

SKIP-PATTERN COMPLIANCE IN THREE TEST FORMS: A THEORETICAL AND EMPIRICAL EVALUATION¹

by

Don A. Dillman, Lisa Carley-Baxter and Arrick Jackson
Washington State University

Conceptual Model

There are at least five distinguishable steps (or stages) through which individuals progress when answering questions. These steps culminate in the respondent complying or not complying with instructions to skip or not skip the next question. They include:

- 1 Perceive the existence of skip instructions.
- 2 Comprehend what one is expected to do as a result of the instructions.
- 3 Evaluate alternative courses of action.
- 4 Make a judgment on what to do.
- 5 Take action that complies or does not comply with the skip instructions.

The last four stages listed here are somewhat similar to the thought process for answering questionnaires outlined by Tourangeau and Rasinski (1988), i.e., comprehension, retrieval, judgment, and reporting of a response. Perception is added here as an initial step because the questionnaire is self-administered, and instructions cannot be acted upon if they are not perceived to exist. The self-administered questionnaire is quite different than a telephone interview, where it is left up to the interviewer to read only the questions that apply to each respondent. In self-

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administered paper questionnaires all questions, applicable or not, can be seen by each respondent, and the respondent must decide which questions to answer.

Application of this five step model leads to the identification of ways that the skip-pattern compliance process may break down.

1 Perceive the existence of skip instructions.

If instructions aren't seen, it's highly unlikely that they will be followed. When the respondent attends to the content of the questions, the skip instructions may simply not be seen.

This appears to be the problem with current practice. Skip instructions remain unseen because of being outside the respondent's visual field as they are attending to the task of answering questions. The typical respondent, while reading, can only comprehend a span of about 8-10 characters at a time. An **enlarged font, bolder type, directional arrows and location of skip directions closer to the answer box** represent some of the visual design tools that have the potential for attracting the respondent's attention (Jenkins and Dillman, 1997).

2 Comprehend meaning of the skip instructions.

It is possible for a respondent to perceive the presence of skip instructions, but not know what she is supposed to do. For example, if the wording "skip to 35" is not interpreted as meaning that the respondent should skip to question 35, then it's unlikely that such an instruction will be correctly followed.

There are two types of errors that can be made with respect to following skip instructions (Raglin, 1998).

Respondents may not skip when they are supposed to skip. This has been called a **loop** error (i.e., the failure to follow the prescribed loop that bypasses the next question).

Respondents may skip when they are not supposed skip. This has been called a **gap** error (i.e., the failure to answer the next question on the page).

Different mental processes are likely to be involved in precipitating the occurrence of gap errors than those that cause loop errors. Loop errors involve the failure to see and/or follow an instruction. They may occur because the words and/or graphical information aimed at conveying the skip direction is not evaluated as telling the respondent to skip. Gap errors may happen because the skip directions are associated with the entire question rather than only being linked to the answer category to which the designer intends it to apply.

3 Evaluate alternative courses of action.

Respondents may view the expectation for skipping certain questions in different ways. Some respondents may welcome the prospect of being able to skip a question, whereas others may want to read every question “just to see what’s there.”

Therefore, although a respondent may have perceived the skip instructions and understood the intention, she may continue to read questions even though she knows that she is not expected to answer them. She may also view following skip instructions as a “voluntary” activity, so that if instructed to skip a question, she can still answer other questions if they seem to apply, or she wants to do it. Thus, deliberately not following skip instructions may be considered an acceptable course of action by certain respondents.

Providing a motivational message about the importance of following skip directions may be helpful in gaining compliance. However, a respondent’s propensity to consider following instructions or to deliberately ignore them, may also be outside the designer’s ability to influence.

4 Make a judgment on what to do.

If a respondent comprehends the intent of skip instructions, but has contemplated not following them, then a decision must be made on what to do. This decision may be influenced by the respondent’s self-perception of whether he wants to be cooperative, and/or how he feels about the task of answering questionnaires. Perceptions the respondent holds about “improving” the quality of answers being given by offering answers to more questions than the questionnaire designer asked for may also come into play.

Filling out a questionnaire is a reasonably quick process for most respondents. Cognitively, that means information is being taken in quickly, and just as quickly replaced by other information. A respondent who knows what a skip instruction means, but chooses to read the next question and becomes focused on it, may lose from memory the intent of the skip instruction read earlier.

5 Take action by going to a subsequent question.

Once a judgment has been made the respondent must then take an action that correctly or incorrectly follows the intent of the skip instruction. Certain physical aspects of completing a questionnaire may intervene between making a judgment and acting upon it, e.g., correctly choosing the next question to read and answer. If the respondent’s attention to the questionnaire is interrupted momentarily, he may forget his intent, and when he returns to the questionnaire start answering the wrong question. Also, the act of turning pages is in itself disruptive. Turning the page also makes it difficult to quickly refer to a previous instruction, and seems likely to increase the likelihood of errors being made.

