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Instructing Web and Telephone Respondents to Report Date Answers in a Format Desired by the Surveyor

Leah Melani Christian
Don A. Dillman
Jolene D. Smyth

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ABSTRACT

We utilize and apply visual design theory to experimentally test ways to improve the likelihood that web respondents report date answers in a particular format desired by the researcher, thus reducing possible deleterious effects of error messages or requests for corrections. In addition, we compare the effects of verbal language changes in the query for both web and telephone respondents. These experiments were embedded in a series of surveys, conducted by web and telephone, of random samples of university students. We seek to examine the sequential and cumulative effects of visually manipulating the size and proximity of the answer spaces, the use of symbols instead of words, and the graphical location of the symbolic instruction. Our results show that the successive series of visual language manipulations improve respondents' use of the desired format (2 digits for the month and 4 digits for the year) from 45% to 95%. We also find that verbal language changes in the query have powerful effects on the telephone survey but have virtually no effect on the web where respondents are provided additional symbolic and graphical information located with the answer spaces. These results suggest that writing effective questions for web surveys may depend as much or more on the presentation of the answer categories/spaces as the question wording itself.[1]

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INTRODUCTION

Telephone surveys, where information is exchanged aurally between the interviewer and respondent, tend to rely primarily on words to communicate questions and instructions to respondents for answering the survey. As interviewers guide respondents through the telephone survey, they can seek clarification if an ambiguous answer is provided, and can convert answers to a particular format desired by the researcher. In contrast, web surveys are self-administered and rely on words as well as additional information communicated through the numbers, symbols, and graphics provided in the survey. Accumulating research suggests that the visual design of web surveys can be manipulated through the use of numbers, symbols, and the graphical layout of questions, to convey additional meaning to respondents and help guide them through the survey. Effectively guiding respondents through web surveys using good visual design should help decrease respondent frustration by increasing the number of respondents able to "get it right the first time" and avoid error messages telling them to "correct" some of the information provided in their answer.

In this paper, we report the results of several web experimental manipulations of the words, symbols, and graphics used to instruct respondents to report dates in a desired format. We also report results from a telephone survey where the question stem was experimentally manipulated to elicit date answers in a more specific format. These experimental comparisons were embedded in a series of three web surveys and one telephone survey of randomly selected Washington State University undergraduate students conducted from 2003 to 2004. The results of each survey influenced the design of subsequent experiments such that the sequential manipulations could be used to identify the most effective combinations of words, symbols and graphics that communicate to respondents how their answers should be formatted. We include several experiments testing the effects on respondent answers of manipulating the size and proximity of the answer spaces, the use of words vs. symbols to instruct respondents, the location of respondent instructions, and the verbal language used in the question stem.

THEORETICAL BACKGROUND

Schwarz (1996) argues that responding to surveys is governed by the same implicit rules that guide the conduct of conversation used in everyday life. In other words, survey respondents follow tacit assumptions, or maxims of communication, which underlie the conduct of conversation, when completing surveys (Grice 1975). These maxims form a cooperative principle where contributions to the survey conversation are expected to be clear, informative, relevant, and truthful (Schwarz 1996). In interview surveys, the interviewer and respondent can continuously interact and exchange information, similar to a conversation in everyday life. Telephone interviewers communicate to respondents mostly through information provided in the question stem as well as any additional interviewer clarifications of the question or of the respondents' answers. Thus, manipulating the verbal language used in interview surveys, particularly the question wording, can have powerful effects on the answers respondents provide.

In contrast, the survey instrument represents the researcher's half of the conversation in self-administered surveys and respondents assume the material provided in the instrument is relevant

to the survey "conversation" (Schwarz 1996). Respondents use the survey context, including the verbal and visual presentation of information, to interpret question meaning and how to provide their answer. For any particular question they must focus their attention on the question stem as well as the answer space to determine what is being asked of them and how they should provide their answer. Thus, in web surveys, researchers can communicate their intentions and expectations throughout the entire visual presentation of the question, including the question stem, answer space or response categories and any additional instructions provided verbally or symbolically.

Verbal language, the words used to convey meaning, is an important source of information for respondents to aural and visual surveys. Past research on improving question wording and instructions has focused in large part only on effective verbal communication (Schuman and Presser 1981, Sudman and Bradburn 1974). However, respondents to paper and web surveys also rely on information communicated visually through numbers and symbols. Symbols may be particularly useful because they often communicate information in a type of shorthand that might otherwise take several words or even multiple sentences to convey. Thus, the words, numbers and symbols provided in the survey questionnaire can independently and jointly help respondents interpret the meaning of questions and navigate through the survey instrument (Redline and Dillman 2002).

