Article

Hammill Institute on Disabilities

Career Development and Transition for Exceptional Individuals
2017, Vol. 40(4) 235–243

DOI: 10.1177/2165143416682476
cdtei.sagepub.com
SAGE

A Preliminary Psychometric Analysis of a Measure of Information Technology Literacy Skills

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Abstract

Information technology (IT) literacy skills are increasingly important for all adolescents to learn, as the majority of post-school pursuits will require at least some amount of computer skills. For adolescents with disabilities, this urgency is perhaps more pronounced, as this subpopulation typically experiences more dismal post-school outcomes than their peers without disabilities. The purpose of this study was to examine the psychometric properties of the *Envision Information Technology Literacy* (EITL) scale based on pretest and posttest responses of students with and without disabilities (N = 150). Findings show promising validity and reliability of the EITL scale. Implications for practice are discussed with regard to uses in high school career courses and as an age-appropriate transition assessment.

Keywords

career readiness, technology, transition, information technology literacy, age-appropriate transition assessment, psychometrics

In today's world, the Internet is quite possibly the main tool used by adults to search for employment opportunities. To search for jobs online, adults must recognize and use online communication tools, web browsers, and Internet portals and databases to find information, while simultaneously evaluating the credibility and quality of such information. Currently, there are no systematic processes and procedures for teaching adults or adolescents these skills. Moreover, computer skills are increasingly important for all high school graduates to have. Nearly all students will need to use technology in workplace settings to some extent in their adult life, regardless of their pursuit of employment or postsecondary education after high school (Partnership for 21st Century Learning, 2009; U.S. Bureau of Labor Statistics, 2004). Thus, computer skills, or information technology (IT) literacy, encompass important skills required for 21st-century learning; are considered part of the "T" in Science, Technology, Engineering, and Mathematics (STEM) initiatives; and may help students to be better prepared for college and careers. For these reasons, it is increasingly important to embed IT literacy into high school classrooms.

For adolescents with disabilities, post-school employment outcomes are more dismal than for their peers without disabilities (National Collaborative on Workforce and Disability for Youth, 2014; Sanford et al., 2011). It is arguably more critical to teach students with disabilities adequate IT literacy skills prior to entering their post-school adult life. To do so, it is important to develop effective, useful curricula and assessments for educators to implement as part of transition programming and services for students with disabilities. The purpose of this study was to explore the psychometric properties of a measure of IT literacy, the *Envision Information Technology Literacy* (EITL) scale. Potentially, if a valid and reliable measure of IT literacy is established, high school educators will more easily embed IT literacy into instruction for all students, with and without disabilities. Furthermore, secondary special educators may be able to measure IT literacy as part of the age-appropriate transition assessment process.

IT Literacy

The Partnership for 21st Century Learning (2009) considers information, media, and technology skills as crucial components of effective citizenship and employment. As such, IT literacy is essentially computer skills, or digital literacy,

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combining reading with efficient and effective searching skills (Coiro, 2012). Importantly, these are skills all high school graduates will need to have to be successful in the workplace or in postsecondary settings. Using employment projections data for 2014 to 2024, the U.S. Bureau of Labor Statistics (BLS; 2015) indicates that a rapidly increasing number of jobs will require some degree of technology skills, and the health care and technical fields are the fastest growing occupations. In fact, health care and mobile industries are increasing so dramatically that more software developers, support technicians, and systems analysts are needed, thereby contributing to a projected 22% increase in all computer occupations by 2020 (Thibodeau, 2012).

Although the number of jobs requiring IT literacy is increasing, the number of qualified workers to fill these positions is lacking, thereby creating a gap between the demand for, and supply of, skilled labor. The International Data Corporation projects that only 3 million qualified workers will be available to fill the 6 million jobs requiring IT skills by 2020 (Microsoft, 2013). Furthermore, some level of postsecondary education is required for entry into 11 of the 15 fastest growing occupations (BLS, 2015), and these occupations tend to yield higher income (Conceição, 2016) while workers who lack the cognitive skills needed to perform increasingly complex and technical work will experience a decrease in earnings and opportunities (Conceição, 2016; Levy & Murnane, 2006). Given students with disabilities already lag behind their peers without disabilities in employment outcomes, it is critical that educators ensure students with disabilities are included in efforts to embed IT literacy skills into high school coursework.

