Implementing Branching Logic by Enabling and Disabling Questions in the Online Version of the National Sample Survey of Registered Nurses: Results of a Usability Evaluation

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Abstract

In 2017, staff in the Center for Survey Measurement of the U.S. Census Bureau conducted usability testing and accessibility testing of the 2018 National Sample Survey of Registered Nurses (NSSRN) online survey. During the usability sessions, participants accessed the survey either on a Census provided laptop computer or on their own mobile device. This report provides a summary of the usability and accessibility methods and results from evaluating the NSSRN online survey. Focus is applied to the experience participants had on webpages where branching logic (i.e., skips sequences) was implemented by disabling (i.e., greying out) or re-enabling question and response fields based upon the answer given to an earlier filter question on the page. Disabling questions to implement skip sequences is different from the typical Census Bureau online survey design where there is only one question per page and skip sequences are implemented by skipping entire pages that do not apply based on prior responses. During usability testing, we observed no usability issues when the question text, the response field, and the response field label were disabled. Participants were able to understand that the question did not apply to them. There was no indication that participants were answering the filter questions in such a way to avoid having to answer more questions. In fact, we observed one instance where the participant changed her answer to the filter question because she could read the subsequent disabled questions and realized she had misinterpreted the filter question. When the participant then changed her answer to the filter question, she actually answered more questions, and not fewer. While disabling the question and the response field appeared to work well for participants, we did observe participant confusion when only the response field was disabled, and not the response field label. When presented with that design, many participants tried to answer the disabled question and did not understand why it would not respond to repeated tapping in the field.

Keywords: online survey design, skip sequence, conditional branching, multiple related questions on a webpage

1. Introduction

The National Sample Survey of Registered Nurses (NSSRN), sponsored by the Health Resources and Services Administration, an agency of the U.S. Department of Health and Human Services, is the largest nationally representative survey of registered nurses in the U.S. The survey had been conducted every four years between 1980 and 2008. The data collection is scheduled to resume in 2018, after a 10-year hiatus, with the U.S. Census Bureau as the new data collector. The survey is sent to a small percentage of actively licensed registered nurses and nurse practitioners in each state. Nurses are asked to report on their education, employment, intentions regarding nursing work, and demographics. These data are used to assess the status and trends in the U.S. nursing workforce (https://datawarehouse.hrsa.gov/data/dataDownload/nssrndownload.aspx).

This survey was last conducted in 2008 via multi-mode data collection using a Web questionnaire or a paper questionnaire and, for non-responders for whom telephone numbers were available, over the telephone. The NSSRN went through a significant redesign for the 2018 collection, adding new items, and combining National Sample Survey of Registered Nurses and the National Sample Survey of Nurse Practitioners into one survey.

In preparation for fielding the 2018 NSSRN, cognitive testing was conducted on the survey questions by Census Bureau staff (Stringer, Hernandez-Viver, Vetting, & Reiser, 2017). After that testing, in November and December 2017, staff in the Center for Survey Measurement (CSM) of the Census Bureau conducted one round of usability testing of the candidate online NSSRN instrument on PC and mobile devices. The goal of the testing was to uncover usability issues with the current design, to cognitively test questions that were either added or revised after the earlier cognitive testing, and to make recommendations for enhancements to ensure that the online survey performs optimally during data collection.

Fifteen individuals participated in the testing -- eight registered nurses and seven nurse practitioners. The NSSRN paper questionnaire (see Attachment A) was used as the baseline for the questions and question order in the online instrument. Testing results and recommendations for both usability and accessibility were provided to the sponsor shortly after testing was finished and are found in Attachment B. The intention of this report is to document those findings, along with the satisfaction ratings associated with the NSSRN online survey collected during usability testing (Attachment C), and eye tracking data collected during the usability testing on the laptop (Attachment D). Results from the usability testing also fed into revisions to the paper questionnaire that will be fielded in 2018. We include this final paper questionnaire (Attachment E), even though it was not tested, because it is an easy way for readers to scan the survey to determine what was tested and what changed based on the usability testing results.

In the body of the report, we provide a detailed description of how participants’ interacted with the conditional branching design used within the survey for both PC and mobile devices.
2. Background on the use of conditional branching within online surveys

Conditional branching, or skip sequences, are used in surveys when the answer to one question dictates what subsequent questions a respondent should answer. The initial question in a skip sequence is called a filter question and based on the answer provided to that question, respondents should answer or not answer subsequent questions. On paper questionnaires, instructions for skip sequences are typically next to the response choice, such as the “SKIP to Question A11 on page 4” next to the “No” response for Question A10 as shown in Figure 1.

![Figure 1 Paper version of the NSSRN showing a skip sequence](image)

The success of these skip instructions depends greatly on the respondent reading and understanding what to do next (Redline and Dillman, 1990). In paper questionnaires with skip sequences, there are errors of omission, when a question is not answered that should be answered, and there are errors of commission, when a question is answered, when it did not need to be answered (Krosnick, 2017).

These errors can be reduced in an online form by automating the branching logic. Perhaps the most typical way is using a design where there is one question per webpage with branching logic implemented between the pages. In these surveys, the respondent always navigates to the next correct question based on the current answers provided. Automated branching removes the errors of commission, and unintended errors of omission.

The online design becomes more complicated if multiple questions appear on the same webpage and skip sequences are within those questions. There are several distinct design solutions for branching between multiple questions on the same survey webpage as shown in Table 1.
Table 1: Design solutions for conditional branching within a webpage

<table>
<thead>
<tr>
<th>Branching design solution</th>
<th>Attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Static skip instructions</td>
<td>This solution is identical to the paper form solution and it doesn't not require any additional programming.</td>
</tr>
<tr>
<td>Skip instructions as hyperlink</td>
<td>A hyperlink next to the response option moves the user to the next applicable question. However, the user must use the hyperlink to navigate correctly.</td>
</tr>
<tr>
<td>Unfolding questions</td>
<td>Questions appear on the screen based on prior responses.</td>
</tr>
<tr>
<td>Disabling and enabling questions</td>
<td>Questions either disable (become grey and nonfunctioning) or enable (become active) based on prior responses.</td>
</tr>
</tbody>
</table>

Static skip instructions and skip instructions with hyperlinks: One design solution would be to use instructions similar to a paper questionnaire; however, this design does not take advantage of automation and the same errors of commission and omission exist. Another solution is to use hyperlinks. Peytchev, Couper, McCabe, and Crawford (2006) conducted an experiment comparing a paging design with branching automated between webpages and a scrolling design with hyperlinks. They found only a few differences between the two conditions. One concern with a scrolling design where skip sequences can be seen by respondents is that respondents will choose to answer questions in such a way that minimizes the number of follow up questions they have to answer, thus increasing measurement error. Peytchev et al. found some support for this behavior with about 2 percent fewer respondents in the scrolling version reported having used alcohol in their lifetime. They also found very few respondents actually using the hyperlinks to navigate to the next correct question.

Unfolding design: Other design solutions for branching between multiple questions on the same survey webpage include showing only the filter question and then depending upon the answer to that question, the subsequent questions could “appear” or “unfold” beneath the question. This method is employed in the American Community Survey, as shown in Figures 2 and 3. While we have not observed usability problems with this design during testing, this is not a typical design because it uses an element of surprise, as questions “pop up” or appear, seemingly, at will. Additionally, in this particular application, the filter question becomes disabled. If a respondent made a mistake on the filter question and meant to report “no”, returning to the filter question to change the answer is difficult and requires use of back navigation. Good online design is consistent so that users know what to expect and it allows the user to be in control (Nielsen, 1995).
Disabling and enabling design: Yet another design for conditional branching within a screen is for the subsequent questions and response fields to become disabled (i.e., light grey) or enabled (typical font coloring) based upon the answer to a filter question. This differs from the prior example because the questions are always on the screen and do not “pop-up.” When an answer field is disabled, respondents cannot enter data into it. The grey and the inability to interact with the field is supposed to convey to respondents that the field is not to be completed or is inactive. A common implementation of this feature is with the “Other/specify” field found in many single or multiple choice survey questions as shown in Figure 4. The default view is with the write-in field grey and disabled. When the “Other” choice is selected, then the field becomes “enabled” as shown in Figure 5.
Expanding that design to disable entire questions as the default view is shown in Figure 6. If the filter question is answered such that the respondent should answer the subsequent questions, then those questions and response choices re-enable, as shown in Figure 7. The questions remain disabled if the respondent answers the filter question in such a way that the subsequent
questions should not be answered. The light grey of the question text in the disabled view still allows the respondent to read the question, but is supposed to indicate that it does not apply.