Additional Concepts and Implications for the Design of Skip Instructions

Certain aspects of gaining correct compliance are potentially within the questionnaire designer's control (e.g., drawing attention to skip instructions). Other aspects of achieving compliance (e.g., a desire to read all questions regardless of whether they comply) may not be within the designer's ability to control.

Skip instructions may be provided at three general **locations** in a questionnaire. They are: 1) prior to asking a question, 2) after the question is asked but before the next question appears on the page, which generally means in association with the answer choices, and/or 3) at the beginning of the next question. Any or all of these general locations may be used to provide information that is relevant to different stages of gaining skip pattern compliance. The first location can sensitize individuals to look for skip instructions and the second provides navigational information at the point the respondent has to make a decision on where to go next. The third location can serve as a reminder if the respondent has forgotten what was being requested.

In addition, these directions can be provided in one or both of two languages, 1) **words** and/or 2) **graphical symbols**. Some individuals are more influenced in their behavior by words than by graphical layout and design. Other people are influenced in an opposite manner. And, some people are significantly influenced by both. This means that it is probably important to utilize both languages in attempting to gain compliance with skip pattern directions. Whether people associate skip instructions with one or all response categories may depend on how these instructions are provide in relation to each answer category, i.e., whether there is perceived to be an explicit connection.

The task of gaining skip pattern compliance can now be described as follows: **The questionnaire designer must successfully manipulate the providing of information to respondents in appropriate locations, and through the appropriate languages, in a way that increases the likelihood that each respondent will successfully complete the five stages of responding to skip-pattern directions.**

Achieving the goal of correct compliance with all skip instructions, and the minimization of both loop and gap errors is far from simple. At one level of thinking it may seem that adding more and more words (warnings of impending skip patterns plus explanations of why it is important to follow skip patterns and not answer other questions, and perhaps information at the beginning of each question on who should or should not complete it) will help. But, the respondent may choose not to read part of that information, thus making the provision of long and detailed instructions counterproductive. Similarly adding more and more graphical information (changes in how skip instructions are located in relation to answer boxes, changes in font size, and the introduction of symbols with cultural meaning such as arrows) may interact to decrease rather than increase skip pattern compliance. Providing people with too much information may interfere

with people's comprehension of it, especially if that information seems in any way contradictory. Therefore, it seems as unlikely that the ideal skip pattern will be constructed by providing skip instructions in great detail as it will be by providing instructions in an unobtrusive way.

The risk of noncompliance with skip instructions is greater for some questions than it is for others. A question with two answers categories, only one of which precipitates a skip, is quite simple. However, a question with several response categories each of which directs respondents to a different follow up question has considerable complexity. It seems likely that the **complexity** of the skip pattern alternatives will increase the risk of noncompliance.

Based on the above considerations, several propositions may be stated. Statement of these propositions is aimed at giving direction to the search for the effective means of gaining compliance with skip patterns.

Proposition 1. The most effective skip pattern instructions will take into account all five steps of achieving compliance, which are outlined above.

There is no single step in the response process where success can assure skip pattern compliance, but failure at any one step can result in lack of compliance. Attempting to create success at each step seems likely to give us the best chance of better compliance.

Proposition 2. The most effective skip pattern instructions will utilize both words and graphical symbols.

It is well established that graphical symbols and visual components of design (e.g., boldness, size of font, location and other visual qualities) can influence whether people perceive something as existing, and make it available for comprehension. At the same time, words can independently convey skip instructions without graphical assistance. Inasmuch as some people are more prone to attend to one than the other, using both in support of one another would seem to give us the best chance for skip pattern compliance.

Proposition 3. The most effective skip pattern instructions will neither be highly detailed and intrusive, nor very simple and unobtrusive.

Too much information can result in respondents disregarding some of that information in and effort to gain control over the task before them. Too little information can leave it unclear as to what a respondent should be doing. Answering questions becomes a routinized activity of answering a question and proceeding to the next one. Skip patterns break the routine. Something needs to intervene to break the routine, but not be so detailed that much of it will be left uncomprehended.

Proposition 4. The likelihood of skip pattern compliance will be affected by the location of questions containing skip instructions. For example, placement of questions with skip instructions at the bottom of the page increases the risk of non compliance.

Correct compliance with skip patterns requires linking prior questions to succeeding ones. This connection is easiest to make when both questions are on the same page. When a page must be turned there is some risk that the respondent will not remember what he was asked to do.

Proposition 5. The likelihood of skip-pattern compliance will be affected by the complexity of the skip request. For example, directing all respondents to skip the next question increases the likelihood of error, compared to only asking those who respond to one (or some) categories to skip.

Asking respondents to each of several categories to skip to different locations means that more skip information must be provided to respondents and increases the likelihood that some of that information may be misinterpreted.

Proposition 6. Procedures that reduce gap errors may increase loop errors and vice versa.

The more that one takes steps to increase the likelihood that skip instructions will be perceived and attended to, the more likely that some who are not supposed to follow those instructions will mistakenly perceive and follow them. Thus, there is some likelihood that getting perfect compliance that reduces loop errors may in fact increase the likelihood that gap errors will be made.

