Internet search approaches: The influence of age, search goals, and experience

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Abstract

This study analyzed observations and interviews of 31 participants, who were divided into six age groups, to understand the influence of end-user goals and experience on Internet search approaches. Users who lacked experience approached the Internet similarly no matter what the age group. Children and older adults were more likely to lack online search experience than other users. In addition, children and older adults were more homogeneous than other users in that they had a narrow range of situational goals, whereas users in other groups had a wide range of situational goals. The study has implications for user services and research in end-user searching. An understanding of the influence of age, experience, and goals on Internet search patterns might guide how, how much, and in what format information should be presented in the future. Knowledge gained from this study can also form the basis of hypotheses for larger studies.

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1. Introduction

The public library is one of the most popular venues in which to access the World Wide Web among people who lack access at home or school (McConnaughey, Everette, Reynolds, & Lader, 1999). People of diverse age and socioeconomic, educational, and ethnic backgrounds attempt to carry out a wide variety of tasks in the public library, including looking for a job, getting tax information, and finding “good” books to read. Many of them look to the Internet to accomplish these or any number of other goals.

Internet searching in a public library, however, is not well understood, so the likelihood of duplicating the problems experienced on older library technology is great. Reports have shown that, on older systems, end-users relied on system defaults, did not understand what was happening with terms, and had problems with term generation, spelling, and syntax.
Early studies of Internet use have reported that users do not take advantage of advanced features, miss relevant hits, or retrieve numerous irrelevant hits because of query structure, misspellings, and term generation (Bilal, 2000; Fidel et al., 1999; Hirsh, 1999; Pejtersen & Fidel, 1998). Studies like these demonstrate the necessity for understanding the influence of goals and experience on Internet searching. Yet, few studies have explored these elements in the context of age groups. A concentration on various age groups in a single study provides a means to probe use patterns that may not be discernible in studies with differing methodologies, sampling procedures, and settings. This article uses data collected from a 2000 study of 31 public library users from various age groups (Slone, 2002). The study explored user behaviors in a Web environment, with special attention to Web-based online catalog use. The purpose was to determine the influence of goals and mental models on information seeking on the Web. The question guiding the current analysis is as follows: How do age, goals, and experience influence search approaches during Web and Web online catalog searching?

2. Literature review

Most studies that use age as a variable for examining searching behavior and search experience have focused on only one group (e.g., children or adults). Studies involving children have found that problems with spelling, grammar, and sentence structure abound (Large, Beheshti, & Breuleux, 1998; Sullivan, Norris, Peet, & Soloway, 2000). Bilal (2000) observed that children with experience using the Web were more successful than inexperienced children in finding needed information. Khan and Locatis (1998), on the other hand, found that experienced high school students could prioritize tasks better than novices, but their searches were not necessarily more successful or more accurate. Similarly, Lazonder, Biemans, and Wopereis (2000) observed that experienced fourth graders could locate Web sites better than inexperienced fourth graders, yet they were not better at browsing within Web sites to find information. Despite these findings, problems children and teens have on the Internet are often linked to lack of experience (Fidel et al., 1999; Hirsh, 1999; Large et al., 1998).

As studies of end-user Internet searching increase, it becomes more apparent that lack of experience yields similar behavior in users, no matter their age. As in studies of children and teens, adults with more search experience perform more effective searches and use more sophisticated strategies than those with less experience (Chen, Houston, Sewell, & Schatz, 1998; Hill & Hannafin, 1997; Palmquist & Kim, 2000). Pollock and Hockley (1997) found too that, while using the Internet, people in various age groups missed relevant information because they lacked the knowledge necessary to use appropriate terminology.

1 This term, used synonymously with Internet online catalog, Web catalog or Web online catalog, refers to a library online catalog that is accessible via the World Wide Web.
Even the oldest users are not immune. Adults older than 50 years have more problems associated with syntax and understanding search results than do younger users (Kelley & Charness, 1995). Sit (1998) concluded that many older adult users progress little beyond the novice stage. He ascribed this to spotty and inconsistent use of computers. Mead, Sit, Rogers, Rousseau, and Jamieson (2000) compared the behavior of novice younger adults (18–33 years) to that of older adults (61–80 years). The authors concluded that online databases were not as accessible to older adults as they were to younger adults. Older users made more syntax errors, had less understanding of Boolean logic, and used fewer advanced tools than did younger adults with similar experience.