Respondents also infer additional meaning from the graphical presentation of survey information and graphical features, such as size, color, brightness, and shape, influence how words, numbers, and symbols are interpreted. For example, the word, "stop," coveys slightly different meaning when it is written in large font and bold print **STOP** or reverse print inside a red octagon 

. Thus, graphical paralanguage is the visual conduit through which the other languages are transmitted (Redline and Dillman 2002).

Other graphical elements such as location and orientation also convey information and influence how respondents interpret the meaning of the other languages. Jenkins and Dillman (1997) have proposed that Gestalt principles of pattern recognition can be used to help understand how survey respondents visually group information. The "Principle of Proximity" suggests that respondents visually "see" images or information as related when they are closer in location to one another and the "Principle of Similarity" indicates that images perceived as like one another or resembling each other are also more likely to be perceived as related. In addition, respondents focus their attention on a foveal region of only about 2 degrees or nine characters in width (Kahneman 1973). These principles lead us to expect that information provided in the survey is more likely to be seen by respondents when placed within the foveal view and in proximity to where survey respondents will need it and that respondents perceive things similar in shape, size or location as related.

Since respondents actively make use of these additional sources of information, survey designers can intentionally use them to provide specific instructions and other information to respondents. In other words, survey designers can use seemingly "formal" design features of the questionnaire, such as symbols, numbers and graphics, in addition to words, to draw attention to particular aspects of the survey, help guide respondents through the survey, and instruct respondents to report information in a particular format. Through the use of symbols, numbers,

and graphical design, respondents may be asked to skip a particular question if it does not apply to them, to report their answers using specified units such as acres or bushels, or to report the duration of events in a particular format such as hours or days. Emerging literature on how the visual design and layout of survey questionnaires affects respondents' answers can be utilized to help researchers design instructions that effectively communicate meaning through both verbal and visual languages.

Research on self-administered surveys, for example, has found that larger answer spaces encourage respondents to provide longer responses. Presenting answer spaces on the web much larger than required for inputting the expected 1 to 2 digits (a number between 0 and 10) resulted in respondents entering "invalid" responses including words or other descriptive information instead of or in addition to a number (Couper, Traugott, and Lamias 2001). In addition, larger answer spaces for open-ended questions on a paper survey were found to encourage longer responses containing both more words and themes (Christian and Dillman 2004). Thus, providing answer spaces that are sized consistent with the expected task should facilitate respondents' answering of the question.

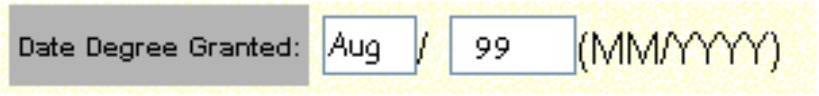
Research aimed at improving respondent navigation has found that symbols can effectively convey instructions to respondents. Christian and Dillman (2004) found that providing an arrow to direct respondents to a subordinate question increases the percentage of respondents answering that question. In addition, experimental research from the 2000 Decennial Census showed that increasing the visual prominence of branching instructions by using symbolic and graphical languages and placing the instructions within the respondents' foveal view increases respondent compliance, thereby decreasing branching errors (Redline, Dillman, Dajani, and Scaggs 2003). Thus, effective communication through the use of symbols can help respondents successfully navigate through the survey instrument.

Finally, grouping questions together on one screen of a web survey (Couper, Traugott, and Lamias 2001), or together in a box on a paper survey (Schwarz 1996) has been shown to increase the likelihood that respondents see the items as related, thus increasing the correlations among the items. Similarly, sub-grouping response options through proximity and the use of headings has been shown to increase the likelihood that respondents see the options within each subgroup as related and infer that they should choose an option from each group (Smyth, Dillman, Christian, and Stern 2004). Christian and Dillman (2004) found that placing an instruction to skip the next question if it did not apply within the navigational path (i.e., before the question where respondents needed to use it) increased compliance. Thus, placing instructions to respondents within the foveal view and navigational path as well as grouping them with the corresponding answer space, should increase the number of respondents complying with the instruction. Each of these findings suggest ways in which survey designers can use words, symbols, and graphics independently and in concert to help respondents complete a survey in the intended order and provide answers in the desired format.

In web surveys, it seems particularly important to use effective instructions to communicate to respondents because web designers can program features into their surveys, such as error messages, that require respondents to return to the question and correct their "error" before being allowed to proceed to the next question. These types of messages have been shown to increase

respondent frustration and the number of respondents terminating the survey (Best and Krueger 2004). The application of visual design techniques to web surveys can help instruct respondents how to report their answers in the format desired before error messages occur, therefore, increasing response efficiency and reducing respondent frustration.