A Test of Three Forms: Current Census Form, Arrow Form and Right Box Form

Three distinct alternatives for gaining skip pattern compliance were tested by constructing a 50-question, four-page questionnaire which varied only with regard to how the skip pattern instructions were provided. Twenty-four of the 50 questions included skip instructions. The questions were of widely varying types and dispersed throughout the questionnaire. The first 19 questions with skip instructions were ones for which the content of the question that immediately followed the one containing the skip instruction did not provide clues that it should not be answered. The ways in which the three forms varied are described below. Appendix A includes a copy of the complete questionnaires for all three test forms.

Form A–Census Question Form

“Skip to x” was provided in same type as the category label, following the category.

The skip instruction was connected to the category label with an arrow (**ŷ**).

In sum, this alternative relies on a directional arrow and written skip direction using the same font and darkness of type as other answer categories.

Form B–Arrow Form

All answer categories were connected by an arrow to either a skip instruction or to the next question to be answered. Skip arrows and directions emanated from the right side of the answer choices, while continuation arrows emanated from the left side of the answer boxes, and were directed outward and downward towards the next question.

A larger and darker font was used for the directions to skip to a later question.

A follow-up word instruction was included at the start of the next question to be answered. This instruction paraphrased the previous answer category(ies) that led to selection of the next question. In simple cases, this wording was simple, e.g., “(If yes)”. In other cases involving two paths to get to it the wording it was complex, e.g., “(If none or sent here from an earlier question).”

In sum, the arrow alternative used 1) directional arrows for both skip and continuation instructions, 2) larger font, 3) bolder type, and 4) a follow up word instruction to indicate who should answer the next question.

Form C-Right Box Form

All answer boxes were placed to the right of the answer categories, instead of being placed on the left side.

Skip instructions were placed immediately to the right of the answer box with no connecting arrow.

Skip instructions were printed in a high contrast format, black print on white background to attract attention.

Skip instructions were printed in a larger and darker type than were the answer categories.

All skip situations were preceded by a phrase “Attention: Check for a skip instruction after you answer the question below” in the same font and darkness as the questions.

A general introduction to skip instructions that was 56 words long, also in the same font and darkness as the questions.

In sum, the right box alternative used the elements of 1) word announcement of each skip possibility, 2) a closer location of skip instructions to answer boxes, 3) bolder print, 4) larger print, and 5) high contrast in the effort to improve skip pattern compliance.

Test Procedures

The arrow and right box alternatives represent quite different approaches to achieving skip pattern compliance. Each of these approaches also included multiple elements, some of which were graphical, and some that were words. To evaluate these approaches classroom evaluations were obtained from 1266 undergraduate Washington State University students, approximately one-third of which were asked to complete each form. Forms were administered to 34 classes ranging in size from 9 to 192 students. In addition 24 video-taped cognitive interviews were done to identify possible explanations for why some alternatives, and their individual elements might work better than others to achieve correct skip pattern compliance.

Insights gained from Classroom Tests of Three Alternatives

Loop Error Rates

Use of the arrow and right box alternatives significantly improved loop error rates. The range of error rates varied greatly across all forms, as shown in Table 1. The control group varied from 0.0% to 45.5% errors, the double arrow group from 0.0% to 35.2%, and the right box group from 0.0% to 18.0%. The mean error rates for the three forms was as follows:

Form A = 11.4%

Form B = 4.3%

Form C = 5.2%

On average, the traditional format or control group was more than twice as likely as the alternatives to produce loop errors (not following the direction to skip). On all 24 items the control group error rate was highest of the three formats. Twelve of the 24 comparisons across all three forms were statistically significant at .05 or less.

However, a quick perusal of the findings for individual questions suggests that these overall findings may be misleading. In the paragraphs below we will consider differences in results between individual questions, problems that appear to be correctable, and other features that significantly influence our recommendations for the 2000 Census Test.

The higher the loop error rate on one form, the higher the error rate on other forms. Table 1 lists loop error rates in order from highest to lowest, based on a simple index obtained by summing error rates across the three groups. Perusal of these numbers make it clear that in general the higher the error rate for this group the higher the error rate for other groups. This comparisons suggests an obvious conclusion. **Some questions are more prone to skip-compliance errors that are others, regardless of the nature of the skip instructions.**

Form A had significantly higher loop error rates (individual two-way comparisons) than Form B and C on 12 of the 24 questions and was significantly higher than form B only on four additional questions. Form B had a higher error rate than C on only one question and was significantly lower than C on four others.

Examination of the individual questions with the highest error rates suggests that these characteristics are associated with higher error rates across forms.