Figure 6: Example of whole questions disabled as the default view

Figure 7: That same question with the filter question answered in such a way that the subsequent questions should be answered and thus they become enabled.
The opposite design could also be implemented, that is, everything on the screen is enabled as the default view and then parts of the screen are disabled based on the answers on that screen. However, this design should only be used when a respondent chooses between two equal choices, such as country or state as shown in Figure 8. In this example, the respondent does not have to answer both questions, he or she should answer only one question, but there is no filter question. If the respondent reported living in a state, the country field should disable, if the respondent reported living in a different country than the U.S., the state field should disable, since a respondent cannot simultaneously live both inside and outside the U.S.

![Figure 8: In this example, the respondent only should select state or country to answer, not both.](image)

While there are many ways to implement the disable and re-enable designs, based on our literature review, we found no empirical studies comparing the use of disabling and re-enabling questions within a survey to accomplish conditional branching nor did we find any discussion on how respondents interact and interpret the disabled text and fields.

**Summary of conditional branching within the NSSRN:** The 2018 NSSRN used the disable and enable design to communicate conditional branching within webpages of the online survey. This report documents the usability issues found with the disable and re-enable designs as observed in the 2018 NSSRN usability testing. We focus our findings on whether respondents appeared to understand what the grey text and response choices meant under the different designs, and whether we observed any indication of measurement error with the designs.

3. National Sample Survey of Registered Nurses Online Questionnaire

The NSSRN online questionnaire is one of many surveys the Census Bureau developed using an in-house codebase framework called Centurion. The survey version usability tested had 12
sections, labeled A through L, covering a wide array of topics concerning the education and employment of nurses, advanced practice nurses, and nurse practitioners. For each section of the survey, there were multiple webpages with a ‘next’ button to navigate forward to the next webpage and a ‘previous’ button if the respondent wanted to return to a prior page. Most webpages in the survey contained only one question; however, several webpages contained multiple related questions with skip sequences built into the page where the questions would become enabled or disabled depending upon the answer to the filter question on that page. There was also some branching logic between webpages within the survey, and if that logic was triggered, whole sections of questions could be skipped.

The survey was designed to render optimally on PC and mobile platforms, called “PC and mobile optimization.” Optimization means that the screens automatically readjusted in size and in design depending on the display size of the device. The PC-optimized version and the mobile-optimized version displayed in the same manner for the enabled and disabled questions and response fields.

The NSSRN is a relatively long survey, taking respondents approximately 30 minutes to complete. There were approximately 150 questions in the version tested; however, the number of questions any one respondent receives is often fewer because of skip patterns. Of those 150 questions, there were four webpages where whole questions were skipped using the disabled and enabled design; 19 webpages with the “Other/specify” write-in field disabled and then re-enabled if that response choice was selected; and seven webpages where state and country were asked simultaneously and on six of these webpages, disabling of the response field was used.

4. Methods

We conducted one round of usability testing on the NSSRN between November and December 2017. This section describes the participants, the devices they used to access the survey, and the procedure implemented during the testing sessions. The last section describes the accessibility methods.

4.1. Participants

Fifteen participants took part in usability testing of the 2018 NSSRN. Eight were registered nurses and seven were nurse practitioners. These two groups were recruited because they complete different sections of the questionnaire. Of the eight registered nurses, one was an advanced practice nurse with a nurse midwife certification; five worked in a hospital; one was a school nurse; and one worked in a hospice care facility. These eight individuals experienced a wide variety of educational paths to becoming a nurse. There was also a wide-variety of the number of years they were a nurse. Of the seven nurse practitioners, three had worked in convenience care; two were currently working in a hospital; one individual had worked in a rural hospital; one was in patient consultation; and one person currently was not working due to relocation, but had
a job lined up. Several of the nurse practitioners had varied employment paths which the survey did not capture well. Participant characteristics are described in Table 2.

Participants were recruited through advertisements on Craigslist, personal connections, an email blast that was distributed to all Census employees, and through an email contact to the Maryland and Virginia local chapters of the American Association of Nurse Practitioners. The majority of participants lived in the Washington, D.C. – Baltimore metropolitan area, with one person currently living and working in Texas.

Table 2: Demographic characteristics of 2018 NSSRN Usability Testing Participants

<table>
<thead>
<tr>
<th>Demographics</th>
<th>n=15</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>13</td>
</tr>
<tr>
<td>Male</td>
<td>2</td>
</tr>
<tr>
<td><strong>Age</strong> – Mean (Std. Deviation) (Range)</td>
<td>37 (7) (25-54)</td>
</tr>
<tr>
<td><strong>Race/Hispanic origin</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>13</td>
</tr>
<tr>
<td>Black</td>
<td>1</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
</tr>
</tbody>
</table>

4.2. Devices used

Eight participants answered the survey using a Census provided laptop; five used their smartphone, and two used their tablet (see Table 3 for the summary of devices).

Table 3: Devices used across both rounds of NSSRN usability testing

<table>
<thead>
<tr>
<th>Device</th>
<th>Registered Nurses</th>
<th>Nurse Practitioners</th>
</tr>
</thead>
<tbody>
<tr>
<td>Census provided laptop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dell Latitude E6430, Windows 7</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Smartphone (BYOD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iPhone 7 Safari – mobile stand</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Android “1 plus 5” Google chrome – mobile stand</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>iPhone X– mobile stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Samsung S5 – free held</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iPhone 6S – mobile stand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tablet (BYOD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>iPad Pro “9.5 inches – free held</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>iPad mini air 8” – free held</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

4.3. Usability Procedure

Each usability test conducted involved the participant completing the draft online version of the 2018 NSSRN while being observed by a Census Bureau test administrator. Participants were instructed to answer the questions as they applied in their real life circumstances. All sessions
included video recording and audio recording with participant consent. Each usability session lasted approximately one-and-a-half hours. To offset the costs of parking and travel, participants received an incentive of $100 for their participation. While 10 sessions occurred in the usability lab at the Census Bureau’s headquarters building, the other five sessions occurred at libraries in the Washington DC metro area. Most sessions were observed by another Census Bureau usability lab researcher, and many were observed by the sponsors of the project. Observers watched and listened in a separate area for sessions conducted at headquarters. For sessions at the libraries, observers were in the same room as participants, but watched the survey completion on a separate device with a feed from the participant’s device so that observers were not hovering over the participants.

Participants were instructed to “think aloud” while completing the survey. The think-aloud technique is modeled on Ericsson and Simon’s (1993) approach to collecting verbal feedback. Our think-aloud protocol was used to maintain a running verbal commentary of the participants’ expectations and reasoning. A participant engaging in thinking aloud verbalizes his or her available, conscious thoughts and decisions while completing the tasks so that the researcher can understand the participants’ cognitive processes as they interact with the web survey interface. The test administrator encouraged the participants to continue to think aloud, using prompts such as, “Keep talking” if they became silent for more than ten seconds.

We collected eye-tracking data for seven of the eight participants who completed the survey on the Census-provided laptop using the Tobii X260 system. The Tobii system was also used to record the audio and video of the participant answering the survey. We did not bring the eye-tracking equipment to one off-site location where the laptop was used to complete the survey. We also did not collect eye tracking for the mobile devices because of the effort needed to analyze that data. Instead we used Camtasia on another Census laptop to record the screen capture of the participant answering the NSSRN on their mobile device. To make the video recording, we had some participants place their device on the Tobii mobile device stand (https://www.tobiipro.com/product-listing/mobile-device-stand/) which eliminates the movement of the device and provided a clear picture of the screen. We had others use their device free-hand and recorded using a Webcam attached to a gooseneck clamp. We observed no discernable difference in usability problems identified between the two methods, but the Tobii mobile stand provided a more readable video capture.

