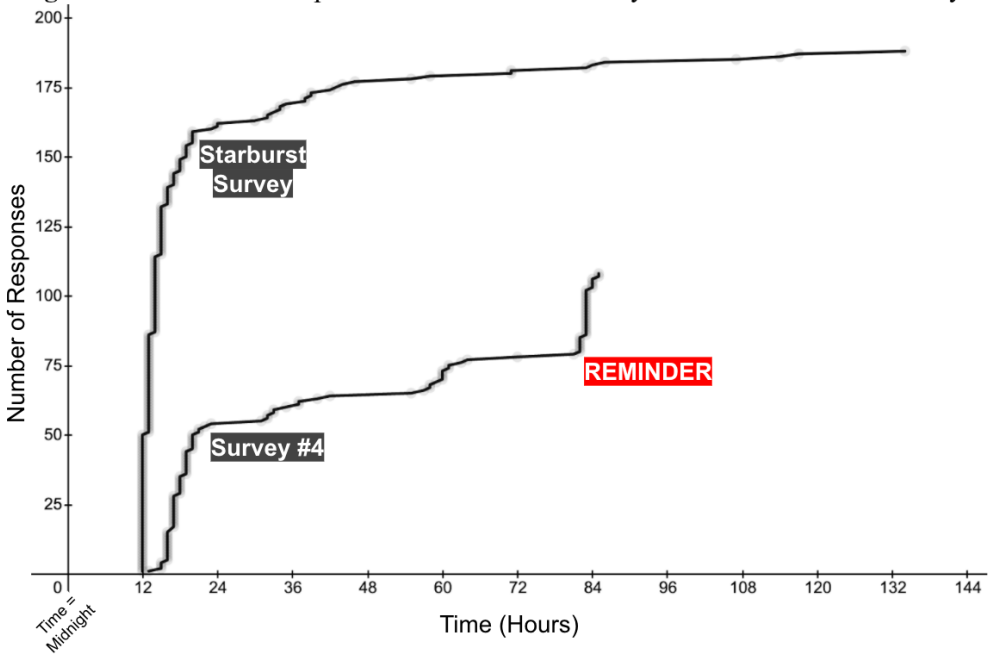


Figure Note: Generated by the researcher from data collected. The final three responses were removed from each survey to reduce outliers.

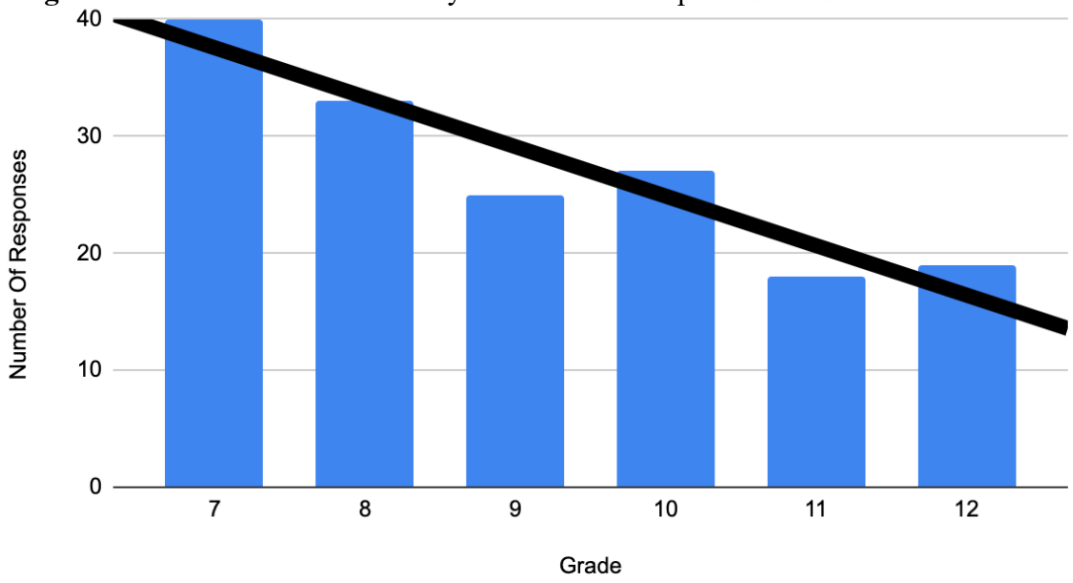
Survey #4 was a two question 2022 fundraiser interest form. The survey conductors informally reminded their classmates to respond to the survey in days following the survey, which was sent out on a Tuesday. To ensure that they gathered enough responses, the survey conductors also provided a formal oral reminder to complete their survey. This announcement was made during a regular school assembly on the Friday of the week they first sent out their survey. Immediately after this oral reminder, they sent out their survey again electronically.

This combination of a verbal announcement and an electronic reminder yielded a spike in responses far beyond that which email-only reminders were able to generate. Other test surveys (n = 2) which used reminders were able to generate 51 responses on average. Survey #4 far surpassed them with its 111 responses. This case suggests that effective reminders will use multiple mediums to communicate the reminder.

The second survey which merits analysis, which the researcher will refer to as "Starburst Survey," was a single question survey sent in 2022 by the high school All Student Body president to the full middle school, high school, and faculty and staff mailing lists. The survey had a total of 191 responses. The survey had one question, which was multiple choice. The question asked "Which of the four original Starburst flavors is your favorite?"

The Starburst Survey was disqualified from inclusion in other analyses because it was sent to groups outside of the high school student body. However, the nature of the survey meant that the survey conductor did not feel obligated to anonymize responses before sharing the survey with the researcher. This enabled the researcher to analyze the survey's respondents, as well. Figure 8 visualizes the Starburst Survey's number responses by grade, excluding faculty and staff. It reveals a negative correlation between grade level and response rate.