- 1 Error rates are very high when all answer choices require skipping the next question. Only three questions exhibited this characteristic and all three are among the top eight loop error rates (ranking 1st, 4th and 7th).
- 2 Skips following write-in boxes produced high error rates. Only two questions had this characteristic and both were among the top eight with regard to loop error rates (ranking 2nd and 3rd).
- 3 Skips from the last question to be answered at the bottom of the column or page produced high error rates. Six questions were the last question to be answered in a column or on a page, and five of these were among the top eleven with regard to loop error rates. An additional question placed next to the bottom but requiring all respondents to skip to the next page had the highest error rate of any question in the questionnaire.
- 4 Questions with answer categories that alternated between skip and continuation instructions also had higher error rates. Questions 12 and 21 which ranked 6th and 8th had this characteristic.

These data suggest that four characteristics of questions may account for much of the non-compliance with skip instructions. The top 11 error rates were associated with one or more of the above qualities as shown in Table 1.

The Arrow alternative performed better than the right box method for write-in questions. On two write-in questions the double-arrow alternative performed much better than did the right box method (11.0% vs. 14.2% for question 13, and 9.8% vs. 18.0% for question 37). It is important to learn why this is the case.

The Right-Box alternative performed better than the arrow method for two questions that required all respondents to skip ahead. Only two questions required respondents to choose among three categories, responses to each of which was directed to skip to a different next question. On both of these questions respondents to the arrow form were more likely than were respondents to the right box form to make errors (11.0% to 8.1% on question 11, and 35.2% to 11.0% on question 35). It is important to learn why this is the case.

The right-box alternative produced slightly higher error rates for most of the remaining questions. With regard to the remaining questions, respondents to the right-box form were a little more likely to make errors for 12 questions compared to 2 for which the opposite occurred. However, these differences are within the range of sampling error.

Conclusion Both the right box and the arrow forms provide promising alternatives for improving skip-pattern compliance with regard to the reduction of loop errors. However, ways to improve the performance of each on certain types of questions is needed.

Gap Error Rates

It's useful to recall that gap errors are probably more serious for data quality than the occurrence of loop errors. This is because a gap error results in a complete lack of data, as opposed to providing extra data that the respondent is not requested to provide.

Overall the gap error rate is lowest for Form A, the control form (0.8% vs. 1.8% for Form B and 1.6% for Form C). It had a lower error rate for 10 questions, compared to 5 for the arrow form and 1 for the right box form. The remainder of the forms had either two or all three of the forms tied for the lowest error rate. However, with only a few glaring exceptions most of the differences are trivial, and well within the bounds of sampling error. Form A had significantly lower rates than both of the other forms on only two questions. It was significantly lower than Form B only for three additional questions and lower than form C on only one additional question. Form B had a significantly lower gap error rate than Form C on only two questions,

and the reverse was true in only two instances. Significant differences of any type occurred for only 7 of the 22 questions for which gap error rates were applicable.

The arrow form had much higher error rates on one question. The error rate for this question (Q24) was 12.4% compared to 2.4% for the control and 1.0% for the right box forms. This difference may result from the arrow stemming from top answer box being visually overridden by skip instructions next to second box combined with the need to turn a page. A second somewhat higher rate (Q47) was the result of printing error, that had both a skip and continuation instruction emanating from the same box.

The right box form had noticeably higher error rates for three questions. The Q7 error rate was 4.8% vs. 3.1% for the control and 1.0% for the double-arrow form. However, it must be noted that a printing error occurred here which resulted in the instruction not being printed on a high contrast (white) background as it was for every other skip instruction. The Q13 error rate was 8.4% vs. 3.1% and 0.6% for the other forms, and was associated with a write-in box. The Q47 error rate was 6.8% vs. 1.5% for the control group, and no comparison was possible with the double-arrow form because of a printing error.

Conclusion For most questions the differences in gap errors are insignificant, but slightly favor (by about one percentage point) the traditional form. Solutions need to be found for one type of question on the arrow form, and two questions on the right box form.

Insights Gained from the Cognitive Interviews

Twenty-four cognitive interviews were conducted, eight of which used each form. Half were done with concurrent think-aloud techniques, and half were done with retrospective methods. Our analysis of these interviews was focused on trying to gain insights into the major findings from the classroom testing, i.e., explanations of the overall findings, and problems associated with particular questions.

Potential Explanations: Higher error rates on the control form.

Error rates for the cognitive interviews tended to mirror those obtained in the classroom tests, i.e., people were more likely to make errors on the control form than on the others. It appeared that some respondents to the control form simply did not see the skip instructions.

In at least one interview it appeared that the respondent, whose first language was not English, was deliberately trying to simplify the response task, by only attending to some of the information on the page, so that she simply ignored the skip instructions.

In another case, a person who described himself as a “scientist” filled out the control form, believed that he had filled it out correctly, and liked the form very much. He appeared to be very meticulous in his approach to filling it out. When he learned that he had made a number of errors, i.e., not seen the skip directions, he was quite embarrassed.

The main defect of the control form seems to be associated with stage one of the completion process; people simply don’t see the skip instructions. This may be happening because people are limited to seeing only 8-10 characters of text when reading (Jenkins and Dillman, 1997). As the eye focuses on the answer box, the skip instructions are in some cases 20 or more characters away.