After the participant finished the survey, he or she completed a satisfaction questionnaire including opinion questions about general usability aspects of the survey (e.g., using forward and backward navigation and comprehension of general survey terminology). Then, the participant was shown a PowerPoint presentation with some screenshots taken from the survey and asked a few questions about those screens, focusing on the new questions. The test administrator followed a protocol during the session and the questions and protocol were approved by OMB using the generic clearance for pretesting 0607-0725.
4.4. Accessibility procedure

Concurrent to the usability testing, accessibility testing was performed by using the Job Access With Speech (JAWS) screen reader for the PC and Google TalkBack for smartphones. We did not test with screen-reader users. The evaluation was performed by a researcher trained in testing for accessibility. JAWS users navigate by keyboard commands on a computer desktop to hear the screen content. Smartphone users navigate by left and right swipes and by touch to hear the screen content. The researcher uses these gestures to test the instruments.

4.5. Analysis

Immediately after each usability session, the researchers summarized the usability and cognitive findings and provided the summary to the sponsor. The summary was based upon the observed behavior of the participant and the verbal feedback. These summaries were used to create the “Quick Report” which included user-centered design issues observed, cognitive problems with the questions and response options, and recommendations. Accessibility testing took place over the course of a few days. “Quick Report” findings for both usability and accessibility are provided in Attachment B.

Participant provided satisfaction data was summarized and is documented in Attachment C.

Eye tracking data for particular screens that were problematic or that were modified after usability testing is available in Attachment D. Eye tracking data were collapsed across the seven participants to form heat maps. These maps are color-coded. They show the general pattern of where participants looked on the screen and where they looked the most (denoted by red areas). We also include quantitative eye-tracking data by participant, including the total number of fixations and fixation duration on the main survey part of the webpage. See Figures 9 and 10 for an example of what parts of the screen were included when summarizing that data. A fixation is maintaining the visual gaze on a single location long enough to read a word. More fixations do not necessarily mean that the survey page is faulty or poorly designed; participants could simply be more engaged with the design. However, designers should strive to convey the meaning of the question and response options with as few fixations as possible because fixations could be considered a proxy for an aspect of respondent burden. The fixation data documented should be used as a baseline when testing the next iteration of the instrument.

Within the body of the report, we also include heat maps, total number of fixations, and fixation duration for screens with disabled text and fields. The purpose of these data is to determine whether participants understand that when the text is disabled, that question does not apply to them. If participants understand that concept, there should be very few if any fixations on the disabled areas of the screen if that part was not enabled during the session. We separate the fixation and heat maps into two groups per screen: one group is if the fields were disabled throughout the session and the other group is if the fields were enabled.
Figure 9: Example screen from the NSSRN with disabled text.

Figure 10: That same screen with two areas of interest indicated for fixation count and duration. One area (the pink area) is the entire screen from the subheading to the navigation buttons, while the red area is the disabled text area. The same areas were identified for each question of interest.
5. Findings and Recommendations

The NSSRN web instrument implements different methods to enabled and disabled text for skips. The following subsections discuss each of the ways.

5.1. “Other/specify” write-in field

On screens where there was an “Other/specify” write-in response field option, that field was disabled until the participant selected the “Other” response choice. There were several screens with multiple choice questions with an “Other” choice at the bottom of the field. These fields were disabled until a participant selected “Other” and then the field would become enabled. We observed no usability problems with the disable field design when it was at the bottom of the response choice list for PC or mobile devices. Figure 11 shows a question about team based care where the last choice is “Other/specify.” This was a complex question, and none of the seven participants for whom we have eye tracking data selected other. Figure 12 shows few if any fixations on the grey box.

![Figure 11: Team-based care question with “Other/specify” field disabled as the default view.](image-url)
Figure 12: All seven participants answering team-based care. No one selected “other” and there are little to no fixations within the grey disabled specify field at the bottom of the screen.

When participants selected “Other” at a question, such as the question collecting the reasons the participant remained in their nursing position in Figure 13, then the heat map indicates that some participants looked and interacted with the field as shown in Figure 14. In this question (several) participants added reasons for remaining in the same job. Again, there were no observed usability issues when the write in box was disabled or re-enabled when the “Other” choice was selected. Participants appeared to understand that when the box was grey, it did not apply to them, but if they selected the “Other” choice, then they should type into the white box.
Figure 13: Factors contributing to remaining in the nursing position question with “Other/specify” field disabled as the default view.
However, the grey disabled “Other/specific” field also acted as stopping point when several response lists were joined together into one question as they were in the employment setting question in Figure 15. Many participants verbally shared that they thought they had to answer once for each section, rather than choose one choice across the entire list. One or two participants said that the grey field made it seem like the end of the list. Notice too that the “Other/specific” write-in field is below the response option and not to the right of the response option as it was in Figures 13 and 14.
The heat map associated with this question in Figure 16 supports the observation that the grey other box appeared to serve as a visual stop sign in this design, shaping this misunderstanding of the question. Very few people looked at the grey box and most of the reading time was spent in the first section of the response choices.
Figure 16: Heat map using seven participants data on the employment setting question. The large red area at the top of the list is over the confusing response item of Critical Access Hospital (See PowerPoint slide #58 in Attachment B). However, also see very few fixations in the “Other/specify” write-in fields.

We calculated the mean number of fixations on this question (136.4 with a range of 3 to 500 and a standard deviation of 187) and the mean total duration of those fixations (19.8 seconds with a range of .25 to 69 and a standard deviation of 27) for the seven participants so future iterations of the design could be compared to these numbers to determine if the fixations decrease if the design becomes more understandable to respondents.

On mobile devices, the problem was magnified as it looked like the end of the response choice list was the grey “Other/specify” write-in field as shown in Figure 17. In that picture, only the first section of the list shows and the grey box is at the bottom of the screen.
This question had several problems with it, including confusing terminology and a design that made it look like the participant had to choose one option from each list. However, the grey write-in box directly below the “Other” response choice seemed to add to the confusion. Placing the grey boxes to the right of the “Other” choice as it was in Figure 13 above, instead of below the choice, might have helped the participant visually navigate the response choices; however, we cannot assume that it would have addressed the entire issue. We also cannot say whether having white write-in boxes for this design would have helped indicate that there was more to the list.

Following the usability testing, the program managers decided to implement two-step questions using a page-based design for this employment setting question. Respondents are first asked to categorize their employment setting into four categories (see Figure 18) and then they are branched to the correct subsequent page that asks for a more detailed employment setting within that category (see Figure 19 for an example screen).
5.2. Skipping entire questions

On four webpages, entire questions were disabled until the participant selected a choice to the filter question, which enabled the subsequent questions. These four screens contained the types of skip sequences that another survey designer might have put on separate webpages. As an example of how these screens looked, Figure 20 shows the view of one webpage upon first access. The subsequent question task was initially disabled. It was enabled when the participant reported that he or she had an additional academic degree as shown in Figure 21. If the participant reported no additional academic degree, the subsequent question task stayed disabled. On all four of these types of webpages, we observed no issues with participants understanding that the disabled section did not apply to them. We did not observe anyone trying to answer in the greyed out question area.
Figure 20: Types of additional degree questions default view for PC

Figure 21: Types of additional degree question when filter question is answered "Yes" enabling the subsequent questions
For this particular question, three participants, for whom we had eye tracking data, did not have another degree and were then able to select “Next” and move forward. The heat map in Figure 22 shows very few fixations in the disabled areas of the screen for those participants, suggesting that participants knew that they did not have to spend time reading that section. However, there are a few fixations denoted by the light green, meaning that participants saw the text. The mean count of fixations on the entire page for two of the three individuals was 69 with a standard deviation of 35 and a range of 44 to 94. The mean count of fixations within the disabled text area was 12 with a standard deviation of 8 and a range of 6 to 12. For this group of individuals, 17 percent (12/69) of the fixations on the page were in the disabled area.

Figure 22: This includes three participants who answered "no" and did not have another degree.

The other four participants, for whom we had eye tracking data, had another degree. The heat map in Figure 23 shows that those participants focused on the enabled questions. The mean count of fixations on the entire page for these four participants was 99 with a standard deviation of 49 and a range of 26 to 134. The mean fixations within the disabled text area was 73 with a standard deviation of 37 and a range of 21 to 101. Overall, 74 percent (73/99) of the fixations on the page were in the disabled/re-enabled area.

