Developing and Using a Computer Self-Efficacy Scale for Adults

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The concept of *self-efficacy* (Bandura, 1986), used in its broadest sense, refers "to beliefs in one's capabilities to mobilize the motivation, cognitive resources and courses of action needed to meet situational demands" (Bandura & Wood, p. 260). Self-efficacy is not the same as actual knowledge of a task, and it is not self-esteem, which refers more to feelings of self-worth. Self-efficacy is situational and highly influences "people's "decisions, goals, their amount of effort in conducting a task, and the length of time they persevere through obstacles and difficulties" (Khorrami-Arani, 2001, p. 18). A useful definition for computer self-efficacy is "a judgment of one's capability to use a computer" (Compeau & Higgins, 1995). For this instrument, the term *adult* refers to one who is over the age of 21 and is no longer receiving instruction in high school. The general importance of learning basic computer technologies, and the influence one's own perceptions have over mastering computer-related skills, gives good justification for studying *computer self-efficacy* (CSE) in adults. The need for assisting older adults to build their self-confidence and thereby increase self-efficacy as they learn new tasks is well demonstrated (Chaffin & Harlowe, 2005). Czaja et al. (2006) believe that older adults who are unable or choose not to participate in computer technology are at risk of not being able to live independently and fully function in a democratic society. While the instrument is useful for all age groups, it is the older adult who is often the target of most interest.

Purposes and Uses for the Scale

The CSESA is designed to differentiate among adults in their perceptions of their computer skills and abilities across a wide age span, different perceived computer skill levels, gender, and ethnicity. It is most useful as a research tool, but it is also useful to evaluate introductory-level computer training programs in a variety of contexts (including academic, non-academic, work, or community centers) that provide adults with information and practice in learning about computer hardware, software, and the Internet. The CSESA would be useful as a pre-test and post-test for computer self-efficacy involving programs that train on all three domains. Literature (e.g., Czaja et al., 2006; Mayhorn, 1999; Morris, 1989; Chaffin & Harlowe, 2006) suggests that it is best to provide this training over a period of six to eight weeks, rather than a single session. This allows time for confidence-building, as well as a general improvement of skills and lowering of computer anxiety. The CSESA is particularly effective assessing older adults (those 60 years old or older) and those who perceive themselves as less skilled. In addition, it can be used in conjunction with other measures to provide a need assessment in anticipation of designing computer training programs for adult audiences.

Instrument Specifications

In the Computer Self-Efficacy Scale for Adults (CSESA), it is hypothesized that the construct of *total computer self-efficacy* (T_CSE) is composed equally of three components. These components reflect self-confidence regarding one's ability to acquire the necessary knowledge, skills, and abilities that are related to use of computer hardware (CSE_H), computer software (CSE_S), and computer Internet-related skills (CSE_I).

The CSESA is a questionnaire composed of 36 items in total. Within the scale, there are 12 items assigned to each of the three subscales representing the domains of hardware, software, and Internet computer skills. To make the questionnaire easier to answer, the scale is divided into three parts of 12 items each. The items are randomized so that domains are not presented in any particular sequence. A six-

point Likert scale, with response options ranging from completely disagree (least confident response, code level=1) to completely agree (most confident response, code level=6) was used to gather responses (see figure 2). Each item begins with the prompt, *I feel confident* …. In designing items for the CSESA, a range of skills from very basic to more advanced were selected for each of the skill categories in order insure sufficient variation in the design. At the same time, it was not desired to make the items too technical for an average adult. For example, in the CSE_H (hardware) subscale, examples of basic hardware skill items are: *I feel confident in saving or deleting information using a floppy disk* (item 7); and *I feel confident using a computer keyboard* (item 9). More advanced skills are probed in such items as: *I feel confident using the Universal Serial Bus (USB) port on a computer* (item 13), and *I feel confident setting up a new computer system right out of the box* (item 19). Software items in the CSE_S (software) subscale ranged from *I feel confident using a computer operating system (such as Windows or Apple;* item 2*)* to *I feel confident using antivirus software on a computer* (item 28). An example of a basic item on the CSE_I (Internet) subscale is *I feel confident knowing how to download files from the Internet* (item 3); an advanced item on this scale is *I feel confident in knowing how to manage cookies (small personal files) on the Internet* (item 20).