Potential Explanations: Errors on arrow form

Although the error rate was much lower than for the control form (4.3% vs. 11.4%), the rate remains higher than desired.

Some people appeared to be confused by the existence of arrows going in two directions, one set on each side of the answer boxes and categories. Several respondents indicated that having such complete directions was unnecessary as well as confusing. If people tend to ignore information as they figure out what to do, it seems possible that to some extent the left-sided arrows were ignored.

The arrows appeared to be a special problem at the bottom of pages where it was the last information to appear on the page, and where it seemed to signify going on to the next question. We believe this use of the continuation arrow is partly (but not entirely) responsible for the higher error rates for questions located at the bottom of columns and pages. However, we did not find evidence that the left-hand arrow caused people to make mistakes in other places.

Some people expressed a dislike for the redundant wording, e.g., “(if yes),” that signaled continuation rather than skipping. This was especially a problem when the phrasing was intentionally vague because of different routes by which a person could get to the same place in the questionnaire, e.g., “(If basketball, wrestling, or sent here from an earlier question.).”

Errors on this form may be associated with a tendency by some people to want to read all of the questions to see what they are about. Once the non applicable questions are read some respondents seem to forget what they were directed to do.

From the perspective of conceptual model posed at the beginning of this paper, it’s apparent that people perceive the existence of skip instructions, and in general they were able to comprehend what to do. However, at the third stage of the model (evaluate alternative courses of action), they saw as an alternative to read questions that they were not directed to read. Attending to

those questions sometimes resulted in forgetting the previous skip direction. It also seems likely that turning pages may interfere with the judgment process. As people start to comprehend the next page they are drawn to the first question, and that may result in their forgetting the response instruction they had just finished reading.

Potential Explanations: Errors on Right Box Forms

The warning instructions added considerable ink to each page, and made the pages look more crowded to some respondents. We also observed that the repetition of the "attention" instructions led respondents to begin skipping that information (which we consider an undesirable behavior because of possibly leading to words within questions being skipped as well) later in the questionnaire. It also appeared that the presence of additional information to be processed might contribute to respondent efforts to simplify the response task by ignoring some aspects of each page, including the skip directions.

Some respondents also found the "attention" instructions "annoying." The number was not large, but because of the reading behavior implications (tendency to skip words), and the concern that more ink may predisposition people to be more selective in what they read, these instructions seem dispensable.

The initial warning instruction provided the biggest block of dark type in the entire questionnaire. It would seem that this information could be reduced in size, and made more readable. Several people found it confusing, and some found it simply, "long." A few respondents found this page denser than did other respondents, and reacted negatively to its appearance for that reason.

The location of the answer choice beside the box seemed to make it easier for respondents to see that information, and seemed most responsible for improving skip-pattern compliance.

We had anticipated that the right box location might be seen as unconventional by some respondents. However, when we removed all three questionnaires from the respondent's view and asked whether answer boxes were on the right or left, we found that most respondents were not aware of which side of the answer categories the boxes were located. This format did not seem unconventional to any of the respondents. We conclude it is a reasonable format that by itself does not have adverse consequences.

With regard to the conceptual model, most people perceived the existence of skip instructions, and comprehended what they were supposed to do. However, some respondents clearly wanted to read every question, and doing so may have led to their forgetting the earlier instruction to skip, as happened on the arrow form.

In one instance where higher errors occurred, they seemed associated with a printing error; question 7 did not have the skip instruction printed on a white background, and had a higher error rate. In two instances the printing of the skip instruction within a white answer box for an open ended question was not followed well. Printing that instruction outside the answer box in a way that would have associated it with that particular answer in a way similar to that used for check answers may have improved compliance.

Form Preferences

During a series of overall questionnaire evaluation questions, respondents were asked to indicate which one form they preferred above all. Twelve respondents chose Form B, nine chose Form A, two chose Form C, and one respondent was not asked this question. However, in general, we do not think the data from this question are the best indicator of which form should be used because on several occasions respondents chose the form they filled out first and also because most respondents gave some recommendations for modifying the form they chose.

Loop and Gap Error Rates

Loop Error Rates Four of the six loop error rate findings for the cognitive interview respondents reflected those of the classroom testing. As with the classroom testing:

The use of the arrow and right box alternatives significantly improved loop error rates. Nearly 18% (17.7%) of control group questions exhibited loop errors, while only 3.6% of the double arrow group and 5.2% of the right box group exhibited loop errors.

Individual questions differed greatly with regard to loop errors. The control group varied from 0.0% to 37.5% errors, the double arrow group from 0.0% to 25.0%, and the right box group from 0.0% to 25.0%.

The higher the loop error rate on one form, the higher the error rate on other forms. Table 3 lists loop error rates from highest to lowest for the cognitive interview respondents, based on a simple index obtained by summing error rates across the three groups.

Except for the differences noted below, the right box alternative produced higher error rates for most of the remaining questions.

The two differences were:

The arrow alternative performed better than the right box method for one of the write-in questions. The double arrow alternative performed better than the right box method for question 13, but not for question 37.