IT literacy is also important because students increasingly read online source materials (Drew, 2012; Kaiser Family Foundation, 2010). Reading comprehension strategies are needed to navigate the Internet, comprehend higher level text, discern between different types of online tools and media, and evaluate information credibility (Coiro, 2003; Drew, 2012; Leu, Kinzer, Coiro, & Cammack, 2004). Not only will students need these skills in high school classes, but they will undoubtedly use IT literacy skills in adult life. As such, promoting IT literacy skill development within school contexts is critical (Barone & Wright, 2008; Hutchison & Woodward, 2014; Northrop & Killeen, 2013; Vasinda & McLeod, 2011). Despite some promising findings on the benefits of IT literacy learning among adolescents with disabilities (Izzo, Yurick, Nagaraja, & Novak, 2010; Lombardi et al., in press), very little research has been conducted in this area.

More recently, digital or blended learning was prioritized in Title IV of the Every Student Succeeds Act (ESSA) of 2015. The Title states digital learning is "any instructional practice that effectively uses technology to strengthen a student's learning experience" (§7112), and subsequently lists tools such as digital learning content, access to online databases, use of data to personalize learning, online and computer-based assessments, and enhanced collaboration between users. The Title also defines "blended learning" as "a formal education program that leverages both technology and face-to-face instructional approaches" (§7112). With the recent prioritization of digital and blended learning for all students, it is particularly important to consider how students with disabilities have access to blended learning environments in which they can become more fluent in IT literacy. Although researchers have offered the possibilities of technology-embedded instruction (Fitzgerald, Koury, & Mitchem, 2008; Means, Toyama, Murphy, & Baki, 2013), efforts to extend this approach to secondary special education and transition services are sparse.

In sum, IT literacy offers much potential with regard to enhancing secondary transition services for students with disabilities and teaching critical technology skills needed for employment and postsecondary education. It is important to prioritize empirical research studies in IT literacy in secondary school settings for students with disabilities, particularly with regard to the recent definitions of digital and blended learning in the ESSA (2015) and the emphasis placed on STEM learning. To prioritize this research, effective and valid measures of IT literacy learning must be developed. As such, the purpose of this study was to investigate the psychometric properties (e.g., validity and reliability) of the EITL scale, a measure of Internet navigation skills, including the use of web-based portals and databases to conduct research, the evaluation of the quality of online information, and knowledge of technology tools within Microsoft Office products (e.g., Word, PowerPoint, Excel).

Method

Sample

The sample included secondary students with and without disabilities (N = 150) in Grades 10 to 12 across six high schools in Connecticut and Ohio. In the sample, 61% of the participants were male, 25% were Hispanic, 47% were eligible for free or reduced price lunch service, and 85% were in 12th grade. The majority of the sample (65%) consisted of students with learning disabilities (LD), other health impairment (OHI), and autism spectrum disorder (ASD). The remaining disability categories that together comprised 18% of the sample were emotional disturbance, intellectual disability, mobility impairment, speech and language disorder, chronic health condition, visual impairment, and hearing impairment. Finally, 17% of the sample was comprised of students without a documented disability. Table 1 shows the overall sample characteristics.

The current study was conducted within the context of a larger quasi-experimental study that focused on the impact of an online transition curriculum on IT literacy skills (for

Table 1. Sample Characteristics Represented as Percentages.