An example of this type of respondent frustration and one that influenced the design of our experiments is from cognitive interviews conducted with respondents to a web prototype of the NSF Earned Doctorate Survey (Altheimer and Dillman 2001) where graduates were asked to report the date their degree was granted. Respondents were provided with two answer boxes (one smaller than the other) separated by a slash and a symbolic instruction (MM/YYYY) to the right of the year box to indicate the number of digits they should use when reporting their answer.



Several respondents tried to enter alphabetic abbreviations for the month (e.g. Aug., Dec.) or to report the year using only two digits. They subsequently showed signs of frustration when they received error messages indicating their answer was not in the desired format and forcing them to figure out what they had done wrong before they could proceed. (Altheimer and Dillman 2001).

In this paper, we explore the effects of manipulating the words, symbols, and graphical presentation of instructions designed to influence respondents to report date answers in a particular format, two digits for the month and four digits for the year. Although we include some experimentation from a telephone survey, most of our experimentation is focused on the web mode, where multiple aspects of the verbal, symbolic, and graphical presentation could be tested. The experimental manipulations reported here allow us to address how four types of verbal, symbolic, and graphical manipulations influence whether respondents provide date answers in the desired format.

1. How does manipulating the *size* and *proximity* of the answer spaces influence respondents' use of the desired format?
2. How does providing *symbols* influence respondents' use of the desired format?
3. How does the *location* of symbolic instructions influence respondents' use of the desired format?
4. How does manipulating the *verbal language* in the question stem influence respondent answers?

PROCEDURES

We discuss the effects of nine experimental manipulations on respondent answers. These experimental comparisons were embedded in a series of surveys (three web and one telephone), each including three to four experimental versions, designed to ask undergraduates about their experiences as students at WSU's Pullman campus. The first web survey in this series, conducted in the spring semester of 2003, consisted of four experimental versions and included

21 questions. A random sample of 3,004 WSU undergraduate students was drawn and 1,591 of the respondents (53%) completed the entire survey. The second web survey was conducted in the fall semester of 2003, also with four experimental versions, and included 25 questions. Fifty-six percent of respondents, 1,705 of the 3,045 randomly sampled, completed the survey. The final web survey was conducted using three experimental versions in the fall of 2004 and also included 25 questions. Sixty percent of respondents sampled (1,082 completes of 1,800 sampled) completed this survey. The telephone survey, which consisted of three experimental versions, was conducted simultaneously with the third web survey in the fall of 2004. Twenty-five questions were included and fifty-nine percent of respondents completed the survey (945 of the 1608 randomly sampled undergraduate students).

The overall design of the web surveys was similar; an interactive or dynamic design was adopted for all three web surveys where most of the questions appeared each on their own page. Questions were presented in black text against a colored background with white answer spaces to provide contrast between the text, answer spaces, and background. All of the screens were constructed using HTML tables where proportional widths were programmed in order to maintain a consistent visual stimulus regardless of individual screen or window sizes. Cascading Style Sheets were used to automatically adjust font size and accommodate varying user browsers and screen resolutions.

For both the web and telephone surveys, each student was randomly assigned a version of the survey to complete. We controlled access to the web survey by assigning each student an individual identification code they had to enter to gain entrance to the survey. All students were initially contacted using postal mail and provided a two-dollar incentive. Telephone respondents were then contacted by the Social and Economic Sciences Research Center's telephone lab to complete the telephone survey (up to 10 call-back attempts were made). Web respondents for whom we had an email address (about 2/3 of the samples) were also sent an initial email, which included a link to the web survey and the student's individual access code. Subsequent contacts to web nonrespondents were sent using postal mail and e-mail.

Since we were experimentally comparing the effects of different formats, respondents to the web survey were allowed to report their answer in any format and no error messages were programmed. In each web experiment reported here, we provided respondents answer boxes, in which they type in the requested date, to report their answers. In addition, telephone interviewers were asked to record the respondents' date answers verbatim to allow us to compare the effects of the manipulations on the answers respondents provide.

In this paper, we aim to show how this series of experiments illustrates the importance of sequential manipulations on respondent answers to survey questions. We included four experimental comparisons on the first web survey manipulating the size of the month box (see Table 1), the use of symbols to instruct respondents (see Table 2), and the location of the symbolic instruction (to the right of both answer spaces versus grouped and placed below each answer space – see Table 3a). The second web survey included two date questions and adopted the use of a smaller month box and larger year box as well as graphically separated the answer spaces (see Table 1). In this survey, we tested the effects of using symbols versus words grouped and placed below the answer spaces (see Table 2), and tested the effects of asking

respondents "what month and year' versus "when" (see Table 4a). For the final web survey, we also adopted the technique of grouping the symbols with the respective answer spaces and tested the effects of locating the symbolic instruction above, to the left, and to the right of the answer spaces (see Table 3b). The telephone survey included three verbal language manipulations in the question stem: "when," "what date," and "what month and year" (see Table 4b).