Like experience, goals are major influences on searching behavior. Xie (2000) found that user behavior during a search depended on a hierarchical set of goals in which higher-level goals impact lower-level goals. High-level goals are very broad. They are what drive users to search. Kim and Little (1987) found that broad or situational goals, such as the need to find educational, job-related, or recreational information, were the reasons why people ended up at public libraries. According to Hert (1996), situational goals are rarely modified during interaction with an electronic system.

A user might set lower-level goals to interact with an electronic system. A lower-level goal related to the high-level goal of education, for example, might lead the user to search the Internet for a reference needed for a term paper. Lower-level goals might also apply to a specific intent of the user to get e-mail, check the news, search for jobs, pay bills, and shop. Such functions are becoming commonplace on the Internet (McConnaughey et al., 1999).

End-users also have goals for how information should look. They make decisions whether to wait for pictures to load, download text, print, memorize, and so forth based on whether the format of the information is relevant to their situational goals (He and Jacobsen, 1996; Fidel et al., 1999). Studies of children’s Internet searching behavior have determined that pictures are a major determinant of relevance (Hirsh, 1999; Sullivan et al., 2000).

3. Procedures

The current study took place at the Richard B. Harrison Library, a branch of the Wake County (Raleigh, North Carolina) public library system, in April and May of 2000. The branch had several computers that gave users access to the Internet and the library’s Web online catalog. The test computer was an Internet computer using Netscape.

The purpose of this study was to explore how age, goals, and experience influence search approaches during Web and Web online catalog searching. Given this focus, the researcher chose to conduct two audiotaped interviews with each participant and observe their online sessions. To observe more instances of Web online catalog use, the researcher approached participants who were attempting to use the library’s stand-alone online catalogs and asked them to take part in the study by doing their search on the Internet.

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2 This term refers to a vendor front-end online catalog that does not allow end-users access to the Internet.
Everyone who approached the stand-alone online catalogs during the specified times—weekdays, 9:30 am to 2 pm, and 3 pm to 9 pm, and Saturdays, 9:30 am to 12:00 noon—was asked to participate. The resulting participant pool consisted of seven children younger than 13 years, four participants aged 13 to 17 years, two people aged 18 to 25 years, seven people aged 26 to 35 years, eight people aged 36 to 45 years, and three people who were 46 years and older. The oldest person was 63 and the youngest was 7.

After permission was granted, short presearch interviews were conducted to gather background information about presearch assumptions, experience, and expectations (see Appendix). These interviews were followed by observations, during which the researcher recorded notes, such as user moves and comments and the number of different Web pages with distinct uniform resource locators (URLs). She gave no help or introduction, recorded only what participants did on their own and did not change the computer interface between participants. After each session, a unique number was assigned to each participant. The first participant, for instance, was assigned P1. The average time spent online for all participants was 19 minutes. The shortest session was 4 minutes, whereas the longest was 1 hour and 23 minutes. The median length per session was 15 minutes.

After observations, a second, lengthier interview, using an interview guide (see Appendix), was conducted. The guide offered focus and aided in understanding what participants did online, why they did it, and how they understood the interaction. Thus, questions depended on what happened during search sessions. The average interview session lasted a little more than 11 minutes, including pre- and postsession interviews. The shortest interview was 7 minutes, and the longest was 16 minutes.

After the data were gathered, the researcher wrote supplemental notes about the session for the first participant. This was repeated for all participants. Taped interviews were then transcribed and data sorted by participant number. A summary sheet was made for each participant. After this was completed, summary sheets, transcripts, and observations were indexed using QSR NUDIST (2000) data-indexing software. The data relating to the research questions were then coded.

Five initial approaches to Internet searching were determined using this procedure. They included (1) linking, (2) searching the Internet by URLs, (3) searching the Internet using search engines, (4) Internet online catalog searching, and (5) searching within a Web-site domain. Navigating from one Web page to another without typing was classified as linking. When a participant clicked in a search engine text box, typed a query, and hit “return,” he or she was classified as having done a search using a search engine. When participants typed text in a URL text box, Web online catalog box, or other domain text box and hit “return,” they were recorded as having done a URL search, a Web online catalog search, or a domain search, respectively.

