# Impact of Menu Sequencing on Internet-Based Educational Module Selection

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## *Abstract*

*Patterns of Internet-based menu item selection can occur for a number of reasons, many of which may not be based on interest in topic. It then becomes important to ensure menu order is devised in a way that ensures the greatest accuracy in matching user need with selection. This study examined the impact of menu rotation on the selection of Internet-based parent-child feeding behavior education and behavior change modules by participants in the Women, Infants and Children (WIC) program across seven states. Five modules were rotated over a course of 4 weeks, each having the opportunity to be listed in all positions in the menu sequence, resulting in a significant ($p<.01$) difference in module access. Modules listed in first and second position observed greater access than the other modules, with the exception of the module "make meals and snacks simple," which retained consistent access trends regardless of position. Overall, modules in the first two positions observed the greatest access, regardless of module title. This study provides evidence of the importance for website developers to consider menu design when developing Internet-based health promotion programming.*

**Key Words**: *Internet, Health Promotion, Nutrition Education*

## Introduction

It has been estimated that 2 out of 3 Americans have access to the Internet, with over 88% of those being at home.[1-3] The majority of these Internet users seek health information.[4] Among lower income populations access to the Internet has also been found to be relatively high.[5-7] However, the Internet is not without limitations. It has been identified that barriers that impact user ability to navigate the selection of health related information do exist. Limited literacy, language differences, cultural differences, lack of understanding of the information, and difficult searching processes impact user ability to access Internet-based health information.[4, 8-9]

The evolution of a menu-based approach for accessing information has expanded the ability to expose users to a broader base of information. Inherent within the Internet, menu pages typically consist of a list of links that allow users to access information categorized by topic, content, behavior, or a host of other classifications. All users need to do is simply click on a listed item to access subsequent web pages. Earlier research on menu-driven approaches has found the organization of items within menus based on alphabetizing or frequency of access has been commonly applied, especially if the search for information is knowledge driven rather than random.[10-12] A potentially better menu approach utilizes categorization, where information is clustered into meaningful groups.[10] This latter approach is commonly used in presenting information via health-related web pages.

Most early interface menus were full-screen with numbered items, whereas modern menus are usually pull-downs, check boxes, or embedded Internet links, all of which are selectable by mouse clicks.[13] When the menu items are written succinctly and in a manner familiar to the user and organized in an appropriate structure and sequence, users can select an item easily and accurately. Once items in a menu have been chosen, the intervention developer is still confronted with the choice of presentation sequence. If the items have a natural sequence- such as days of the week, chapters in a book, or sizes of eggs- then the decision is trivial. Typical basis for sequencing items include chronological ordering, numeric ordering (ascending or descending), and physical ordering (e.g., by size or weight). If no task-related ordering exists, the developer must choose alternatives including alphabetical ordering, related group ordering, frequency of use, and overall importance of the information provided by each of the modules offered. This last one is difficult to determine among users without an understanding of the underlying population. Population based determination of module importance based on need for behavior change may be a method for ordering the module selection menu.

If frequency of use is a potential guide to sequencing menu items, then it might make sense to vary the sequence adaptively to reflect the current pattern of use. Unfortunately, adaptations can be disruptive, increasing confusion and undermining the users' learning of menu structures. In addition, users might become anxious that other changes might occur at any moment. Evidence against the utility of such changes was found in a study in which a menu of food items was re-sequenced to ensure that the most frequently selected items migrated toward the top.[14] Users were clearly unsettled by the changing menus, and their performance was better with static menus. However, it is not the intent of this paper to compare and contrast computer design modalities or to explore barriers to Internet access. Rather, this paper reports the impact of menu rotation on menu selection associated with wichealth.org, an Internet-based parent-child feeding behavior change intervention.

The website, wichealth.org, is a theoretically driven behavior change intervention based on the eHealth Behavior Management Model.[6] Pertinent to wichealth.org are a number of modules that address parent-child feeding behaviors associated with clients enrolled in the Women, Infants and Children (WIC) program. At the time of this study, five specific modules existed, each addressing a particular behavior commonly found as a need among WIC populations. To date, over 100,000 wichealth.org module completions have occurred, representing WIC clients across seven states.

Interactive website design, as demonstrated by wichealth.org, attempts to simulate an experience for the user consistent with a face-to-face discussion with an individual having specific expertise or information of interest and benefit to the user. Users accessing the wichealth.org site are presented with a choice, via a menu, of the type of healthy child feeding modules about which they are interested or feel they need to know more. After this choice is made, an interaction is initiated that will collect information from the user in order to tailor subsequent questions and educational messages provided. This choice, however, is an essential step toward the user accessing the information they need and want. An interface that allows the user to make choices that are

not confounded by the design itself requires careful and thoughtful development. In contrast, poor menu organization and approach can result in users not receiving what is needed most for impacting learning and, ultimately, behavior change.