The right box alternative performed better than the arrow method on one of the two questions that required all respondents to skip ahead. The right box method performed better on question 11, but performed equal on question 35.

Gap Error Rates The major gap error rate findings for the cognitive interview respondents was similar to those found in the classroom testing. Specifically:

The gap error rate is lowest for the control form. The control form averaged 1.4% gap errors, while the double arrow form averaged 1.9% gap errors, and the right box form also averaged 1.9% gap errors.

The differences were:

The much higher error rate found on the arrow form for Q24 in the classroom testing did not show up in the cognitive interview testing. None of the cognitive interview respondents made a gap error on this question.

The right box form did not have noticeably higher error rates for questions 7, 13, and 47. On question 7, the control form had the higher error rate (12.5%) while the double arrow form and the right box form had no error rate for this question. None of the cognitive interview respondents made a gap error on question 13 or question 47.

Recommendations for Census 2000 Testing

A Both the double-arrow format and right box formats exhibit sufficient promise that both should be carried forth into the Census 2000 test.

Reducing loop errors by more than 50 percent, in conjunction with gap errors that on average vary less than one percent from the control form (with the exceptions noted above) makes both methods quite promising for future use. However, we think both methods should be modified somewhat in an effort to improve their effectiveness for reducing both gap and loop errors.

B Recommendations for modification in the arrow form.

- 1 Eliminate the left hand arrow The continuation arrow at the bottom of each page seems responsible for some of the page-turning errors. We are ambivalent about removing it in other locations, where it seemed not to cause problems, but recommend doing so to maintain consistency. The problem it seems to create at the bottom of pages is greater than the benefit we think it gives in other locations. At present it is one of two features used to connect answers in a preceding question to continuing to the next question, the other being the redundant phrasing, e.g., “(If no).”

- 2 Because of removal of continuation arrow, we recommend keeping the redundant phrasing for continuation questions. We also think this redundant phrasing may be especially important for preventing errors when the respondent is going from the bottom of one column to the top of the next, or turning a page. However, some of the current wording does not work well. For example, “(If directed here from a preceding question)” was used when people could get to a question from two separate questions, rather than just the preceding one. The phrase, “(If basketball or wrestling)” seemed to produce bias for question 13, making at least one person think he could only mention a basketball or wrestling athlete as a favorite sports star.

One reason for favoring the use of redundant continuation phrasing over the use of arrows (if a choice must be made) is observation of people who read subsequent questions even though they have been told to skip. This information is part of that question and provides the closest proximity to the question that should not be answered, and therefore might have some effectiveness in keeping people from making loop errors.

We suggest using a format like this:

Simple continuation from previous question, e.g., 12 to 13: “(If yes to 12.)”

Two question continuations: “(If yes to 36 or skipped here from 35.)”

When continuation is more complex than yes or no, e.g., wrestling and basketball boxes checked, we might consider “(If not asked to skip in 12.)”

If everyone is asked to skip the next question (item with very high error rate for all forms) then this instruction would be used: “(Answer only if sent here from 34.)”

In sum, the word instructions would be made more specific by inclusion of question numbers, and would be tailored to the situation.

In practice, we also think it makes sense to avoid putting especially complex skip instructions (e.g., all answer skip, but to different places) at the bottom of a page.

(NOTE: We think it is undesirable to eliminate both the arrows and connective phrasing at beginning of the next question, but realize that the way we used them in the test questionnaire created difficulties. We also believe it is desirable to get less ink on each page. A solution might be to use arrows for continuations down the page but never across columns or pages. In those situations we could switch to connective phrasing. When both a skip and a continuation go to a particular question we could use both. The awkwardness of some of the arrows when categories that continue are non adjacent by reordering the categories. A few skip situations would not lend itself to these solutions, but for the most part we think we could get this solution to work.)

3 Add an introduction only when first skip pattern instruction is presented:

“Note: If you choose yes for your answer to this question, please continue with the next question. If you choose no please follow the direction to skip to 7.”

Alternatively, a note might be added after the first skip instruction, at the beginning of the next continuation item.

“Please note that if you chose yes for your answer to the previous question you were asked to skip over this question. If you chose no then this question should be answered.”

Is this necessary? We aren't sure. We don't see a lot wrong with its use in the right box form, although a few people thought it was unnecessary, and objected to its presence.

4 Reduce size of font slightly; that would help associate answers more precisely with only one answer.

C Recommendations for modification of the right box form.

- 1 Separate skip direction from answer box, but link it to answer box with a small connecting arrow. Use of a small arrow to connect answer boxes to skip instructions may help get each instruction identified with only one box, and reduce gap errors. This method would be used for all questions, including the open-ended answer spaces, where its location inside the white answer box seemed to be a significant problem. We would put the small arrows directly onto the background color and start the white background in the next space.
- 2 Eliminate all “attention” instructions before each question that has skip directions for one or more answers. This elimination would reduce the amount of information that needs to be processed by each respondent, and may keep them from skipping words. These instructions also seemed to annoy a few people.
- 3 Keep the initial instruction, but shorten it significantly. At present it is too long. The version offered above for the arrow form may be helpful.