Characteristic	Comparison (n = 49)	Intervention (n = 101)	Overall (N = 150)
Gender			
Male	71.43	55.45	60.67
Female	28.57	44.55	39.33
Free/reduced price lunch			
Yes	42.00	51.00	46.50
No	57.00	49.00	53.50
Ethnicity			
Hispanic	26.53	24.75	25.33
Non-Hispanic	73.47	75.25	74.67
Disability			
No disability	2.04	23.76	16.67
Autism spectrum disorder	6.12	16.83	13.33
Visual impairment	2.04	1.98	2.00
Chronic health condition		2.97	2.00
Other health impairment	28.57	15.84	20.00
Hearing impairment		0.99	0.67
Intellectual disability	4.08	2.97	3.33
Learning disability	51.02	22.77	32.00
Mobility impairment		3.96	2.67
Emotional disturbance	6.12	4.95	5.33
Speech and language disorder		2.97	2.00
Grade			
10th	4.08	2.97	3.33
11th	2.04	16.83	12.00
12th	93.88	80.20	84.67

more details, see Lombardi et al., in press). Thus, the current sample included responses from students in the intervention group (e.g., students received the online curriculum) and responses from students in the comparison group (e.g., students received business-as-usual transition services that were not delivered via an online platform). Students enrolled or assigned to the participating teachers' courses or caseloads were automatically selected for participation in the study. Enrolled students were asked to consent to participate with parent notification or a consent letter, depending on their age (students age 18 or older were provided with a consent letter; students below age 18 were given a parental notification letter).

Measure

EITL scale. The EITL scale is an untimed 28-item multiple-choice test in which students must select the correct fact-based answer, and it maps onto three domains of IT literacy: (a) tools/mechanics of the Internet (e.g., how to access and use the Internet, how the Internet is organized), (b) research processes (e.g., how to properly cite sources, how to most effectively search the Internet for information), and (c) application to career research (e.g., how to search career databases). Previously, a pilot was conducted on the instrument using 40 subjects, and the EITL scale has been used in previous studies (Izzo et al., 2010). Pilot results yielded a Cronbach's alpha of .82 and an intraclass correlation coefficient (ICC) of .676. The psychometric properties of the EITL scale have not been rigorously examined; hence, this was the purpose of the current study.

The EITL scale was initially established as a curriculum-based measure of the online transition curriculum EnvisionIT (Izzo et al., 2010). At the time, Izzo and colleagues wished to assess student ability to effectively conduct online research and discern credible website information, and they were unable to find an existing measure with such a focus for high school students. The EITL scale was initially developed in 2002 by an Ohio State University (OSU) IT librarian, who used the scale in her online college-level course *Internet Tools and Research Techniques*. This course was designed to help OSU students learn how to effectively search the Internet, discern credible information, and evaluate websites. Ultimately, the course was designed to increase students' IT literacy skills. Subsequent iterations of the EITL scale were adapted to a high school population with a focus on applying learned IT literacy skills to online career research. The scale has undergone several iterative rounds of feedback and updates that have occurred simultaneously with the development and refinement of the curriculum. This iterative process occurred between 2003 and 2012 as part of a project funded by the Office of Special Education Programs with the U.S. Department of Education.

Analytic Approach

In this study, three approaches to item analyses were utilized in the following order: (a) classical test theory (CTT), (b) exploratory factor analysis (EFA), and (c) item response theory (IRT). Due to the fact that both pretest and posttest responses were available, there was a unique opportunity to determine whether items functioned in a similar fashion across time. Thus, a classical item analysis was conducted on the 28 items separately for the pretest and posttest responses using BILOG-MG 3 (Zimowski, Muraki, Mislevy, & Bock, 2003). These preliminary analyses were used to determine whether there was consensus between time points with regard to specific items that should be removed (i.e., these offending items are either unrelated or were negatively related to what was being measured). If consensus was reached, then the offending item(s) were removed prior to the next analytic step, which was the EFA.

Estimation. Using the remaining items, non-linear EFAs were executed using Mplus version 7.3 (Muthén & Muthén, 1998–2015) on the pretest and posttest responses from the intervention and comparison groups (N = 150). At each time point, one through four factor solutions were requested to ensure that dimensionality could be fully assessed, as there were related domains that make up the EnvisionIT curriculum. Therefore, an oblique approach was warranted (Preacher & MacCallum, 2003). To carry out these analyses and because data at hand were dichotomous in nature, the weighted least square mean and variance adjusted (WLSMV) estimation procedure was used instead of standard maximum likelihood (ML) estimation. This decision was critical because ML is not appropriate for a non-linear factor analysis (Schmitt, 2011).