1 The third participant who answered the filter question with “No” had only one fixation recorded on this particular screen and therefore we excluded these data as it was an outlier.

2 In the Tobii software, only the default screen is shown as the background in the heat map, but the fixations are from the entire time the page was visible, including when the questions were enabled.
Figure 23: This includes 4 participants who answered “yes” that they did have another degree. The image is made with the default disabled text, but the page changed dynamically and was enabled for these four participants.

For this webpage, the eye tracking data matched the observation that participants appeared to understand that the grey area did not apply to them, but the re-enabled area did. The mobile view of the question is not different from the PC design as shown in Figure 24. Participants using their mobile devices also understood that the grey text did not apply to them and were able to navigate past the grey fields and text to the navigational buttons at the bottom of the page.

Figure 24: Types of additional degree questions default view for a mobile phone
Another of the four webpages with disabled and re-enabled questions was about enrollment in an education program and is shown in Figure 25. This series contained five questions, one filter question, and four sub-questions which were enabled if the participant selected one of the “Yes” response options indicating that he or she was enrolled in a formal education program. On PC and on mobile, the participant had to scroll to see all of the questions and to get to the “Next” navigation button. Like the prior example, all participants appeared to understand that the grey meant the questions did not apply to them.

We observed one participant initially selecting “no” that she was not enrolled in an education series to the filter question, but then changed her answer to that question because she read the grey question about online courses. She realized that the survey considered online courses to be part of an educational program, which was not her original understanding. Her behavior was the opposite of what other researchers had feared about allowing the respondent to see the skip sequence. Instead of answering the filter question in such a way as to receive fewer questions, this participant actually answered more questions, and answered them more accurately than had there been only one question per screen. Had that been the design, the participant most likely would not have changed her answer to the filter question because she would she would not have
seen the subsequent question about online courses and would have stayed with her original understanding of the question that the qualifying educational programs were classroom-based. This behavior can be compared to another participant who was answering a page-based section of the survey. One of the questions in that section was so difficult (see PowerPoint slide #46 in Attachment B) that she navigated back to the original filter question and changed her answer so that she would not answer the subsequent questions. Thus, having a page-based design does not necessarily eliminate intentionally reporting incorrectly to avoid subsequent questions.

While we do not have the eye tracking data for the participant who changed her answer to the filter question, we do have the eye tracking data for the six participants who answered no to the filter question (Figure 26) and one participant who answered yes to the filter question (Figure 27). Again the pattern is similar to the prior example with participants seeing the grey disabled text, but not focusing greatly on it when it is disabled.

For the six participants who answered “no” and did not enable the remaining questions, the mean count of fixations on the entire page was 38 with a standard deviation of 31 and a range of 7 to 82. The mean fixations within the disabled text area was 6 with a standard deviation of 5.5 and a range of 1 to 13. Overall, 16 percent (6/38) of the fixations on the page were in the disabled/re-enabled area. These data can be compared to the data from the participant who answered “yes” to the filter question and enabled the remaining questions. That person had 114 fixations total on the page and 56 of those were in the enabled area, so almost half of the fixations were on the enabled questions.

Figure 26: Six participants who answered that they were not enrolled in courses in the fall of 2017 to the filter question and therefore the subsequent questions were not enabled. Notice very few fixations in the disabled text; yet the participants did see the text.
Figure 27: One participant of the seven who were eye tracked did answer yes to the filter question and complete the remainder of the questions on the webpage

5.3. Inconsistent use of disabling and re-enabling question and response text in the NSSRN online instrument used during usability testing

While disabling entire questions and response choices seemed to cause no usability problems for our participants, we did observe user confusion when only the response field was disabled and not the question associated with that field. For example, one screen in the instrument contained a question about whether the respondent had ever left the nursing field, and if so, the subsequent question on the webpage asked how many years he or she had left. Only respondents who answered that they had left the nursing field should have answered for how many years they left. The default screen layout in Figure 28 shows that although the field of the second question was disabled, the question text still appeared on-screen. Of the seven laptop sessions that were eye tracked, no one answered yes that they had left the field of nursing, meaning that they should not have answered the second question; however, video recordings show that two of the seven people, tried to tap in the disabled field. And, it appears, that several of these participants read the second question which was not disabled, even though it did not apply to them, as shown in Figure 29. However, the proportion of fixations in the disabled area to the entire question (14 percent or (2/14.5)) was similar to the earlier design where the disabled text was used. We do not understand why the fixation counts on this question did not match the observation, especially because two participants attempted to answer the disabled question.
On mobile devices, the same thing happened. In Figure 30, the participant is trying to tap into the disabled field even though she had answered “no” to the previous filter question. While none of these individuals discontinued the survey at this point, nor did they verbally indicate that they
would, it could become a point of frustration for participants. At minimum the design is inconsistent compared to the other four webpages discussed in the prior section.

Figure 30: In this picture the participant had answered no and so should not have answered the next question about how many years they had left nursing. However, since the second question was bolded and not greyed, the participant attempted to answer the question.

For the 2018 NSSRN production instrument, the screen was revised to ensure that the question text and response label was gray prior to the respondent selecting an answer for the initial question on the page “Have you left work in nursing for one or more years since becoming an RN?” as shown in Figure 31. If the respondent selects “Yes” the response box will become enabled and the question text and response label text will change to black font to indicate that the respondent should answer this follow-up question, as shown in Figure 32.

Figure 31: Revised screen for the 2018 NSSRN with the subsequent question text and response field disabled as the default view.
We observed a similar problem when only the response field was disabled and not the field question or label. This happened several times on screens that required either the state or country, but not both. All participants answered their state and then the next field was country. Once a state was selected, the country field became disabled, but not the question as shown in Figure 33. On several screens with this design, participants tried repeatedly to answer the country question, without success because they did not realize the field was disabled. The user-problem was magnified because on the first occurrence of this type of question, the country field was enabled, and so participants expected that they were supposed to answer both state and country on every screen where it was available. The eye tracking heat map in Figure 34 confirms that for the 3 participants who received this particular screen, they spent time on the disabled question and tried to answer it. The mean number of fixations on the entire page was 116 with a range of 23 to 183, and the mean number of fixations on that disabled area was 18, with a range of 2 to 32. So, for this screen, about 26 percent of all the fixations were in the disabled area.
Figure 33: Example of a question where the state is selected, which triggered the country field to be disabled, but the country question remained enabled.
5.4. Multi-part questions which might have benefitted from disabling and re-enabling question and response text

Disabling and re-enabling might have helped participants navigate the question about where they received their degree. That question was a multi-part question, where the respondent is supposed to select U.S. or outside of the U.S. and then provide more details regarding the state or the country, depending on the first answer. However, the two questions are visually intertwined as shown in Figure 35. Instead of having a separate second question below the first question, part of the second question is beneath the first response to the first question and the other part of the second question is beneath the second response to the first question. There was no disabled or enabled text or fields used on this webpage. One participant reported “In the United States” and the state and then also selected a country, which is an error of commission.
Another participant did not select “In the United States” despite selecting the state name, which is an error of omission.

Figure 35: Multi-part question without enabling or disabling

Eye tracking data confirms the possible confusion since there seems to be some focus on the country label and field (see Figure 36) and yet none of the seven individuals obtained their education outside of the United States. Overall the mean count of fixations was 23.5 with a range of 4 to 48 and the average total fixation duration was 4 seconds with a range of .32 to 9.17 for the seven participants.
For the 2018 NSSRN production, this question was redesigned so that the State and Country drop-down boxes are disabled when the respondent entered the page and they are no longer intertwined within the question; rather, they are below the main question as shown in Figure 37. If the respondent selects “In the United States” for the first question “Where was this program located?” the State drop-down box enables and the country drop-down box remains disabled for the second question as shown in Figure 38. If the respondent selects “Outside of the United States,” the country drop-down box enables and the state drop-down box remains disabled.
Figure 38: Redesigned screen showing that the state field enables if in the United States is selected.