Chi-square tests are used to test for statistically significant differences in responses across the various experimental comparisons within each survey. Although we conducted the first and last surveys in the series about 18 months apart, during which time some members of the student population left and others entered, the basic similarity of respondents and procedures used to sample them, provides the potential of making general comparisons on format effects across data collection periods. We believe such comparisons are informative, but we limit our statistical tests to within data collection periods.

EXPERIMENTAL COMPARISONS AND RESULTS

How does manipulating the size and proximity of the answer spaces influence respondents' use of the desired format?

One experiment from the first web survey compares a version where the month box is about half the size of the year box, to a version with equal size answer boxes; both versions also include the words "Month" and "Year" located underneath the respective answer spaces (see Table 1). We expect increased use of the desired response format in the version with the smaller month box because its size communicates to respondents that fewer digits should be used to report the month than the year. Consistent with this hypothesis we find that respondents are significantly more likely to report the date in the desired format (63.3 vs. 55.3%, $\chi^2 = 4.7$ p=.031) when the month box is about half the size of the year box (Table 1). While reducing the size of the month box does not significantly impact how respondents report the month, it does significantly increase the likelihood that respondents report the year using four-digits (76.9 vs. 67.3, $\chi^2 = 9.9$ p=.002).

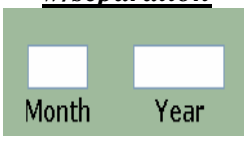
We also compare the version with the smaller month box from the first web survey, where the answer spaces are located in close proximity to one another, to a version from the second web survey where the spaces are graphically separated (and the smaller month box is also used). We expect that placing the answer spaces in close proximity will encourage respondents to perceive the answer spaces as connected or related using the Gestalt principles of proximity and similarity whereas separating the boxes will encourage respondents to perceive them as visually distinct. When respondents see the answer spaces as connected (due to their proximity), they should be more likely to use the same answer format in both boxes whereas when they see the boxes as visually distinct they may be encouraged to use different answer formats for the month than the year.

We find that respondents are almost 20% more likely to report their answer in the desired format when the answer spaces are connected (63.3%) than when they are graphically separated (45.4%). When the boxes are graphically separated, 25% of respondents use alpha characters

(e.g. Aug. or May) to report the month whereas less than 1% do so when the answer spaces are located in close proximity to one another. While a similar percentage of respondents report the month using one-digit across the two formats, a greater percentage report the month using two digits (78.9 vs. 50.6%), the desired format for the month, when the answer spaces appear connected. However, respondents are more likely to use a four-digit year (85.1 vs. 76.9%) and less likely to use a two-digit year (7.8 vs. 21.7 %) when the answer spaces are graphically separated than when they are located in close proximity and appear connected.

It seems that the separation of the boxes is interacting with different cultural ways of reporting dates. In the United States, it is common to report dates in either a long format (e.g. October 25, 2005) or a short, abbreviated format (e.g. 11/1/5 or 1/15/2005) and people can choose from a variety of alpha and numeric character combinations in reporting the date. It appears that the visual connectedness of the answer spaces in the first web survey encouraged respondents to use an abbreviated date format and to use similar answer formats—two digits—for both the month and year boxes. In contrast, the graphical separation of the answer boxes in the second survey encouraged respondents to perceive them as visually distinct so respondents were more encouraged to enter different types of information into the two boxes. Therefore, more respondents adopted the long format, reporting the month using alpha characters and the year using four digits. The use of the four-digit year was most likely also encouraged by the differential sizes of the month and year boxes in this treatment.

Table 1: How does manipulating the size of the answer spaces influence respondents' use of the desired format?

	When did you first begin your studies at WSU?		What month and year ...?
	Equal size boxes	***Half size mo. box***	***Half size mo. box w/separation***
			
Survey	Web #1	Web #1	Web #2
n	367	351	423
Desired Format	55.3	63.3	45.4
	$\chi 2=4.7$ p=.031		
1 digit month	18.3	20.5	17.5
2 digit month	80.4	78.9	50.6
Word month	1.1	0.6	25.1
2 digit year	32.4	21.7	7.8
4 digit year	67.3	76.9	85.1
	$\chi 2=9.9$ p=.002		