Model fit. Multiple fit indices were used to assess model fit. These included the root mean square error of approximation (RMSEA; Steiger & Lind, 1980), the standardized root mean square residual (SRMR; Bentler, 1995)—from the absolute perspective; and the comparative fit index (CFI; Bentler, 1990) and the Tucker–Lewis index (TLI; Tucker & Lewis, 1973)—from the incremental perspective. For fit to be deemed acceptable, it is necessary for agreement to be reached between these two perspectives, where RMSEA and SRMR must be 0.08 or smaller, and the CFI and TLI must be 0.90 or larger (Hu & Bentler, 1999). Once fit has been established, it is necessary to ensure that the resulting factor structure is interpretable and makes theoretical sense. If this is accomplished, then an argument for construct validity can be made using this *variable-centered* methodology.

Factor extraction. To determine the correct number of factors to extract, we examined (a) model fit indices and (b) the resulting factor loading patterns to determine whether or not these patterns made theoretical sense. Once consensus was reached with regard to the number of factors to be extracted from the pretest and posttest responses, the resulting factor solutions were compared with one another. If items from either the pretest or posttest responses had a negative loading/discrimination or were 0.20 or smaller, then these items were removed to ensure that the resulting items functioned in a similar manner across time.

Application of IRT. Unlike other factor analytic methods, IRT assumes that the items on a given test are measuring one construct (e.g., IT literacy), which is known as the assumption of unidimensionality (De Ayala, 2013). Furthermore, IRT is unique in that it allows for the consideration of person and item parameters, unlike CTT; yet, sample size requirements are much greater than for EFA. The simplest IRT model is the one-parameter logistic model (1-PL), which estimates a unique difficulty parameter for each item. Difficulty is interpreted in IRT as the trait (ability) level required to have a 50% chance of answering the item correctly (in the form of a Z score); this is because both parameter estimates (person and item) have been placed on the same scale. In this model, it is assumed that each item is equally capable of discriminating between those who are high on ability (IT literacy) and those who are not. The two-parameter logistic model (2-PL) is an extension of the 1-PL model, which allows items to differ in terms of their discriminatory ability. These models are more complex and require a larger sample than what was available in the current study. Therefore, it was not feasible to use IRT for validity purposes due to the sample size at hand (De Ayala, 2013). As such, a 1-PL model was estimated with BILOG-MG (Zimowski et. al., 2003) and using response data from the intervention group at posttest, allowing for a deeper investigation into the relationship between the items with respect to their difficulties. Aside from estimating the 1-PL IRT model, a reliability analysis was executed using the same response data so that the percentage of total variance that was random in nature could be estimated.

Results

CTT

After subjecting the 28 operational items to a classical item analysis, results show agreement was reached among pretest and posttest responses with regard to removing a single item. The offending item (Q19: *Credibility is when lots of websites with similar information are linked to the website you are using for research*) had item-total correlations of −0.171 and −0.455 for the pretest and posttest, respectively. There were a handful of other problematic point-biserial correlations (Q7, Q17, Q20, and Q24) that contained either negative point-biserial estimates or estimates that were less than r = 0.10, offering the interpretation that these items were either inversely related or not related to the total score. As such, consensus was not met, and these four items along with the remaining 23 items were subjected to a set of non-linear EFAs. All resulting CTT estimates and their respective item stems are listed in the appendix.

EFA

Pretest. With regard to the pretest responses, a minimum of two factors were extracted for agreement between fit indices to be reached. The CFI and TLI indices were estimated to be 0.933 and 0.921, respectively, while the RMSEA was estimated to be 0.035 (90% confidence interval [CI] = [0.017, 0.049]), all of which point toward acceptable fit to the data. Upon investigating the two-factor pattern, simple structure was retained. The correlation between these factors was estimated to be 0.456.