5.5. Accessibility of disabled and enabled design for both PC and mobile devices

For PC JAWS users, JAWS encountered and read aloud the grayed out questions, response option labels, and instruction text. The response options are labeled “unavailable.” Talkback on smartphones functioned in the same way, that is, all grayed text and response options were vocalized and only the response options are labeled with “unavailable.” When a screen-reader user encounters a new page or screen, they will typically navigate through the entire listing to determine the layout and how to interact with the screen. Where the sighted user may not read all of the grayed question text once they determine it does not apply, a screen-reader user will not know the text is grayed out until accessing a response option which will be labeled as “unavailable.” Screen-reader users will take longer than sighted users to process this text in the disabled areas. There is no way to skip to the next enabled question automatically for screen-reader users. While this is how the disabled and re-enabled screens functioned, because we did not test with actual screen-reader users, we were unable to get any input from them about their experiences with disabled and enabled text designs.

6. Summary and Discussion

The NSSRN online survey used disabled and re-enabled questions, labels, and fields to indicate skip sequences. This design allowed multiple questions to be on the same webpage in the survey. When entire questions were in skip sequences, the default view on the webpage was that the fields and questions were disabled. During usability testing with this highly educated population, there were no problems observed when both the question text was disabled in addition to the response field. Participants quickly understood that the question did not apply to them. Eye tracking data confirms this observation; participants spent very little time looking at the disabled questions and fields. We did not observe any instance of these participants reporting in such a
way as to purposely reduce the number of additional questions they had to answer. On the contrary, we observed some advantage to having multiple related questions on the same page with the disabled and enabled branching logic design used. For example, we observed one participant scan through the disabled questions and change her answer to the filter question when she saw that one of the disabled questions asked what percent of the educational classes were online. Because she saw the subsequent question (even though it was disabled), she was able to infer that the survey considered online classes within the scope. Had the survey design been implemented with the more traditional one question per screen approach, she would have never seen the subsequent question, and most likely would not have changed her original answer.

However, we also observed that if the question or label was enabled (meaning it was black and not grey) and just the field was disabled, then participants became confused because they tried to answer the question, even when it did not apply to them. In these cases, the response field would not accept an answer. This observation was also confirmed with eye tracking data. While eventually everyone moved on within the survey, the experience was frustrating and therefore we recommend that when enabling and disabling is used, both the question and the response field should appear the same way.

When there is a filter question, then the subsequent questions should be disabled until an answer to the filter question triggers the subsequent questions, and then both the label and field should be enabled. This prevents respondents from answering out of order. When there are two related questions, like which state or country, and no filter question, then both fields and labels/questions should be enabled as the default. If the respondent selects a state, then both the country field and the country label/question should be disabled and if the respondent selects a country, then both the state field and state label/question should be disabled. The design needs to be flexible enough to allow a respondent to change their answer to the state and/or country so that the other field re-enables in the situation that a response was made in error.

For the “Other/specify” fields, again this highly educated group of participants understood that unless the “Other” response choice was selected, they did not have to enter data into the write-in (or type-in) field. However, the grey box below the other response choice did serve as a stopping point for the group of response choices. This was a problematic design when there were several sections of response choices and an “Other/specify” field for each section. Participants assumed they had to choose one response for each section.

To our knowledge, there has not been extensive research on enabling and disabling questions within a survey to indicate skip sequences. This report provides a source for documenting this skip sequence solution as it relates to usability and user experience. It does not make any claims about the impact of the design on the resulting survey response distributions as the research was qualitative in nature.
7. Limitations

The group of participants who interacted with the online survey was highly educated. We cannot generalize to other groups of respondents. The methodology when testing mobile device changed mid-way through the testing period. Some participants placed their phone on a Tobii mobile device stand while answering the survey, while others held their phone while answering the survey. Although we observed no noticeable differences in usability problems uncovered using either method, there are advantages and limitations of both. Using the mobile stand means that participants do not hold their phone. Any usability difficulties they have in simultaneously holding their phone and answering the survey will not be observed. We also observed more index finger use when the phone was on the stand rather than free held. Some users use their thumb to select answers or navigational buttons. No users used their thumb when using the mobile device stand. Any usability issues with making selections or navigating using a thumb touch will not be observed when using the mobile device stand. While using the free held method is how users would answer the survey in real life, occasionally we could not observe the interaction of the participant with the phone screen because of the angle the participant held the device or because the participant readjusted the position of the device so that it was outside of the camera view. In these instances, we had to ask the participant to tilt or move the phone to a position so that we could capture the device on the recording. Both the stand and the free-held methods disrupt the natural method of completing the survey, but neither method seemed to affect usability issues observed nor the interaction with the branching design used.

8. Future usability research on designing for branching logic

Repeating this study, or a similar study using enabling and disabling with a different respondent pool would aid in determining if the disable and re-enable design is universally understood.

Because we have gathered some eye tracking data, it would be useful to repeat the usability sessions with the revised NSSRN online instrument to determine whether disabling both the question text and response field reduces the number and duration of the fixations on those screens where only the response field (and not the question text) was disabled during usability testing. Likewise, it would be interesting to test a modification of the ACS screen with the pop-up question to an enabling and disabling design to see which design works better for respondents.

Future work should also examine the distribution of responses to filter questions and include some kind of validation data source to determine whether respondent answer those questions accurately or whether they answer them to avoid subsequent questions.
9. Acknowledgements

We thank the staff of Elizabeth Sinclair and Daniel Doyle in ADDP for the opportunity to usability test the NSSRN and learn about respondent interactions with the disable and enable functionality. We also thank our reviewers including Elizabeth Sinclair, Chris Stringer, Lin Wang, Joanne Pascale, and Paul Beatty.

10. References


Attachment A: Paper version of the NSSRN containing questions used in usability testing of the online NSSRN
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Attachment B: Quick Report: Including Usability and Accessibility Testing Results

# National Sample Survey of Registered Nurses
Usability Testing Results

Elizabeth Nichols and Kathleen Keyhart
Center for Survey Measurement
U.S. Census Bureau
December 14, 2017

## Goals of testing
- Determine usability problems with NSSRN
  - Both PC design and mobile design
- Focus on working Registered Nurses and Nurse Practitioner paths in the instrument
- Secondary goal: Identify any cognitive issues with new questions (and existing questions if identified during the session)

## Methodology
- In-person qualitative sessions with researcher and currently licensed registered nurse (RN) who was working as a nurse either full or part-time as of December 2010
- Audio and video record IP’s device during session; eye tracking on laptop
- Demographic questionnaire
- Researcher provides invitation letter, complete NSSRN on their mobile phone, tablet, or Census Bureau-provided laptop
  - Vignettes to login, log back in
  - RN answers satisfaction questions
  - Retrospective debriefing

## Recruiting
- BDC broadcast on 10/18
- Craigslist ad
- Personal contacts
- Email contact to the local chapters of the American Association of Nurse Practitioners: NPAM and VCN on 11/28

## RN Participant Info and Devices

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<thead>
<tr>
<th>Participant and Device Type</th>
<th>Participant Name</th>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>RN</td>
<td>John Doe</td>
<td>Phone</td>
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<tr>
<td>RN</td>
<td>Jane Smith</td>
<td>Tablet</td>
</tr>
<tr>
<td>RN</td>
<td>Michael Brown</td>
<td>Laptop</td>
</tr>
<tr>
<td>RN</td>
<td>Sarah Lee</td>
<td>Smartphone</td>
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</table>

## NP Participant Info and Devices

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<th>Device</th>
</tr>
</thead>
<tbody>
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<td>Emily Green</td>
<td>Phone</td>
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<tr>
<td>NP</td>
<td>Andrew Wilson</td>
<td>Tablet</td>
</tr>
<tr>
<td>NP</td>
<td>Lisa Martin</td>
<td>Laptop</td>
</tr>
<tr>
<td>NP</td>
<td>David Johnson</td>
<td>Smartphone</td>
</tr>
</tbody>
</table>

## Letter and URL
- Letter seemed satisfactory
- Make sure URL is searchable on google (2 Rs tried to find it that way)
  - Several thought the URL incorrectly
  - Some tried to sign in on the OMIS page for the NSSRN

## Outline
- IT Issues
- Usability Issues
- UX Expert Review
- Future Work
- Cognitive Issues
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

**IT Issues**

- **IT Issues - B15 (High priority)**
  - iPhone or iPad the total shows as 10% (when it is 100%); however, Android and laptop show as 100%.
  - Recommendation: Make sure the total correctly appears as 100% across Apple and PC devices.