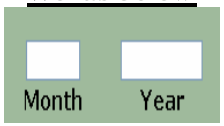
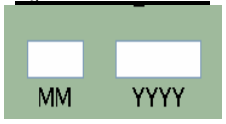
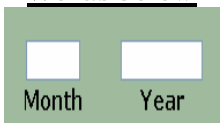
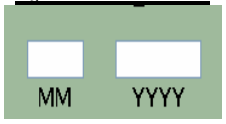
It must also be noted that the wording of the question stem was changed from, "When did you first begin your studies…" for the first survey to "What month and year did you begin your studies…" for the second survey. Experimental results to be discussed below provide evidence of no significant differences in respondents' reporting of the month and year when independently testing the effects of this manipulation in the question stem on the web. This suggests that the question wording may have had little or no impact on respondents' choice of response format between the first and second web surveys. However, we cannot state conclusively the independent effects of increasing the graphical separation between the answer spaces on the second web survey so further research is necessary to test the independent effects of this change within one survey.

How does providing symbols influence respondents' use of the desired format?

The second set of experiments from the web surveys compares the use of words to label the month and year boxes to a version where symbols (MM YYYY) are used. In the first web survey, this experiment is implemented using equal size month and year boxes (see Table 2). This experiment is also included in the second survey, but with a smaller month box, a change made in response to the findings of the experiment we just reported, and with the answer spaces graphically separated (see Table 2, right two columns). We expect respondents to be more likely to report their answer in the desired format when provided the version with the symbolic instruction because the symbols convey more specific information than the version with word labels alone; the use of 2 M's and 4 Y's indicates the number of digits respondents should use when reporting their answer.

Consistent with our hypothesis the symbols significantly increase the likelihood that respondents report their answer in the desired format (Table 2). On the first web survey, 55.3% of respondents to the version with word labels report the date using the desired format whereas 90.6% of respondents report the date using the desired format when provided the symbolic instruction ($\chi 2=131.2$, p=.000). On the second survey, 45.4% of respondents to question one with the word labels use the desired format, and 87.2% of the respondents to the version with the symbols report the date using the desired format ($\chi 2=171.4$, p=.000). For the second question, 35% of respondents to the version with word labels and 70.9% of respondents to the version with the symbols report the date using the desired format ($\chi 2=112.2$, p=.000).

Table 2: How does providing symbols influence respondents' use of the desired format?

	When did you first begin your studies at WSU?		What month and year do you expect to complete your studies at Washington State University?		What month and year did you begin your studies at Washington State University?	
	Words below	***Symbols below***	***Words below***	***Symbols below***	***Words below***	***Symbols below***
						
Survey	Web #1	Web #1	Web #2	Web #2	Web #2	Web #2
n	367	438	423	446	423	446
Desired Format	55.3	90.6	45.4	87.2	35.0	70.9
	$\chi 2$=131.2, p=.000		$\chi 2$=171.4, p=.000		$\chi 2$=112.2, p=.000	
1 digit month	18.3	3.4	17.5	2.7	15.8	1.1
2 digit month	80.4	96.1	50.6	88.1	40.4	72.0
Word month	1.1	0.2	25.1	1.8	18.4	1.8
2 digit year	32.4	5.5	7.8	0.9	6.2	0.2
4 digit year	67.3	94.0	85.1	91.7	67.4	74.0

How does the location of the symbolic instructions influence respondent's use of the desired format?

A third series of experiments evaluates various locations of the symbolic instruction in relation to the answer boxes. On the first web survey, we compare a version where the month and year symbols are placed together to the right of both the month and year box to one where each month and year symbolic instruction is grouped and located below its corresponding box (see Table 3a). In accordance with the Gestalt principle of proximity, we expect that grouping the symbolic instructions with their answer spaces will increase the likelihood that respondents apply the instructions to the corresponding answer spaces. On the third web survey, we keep the symbols grouped with their respective answer spaces but test the effects of placing them above, to the left, and to the right of the answer boxes (see Table 3b). Placing the symbolic instruction in the navigational path (to the left of each answer space) is expected to increase the percentage of respondents seeing and using the instruction when providing their answer because the symbols are located in the natural reading order, before the corresponding answer space.

We find that respondents to the first web survey are slightly more likely to report the date using the desired format when the symbols are located below each corresponding answer space than when they are grouped together (see Table 3a) and located to the right of the answer spaces but this difference (90.6 vs. 88.5%) is not significant ($\chi^2 = 1.1$, p=.302). However, a significantly greater percentage of respondents (94 vs. 89.9%, $\chi^2 = 5.9$, p=.015) report the date using a four-digit year when the symbols are placed below the answer boxes. We attribute this finding to the year instruction falling outside of the respondents' foveal view on the version where the symbols are placed to the right of both boxes whereas both the month and year instructions are within the foveal view when the instructions are grouped below the corresponding answer spaces. Thus, when the year instruction is outside of the respondents' foveal view, on the version with the symbols to the right of both boxes, respondents are less likely to see and apply the instruction when reporting their answer.