Posttest. With regard to the posttest responses, findings show a two-factor solution was empirically sufficient with regard to the structure's representation of the data. The CFI and TLI were estimated to be 0.976 and 0.972, respectively, while the RMSEA was found to be 0.034 (90% CI = [0.015,

Table 2. EFA Solution Table.

	Preliminary		Operational	
	Pre	Post	Pre	Post
Item	λ	λ	λ	λ
Q3	0.558	0.795	0.542	0.794
Q4	0.504	0.669	0.478	0.666
Q5	0.631	0.537	0.574	0.546
Q6	0.322	0.784	0.318	0.785
Q7	0.169	−0.393	[a]	[a]
Q8	0.462	0.936	0.455	0.935
Q9	0.478	0.767	0.453	0.761
Q10	0.484	0.031	[a]	[a]
Q11	0.842	0.200	[a]	[a]
Q12	0.598	0.419	0.548	0.426
Q13	0.590	0.893	0.616	0.893
Q14	0.702	0.742	0.748	0.741
Q15	0.642	0.420	0.628	0.432
Q16	0.693	0.696	0.694	0.694
Q17	0.449	−0.116	[a]	[a]
Q18	0.641	0.844	0.641	0.847
Q19	[b]	[b]	[b]	[b]
Q20	0.241	−0.164	[a]	[a]
Q21	0.575	0.753	0.565	0.747
Q22	0.327	0.669	0.349	0.667
Q23	0.519	0.606	0.564	0.601
Q24	0.578	−0.082	[a]	[a]
Q25	0.316	0.498	0.335	0.496
Q26	0.549	0.117	[a]	[a]
Q27	0.285	0.657	0.297	0.651
Q28	0.477	0.823	0.532	0.822
Q29	0.719	0.761	0.680	0.765
Q30	0.642	0.897	0.669	0.900

Note. EFA = exploratory factor analysis; CTT = classical test theory. [a]Item removed due to lack of consensus across time and/or low factor loadings. [b]Discarded after CTT.

0.048]), all of which point toward acceptable fit. Although this two-factor solution showed good model fit, it did not provide simple structure. In fact, a total of nine significant cross-loadings were present and disagreed in terms of direction. For example, Q7 loaded onto the first factor at −0.412, yet loaded onto the second factor at 0.393. In light of these findings, it was determined that despite good model fit, a meaningful factor solution did not result. Therefore, the single-factor solution from both the pretest and posttest responses was determined the more optimal solution, and a total of seven items were removed. Table 2 shows the single-factor solutions for both pretest and posttest responses.

Final EFA. With the slimmed down, 20-item version of the EITL scale, another set of EFAs were run to determine how these items loaded onto IT literacy. With regard to the pretest responses, the model fit the data well: The CFI was 0.951, the TLI was 0.945, and the RMSEA was 0.034 (90% CI = [0.00, 0.052]). The posttest responses on these 20 items were also found to fit the data well, where the CFI and TLI were estimated to be 0.960 and 0.955, respectively, while the RMSEA was estimated to be 0.061 (90% CI = [0.046, 0.075]). The factor loadings are listed in Table 2.

Table 3. One-Parameter Item Response Theory Model.

Item	*b*	*SE*
Q8	−0.846	0.201
Q5	−0.803	0.153
Q3	−0.670	0.170
Q13	−0.545	0.188
Q18	−0.505	0.169
Q30	−0.505	0.181
Q9	−0.427	0.165
Q14	−0.427	0.154
Q15	−0.313	0.132
Q29	−0.312	0.165
Q4	−0.276	0.144
Q28	−0.275	0.159
Q6	−0.202	0.155
Q23	−0.095	0.131
Q16	−0.058	0.153
Q27	0.150	0.141
Q21	0.185	0.157
Q12	0.253	0.122
Q22	0.322	0.142
Q25	0.460	0.124

Note. Intervention group responses only; estimates sorted from easy to difficult.

IRT

Because the assumption of unidimensionality was tenable at both time points, we examined the operational EITL items at posttest within the IRT framework. Due to the omission of responses from the comparison group, a total of 101 responses were used in this analysis, which allowed for a deeper examination of the functionality of the EITL scale items for those who received the curriculum.