- **IT Issues - B15 (Medium priority)**
  - The hover says “hours” and one R initially put hours in, then realized we wanted percents.
  - Recommendation: Change the hover to Percents instead of Hours.

**IT/UX issue: H2 (High priority)**

- The “Not” box is disabled.
- There are a lot of white spaces under the “Other” tab.
- The question text refers to a name that doesn’t exist in the issues.
- Recommendation:
  - An “X” next to white space.
  - Remove option to “Have you opened an existing answer under the your name?”
  - Add an “Add Name” button with an add form.
  - Add “Not found” text with an add form.

**IT Skip Issue (High priority)**

- There is a skip sequence error if Rs answer K3 as a “Yes”. Two respondents selected “Yes” and never received Q.11 (Email and phone contact info).

**Typos (High priority)**

- Privacy act has a space between the letters for or. It looks like “or”
- Banner for Section F: “Practitioners” is spelled incorrectly
- B14c: “Followings” is spelled incorrectly
- B15a: Make sure “include preparation” is separated.
- K3: Nurse-midwife has a dash on Internet not paper.
- The re-review section keeps the older year numbers even though we changed it to 2016 in the main survey (It looks like they hard coded those years – so beware if we reuse this survey after 2018)
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

Usability Issues

Outdated warning message – (High priority)

- A user read the warning message and said it’s a government computer, this is my phone. He was worried about being monitored.
- Recommendation: The latest approved message is to the left. (August 18, 2017 email)

Possible inadvertent break-off on 1st question – A1a (High priority)

- The user said it was not clear if it was on or off.
- Recommendation: Make it clear that it is on.

Labeling and response option issues – B14 (High priority)

- The label on the left is not clear what it means.
- Recommendation: Clarify the label.

UX design issue: B13 and H8 (Medium priority)

- The current design makes it look like it is two choice options.
- Recommendation: Remove the second choice.

UX – B13 Example of Recommendations

- Example of “accordion screen”(left).
- OR consider collapsing categories to I3 (below).

Re-review screen – (Medium priority)

- The instructions are not clear for the user to understand.
- Recommendation: Clarify the instructions.

Autotab needed for Login ID (Medium priority)

- 3 Rs commented that they wanted an autotab on the login fields. That is, once you have entered 4 digits for the ID, your focus is automatically moved to the next field. Decennial census online instruments and ACS use this design.
- Recommendation: Use autotab feature.
DOB year starts with 1891 – (Medium priority)
- Many Rs commented on the backward years offered for date of birth and the fact that it starts with a ridiculous number of 1891.
- Recommendation: Start with the most recent "logical year" and then work backwards to a "logical end", not 1891.

Match the write in space size to the number of characters allowed. Many Qs (Medium priority)
- The picture shows the maximum number of characters allowed. Two Rs ran out of room at the write-ins because the space suggests they can write more.
- Recommendation: Either shrink the space or allow them to type more. It is doubtful that people will type in all caps, but you can look at prior data to see what they do. Add a character countdown feature to show them how much space is left.

Salary amount formats: B26 & E5 – (Medium priority)
- Several Rs tried to enter commas when they entered their salary, several Rs also commented that they had to count the zeros so "they didn’t seem too rich"
- Recommendation: Use input format with embedded commas and right justify amounts. The National Survey of College Graduates adopted this design.

Disabled and enabled text for skips – A12a Positive UX design
- One Rs initially replied “No” but then read the shaded box for the subquestions and asked, “Why?” All other Rs in the course work to become an AP.
- Other Rs also noted, “oh that is not for me”, etc. when shown the disabled text.
- It is important that all the text, response options, etc. are consistently available when using a skip, but be sure to review the link. The next 3 slides identify areas where we need more standardization of the disabled text.

Usability Issue: Consistency in Disabling Text (Medium priority)
- In this example, country response field is actually disabled, but the question is not. For here and any other country response, we need to disable the question as well.
- Rs tried to select country and it was a frustrating experience.
- See the next slide for some suggestions.

UX issue – country data collection (Medium priority)
- A38i, country (label) did not grey out after selected a state. It looked like he had to select it, but it was not functional when she tried.
- B3: country has to be selected even after state is entered. U.S. is also buried in country list alphabetically.
- E4, E8 (country label) is not disabled once you select state. However, if an instruction next to the label (not USA) which seemed to help (see figure)
- there might be other country fields within the survey doubly listed.
- A57s had difficulty with the design across the survey because of the inconsistency.

Disable/enable design needs to be consistent – H2 and A5 (Low priority)
- H2 (top figure) – the entire 2nd question should be disabled until they select yes. It paused and read and then figured out it did not apply to them.
- A5 (bottom) Consider a different design that is more in line with the H2 example. Of course, you need to enable and disable the correct fields and labels, unlike the mock up.

Telephone # - L1 – (Low priority)
- One R filled with phone number trying to enter spaces. Currently, it enters as straight numbers.
- Recommendation: Use a standard format for entering phone numbers, like 01564 555 5555. The other alternatives is to use 3 fields like decimal with an autowrite between the fields (not shown).
Pop up windows – FAQs etc. – (Low priority)

- FAQs: When asked to log out and save the respondent went to the upper right hamburger menu with no issue and selected FAQs for help which were missing. She used the instructions which are fine although there is no close button on either one to get back to the main page. She could navigate by using the browser windows on her phone. Might consider using close window in window.

Medium priority

- Some drop downs use the states spelled out and some use abbreviations. While we think all months are spelled out, it is preferred to do that compared to an abbreviation or numbers.
- Recommendation: Be consistent and for 508 compliance and plain language reasons spell out states and months in dropdowns.

U.S. Expert Review Comments

Low priority

- Change all paper form instructions that start with “Mark” to either “Select one” or “Select all that apply.”
- D7: the “Other” choice is not lined up with the response option.
- (Respondents did not comment on any of these issues).

Welcome – expert review – (Low priority)

- We’ve recommended using a keypad for numeric data entry on mobile.
- This speeds up the process for the respondent because they do not have to switch keyboards and it also quickly communicates what type of input we want.
- NCD, the ACS, and the 2016 Census Test have adopted the keypad design.
- Recommended question: Line of ID, telephone number range (B19, BE),
- number of years worked (B15), number of hours worked (B16), months per year
- (B21), % questions (B23, B27), F24/F27), and ZIPs.

Consider a keypad for numeric entries (Low priority)

- One is used back browser button a lot instead of previous button – while others said previous
- button
- Recommendation: Work on adding a back button
- Expert review: Once the page loaded on the top of the page, but the button did not load. In the instructions
- “More Options” it select what is above the field for the
- “More Options” button.
- Recommendation: Consider adding that option to the user.

Navigation – (Low priority)

- J1: Completed city and ZIP, but left state blank. We are not
- sure why R did that, other than that she had entered very similar
- information many times before.
- Recommendation: If ZIP is entered, could we prefill state? Other
- websites do that; however, they might use street too.
- B26: R wanted a calculator on the salary screen.
- Recommendation: It might be an interesting addition that could lead
- to some good research if paradigms on the use of the calculator was
- collected.
**Positive UX design**

- L1 autopopulated with her correct email.
- Radio button spacing seems adequate for smartphones and tablets!
- Survey was actually quite consistent in the design and worked quite well compared to many of the other surveys we've tested.

**Future Work**

High priority

**Future UX research**

Dropdown design for B18 and B19

- No problems with dropdown response-option design. It worked on mobile too.
- Recommendation: You should compare responses against an item-by-item design for mobile or a grid on PC as this does take longer and there is also the spinner for iOS phones where it is more difficult to see response choices.

**Question order might increase breakoffs**

- Typically, demographic questions are asked either at the beginning of a survey or at the very end.
- However, the section following this demographic, Section F, asks about certifications and licenses. One (in mobile) spontaneously commented that "we changed the pace of the questionnaire when we started with the questions. He was reading the survey, he kept walking down after the questions, and because there is no progress indicator and he did not know how much longer the questionnaire would go on. He indicated that he might break off at this point had he not been in the lab setting.
- Recommendation: Progress indicators have led mixed reviews for increasing breakoffs; therefore, we would only suggest one if you were able to do a split sample experiment. Randomize them off by design at this point in the survey and really at all points in-scope. Like demographics, these questions are important, and you could consider putting them in a similar location in future versions of this survey.