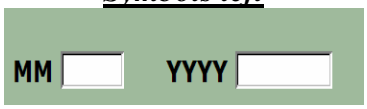
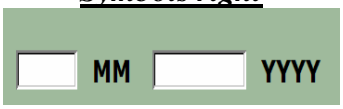
The results from the third web survey (Table 3b) show that a greater percent of respondents report their answer in the desired format than in the previous two surveys. In this experiment, adopting the half size month box, separating the month and year box, and grouping the symbolic instruction with the corresponding answer box resulted in at least 93% and as many as 95.8% of respondents reporting their answer in the desired format. The highest use of the desired format is on the version where the symbols are placed to the left of the answer boxes in the natural reading order (95.8%) and the chi-square difference between this version and placing the symbols to the right (92.9%) approaches statistical significance ($\chi^2 = 2.9$, p=.091). We conclude that grouping the symbolic instruction with the corresponding answer space, regardless of location, increases the likelihood that respondents see both instructions and report their answer in the desired format.

Table 3: How does the location of the symbolic instruction influence respondents' use of the desired format?

a. When did you first begin your studies at WSU?

	Right of both boxes	***Grouped below***
		
Survey	Web #1	Web #1
n	435	438
Desired Format	88.5	90.6
	$\chi 2=1.1$ p=.302	
2 digit year	9.9	5.5
4 digit year	89.9	94.0
	$\chi 2=5.9$ p=.015	

b. When did you begin your studies at Washington State University

	Symbols above	***Symbols left***	***Symbols right***
			
Survey	Web #3	Web #3	Web #3
n	351	379	352
Desired Format	94.0	95.8	92.9
Chi-square tests	Symbols above vs. left	$\chi 2=1.2$ p=.278	
	Symbols above vs. right	$\chi 2=0.4$ p=.548	
	Symbols left vs. right	$\chi 2=2.9$ p=.091	

How does manipulating the verbal language in the question stem influence respondent answers?

In the last web experiments, we examine the effects of verbal language changes in the question stem that are designed to increase the specificity of the date answers. The first experiment, embedded in the second web survey, tests the effects of a verbal language change in the question stem ("When" vs. "What month and year") to ask respondents when they began their studies (see Table 4a). We expect the more specific "month and year" instruction to increase the percentage of respondents using the instructions provided at the time of response, thereby reporting their

answer in the desired format, two digits for the month and four for the year. However, the results indicate that the symbolic instruction located with the answer spaces, where they will need it at the time of response, effectively instructs respondents to use the desired format regardless of whether they are asked "When" or "What month and year" they began their studies. When comparing across the two formats there are no significant differences in the percent of respondents reporting their answers in the desired format for either of the two questions in the second web survey (see Table 4a).

Table 4: How does manipulating the verbal language in the question stem influence respondent answers?

a.

	Survey	n	Desired Format (Q1)		Desired Format (Q2)	
"When"						
When did you begin your studies at Washington State University? MM YYYY	Web #2	393	89.3		69.5	
				$\chi 2$=0.9 p=.348		$\chi 2$=0.2 p=.661
"What month and year"						
What month and year did you begin your studies at Washington State University? MM YYYY	Web #2	446	87.2		70.9	

b.

	"When"	***"What date"***	***"What month and year"***
	When did you begin your studies at WSU?	**What date did you begin your studies at WSU?**	**What month and year did you begin your studies at WSU?**
Survey	Telephone	Telephone	Telephone
n	314	313	326
Season/Semester	57.3	32.3	11.0
Month and Year	13.4	49.5	83.7
Chi-square tests	"What month and year" vs. "What date"		$\chi 2$=84.6, p=.000
	"What month and year" vs. "When"		$\chi 2$=316.9, p=.000
	"What date" vs. "When"		$\chi 2$=95.0, p=.000

In the telephone survey, we also include an experiment comparing various verbal language changes in the question stem. Respondents are asked "When," "What date," or "What month and year" they began their studies (see Table 4b). On the telephone, where information is aurally communicated and respondents are not provided additional symbolic instructions and graphical information at the time of response, we expect verbal changes in the question stem to effectively instruct respondents to provide the month and year when answering the date question. In contrast to the web survey where we were interested in the number of digits respondents use to report dates, on the telephone survey, we are interested in measuring whether respondents report both the month and the year, in either words or numbers (e.g. August 1999 or May 01).