When no new categories emerged, participants were grouped according to codes A, B, C, and D. Those who used only one approach were coded as A. Participants who used two approaches were coded as B. Codes C and D were used for participants who took three approaches or more than three, respectively. Codes were placed into a visual analysis device called the “spectrum” (Figure 1). The core of the spectrum is arranged into regions A, B, C, and D, corresponding to assigned codes. Participants are grouped within regions
according to similarities in use patterns. For example, if a participant took two approaches and used the Web online catalog and linking, they would be grouped within region B with others that used the same two approaches. Bullets represent the types of approaches users took.

The top layer of the spectrum represents age groups. Age-group categories were determined by first examining the ways in which most public libraries use age to define broad groups of users. In general, public libraries classify users into three main age categories: children, teenagers, and adults. Although definitions of these groups vary by library, the study sought to be true to these general classifications by dividing users into similar categories. Hence, children aged 7 to 12 years were placed in the under-13 group, and users in their early teens were placed in the 13- to 17-year age group. The adult group was divided into young adults (18–25 years), two middle adult groups (26–35 years, 36–45 years), and an older adult group (> 45 years). The result was a list of six groups. The top layer of the spectrum in Figure 1 represents these age groups and lists the codes for each group.

4. Results

4.1. Categorization of experience

To determine experience, the researcher asked participants about past Internet experiences. Codes were assigned based on whether participants had experience with the following: (1)
search engines, (2) browsing (surfing, or exploring the Internet without a pressing need to find anything specific), (3) e-mail, (4) URLs, (5) online catalogs in general, and (6) chat rooms and/or newsgroups. The researcher recorded the range of Internet experiences rather than the amount of experience with individual tools.

4.2. Experience

This section examines Internet experience in relation to age and approaches. People in regions C and D of the spectrum had experience with more Internet tools than people in the A and B regions. This finding is illustrated by the range of previous Internet experience shown in the top layer of the spectrum (Figure 2). Regions C and D are denser than regions A and B. In short, people with more Internet experience used more search approaches than people with less Internet experience.

4.2.1. Users younger than 13 years

Children younger than 13 years demonstrated several approaches that pointed to lack of experience. They were often confused by, or not aware of, menus, search engines, and other tools, and they accessed a limited number of Web pages. In addition, this group was one of only two groups that included participants who did all linking and participants who did no linking. Related to this linking behavior was the use of URLs, which often occurred in place

Fig. 2. Internet approaches in comparison with age group and experience.
of linking. Many children gravitated to URLs because the URL text box was more visible than other tools.

Most children were in the first two regions of the spectrum, which consisted of users with less Internet experience than users in regions C and D. Only two of the seven users younger than 13 years, P11 and P28, were experienced users. They demonstrated this sophistication by using a combination of approaches and advanced strategies. P11, for instance, used the Internet to find the meaning of an acronym so she could use the full spelling in a Web online catalog search.

4.2.2. Users aged 13 to 17 years

In general, the four participants in the teen group showed a greater degree of sophistication than the under-13 age group. They approached the Internet by using either the Web online catalog or, when this was not enough, search engines. This group included two of only three participants who used four or more approaches to Internet searching. This group is also notable in that all members had experience with e-mail, indicating that their prior experience with the Internet had not been limited to public library use.

4.2.3. Users aged 18 to 25 years

The two participants who were 18 to 25 years old used three different approaches to Internet searching. This finding indicates a fair amount of comfort with the Internet. One user had experience with five Internet tools prior to the study, whereas the other had no experience with Internet tools. The comfort level for the participant with no Internet experience stemmed from prior use of stand-alone catalogs. He described the Internet as “intuitive,” comparing it to a stand-alone library catalog.

4.2.4. Users aged 26 to 35 years

Linking and use of the Web online catalog were the approaches used most often by users aged 26 to 35 years. Unlike users in the less experienced groups, linking for these users was associated more with an assessment of the best approach to use rather than lack of knowledge of other methods. Although five of the seven participants in this group were in the least experienced regions of the spectrum, their searches were quick and efficient because of their familiarity with online catalogs, in general, and their use of the Web online catalog.