Table 3 shows the resulting item difficulties stemming from the 1-PL model. The mean difficulty across these 20 items was 0.244 with a standard deviation of 0.372. All items had a difficulty of at least −0.846 and were no larger than 0.460, indicating that the EITL scale gathers the most information near the population's mean ability. Results show the easiest item was Number 8 (Q8: $b = -0.846$, $SE = 0.201$; *Bookmarks or Favorites are a way that you can ____________ website pages so that you can get to them faster*), whereas the most difficult item was Number 25 (Q25: $b = 0.460$, $SE = 0.124$; ____________ ____________ *have human editors that evaluate,* *select, and organize websites into a hierarchy of categories*). The resulting −2 log likelihood was found to be 2099.4. It should be noted, however, this estimate of model fit can only be used in local situations and is not a global measure of fit.

Reliability. After the 1-PL model was estimated, a reliability analysis was executed using the same response data. Results were more than acceptable, with an alpha value of 0.915. Therefore, this 20-item version of the EITL scale at the posttest was highly consistent with one another. Notably, more than 90% of the variance is attributed to the intervention student responses, whereas less than 10% of the error is unaccounted for.

Discussion

The purpose of this study was to examine the psychometric properties of the EITL scale, a measure of IT literacy skills intended for adolescents with and without disabilities across various high school settings. IT literacy skills have become increasingly critical in more recent years due to the growing expectation that adults will use at least some amount of technology skills in the workplace and/or postsecondary settings (BLS, 2004; Partnership for 21st Century Skills, 2009). The EITL scale adequately measures students' knowledge of (a) tools/mechanics of the Internet (e.g., how to access and use the Internet, how the Internet is organized), (b) research processes (e.g., how to properly cite sources, how to most effectively search the Internet for information), and (c) application to career research (e.g., how to search career databases). Moreover, IT literacy skills have some overlap with Common Core State Standards in English/Language Arts, particularly with an emphasis on searching and evaluating the credibility of online sources (National Governors Association Center for Best Practices, Council of Chief State School Officers, 2010). The findings from this study further support earlier research (e.g., Izzo et al., 2010) that demonstrates preliminary validity of the measure and the importance of embedding IT literacy into curricula, instruction, and the Individualized Education Plan process via age-appropriate transition assessment. Overall, the findings from the current study build upon and extend the psychometric rigor of the EITL scale. Specifically, evidence of robust validity and reliability was found and lead to a more efficient 20-item measure.

Promising construct validity evidence of the EITL scale was found via the progression of the non-linear factor analyses—preliminary and operational. The benefit of using EFA was twofold: (a) this methodology possesses more statistical power than the IRT model needed (e.g., 2-PL, at a minimum), whose estimation is more cumbersome because item and person parameter estimates must be attained and placed on the same scale; (b) it allowed for time-invariance to be approximated via comparison of factor loadings across testing occasions. A thorough time-invariance investigation did not ensue, as it is necessary to first conduct the exploratory analysis, which also serves as a prerequisite to any validity study in which IRT is used per the assumption of unidimensionality. Therefore, this study accomplishes the first step required for validation: the variance structure (e.g., dimensionality) of the EITL scale has been explored, resulting in the operational EITL item set. An important next step to further validate the EITL is to confirm the one-factor structure with a new sample.

For the IRT and reliability analyses, responses from the comparison group were not used. It was reasonable to restrict the 1-PL model and the reliability analysis to posttest responses of the intervention group so that measurement error could be reduced. In other words, the error associated with not having experienced the intervention is not entered into the analysis, making way for the interpretation that less than 10% of the variance is due to random error. Because IRT models require more observations than EFA and CFA, the inclusion of the 49 comparison responses would not have had a large impact on the precision of item parameter estimates. In other words, the 1-PL model would be underpowered even if all responses had been used. Therefore, the resulting difficulty estimates and reliability show further evidence of psychometric rigor, and the resulting alpha value was well above adequate ($\alpha = .915$).