Results from the telephone survey confirm that verbal language instructions in the question stem can powerfully influence the answers respondents provide (see Table 4b). Only 13.4% of the respondents to the "When" question stem report the date using the both the month and year whereas 49.5% do so when asked "What date" and 83.7% do so when asked "What month and year." Instead of providing the month and year, respondents to the "When" version are more likely to report the year only. Additionally, 57.3% of respondents report the season or semester (i.e. Fall 2000) when asked "when" they began their studies whereas only 32.3% of respondents to the "what date" version and 11.0% to the "what month and year" version provide the season/semester instead of the month. Since semesters are frequently referred to as Fall, Spring, and Summer at WSU, it seems that students associate when they begin or expect to complete their studies with the corresponding semester or season instead of the month (August, January, and May, respectively). Perhaps the design of future questions for this population should consider that students, oriented to an academic calendar, associate these types of dates with the semester or "season" corresponding to the appropriate time period, and may find it difficult to recall the exact dates.

DISCUSSION

Our experimental comparisons across three sequential web surveys indicate that manipulating the verbal, symbolic, and graphical languages used to instruct respondents on how to answer what seems to be a fairly simple query, asking respondents to report the date they began studying at a university, can dramatically improve the percentage of respondents reporting date information in a particular format desired by the researcher, in this case a two-digit month (e.g. 08) and a four-digit year (e.g. 2001). For this fairly simple query, a drop down menu could effectively handle the number of possible months and years the survey population might need to answer the question, and the use of a drop down menu would ensure that answers are in a desired format. However, for many types of questions, drop down menus may be too cumbersome because researchers would have to include a large number of potential answer categories (e.g. years of birth ranging from 1900 to present). In addition, it is common to ask people to report date answers on the Internet and depending on the other information being requested, a drop down menu format may not be appropriate. Thus, understanding how manipulations of the size and graphical location of answer spaces, what symbols may be used to instruct respondents to answer in a particular or desired format, and the location of instructions to respondents, constitutes a set of issues that would seem to have wide applicability in web survey research.

Overall, we find that the sequential manipulation of the size of the answer spaces, providing symbols instead of word labels, and locating the symbolic instruction in the natural reading order increases the percentage of respondents from only about 45% to over 95% reporting their answer in the desired format (see Figure 1). Specifically, we find that the size of the answer spaces influences how respondents report their answer; providing them with a smaller box for the month and larger for the year, instead of equal size boxes, increases the percentage of respondents reporting their answer using four digits for the year thereby significantly increasing the percentage of respondents using the desired format from 55.3 to 63.3% (Figure 1).

In addition, placing the answer spaces in close proximity increases the use of the desired format by almost 20% (from 45.4 to 63.3%) because introducing the graphical separation of the spaces encourages respondents to visually and conceptually separate them whereas placing the answer spaces in close proximity encourages respondents to visually connect the answer spaces and provide two-digits for both the month and the year. It is important to recognize that these results are from a comparison in which the wording of the question was changed between the two surveys from "When did you first begin your studies…" to "What month and year …." Although an additional experiment showed that the wording made no difference when respondents are provided with a symbolic instruction, we did not conduct a separate test with the "month" and "year" labels and thus cannot conclusively state that the effect of spacing is not influenced by the question wording changes between these two surveys.

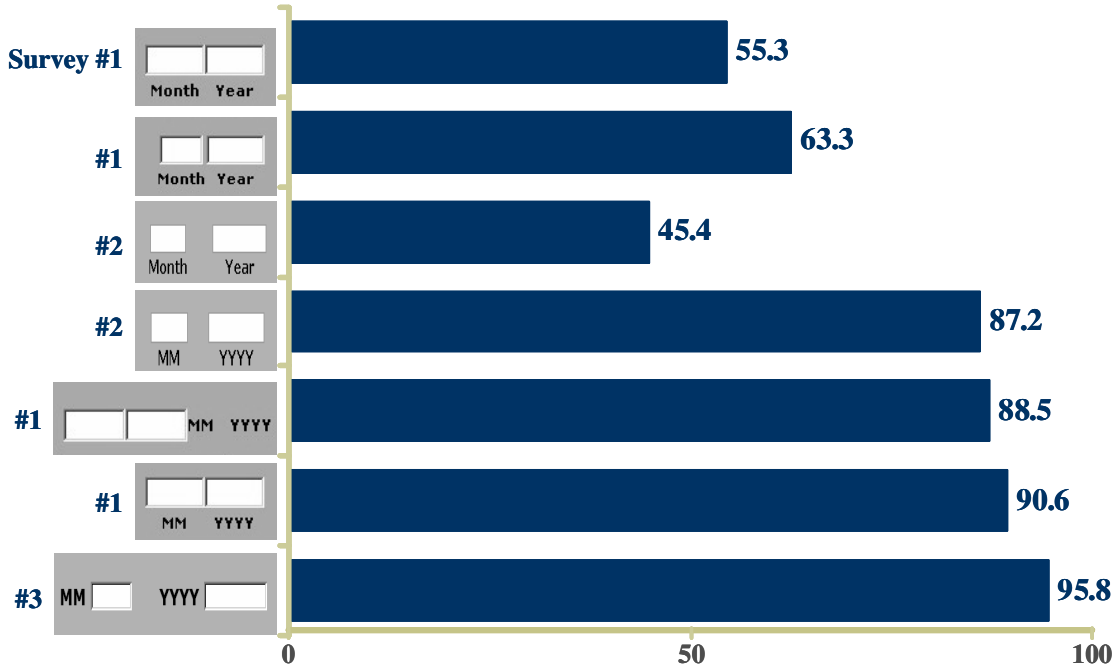
In addition to the size and connectivity of the answer spaces, Figure 1 also shows how the use of symbols (e.g. MM YYYY) rather than words ("Month" and "Year") overwhelmingly increases the percentage of respondents using the desired format by at least 30% (from 55.3 to 88.5% on the first web survey) and up to as much as 42% (from 45.4 to 87.2% on the second web survey). The symbols convey additional information to respondents (i.e., the number of digits expected) and are effective because they communicate that information in a short hand that might otherwise take several words or even sentences to explain. Thus, respondents interpret meaning and how to report their answer from the symbols *and* the size and proximity of the answer spaces.