## Methods

The target population for this study consisted of WIC clients from seven states (IL, IN, MI, MN, OH, WA, WI) who completed a wichealth.org module during a 5-week period. Participating subjects self-selected to complete a wichealth.org module as a means of meeting secondary contact requirements associated with the WIC program. User submission of an online survey at the end of the session was used to record module accessed. Data collection protocols using wichealth.org have been approved for use by the Western Michigan University human subjects institution review board. Online informed consent is available prior to completion of the online survey.

Five wichealth.org modules were made available to clients. These were initially ordered in the menu design sequence associated with the original website design, and included "Make Meals & Snacks Simple" (MS), "Secrets for Feeding Picky Eaters" (PE), "Create Good Eating Habits in Your Child" (GH), "Help Your Child Make Good Eating Choices" (GC), and "Trust Your Child to Eat Enough" (TC) (see Figure 1).

Based on 6,844 sessions completed over a 3-month period prior to this study, the modules with the most access were MS (28.7%) and PE (16.6%), which also had always been the 1st and 2nd module options in the initial menu sequence. This finding raised questions whether these modules were being selected by users due to their perceived need or the position of the module on the menu. To answer this, module menu order was rotated at the beginning of each of 4 weeks, with the module previously listed in last position being rotated to first position and all other module positions moving down one position in menu order. For example, the first rotation resulted in module TC (previously listed last) being listed first with all other modules moving down one position in menu order. This process continued until all five module titles had the opportunity to be listed in the first position of the menu sequence. Menu rotation frequency counts were analyzed using Chi-square to determine significant differences in module access based on sequence position.

## Results

Table 1 presents the subsequent menu rotations that occurred over the 4 weeks following the baseline observation. Nearly 9,000 (n=8,984) user module accesses occurred, with the majority (n=6,844) collected over an 8-month period serving as the baseline for this study. Frequency counts observed for each module and menu sequence implemented were strongly significantly different ($p<.01$) depending on sequence position. For instance, the first rotation elevated TC to the first position in the menu sequence where it received 35.6% of all module accesses. The second week found the menu rotation of module GC to first position in the menu sequence resulted in GC also becoming the most accessed module for the week (30%), whereas TC, which was previously the most accessed module (and had been moved to second position in the menu sequence), observed a dramatic reduction in access (18.7%). All modules experienced their greatest likelihood of being accessed when they were located in the first position on the menu. In addition, the second most frequent access of each module occurred when it was listed in the second menu position. When modules were moved to either the 3rd, 4th or 5th positions, their frequency of access was diminished. An exception occurred with module MS, where the data clearly indicated it was unaffected by menu position, demonstrating it is likely perceived as useful or able to fulfill a need for a broad set of the user population. Table 2 further evidences the impact of menu rotation, depicting the greatest selection occurred when modules were positioned first or second, regardless of module title.

## Discussion

The impact of linear or sequential top-to-bottom menus was found to be strongly significant among the population of WIC clients using wichealth.org. This may be due to a variety of reasons such as low interest level, past practice of accessing material in sequential order, low reading ability, or identification with the module name presented on the menu. Low interest may have caused users to select the first menu item because it was fastest and they were most interested in just completing the intervention. Access by sequential ordering could be due to a habit associated with selecting items beginning at the top of a list rather than first considering title or content. Low reading ability would inhibit individuals from understanding what the topics are about and thus defaulting to the first one available at the top of the menu. Finally, the wording of the module titles on the

menu may have affected how the users identify with the topic making more or less likely they selected a particular module. No known external factors or events that may have influenced module selection occurred during the 9-month period, further strengthening findings.

Three potential solutions might impact user menu selection. First, low reading ability and the effect of sequential menu ordering may be impacted by using relational images or icons that serve as effective illustrative metaphors for the content provided by the module. A module entitled "Trusting your child to eat enough" may not convey to the user the same information as an image of a child sitting in front of a half eaten plate of food. Visualizing the issue may allow users to connect more with the material presented within the module, thus making it more likely they will select it. This strategy has since been implemented within the wichealth.org project. Inclusion of additional modules, icon images, and tag lines pertaining to description of the module and previous user comments have also been added to wichealth.org. Although no formal analysis of this impact has been conducted, observed frequency counts of access has found a more consistent and even distribution of access across all modules, regardless of position.[15] Second, more programming could be developed to provide users with screening questions rather than a menu in order to tailor the appropriate module to the user given their interests and needs. Thus, just as the content within each module is tailored to the user's stage of change concerning the particular child feeding behavior, the topic to be covered would also be tailored to the user based on current behaviors, needs, and interest in the content to be provided. Finally, implementation of a non-linear menu design, such as a matrix or grid type menu or a circular format, would present the modules in a less sequential manner.