Limitations

While the results of the current study are promising, there are several limitations to consider in the interpretation of the findings. First, the non-linear factor analyses were underpowered, as there were only 150 responses available. However, despite the limited sample size, best practices were utilized. Specifically, the WLSMV estimator was used, which is the robust version of the weighted least squares estimation procedure. In addition, use of the WLSMV estimation procedure was valid, as factor extraction for EITL was not reached via chi-square difference tests, for which WLSMV should not be used (Schmitt, 2011); rather the authors relied on the global fit indices (e.g., CFI, TLI, and RMSEA). Second, the majority of the sample consisted of students with disabilities (83%). Potentially, the EITL may not function similarly across students with and without disabilities, and more research is needed to clarify. Specifically, invariance testing across students with and without disabilities is an important step in future research.

Future Directions for Research

As mentioned, this study provides the initial validation of the EITL scale, from which future studies can build on. Of great importance is to conduct a confirmatory study on the EITL variance structure. After confirmation of the EITL variance structure, an invariance study could be conducted to establish both time and group invariance, where the latter will speak directly toward the external validity of the EITL scale (Little, 2013) via a multiple-group confirmatory factor analysis. Moreover, it is possible to assess the scale's criterion validity by estimating correlations between itself and standardized reading measures (e.g., curriculum-based measures in reading comprehension). These efforts can be accomplished in a concurrent fashion, where responses on these standardized measures are correlated with EITL responses from the same test administration period.

Implications for Practice

IT literacy skills are important computer skills that include web browsing, discerning credible sources, and navigating databases related to post-school pursuits in employment and postsecondary education. IT literacy can be embedded into existing courses, such as English/Language Arts, as computer skills are tools that can help students with disabilities access content-area instruction. The EITL scale could potentially be used in various high school classroom settings including general education English/Language Arts, Career courses, and in the context of secondary special education. Furthermore, the EITL scale could be considered as an age-appropriate assessment that could be integrated into secondary special education and transition services.

The EITL scale offers general and special educators the opportunity to screen all high school students for IT literacy skills to determine who may need more intensive intervention. These efforts are best pursued in collaboration between general and special education teachers, school counselors, and other professionals who focus on career readiness. Depending on teacher preference, the EITL scale could be administered as a pencil-and-paper test or with any commercially available online survey program (e.g., Qualtrics). Scoring the EITL scale is quick and straightforward (e.g., count up the number correct of the multiple-choice items). The EITL scale could be used as a progress monitoring tool that informs individual student gaps in computer skills and prioritizes the instruction of skill deficits.

The EITL scale is recommended for use as a curriculum-based measure alongside the EnvisionIT online transition curriculum (Izzo et al., 2010; Lombardi et al., in press). The assessment and intervention can be used in tandem to teach critical technology and transition skills, monitor progress, and intensify supports as needed to adolescents with and without disabilities. Although the EITL scale is mapped to the EnvisionIT curriculum content, the scale does not necessarily have to accompany the curriculum. Even without the implementation of the curriculum, practitioners should consider using the EITL scale as an aid to prioritizing IT literacy learning and clarify potential ways it could be embedded into content-area instruction in English/Language Arts or Career elective courses. In addition, EITL scores may be used as a data source in efforts involving individualized learning plans for all students (Solberg, Phelps, Haakenson, Durham, & Timmons, 2012), and in the IEP process for students with disabilities (Yell, 2012). In some states (e.g., Connecticut), there are recent laws that mandate the creation of such plans, but little guidance on implementation has been offered. Ideally, assessment with the EITL could occur at the beginning of the senior year to facilitate better preparation to enter into employment and postsecondary education settings by the time of high school graduation.

Ultimately, IT literacy skills are relevant to a wide range of employment and postsecondary settings, and thus represent essential skills for adult life. Particularly, for students with disabilities, IT literacy has the potential to provide an opportunity to ameliorate employment and postsecondary education disparities with their peers without disabilities. It is therefore crucial that school counselors and teachers collaborate to embed IT literacy content into high school settings to better prepare students for graduation and beyond.