Figure 9 Starburst Survey's Number of Responses Per Grade



Note: Generated by researcher from response data on the Starburst Survey.

The researcher was able to generate multiple explanations for this correlation. First, younger grades may have been more likely to view the student body president, a senior, as an authority figure. Second, the frequency of surveys being sent out could have contributed to cumulative levels of survey fatigue over the years, leading older grades to become more resistant to responding as they grew tired of surveys. This explanation would confirm the effect of survey fatigue as previously discussed in the literature review.

Limitations

This study's methods and findings have various limitations which may limit their relevance. The study had a relatively small sample size, which makes its findings statistically weak. The study only investigated surveys at a single Southern California high school. The culture and habits of students at this high school may have differed from those of the typical high school, suggesting that results of this study may not apply universally. All findings, especially those which

had a small sample size, may have been correlational rather than directly related. This study's secondary findings should be regarded as one from a case study, provoking further investigation but not enough to make solid conclusions.

The fact that all surveys used in this study were short, with an average of two questions, suggests that this study's findings may be relevant only to short surveys.

While some survey conductors may have taken a very passive approach to gaining survey responses, others may have informally reminded their friends and classmates to complete this survey, an action which could not be measured in the data. This difference in survey conductor actions may have affected results.

In several cases, data was not able to be gathered on certain elements of test surveys. This lack of data may have impacted results.

A relevant portion of surveys tested were sent in 2021, while the school was online. This unusual school setup may have impacted ways surveys were disseminated and advertised, suggesting that findings from this study may be less relevant to non-online school setups.

The vast majority of test survey conductors were male (n = 12), with only 2 being female. This major gender imbalance may have impacted results.

The researcher may have made human errors while inputting data to generate various graphs used. The researcher may have misplaced or misused various surveys which it intended to use for testing.

All graphs of survey response rates over time used adjusted survey data which eliminated the final three responses to reduce outliers. This practice may have led to misleading or confusing graphs.

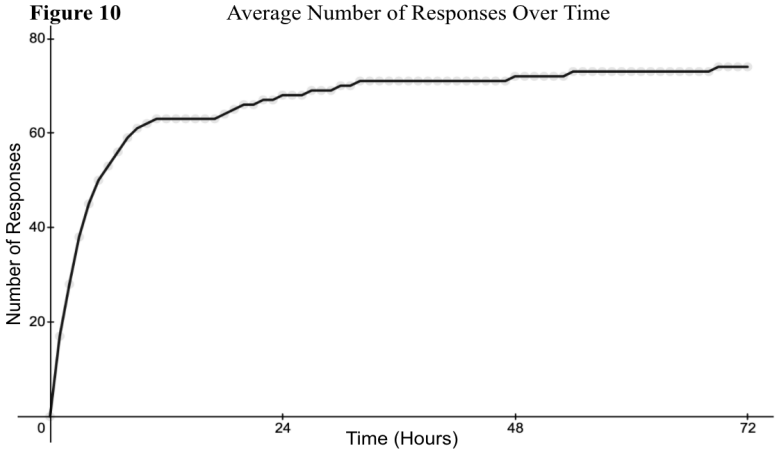
Finally, the study's disqualification criteria for test surveys may have led to biased results.

Conclusions and Implications

This study was successful in coming to a conclusion on when survey responses taper off. It found that average elapsed time to (adjusted) final response was three days, a finding may suggest an effective point for survey reminders. However, the information this study presents may not reveal the most effective point of reminder timing.

To aid conclusions, the researcher used data which they collected to generate Figure 10, a graph illustrating the number of responses per hour of survey being open, using all surveys (n = 8) which were known to not use reminders. All eight surveys used had their final (adjusted) response less than 72 hours after they were sent out.

Figure 10 Average Number of Responses Over Time



Note: Generated by the researcher from data collected. Each data point corresponds with the average number of responses of all test surveys which were known to not utilize reminders. An x-value of 0 corresponds with zero hours after survey being sent out.

Figure 10 presents a relevant question: Should reminders be placed at the point where survey responses start to slow, or when they stop entirely? This offers a significant field of further inquiry. Other findings of this study present

relevant questions as well. The finding that surveys sent later in the day have slightly lower response rates than surveys sent earlier in the day presents an area for future investigation. More conclusive investigation into the most effective time of day for surveys should be undertaken.

The other findings of this research present multiple questions which should be further investigated. First, the case of the Starburst Survey provides an effective metric through which survey fatigue may be able to be measured. By finding that people respond less as they get older, it also supports the theory of survey fatigue. The Starburst Survey also directly confirms studies like Porter, Whitcomb and Weitzer's, which found that students who have been surveyed previously will be less likely to respond to future surveys (2004). Future researchers should attempt to further quantify survey fatigue so that its effects can be measured and grappled with.

Survey 4 demonstrated multiple-mode reminders to be potentially useful and effective. This is a new and relevant finding: Many studies have found that multiple-mode survey invitations and reminders are effective in improving response rates relative to controls (Beebe et al. 2018; Beebe et al. 2012; Patrick et al. 2022). However, none which the researcher came across investigated effects of almost simultaneous verbal reminders and emailed reminders. This suggests that the form of reminder shown with Survey 4 is new to the body of knowledge, and suggests that there should be more investigation into this announcement-email combination.

This study presents many relevant questions surrounding timings in surveys and their reminders. At what time of day should surveys be sent out? How many days after survey invitations should reminders be sent out? Should reminders be sent out when responses cease entirely, or when they begin to slow? These questions should be investigated in future research.

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