We also find that graphically manipulating the symbols by grouping them with their respective answer spaces and placing them within the navigational path (to the left of the corresponding answer space) increases respondents' use of the desired format. These results show that sequentially manipulating the graphical size and separation of the answer boxes, using a symbolic instruction to effectively convey the number of digits to report, and grouping the instruction with the answer boxes increases respondents' compliance such that with all of these changes 95.8% of the respondents report their answer in the desired format, a 50% increase from the least effective format (see Figure 1).

Finally, we find that verbal language changes in the query have more powerful effects on the telephone than on the web. Telephone respondents are more likely to report both the month and the year when explicitly asked to do so in the question stem. However, on the web, where respondents receive additional instructions located with the answer spaces where they will need them at the time of response (i.e., symbols, the size, and placement of the answer boxes), the change in the query does not significantly increase the percentage of respondents reporting their

answer in the desired format. Since telephone surveys rely on aural communication, verbal changes in the query seem to have more powerful influences on respondent answers than in web surveys, where other forms of communication convey additional information to respondents.

Figure 1: Sequential effects of web experimental manipulations on respondents' use of the desired format (Web Surveys #1 - #3)



CONCLUSION

The results of these experimental manipulations are striking. They illustrate how the wording of questions influences answers differently in telephone than in web surveys. In telephone surveys, the wording of the question is the primary source of meaning respondents' draw upon when answering survey questions and small changes in wording can have powerful effects on respondent answers. Additionally, the interviewer serves as an intelligent system that can verbally communicate important information to the respondent and can translate responses into appropriate formats. When surveying respondents by telephone, using appropriate words in the question stem to request specific information from respondents can also decrease the variability in how interviewers ask for clarification and/or interpret the meaning of respondents' answers, thereby helping provide equivalent stimulus to all survey respondents. Thus, the experiments reported here illustrate the need to apply our survey design tools differently when constructing telephone and web surveys; additional information needs to be conveyed visually when the interviewer is not present to clarify expectations for the respondent or simply convert answers into the desired answer format.

In addition to the verbal language in the question stem, web respondents actively make use of information provided in the response categories and/or answer spaces, and the information provided in the query may be interpreted differently depending on the additional information conveyed through the response choices or answer spaces. Web respondents also rely on multiple types of information within the questionnaire itself and actively make use of verbal, numeric, symbolic, and graphical languages of questionnaire design to determine meaning and interpret how to answer survey questions. As a result, designers of self-administered surveys can simultaneously manipulate these visual languages so they support and complement one another to convey particular messages or instructions to respondents and can communicate to respondents throughout the entire presentation of the question (the query, response categories, and/or answer spaces). Thus, the visual design of web questionnaires can be used to convey additional information to respondents and help facilitate their answering of the survey, a function somewhat similar to the role of the interviewer in telephone surveys.

The design and visual presentation of survey information, through the manipulation of verbal, numeric, symbolic, and graphical languages, can facilitate respondents' answering of survey questions and help them "get it right the first time." Helping web respondents provide answers in the desired format reduces the likelihood of their receiving error messages that web surveyors may use to decrease item nonresponse and to verify that responses are in an acceptable format but that have also been found to increase abandonment or termination of the survey. Thus, web survey designers can apply visual design techniques to reduce respondent frustration, increase response efficiency, and improve the overall survey experience for respondents.

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