**Duplicative questions might increase breakoffs**

- For NPs, the A10 series and the A11 series appear to collect nearly the same information.
- They are also asked again if they are an NP in F1a.
- For RN-only Rs, K3 and A11 are basically the same question. At least two Rs commented negatively on the duplicative questions.
- Recommendation: This would require a reworking of the questionnaire to eliminate the duplicative questions.

**Cognitive issues**

- Several Rs mentioned a "compact nursing license" when presented with A1b. This type of license allows nurses to practice in multiple states depending on the care covering it. All Rs seemed to get the open-ended item, but it would be nice to allow them to acknowledge that they have a compact license.
- Recommendation: Add a checkbox to say that this license is a compact license. Do you really need the check box that they are licensed in more than 4 states? How often does that occur now that there are compact licenses?
possibly some measurement error - A8
Debrief

- One R mentioned that the data was selected for other reasons and it might not have been the best fit. The other R was selected based on their own experience.
- The terms ‘principal nursing position’ and ‘primary nursing position’ were discussed, with one R suggesting that it might be better to use the term ‘primary’.
- One R noted that the term ‘principal’ was used inconsistently.
- One R suggested the term ‘principal’ was used to indicate a higher level of responsibility.

Self-financed – A9

- Self-financed did not imply that parents paid for several Rs.
- Several Rs selected other resources to indicate that their parents paid for tuition.
- Recommendation: Review the NSCG list of funding sources for the appropriate label for the first category.

Section B
“Principal nursing position” versus “primary nursing position”

- One R said term “principal nursing position” was really weird and unusual. That she had never heard anyone say that, they talk about their “primary position is in unit x”.

Text dense on mobile phone – B1 and B2

- One R commented on the wordy instruction between B1 and B2.
- Everyone seemed to read this instruction.
- Recommendation: Consider whether you can condense the instruction.

Response choice missing for question about how long he/she looked for a job – B4

- 2 RNs actually never looked for the job, but they selected 1-6 months.

Cognitive issues: Preceptor and Orientations – Debrief B5 and B6

- There were no prior experiences with the term ‘cognitive issues’ in a formal orientation program for RNs.
- Hospitals had an orientation program and acknowledged the term, however it may not have been used.
- “By person” was used instead of “by person – a”.
- One R mentioned that the term was used inconsistently.
- One R mentioned that the term was used inconsistently.
- Recommendation: Review the NSCG list of funding sources for the appropriate label for the first category.

Ordering of question options – A11

- One R said the order of choices was out of sync with how common the different specialties are. Recommended NF, Nurse Anesthetist, then nurse midwife, then clinical specialist last.

Team based care training in Principal Nursing Position section – B9

- It is not clear whether you want all training the person has ever received about team-based care, or just the training in their principal nursing position. All Rs selected all the training they have ever received, but some initially said they didn’t get any, then went on to select the formal schooling training they received.
- Recommendation: Consider moving this question to the education section.
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

Ordering of question options – B10

- One R said the most common choice was the third option and it should be at the top. He also added that “per diem” is weird next to self-employed per diem means part time at different hospitals, not the same as “self-employed”.
- Several Rs struggled to find their response option and every R selected the third choice.

Critical Access Hospital – B13

- Many Rs selected Critical Access Hospital in error. They should have selected the 2nd choice.
- 14/13 Rs did not know what Critical Access Hospital was. The one NP who did know what it was said it was a hospital in more rural areas. She seemed comfortable with her response.
- First three choices under hospital were confusing one R.
- The other terms used were Trauma 1, Trauma 2 or Trauma 5 hospital, Acute Care hospital, outpatient, and rehab.

Cognitive issues and debriefing – B15

Debrief on category (c)

- Several Rs said this was a difficult question. Everyone but 1 understood what to do, however one put in hours and one went over 100% thinking about how much she does everything, like she manages all the time, does patient care half the time, etc.
- In (c), there were a variety of tasks described for this category, being the charge nurse, or making the schedule or assignments, or being a preceptor. These in a hospital setting and it would vary week to week.

Cognitive issue – B16

- Several Rs created the response option list to mark one and not mark all because the question uses the word “miss” or “the word that” each list contains 10 to 12 distinct items, so to apply a cog with the word “miss” that word is the instruction mark all.
- Recommendation: Either make the instruction read, “select the correct option,” or remove the word “miss.”
- Some choices are missing: Conventional care, the school nurse, internal medicine/family physicians, and Laboratory care.
- Recommendation: Consider adding some choices.

Cognitive issues (and heading error) – B17b

Debrief

- Several commented that 2 year old is not 2-yr-old.
- Several Rs commented that neonates are very young less than 90 days or no. Several also used the term “infant” instead of neonate.
- Infants are less than 1 year and Pediatric is 1-12 years.
- One R commented instead of pediatric, a never term (“other adults”) (however we just heard this from one R).
- wording uses “not eligible and education” but should it say “Principal Nursing Position”

Measurement error – B17c

- It is “mark one” and one R could not select an accurate answer. She works 50/50 on Gyn and OB. Ultimately she put Gyn as the answer. She said that OB and Gyn are listed separately on this survey but they really overlap.
- Several categories are missing including:
  - Pediatric
  - Family medicine/ internal medicine
  - Conventional care

Measurement error – B18

- Many Rs commented that their IT system was terrible but then selected “somewhat” or even to “a great extent.” One R also commented that she didn’t know what the question was referring to – the EMR system or the IT system.

Possibly biased questions – B19

- The questions are phrased that each of these should be a great extent; however, for places where they do not do discharges, it seems like the R is rating the employer poorly. One R said they don’t do discharge planning, but “that doesn’t mean negative.”
- Recommendation: Unless this is a time series question, redesign this question to first find out what the organization does and then rate the other areas.
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

Value-based care and other training topics – B20
Debrief

- Two RNs almost selected Yes and then caught themselves. It is difficult to diagnose the issue, but it might be because the “State board of Nursing” is underlined.

- Recommendations: Only ask this question if they previously said they were a nurse practitioner.

Telehealth – B21
Debrief

- We were asked to debrief on these two questions.

- RN had no difficulty with either question, and were considering asking their patients when answering the questions.

- However, we noted that RN had 5 different jobs, one in 2013 and a different one in 2016. We asked RN if there were any changes, and RN said that because the original job had more users.

- What’s the answer of F127? If the new measure increases content load, then the survey should make sure the job was the same between those two time periods.

Layout issue: F1A

- Two RNs almost selected Yes and then caught themselves. It is difficult to diagnose the issue, but it might be because the “State board of Nursing” is underlined.

- Recommendations: Only ask this question if they previously said they were a nurse practitioner.

Telehealth – B21
Debrief

- We were asked to debrief on these two questions.

- RN had no difficulty with either question, and were considering asking their patients when answering the questions.

- However, we noted that RN had 5 different jobs, one in 2013 and a different one in 2016. We asked RN if there were any changes, and RN said that because the original job had more users.

- What’s the answer of F127? If the new measure increases content load, then the survey should make sure the job was the same between those two time periods.

Fee reimbursement – F18
Debrief

- This is a difficult question.

- Two RNs misunderstood the question. Of these RNs, one RN said she always don’t know.

- There are billing departments and they handle this.

- Only one RN wasn’t clear what calculation means.

- The examples in the functional areas also confuse because one RN said that patients are given a gift card when they are discharged and if they have insurance, fee-for-service means out of pocket to some RNs.

- The final report of F18 has more in-depth analysis of this question.

- Recommendations: Conduct a focus group to investigate this topic.

F8
Debrief

- Larger, this question had no cognitive difficulty despite the text being cut off.

- One RN pointed out that it was considered an equal office, and another RN made a point to finish a sentence.

- RNs also asked the RNs the “how” of the employment.

- Recommendations: If you ask a focus group for the next question, you should add this question at the end.

Definition of nursing – H1 and H3

- One RN wondered if we wanted to count her LPN years when it asked about how many years she was in nursing at H1.

- Another RN reported yes to H3, but he was thinking of a job he had as a CNA not as an RN. We clarified this during debriefing.