4.2.5. Users aged 36 to 45 years

Participants aged 36 to 45 years were rarely confused by common Internet tools, such as menus, search engines, or URLs, and did not choose the URL text box or linking as alternatives to more efficient, but less visible, approaches. Despite the fact that two users had no Internet experience, whereas another two had a great amount of experience, the group had more experience on average than all other groups except those in the group of 13- to 17-year-olds. As with users aged 25 to 35 years, familiarity with older online catalogs and the use of the Web online catalog played a role in making searching less complicated.
4.2.6. Users aged 46 to 64 years

This group consisted of only three people. Participants were more like users who were younger than 13 years than any other group. This was the only other group, besides children, with members who did no linking and members who did all linking. People who did not use linking used URLs on the Web. As stated previously, the use of URLs was also popular with children.

4.3. Categorization of goals

Three categories of goals were examined: broad and/or situational, specific, and format goals. Broad goals, the situations that drove users to search, strongly influenced other goals. These included educational, recreational, job-related, and personal-use goals (those which help people cope with the informational needs of daily life, i.e., medical needs, buying products, or finding people).

Users set specific goals for interaction with the Internet. On the Internet, they sought information they thought they needed to meet the situational goals. Specific goals included searches for historical and/or background information, known persons or organizations, current information, supplemental information, and fiction. Users set format goals for what they wanted the information to look like. Format-appearance goals included detailed text (e.g., dense text on a page, such as full-text articles), brief text (e.g., factoids, snippets, or captions), nontextual data (e.g., pictures, music, and games), and e-mail. Codes for all goal types are described in Figure 3.

In Figure 3, situational (broad) goals are represented in the layer above the “Age Groups” layer. They are letter coded to correspond to the first letter of the goal. Specific goals are superscript numerals with the situational goals, and format goals are in the top layer of the spectrum.

4.4. Goals

4.4.1. Users younger than 13 years

Situational and format goals defined users in the under-13 age group. Of the seven users in this group, six used the Internet for recreational purposes. This use was often influenced by the library needs of parents or routine after-school activities. Three children, for instance, were recruited on a night when their parents were at a meeting in the library’s meeting room. The children used the computers to entertain themselves during their wait. Another two were after-school users who frequented the library daily.

Adults seeking information to address a recreational goal had a particular topic or subject in which they were interested. Children, on the other hand, were not particularly interested in any one subject. When they could not find what they originally sought, they settled for something that was just as “interesting” to them. Specific goals associated with children were historical and/or background information and known persons or organizations.

Participants younger than 13 years sought all forms of nontextual data, including pictures, games, and music. P28, for example, made relevance judgments based on whether
a Web site provided the music she wanted to hear. Pictures, however, proved to be the most popular format for children. Children waited for graphics to load before moving on to another site, even when the pictures had nothing to do with what they were seeking initially. Brief text, usually in the form of captions, was also strongly favored. The heavy preference for nontextual data and brief text coincides with recreational use as the defining situational goal for this age group. Children were not inclined to read long passages online or to seek a book unless absolutely necessary, so searches for detailed text were not popular.

4.4.2. Users aged 13 to 17 years

Of the four users in this age group, two wanted to address recreational goals, whereas two wanted information for educational purposes. The participants who used the Internet for recreational purposes sought fiction books using the Web online catalog. Of the two who sought fiction, P19 in region B performed a simple Web online catalog search, which yielded
the necessary information. P8, however, performed a more complicated search using the Web online catalog in combination with a search engine. Eventually, she went back and forth between amazon.com and the Web online catalog to pinpoint the book needed. For P9 and P23, the search became complicated because they sought historical/background information to meet an educational goal. Both were driven by a need to find specific “answers” to questions rather than exploring various answers. Hence, both are in region D of the spectrum. They also had education-related time constraints, so were very motivated to find the information during their session. Although few users in the under-13 group sought detailed information, the opposite was true of users in the 13-to-17 age group. All sought detailed information. Pictures were welcomed, but users preferred them to be appropriate.

4.4.3. Users aged 18 to 25 years

This group, consisting of two people, was the first in which a participant sought job-related information. Unlike participants in the under-13 age group, who changed their topics depending on what they found, the recreational user in this group was motivated by curiosity. Determined to find an answer to his question, P7 was not inclined to settle for information that deviated from his goal. Rather, P7’s recreational goal eventually led to his seeking supplemental information in detailed format. In addition, he did not appear overly interested in pictures that did not pertain to his search. Whereas users in the 13-to-17 age group sought only historical/background information and fiction, neither user in the 18-to-25 age group sought this type of information.