Next Steps

It's useful to pause and consider what has been accomplished with this research. In one test we have identified a way to cut by more than half, the failure to follow skip directions, that is the tendency to make loop errors. We have also maintained a low gap error rate, but not quite as low as when people are ignoring the skip instructions. The two kinds of errors are undoubtedly related. If loop errors were made for every skip question, then logically, we would expect there to be no gap errors (unless omissions were being made independent of the skip pattern instructions).

In the long run we believe it is undesirable to allow or encourage people to answer every question, regardless of whether it applies to them. We believe that doing so will create frustration on the part of respondents that leads to lower unit response rates. Gaining a reduction in gap error rates by accepting a unit response rate is undesirable. Thus, we need to concentrate on lowering loop error rates while at the same time achieving low gap error rates.

To achieve that goal, two goals need to guide future research. First, we need to focus on particular situations and types of questions. These situations include: 1) when people turn pages or move from one column to the next, 2) when every item requires a skip, and 3) when write-ins are requested. Resolving these problems is the highest priority for future research.

We believe a middle ground of providing sufficient information, without providing too much information, needs to be pursued, in order to get people to perceive and comprehend skip directions, yet not become frustrated because of getting so much information that they begin to avoid attending to some of it.

Table 1. Percent of respondents making Loop errors by form, ranked by sum of errors across all forms.

Q#	A	B	C	Total	Potential Reason
Q35*	45.5 ^{2,3}	35.2 ³	11.0	91.7	Every answer skips; Bottom of page for some respondents
Q13*	20.9 ²	11.0	14.2	46.1	Skip follows write-in answer
Q37*	18.0 ²	9.8 ³	18.0	45.8	Skip before write-in answer
Q11*	23.0 ^{2,3}	11.0	8.1	42.1	Every answer skips; Bottom of page
Q48*	20.9 ^{2,3}	5.3	6.8	33.0	Last of long skip sequence
Q12	16.5	6.5	7.7	30.7	Alternating skips
Q46*	15.0 ^{2,3}	6.8	8.6	30.4	All answers skip
Q21*	16.3 ^{2,3}	3.2 ³	10.2	29.7	Alternating skips
Q7*	15.6 ^{2,3}	5.5	5.7	26.8	Bottom of page
Q36*	14.5 ^{2,3}	4.6	4.3	23.4	Bottom of page
Q30*	11.6 ^{2,3}	5.4	6.2	23.2	Bottom of page
Q34*	14.8 ^{2,3}	2.9	4.6	22.3	
Q9*	10.3 ^{2,3}	5.3	5.8	21.4	
Q20	13.0 ^{2,3}	2.8	5.6	21.4	
Q17	7.2 ²	2.0 ³	5.8	15.0	Bottom of page
Q8	8.0	1.6	4.8	14.4	
Q47**	2.9	4.6	2.3	9.8	
Q16	6.4 ^{2,3}	0.6 ³	2.4	9.4	
Q24	4.5 ²	0.9	2.5	7.9	Bottom of page
Q43	6.5	0.0	0.0	6.5	
Q5	2.9	1.2	1.9	6.0	
Q27	3.6	0.0	2.2	5.8	
Q28	0.3	0.3	0.0	0.6	
Q45	0.0	0.0	0.0	0.0	
0	11.4	4.3	5.2	20.9	

*Questions that respondents can get to by skipping from an earlier answer. **Invalid arrow on Form B.

^{2,3}Superscript numbers refer to statistically significant differences in proportions at the .05 level. For example, on Q35, the proportion of errors made by respondents on Form A is significantly different from the proportion of errors made by respondents on Form B as well as on Form C. The Z test was used to test for significant differences in proportions at the .05 level. ² means the error rate for the Form in that column is statistically different from Form B. ³ means the error rate for the Form in that column is statistically different from Form C.

Table 2. Percent of respondents making Gap errors by form, ranked by sum of errors across all forms.

Q#	A	B	C	Total	Potential Reason
Q24	2.4	12.4	1.0	15.8	Possibly conflicting instructions
Q47**	1.5	6.8	6.8	15.1	Invalid instruction on Form B
Q13*	3.1 ³	0.6 ³	8.4	12.1	Write-in box
Q7*	3.1 ²	1.0 ³	4.8***	8.9	Form C not on white background
Q45	1.2 ²	3.6	1.9	6.7	
Q5	0.2 ^{2,3}	2.6	3.3	6.1	
Q43	0.2 ^{2,3}	3.6	1.9	5.7	
Q37*	0.6	1.8	2.4	4.8	
Q16	2.3	0.9	0.9	4.1	
Q9*	1.6	0.3 ³	2.0	3.9	
Q36*	0.4	1.7	1.4	3.5	
Q30*	0.2 ²	2.6 ³	0.2	3.0	
Q12	0.0	0.0	2.6	2.6	
Q20	0.8	0.3	0.8	1.9	
Q28	0.0	1.7	0.0	1.7	
Q8	0.0	1.6	0.0	1.6	
Q17	0.0	1.0	0.5	1.5	
Q27	0.0	0.5	1.0	1.5	
Q34*	0.0	0.0	0.7	0.7	
Q48*	0.0	0.3	0.3	0.6	
Q21*	0.0	0.4	0.0	0.4	
Q46*	0.0	0.0	0.0	0.0	
0	.8	1.8	1.6	4.2	

*Questions that respondents can get to by skipping from an earlier answer.