Code	1	2	3	(3.5)	4	5	6
Response	Completely disagree	Mostly disagree	Somewhat disagree		Somewhat agree	Mostly agree	Completely agree
Interpretation	*Least confident response*	. . .	. . .	*(Mid-point)*	. . .	. . .	*Most confident response*

Figure 1. Six-point response design for the CSESA and the response coding for each level.

Data Collection Methods and Results

Demographics

There were N=108 responses collected for the pilot survey of the CSESA. Of these, 49 responses were obtained using printed copies of the survey, while 59 were obtained online using Survey Monkey (http://www.surveymonkey.com). The population sample included adult and continuing education students over age 21, online students at universities in the Midwest and East, and students taking a computer basic skills course at a local library. Overall, the sample was primarily female (70%), between 40 and 60 years old (54%), highly educated (64% were graduate students or professionals), Caucasian (62%), and intermediate in self-assessed computer skills level (64%). It is recognized that many of the items on the CSESA scale are very basic computer skills. For this sample, the overall mean CSESA score was 5.15, or within the "mostly agree" category. This sample represented a population that expressed high confidence regarding most basic computer skills surveyed. In the pilot sample, those under age 21(N=2) and those over the age of 80 (N=2) were not represented sufficiently to generalize. However, the pattern demonstrated among the other age groups is not expected to change—that is, the youngest demographic is expected to be the most confident, and the oldest the least confident with respect to computer skills. Even with a high overall score on the CSESA for the pilot sample, however, significant differences did emerge among the age groups as well as the skill levels of the respondents.

Findings

The CSESA Instrument uses 36 items for the total scale; these are divided into 12 items each for the following subscales: hardware, software, and Internet. The desired mean response level for all responses

would be at the center of the design, which is 3.50 (three categories are below and three categories above this value). The pilot sample for the CSESA exhibited a mean (M) of 5.15, or within the "I mostly agree" category. While this particular result is substantially above the midpoint of the design (3.5), it would be expected that the general population would exhibit a mean closer to the design midpoint. In addition, there is a shift in computer confidence as the population sample gets older. For the three subscales, the overall means were as follows: hardware, 5.10; software, 5.12, and Internet, 5.23. This compares to a statistically significant ($F= 13.40$, $p= .007$) drop in self-efficacy as the age level rose from 21-39 years old ($M= 5.35$), to 40-59 years old ($M= 5.17$), and 60-79 years old ($M= 4.08$).

The results of one-way ANOVA of the overall mean score on the CSESA indicate a significant difference overall among the skill groups (low, intermediate, and high) for perceived computer self-efficacy. Higher skill-level groups have higher self-confidence in their abilities to master computer skills at all age levels ($F=17.31$, $p=.000$).

Validity and Reliability

Content Validity

The CSESA items were designed by the author and professionals who teach basic adult technologies (computer) courses. Items were created to reflect audiences that might include those who were self-taught and those who might have participated in computer training courses. The key purpose for using adult education teachers was to be sure that the level remained basic but that no key skill areas were missed in the items. Feedback was (1) keep the item as is; (2) delete the item; (3) change the way the item is stated. A second phase in validation, once the initial items were established, was to test the instrument using a few members of known expertise groups. One key indicator of content validity is the use of all categories as demonstrated in the pilot survey of the CSESA instrument. Although data from the pilot study ($N=108$) indicated an overall high mean CSE score for the three computer domain subscales (hardware= 5.08, software= 5.10, Internet=5.22), results also indicated that 87% of the responses used the entire range and/or one of the extremes of the scale. Usage of the extremes (and hence the full range) of the scale is likely to occur if the demographics sample appropriately across age, ethnicity, gender, and skill levels, as is intended.

Criterion Validity

Since a high computer self-efficacy score would imply high confidence regarding the ability to perform typical computer tasks, it would follow that these persons would also have higher motivation to complete a given sequence of courses designed to teach these skills. This might be useful in screening applicants or estimating completion rates for intended programs of study (for example, a seven-course sequence over a period of seven weeks). Prior knowledge of computer skills is well documented to increase computer self-efficacy.