- For both these RNs, they were employed in the field of nursing, but the sponsor wants only RN positions for section H that needs to be clarified.

Cognitive issues with Section I

- Several RNs said that it would depend on the situation and there was not that choice, so RNs spent time thinking about how to answer this question.

- RNs did not know what this national database was about. There is no way to indicate that either in the questionnaire. Several pointed out that reimbursements for RN is lower than for doctors and if they treat the same way, they should get paid the same.

- Recommendations: None
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

Transition needed - J1

- The transition from the other questions to this one in the general information section is not clear to respondents. The reverse print is not enough to make the distinction.
- It should be clear what address is implied.
- One field is to be filled with the social security number. It is not indicated which field is being asked for.
- It should be clear for the user how they work.
- Recommendation: Add. The next set of questions are about your characteristics. Also, why don’t you ask the question more simply. "Where did you live on December 14, 1990?"

Missing certifications- K2

- One of the mentioned two certifications were missing.

2018 NSSRN Accessibility Evaluation

Lawrence Malakhoff
Center for Survey Measurement
December 14, 2017

Methods

- Tested with the JAWS screen-reader and the Internet Explorer browser on the MS-Windows 7 desktop
- Tested with the TalkBack screen-reader and the Chrome browser on an Android smartphone

Desktop Accessibility Testing Issues

- Screen reader users will never hear the warning text on the login screen because it is below the sign in button.
- The login fields do not auto-tab after the first four digits of the ID are entered into the first field, requiring the user to tab to the second field to enter the last four digits.
- Some drop-down menus for the state response are populated with state abbreviations instead of fully spelled out state names.
- Instructions to “mark one box” and “mark all that apply” are for paper survey forms, not Web surveys.
- Typographical errors

The warning message is never heard

No auto-tab on the login field
Attachment B: Quick Report: Including Usability and Accessibility Testing Results

Abbreviations used for State names

Artifacts from the Paper survey are present

Typographical Errors

Mobile Accessibility Testing Issues

- Same issues as desktop for warning text, state drop-downs, typographical errors, and paper form artifacts
- The login fields do not auto-tab after the first four digits of the ID are entered into the first field, requiring the user to swipe right to the second field to enter the last four digits
- Previous/Next navigation worked until question A10 [show-stopper]
- On question B1, text from question A12a was read

Previous/Next Navigation inaccessible beginning with Question A10

81  82  83  84  85
Satisfaction Results
Participants were asked to complete an electronic satisfaction questionnaire immediately after completing the online NSSRN. The questionnaire was structured as a series of Likert-like scales gathering feedback about different aspects of the online questionnaire. The questions, mean score and standard deviation are reported in Table 4. Overall, participants were satisfied with the questionnaire; however, examining the standard deviations, we find that those greater than 1 were related to problems in the questionnaire including use of terminology (see Attachment B, Cognitive issue slides 47+), organization of questions (see Attachment B, slides 44, 45, 57, and 73), and correcting mistakes (see Attachment B, slides 10 and 11).
## Table 4: Participants’ Satisfaction ratings with specific aspects of the instrument

<table>
<thead>
<tr>
<th>Question</th>
<th>Mean</th>
<th>Std. Dev</th>
<th>Num of NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overall reaction to the Web Survey:</td>
<td>5.3</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>2. Screen Layouts:</td>
<td>6.2</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>3. Use of terminology throughout the survey:</td>
<td>5.9</td>
<td>1.1</td>
<td>0</td>
</tr>
<tr>
<td>4. Instructions displayed on the screens:</td>
<td>6.3</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>5. Questions displayed on the screens:</td>
<td>6.1</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>6. Questions can be answered in a straightforward manner:</td>
<td>5.4</td>
<td>0.7</td>
<td>0</td>
</tr>
<tr>
<td>7. Organization of questions, instructions and response categories in survey:</td>
<td>5.8</td>
<td>1.3</td>
<td>0</td>
</tr>
<tr>
<td>8. Forward navigation:</td>
<td>6.7</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>9. Overall experience of completing the survey:</td>
<td>6.3</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>10. Correcting your mistakes:</td>
<td>5.9</td>
<td>1.7</td>
<td>1</td>
</tr>
<tr>
<td>11. Reading text:</td>
<td>4.7</td>
<td>0.5</td>
<td>0</td>
</tr>
<tr>
<td>12. Typing text:</td>
<td>4.6</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>13. Clicking links/radio buttons:</td>
<td>4.8</td>
<td>0.6</td>
<td>5</td>
</tr>
<tr>
<td>14. Zooming in or out:</td>
<td>5.0</td>
<td>0.0</td>
<td>13</td>
</tr>
</tbody>
</table>

Source: 2018 NSSRN Usability Testing (n=15)
Eye tracking Data
In this attachment we provide selected NSSRN screens with heat maps, fixation counts and fixation durations for seven participants who used the PC. These data can be used as a benchmark for future iterations of the survey.

Login screen:
The heat map in Figure 40 shows that the login ID fields generated the most fixations. On the entire screen, the mean fixation count is 67.43 with a range from 3 to 176. The total fixation duration is 12.2 seconds with a range of 0.70 to 20.4. Very few of the seven participants looked at the Warning message at the bottom of the screen. However, much of that screen was below the fold (meaning participants would have to scroll to see it.)

Figure 39: Login screen

Figure 40: Heat map of login screen (n=7)
Privacy Act screen:
The heat map in Figure 41 shows the privacy act screen. The red area, indicating more fixations, occurred because of the typographical error where the word “or” was instead printed with a space between the “o” and the “r” as shown in Figure 42.

Figure 41: Heat map of Privacy Act screen (n=7)

Figure 42: Blow up of the heat map with the red area and then that same area without the heat map, showing that the "o r" generated additional fixations.
PIN screen:
The heat map in Figure 43 shows fixations on the PIN and on the verification question. On the entire screen, the mean number of fixations was 49 with a standard deviation of 24 and a range of 7 to 76. The mean total fixation duration is 9.27 seconds with a standard deviation of 5.1 seconds and a range of .57 seconds to 15 seconds.

Filter screen for survey:
This screen was answered incorrectly by a few participants. The heat map in Figure 45 shows fixations throughout the question. On the entire screen, the mean number of fixations was 48.7 with a range of 4 to 112 and the average fixation duration was 8.57 seconds with a range of 0.48 to 19.4.
Attachment D: Selected NSSRN screens for eye tracking

Figure 45: Heat map of filter screen for survey (n=7)

Figure 46: Filter screen for survey
**Prior health-related jobs**
Several participants commented that there were few if any difference between the first two response choices and the heat map in Figure 47 shows concentration of fixations on those choices. The mean number of fixations on the screen was 84.1 with a range of 18 to 249. The mean fixation duration was 15.03 seconds with a range of 1.07 to 50.80.

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**Figure 47: Heat map of health-related employment prior to first RN degree (n=7)**

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**Figure 48: Health-related employment prior to first RN degree question**
Number of hours at work
There were problems with the design and wording of the second part of the number of hours at work question. Several participants understood that they should enter their salary rate, and not the number of hours. The heat map in Figure 49 shows concentration of fixations on the wording and section of the screen. The mean number of fixations on the screen was 133.1 with a range of 45 to 267. The mean fixation duration was 19.6 with a range of 4.8 to 38.2.

Figure 49: Heat map of number of hours worked question (n=7)

Emphasis at work
There were no cognitive or usability problems with the design and wording of this question; however, using dropdowns for fewer than seven choices is not typically recommended. Other surveys have used an item-by-item design for mobile or a grid on PC for the same type of question. The heat map in Figure 51 shows concentration of fixations on the wording and section of the screen. The mean number of...
fixations on the screen was 54.4 with a range of 9 to 164. The mean fixation duration was 8.9 seconds with a range of 1.0 to 32.5.
Financing the registered nurse degree
Several participants wanted a category for parent-financed and the heat map in Figure 53 shows fixations throughout the response choices on the screen. The mean number of fixations on the screen was 83 with a range of 19 to 152. The mean fixation duration was 14.2 seconds with a range of 1.9 seconds to 29.4 seconds.
Attachment D: Selected NSSRN screens for eye tracking
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