4.4.4. Users aged 26 to 35 years

Participants between the ages of 26 and 35 years represented all four situational goal categories and all five specific goal categories. Of the seven users in this age group, two sought personal-use information. The only other groups seeking information for personal use were children and older adults. The choice of search approaches appeared to stem from specific goals. For example, P15 sought novels, so she used the Web online catalog and search engines. If she had been seeking a specific title, she might have used only the Web online catalog and quit; however, she wanted to explore many novels before making a selection. P3, on the other hand, was less willing to explore alternative topics in her search for supplemental information, so she used the URL text box to go directly to the Web online catalog.

The three educational users in this age group appear in region B of the spectrum. Two of the three used the online catalog as the major indirect source of information, whereas the third used a search engine. All three sought historical/background information, which is strongly associated with both educational goals and Web online catalog use. The most popular format category for users in this age group was detailed text. The search for educational information appeared to be the motivating force behind the need for detailed text.

4.4.5. Users aged 36 to 45 years

Situational goals for this age group spanned three categories: recreational, educational, and job-related. Those who had educational goals sought book information. Thus, the Web online
catalog was a popular starting point. Among educational users, in general, the Web online catalog was consulted before a Web search was conducted. Eventually, both P21 and P29 used amazon.com in conjunction with an online catalog search to narrow or refine their topics. People seeking job-related information preferred search engines.

Unlike users in the under-13 age range, users in this group had varied specific goals. Furthermore, all specific goal and format goal categories were associated with this group. Four people sought historical/background information. Of the four, three used the information to address an educational goal. Two people sought supplemental information for recreational and job-related purposes. Detailed text was the most preferred format. Of the two participants who used e-mail, one was in this group, whereas the other was in the 46-to-64 age group.

4.4.6. Users aged 46 to 64 years

This group consisted of three people spread over regions A, B, and C of the spectrum. The fact that this group represented two of only five people who sought personal-use information was notable given that there were only three users in this age group. This was a very small sampling, however.

Users between the ages of 46 and 64 years showed sharp similarities and differences compared with users in the under-13 age group. In contrast to users younger than 13 years, this group did not include recreational users, and no one from this group sought nontextual data. Similarities between the two groups included heavy use of URLs and a very strong association with one situational goal. For children, the strong association was with recreational goals, and for older people, the strong association was with personal-use goals.

Other characteristics also defined users in the 46-to-64 age range. None used the online catalog, preferring instead to use URLs, linking, or search engines. Three specific goals were associated with users in this age group: historical/background, known item, and current information searches. Searches for known items and current information were associated with personal goals, whereas historical/background information was associated with job-related goals. This group was one of only two that sought e-mail messages.

5. Limitations

A purposive sample limited to a small number of public library users at preselected times was used for this study. Thus, results must be generalized with great caution to a larger group or different setting.

In addition, observations were obtrusive and affected the natural flow of activity. The practice of asking participants to use a different system from the one they had intended to use affected how they searched. This might have changed their assumptions of what was necessary to complete the search.

Open-ended interview questions were designed to solicit answers based on each participant’s interpretation of his or her own situation. The interviews also allowed participants to
answer the same questions in many different ways. Hence, responses to some questions were
dissimilar from one user to the next.

6. Discussion

Children and older adults, often the least experienced users, used similar search
approaches. For example, they linked heavily or not at all and gravitated to URLs
because the URL text box was more visible than, say, search engines. Search engines
have been found to be too complex for inexperienced Internet users (Pollock & Hockley,
1997). Slone (2002) found that participants who used URLs and did no linking or all
linking had poor mental models of the Internet. It is not clear why children and older
adults were less experienced than other groups, but Sit (1998) posited the theory that
older adults do not have regular access to technology. More research is needed, however,
to understand the relationship between age and experience, particularly among older people
and children.

Additional research also can determine whether similar searching behaviors among these
groups point to other influences besides experience, such as situational goals. Recreational
goals, for instance, were strongly identified with children, whereas personal goals were
strongly identified with older adults. Opalinski (2001) noted the importance of personal
information to older adults. Both recreational and personal goals were found to be less
motivating than educational or job-related goals (Slone, 2002). Rather than speculate that
children and adults are more like each other than other groups, it might be more appropriate
to say that personal goals and recreational goals are very similar and that the similarities in
use by children and older adults reflect this. Would not both groups have a great deal in
common, however, for them to be so strongly identified with two such similar situa-
tional goals?