**Invalid arrow.

***Skip box not in white.

^{2,3} Superscript numbers refer to statistically significant differences in proportions at the .05 level. For example, on Q35, the proportion of errors made by respondents on Form A is significantly different from the proportion of errors made by respondents on Form B as well as on Form C. The Z test was used to test for significant differences in proportions at the .05 level.

² means the error rate for the Form in that column is statistically different from Form B.

³ means the error rate for the Form in that column is statistically different from Form C.

Table 3. Percent of cognitive interview respondents making loop errors by form, ranked by sum of errors across all forms.

Q#	A	B	C	Total	Potential Reason
Q13*	37.5	12.5	25.0	75.0	
Q11*	37.5	25.0	12.5	75.0	
Q35*	37.5	12.5	12.5	62.5	
Q46*	37.5	12.5	12.5	62.5	
Q9*	37.5	0.0	25.0	62.5	
Q30*	37.5	12.5	0.0	50.0	
Q5	37.5	0.0	0.0	37.5	
Q34*	25.0	0.0	12.5	37.5	
Q37*	12.5	12.5	0.0	25.0	
Q7*	25.0	0.0	0.0	25.0	
Q20	25.0	0.0	0.0	25.0	
Q17	25.0	0.0	0.0	25.0	
Q48*	12.5	0.0	0.0	12.5	
Q21*	12.5	0.0	0.0	12.5	
Q8	12.5	0.0	0.0	12.5	
Q16	12.5	0.0	0.0	12.5	
Q24	0.0	0.0	12.5	12.5	
Q27	0.0	0.0	12.5	12.5	
Q12	0.0	0.0	0.0	0.0	
Q36*	0.0	0.0	0.0	0.0	
Q47**	0.0	0.0	0.0	0.0	
Q43	0.0	0.0	0.0	0.0	
Q28	0.0	0.0	0.0	0.0	
Q45	0.0	0.0	0.0	0.0	
0	17.7	3.6	5.2	26.6	

*Questions that respondents can get to by skipping from an earlier answer.

**Invalid arrow.

Table 4. Percent of cognitive interview respondents making gap errors by form, ranked by sum of errors across all forms.

Q#	A	B	C	Total	Potential Reason
Q38	25.0	0.0	12.5	37.5	
Q7*	12.5	0.0	0.0	12.5	
Q14	0.0	0.0	12.5	12.5	
Q15	0.0	0.0	12.5	12.5	
Q16	0.0	0.0	12.5	12.5	
Q37*	0.0	12.5	0.0	12.5	
Q44	0.0	12.5	0.0	12.5	
Q24	0.0	0.0	0.0	0.0	
Q47**	0.0	0.0	0.0	0.0	
Q13*	0.0	0.0	0.0	0.0	
Q45	0.0	0.0	0.0	0.0	
Q5	0.0	0.0	0.0	0.0	
Q43	0.0	0.0	0.0	0.0	
Q9*	0.0	0.0	0.0	0.0	
Q36*	0.0	0.0	0.0	0.0	
Q30*	0.0	0.0	0.0	0.0	
Q12	0.0	0.0	0.0	0.0	
Q20	0.0	0.0	0.0	0.0	
Q28	0.0	0.0	0.0	0.0	
Q8	0.0	0.0	0.0	0.0	
Q17	0.0	0.0	0.0	0.0	
Q27	0.0	0.0	0.0	0.0	
Q34*	0.0	0.0	0.0	0.0	
Q48*	0.0	0.0	0.0	0.0	
Q21*	0.0	0.0	0.0	0.0	
Q46*	0.0	0.0	0.0	0.0	
0	1.4	1.9	1.9	4.3	

*Questions that respondents can get to by skipping from an earlier answer.

**Invalid arrow.

***Skip box not in white.

References

- Jenkins, Cleo R. and Don A. Dillman. 1997. "Chapter 7: Towards a Theory of Self-Administered Questionnaire Design." In Lars Lyberg et al. *Survey Measurement and Process Quality*. New York: John Wiley Company.
- Raglin, D. 1998. "Using the 1996 National Content Survey to Measure the Impact of Alternative Skip Patterns on the Correction of Employment Data." *Proceeding of the 1997 American Statistical Association*.
- Tourangeau, R. and K.A. Rasinski. 1988. Cognitive Processes Underlying Context Effects in Attitude Measurement. *Psychological Bulletin* 103(3): 299-314.

APPENDIX A

Form A-Census Question Form

Form B-Arrow Form

Form C-Right Box Form