As with any study, limitations may have impacted findings. In particular, process and impact evaluations of wichealth.org as a method for influencing parent-child feeding behaviors have consistently found WIC clients most likely to use wichealth.org as a form of secondary contact are those who are on the more active end of the stages of readiness to change (maintenance, action, preparation) rather than those more resistant to change (contemplation, precontemplation).[15] It would seem that those more actively involved in the behavior change process would be more likely to seek out specific skills and thus be less dependent on menu positioning, although that was not necessarily observed here. As such, it is not possible to generalize these results to all WIC clients, as equal representation with regard to stages of readiness to change was not observed. Similarly, users who accessed wichealth.org may have been more literate with regard to computer usage than other WIC populations, especially since it has been previously found that 83% of all wichealth.org users have easy access to the Internet through either home, work, or a parent's of friend's home.[15] Being familiar with computer and Internet navigation may have prompted users to simply "click before reading." Most Internet-based health information is displayed as a list, with no weight associated with sequencing of information. Simply selecting the first item on the list may be a process followed by some Internet users. Further study would be necessary to determine whether this assertion is correct.

Other limitations may be associated with difference in perceived behavioral needs or in clarity of module titles, especially with regard to the module MS. An assessment conducted in 2002 with nearly 2,500 clients and WIC personnel clearly identified MS as being the parent-child feeding behavior with the greatest need for and interest among WIC clients.[5] This high need and interest may have accounted for some of the reasons why access of this module did not change based on menu position. This access phenomenon may also be caused by simplicity of the MS module title in comparison to the other modules. At first glance clients may have an easier understanding of what might be contained within a module associated with "make meals and snacks simple" rather than the one pertaining to "create good eating habits in your child."

Findings associated with this study are important in a number of ways. First, a need exists for better consideration of how menu items are positioned for Internet-based selection, especially among WIC clients accessing the Internet for education and behavior change processes. Developers of web-based interventions should experiment with menu ordering, pilot testing each approach with target populations to identify the menu display least likely to be influenced by menu positioning. Second, this study provides support for how clients may be likely to interact with Internet-based public health interventions, especially those containing a variety of separate behavior and topic-oriented interventions. Third, rotation of menu topics might be a viable process for ensuring over time that equal opportunity is given to a variety of topics. Random and dynamic menu rotation would further reduce the impact of menu sequencing based on an elapsed period of time (such as was used in this study). Fourth, this study provides the impetus for

developers to consider use of images, icons, questioning, and other mechanisms for further identifying the content within a text-based menu choice. Finally, it is recommended that similar studies be conducted on other existing health-related Internet interventions. A variety of menu rotation techniques and strategies should be explored and shared among other web developers.

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**Table 1.** Module selection associated with rotated menu sequences.

| | Module | | | | |
|---|---|---|---|---|---|
| **Menu Sequence Pattern** | **MS** | **TC** | **GC** | **GH** | **PE** |
| **1 (n=6844)** | (1) 28.7 | (5) 16.6 | (4) 10.2 | (3) 16.1 | (2) 28.5 |
| **2 (n=506)** | (2) 27.7 | (1) 35.6 | (5) 11.7 | (4) 13.4 | (3) 11.7 |
| **3 (n=487)** | (3) 26.3 | (2) 18.7 | (1) 30.0 | (5) 14.0 | (4) 11.1 |
| **4 (n=494)** | (4) 23.1 | (3) 16.8 | (2) 12.4 | (1) 31.2 | (5) 16.6 |
| **5 (n=653)** | (5) 25.4 | (4) 16.4 | (3) 10.7 | (2) 18.8 | (1) 28.6 |
| **Total Count** | **2,509** | **1,595** | **1,032** | **1,514** | **2,334** |
| **Total %** | **27.9** | **17.8** | **11.5** | **16.9** | **26.0** |

Note: Position of module for each menu sequence pattern is indicated in parentheses above each percentage value.

**Table 2.** Module selection based on menu position.

| Menu Position | Count | % |
|---|---|---|
| **1** | 2,628 | 29.3 |
| **2** | 2,367 | 26.3 |
| **3** | 1,441 | 16.0 |
| **4** | 1,039 | 11.6 |
| **5** | 1,509 | 16.8 |
| **Total Count** | **8,984** | **100.0** |

**Figure 1.** wichealth.org initial menu sequence.