The most desired format category for users in the under-13 age group was nontextual
data. Children opted for short text and visually stimulating results. This finding supports
research by Hirsh (1999), who determined that pictures were a major determinant of
relevance for children. Sullivan et al. (2000) found that children tended to wait for an
entire picture to load before leaving a page. Similar behavior was seen in the current
study. The desire for pictures decreased with age. This finding may be related to human
developmental stages or life stages, which merit attention but are beyond the scope of
this article.

Another noteworthy phenomenon is homogeneity of user goals based on age group. There
appeared to be an ebb-and-flow effect with respect to homogeneity of situational goals. For
instance, children were more homogeneous in that all but one of them wanted information for
recreational purposes. The four users in the 13-to-17 age group were only slightly more
homogeneous. They could be evenly split into two separate groups. The age groups of 18 to
25 years, 26 to 35 years, and 36 to 45 years could not be defined by one situational goal; one
cannot say that most users in each group wanted, for example, recreational or educational
information. Homogeneity increased sharply with adults older than 45 years. Personal goals
defined this group. More research might determine whether the notion of homogeneity will hold with a larger group and, what influences homogeneity and heterogeneity.

7. Conclusion

A public library represents an opportunity to examine the behavior of end-users with varying characteristics, goals, and experiences. In the current study, inexperienced users from a variety of age groups approached the Internet similarly. A lack of Internet experience, however, often led to quick abandonment of the Internet as an information source. Thus, people who do not understand the Internet often cannot truly access it. The fact that children and older adults were more likely to lack Internet experience than other users is revealing. It indicates that librarians and Web designers have a role to play in ensuring accessibility of the Internet across a wide range of ages and experience levels. Goals also played a role in how users of various ages searched. Situational goals, for instance, guided the entire search process. Some situational goals, however, are more motivating than others (Slone, 2002). When users who lacked experience and a highly motivating goal encountered problems, it was easier for them to give up than to persist. A better understanding of the influence of age, experience, and goals on Internet search patterns might guide how, how much, and in what format information should be presented in the future. Interfaces that incorporate this knowledge would take library and information science professionals a long way toward providing true Internet accessibility to a wide range of users.

Appendix: Sample interview guide

DATE: (day of week) (time) TIME: (begin) (end) PARTICIPANT #: ______

Section I. Presearch interview

1. What is your purpose for using the computer today?
2. What kind of information will you be searching for? What do you want the information to look like when you’re done?
3. With 1 being none or very little and 5 being a huge amount, how much information do you need? 
   1 2 3 4 5
4. With 1 being none or very little and 5 being a huge amount, how much information do you expect to find on the online catalog on the topic you are searching? 
   1 2 3 4 5
5. With 1 being none or very little and 5 being a huge amount, how much information do you expect to find on the Internet on the topic you are searching? 
   1 2 3 4 5
Section II. Postsearch interview

1. What did you like (or not like) about your session?
2. Can you describe the Internet to me?
3. Can you describe the online catalog to me?
4. Did you get lost or have difficulty finding a site you were searching for?
5. Why did you not search the Internet?
6. Why did you not search the online catalog?
7. Which of the following best describes your Internet use before today? I have used the Internet:
   - to check e-mail
   - to search using search engines
   - for chat or newsgroups
   - for browsing—exploring one or more sites
   - to access the library’s online catalog
   - other: ____________________________
   - I have never used the Internet before today
8. Why did you select (site[s])?
9. Why did you select (term[s]) to search?
10. Did your search of any other site give you some ideas about searching the online catalog?
11. Did your search of the online catalog give you some ideas about searching any other site?

Section III. Background information

1. Gender: F, M
2. What is your age range?
   - under 13
   - 13–17
   - 18–25
   - 26–35
   - 46–64
   - 65+
3. What is your highest level of education completed?
   - less than high school
   - high school
   - college courses or trade school
   - bachelor’s degree
   - some graduate courses taken
   - master’s degree or above
4. How would you describe your racial/ethnic background? ____________________________
References