The reliability and discrimination analysis for the CSESA Instrument indicates that it has a Chronbach alpha coefficient of $\alpha=0.969$. The three subscales exhibit alpha coefficients as follows: hardware, $\alpha =0.899$; software, $\alpha =0.930$; and Internet skills, $\alpha =0.926$. The corrected item-total correlation displays the degree of discrimination among the items of the subscales, as well as for the overall CSE scale itself. The average corrected item-total correlation is 0.700 for the CSE scale. It is desirable to have the subscales exhibit high correlation between items. Homogeneous subscale items should exhibit higher inter-item correlations than the overall scale. The Item-total correlations for the subscales and the related within-scale comparisons are: hardware, 0.653 (0.640 within subscale); software, 0.718 (0.712 within subscale), and hardware, 0.700 (0.715 within subscale).

Construct Validity

Computer self-efficacy (CSE) is very well studied and there have been many instruments developed for this purpose. The oldest reference in literature is Murphy's (1989) CSE scale, which measures CSE using subscales of hardware, software, and mainframe skills. The relevance of mainframe experience in current computer environments is probably questionable; however, the CSE SA should have a high positive overall correlation with the Murphy (1989) instrument and any other instruments constructed for computer efficacy. Several other constructs are often considered along with CSE. These include *computer anxiety, computer attitudes, and Internet attitudes.* Computer anxiety refers to an emotional fear of using a computer or even the possibility of using one; it includes fear of damaging the computer or looking foolish. Computer attitudes involve beliefs and feelings that are separate from one's emotional responses to the computer. Attitudes toward using the Internet is only being recently studied, but it is suggested that positive attitudes toward accessing the Internet and using the computer to accomplish web-related activities is positively related to overall computer self-efficacy. Instruments of this type include the Computer Anxiety Rating Scale (CARS; Heinssen et al., 1987; Siam, Othman, & Nordin, 2005) to measure computer anxiety. The instrument employs 19 items using a five-point Likert scale (1=strongly disagree to 5=strongly agree), with an anxiety scale rating of from 19 (low) to 95 (high). Persons who exhibit high levels of computer anxiety should have strong negative feelings about their abilities to deal with computers, so the CSESA scale would be negatively correlated with the CARS instrument. Two scales measuring computer attitudes (CAS; Loyd & Gressard, 1984) and Internet attitudes (IAS, Nickell & Pinto, 1986) combine computer anxiety, computer confidence, and computer liking to produce a single CSE score. The CSESA should have a large positive correlation to these two scales.

Finally, CSE should have no correlation to the more general (but unrelated) conceptual construct of self-esteem. One wouldn't expect a perception of an ability to acquire computer-related skills to be a predictor for one's perception of self-worth. A general measure of self-efficacy which is not specific to the computer might still be related to CSE, even though it does not tap a specific computer skills domain. Self-confidence in general may carry over to one's perceptions about the computer, so there should be some degree of positive correlation to this more general construct. However, *self-efficacy* itself deals with a much broader perception of abilities. There would be many other constructs that could be compared in this way (e.g., loneliness, depression, social affiliation, etc.).

Administration Guidelines

The 36 items that compose the CSESA should require about 20 minutes for a respondent to complete. There are four pages (parts) to the instrument; the first page collects demographics, while the last three collect the survey responses. The instrument should be produced in a readable font, such as Arial 12-point type. Unless the CSESA is to be scored electronically, it is not necessary to shade the circles for the responses; instead, subjects may mark legibly with an "X" or check within the circle. Before respondents begin taking the questionnaire, read the instructions for the survey. Be sure to indicate that it is a survey that has no right or wrong answers and that it is asking how they feel about the particular computer skills that are described.

Briefly review the wording of the items ("*I feel confident…*") followed by a specific six response options: I completely *agree*; I mostly *agree*; I somewhat *agree*; I somewhat *disagree*; I mostly *disagree*; I completely *disagree*. If this instrument is administered to an older adult population, it is important to point out that the responses shift from agreement to disagreement as one goes from left to right. To prevent confusion, the phrasing of the items and the positions of the responses do not change. It is important that all the items in the CSESA are answered. Remind the subjects to be sure to complete each item and to briefly check it to be sure they have completed every item before handing it in. Announce that

respondents may begin the questionnaire, remain available, and have a designated place to collect responses.

***Note*:** Please request a copy of the instrument if you wish to examine the individual items. In addition, this summary is taken from a more complete technical report on the CSESA. It is also available upon request.

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