Appendix

Classical Item Analysis.

Item	Pretest		Posttest	
	Difficulty	Discrimination	Difficulty	Discrimination
Q3: What is the term for the unique address of a Web page that may be used to make hyperlinks?	0.613	0.512	0.707	0.679
Q4: Which one of these is an example of a complete URL?	0.640	0.467	0.633	0.501
Q5: In most Web browsers, which of these actions would actually work to close or open browser windows/tabs?	0.573	0.563	0.653	0.527
Q6: What shortcut keys could you use to copy and paste text?	0.433	0.314	0.547	0.718
Q7: The ________________________________ is the software that supports websites on the Internet.	0.567	0.14	0.647	−0.238
Q8: Bookmarks or Favorites are a way that you can ____________ website pages so that you can get to them faster.	0.867	0.378	0.713	0.855

(continued)

Appendix (continued)

Item	Pretest		Posttest	
	Difficulty	Discrimination	Difficulty	Discrimination
Q9: What is one way to make your PowerPoint presentation look professional?	0.653	0.446	0.62	0.652
Q10: What should you NOT do in a PowerPoint presentation?	0.620	0.422	0.707	0.28
Q11: If you open too many browser windows at one time, you might ________________________.	0.787	0.785	0.793	0.419
Q12: Which of the following is not one of the top three purposes websites have?	0.167	0.508	0.36	0.509
Q13: If a website is classified as a "commercial" site, what is the site's primary purpose?	0.613	0.526	0.627	0.821
Q14: If a website is classified as an "advocacy" site, what is the site's primary purpose?	0.473	0.634	0.58	0.746
Q15: What purpose are Reference websites designed to serve?	0.607	0.579	0.54	0.501
Q16: Which of the following options is the most reliable way to determine the purpose of a website?	0.507	0.604	0.547	0.644
Q17: Why is it important to use strategies to see if a website is credible?	0.393	0.394	0.433	0.067
Q18: What can you look for in a website to see if the information is credible?	0.527	0.583	0.613	0.823
Q19: ____________________________ credibility is when lots of websites with similar information are linked to the website you are using for research.	0.227	−0.171	0.347	−0.455
Q20: Which of the following statements demonstrates the best level of recognition for credibility?	0.467	0.202	0.6	0.056
Q21: How can you narrow your search or broaden your search on the Internet?	0.460	0.515	0.487	0.648
Q22: What are Search Operators?	0.387	0.293	0.433	0.551
Q23: A combination of search words and search operators is called a __ __________________________________.	0.527	0.431	0.533	0.435
Q24: You can use synonyms to get alternative results from your search words. What are synonyms?	0.453	0.484	0.567	0.096
Q25: ______________ _______________ have human editors that evaluate, select, and organize websites into a hierarchy of categories.	0.440	0.295	0.427	0.277
Q26: Yahoo! and Google also offer email, music, and map services. They are examples of ___________________.	0.160	0.453	0.347	0.229
Q27: How can you tell if a website is secure?	0.353	0.257	0.48	0.495
Q28: A large collection of information that is organized and stored on a computer is called a _________________________.	0.573	0.412	0.56	0.675
Q29: What is the rule to remember for using what you find on the Internet in your schoolwork or in a job?	0.513	0.681	0.587	0.724
Q30: The purpose of a database is to ____________ information into files, records, and fields to make searches easier and faster.	0.700	0.598	0.673	0.822

Note. Difficulty is interpreted as easiness. Items are multiple choice, and response options are not shown.

Acknowledgments

The authors wish to acknowledge Nancy O'Hanlon, Faculty Emeritus, Ohio State University Libraries, for her early work on the Envision Information Technology Literacy (EITL) scale.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: The EnvisionIT curriculum and related products were produced under the U.S. Department of Education (USDOE), Office of Special Education Programs Grants H327A020037, H327A050103, and H327S120022. The views expressed herein do not necessarily represent the positions or polices of the USDOE. No official endorsement by the USDOE of any product, commodity, service, or enterprise mentioned in this document is intended or should be inferred.

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