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# Creating a Novel School-Wide Assessment for Evaluating the Effective use of Information Technology Skills

**Cindy Robertson, Ph.D., Anca Doloc-Mihu, Ph.D., Mia Malloy, Ph.D., Jared White, Ph.D., Patrick Ludolph, Ph.D., Daniel Butler, M.A., Mark Iken, Ph.D., Thomas Lilly, Ph.D.**

**Author Note**

Cindy Robertson https://orcid.org/0009-0009-9041-3741
Anca Doloc-Mihu https://orcid.org/0000-0001-9960-5752
Mia Malloy https://orcid.org/0009-0006-4957-8913
Jared White https://orcid.org/0009-0005-9815-4546
Patrick Ludolph https://orcid.org/0000-0001-8047-6217
Daniel Butler https://orcid.org/0009-0001-6572-3571
Mark Iken https://orcid.org/0009-0009-5655-1163
Thomas Lilly https://orcid.org/0000-0001-5457-2838
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**Abstract:** At our college, we assess eight Integrated Educational Experience (IEE) Student Learning Outcomes to ensure its alumni are prepared for careers after graduation. IEE3 asks students to "demonstrate effective use of information technology." A small faculty cohort redesigned a college-wide assessment tool to align with the content being taught in our Introduction to Computing course. The content of the assessment includes a test of skills in computer hardware, system and application software, file management, networking, internet research, social media, ethics, security, emerging technologies, and mobile devices and is administered to over 60 course sections at the beginning and end of each semester. The pre/post results of our initial rollout semester were compared to determine learning gain and address deficiencies. The methodology used for the development of assessment is chronicled, and preliminary data are reported.

**Keywords:** *assessment, curriculum, pedagogy, information technology, digital literacy*

## Introduction

Over 20 years ago, Marc Prensky declared the arrival of the "digital natives." These were students who had grown up with access to technology that had fundamentally changed the way they learned and communicated (Prensky, 2001). Some of the criticism he has received has been unfair; most of his article was about how educators—digital immigrants—needed to adapt, not about the tech savvy of the younger generation.

Keith Nelms's study of those digital natives reiterated what much of the literature has found: students are not capable of using college-necessary technology, "nor are they particularly adept at assessing their own technological expertise" (Nelms, 2015). In other words, college students do not even know

what they do not know. Eric Bradlow, Stephen Hoch, and Wesley Hutchinson also found that self-assessments, with regard to information technology (IT) literacy were suspect (Bradlow et al., 2002). Nonetheless, many studies have continued to rely on self-assessment, which refers to a broad range of methods and strategies that enable students to assess and, when appropriate, evaluate the characteristics of their own learning experiences and outcomes (Panadero et al., 2016). Ravishankar and Zeitz (2024) used self-assessment to measure knowledge confidence and topic familiarity in a college-level object-oriented programming class. Margarida Lucas et al. used such self-assessment in developing a new instrument based on the European Digital Competence Framework (Lucas et al., 2021). Francisca Angélica Monroy García, Fatima Llamas Salguero, María Rosa Fernández-Sánchez, and José Luis Carrión del Campo used self-assessment via a 174-question Likert-scale survey to assess students' use of ICT knowledge and skills (García et al., 2022).However, as noted by the Nelms and Bradlow et al. studies, student self-assessment of their knowledge and abilities tend to differ from their performance on more objective measures in which students must answer questions or otherwise act out their competency. In a study of sixth-graders, Koen Aesaert, Joke Voogt, Els Kuiper, and Johan van Braak compared self-assessment and performance-based assessments and found that students tended to overstate their abilities, with the least capable overestimating themselves "more severely" (Aesaert et al., 2017).

These weaknesses in self-assessment highlight the need for objective, performance-based IT assessment, but there is little consensus on what shape that assessment should take. Indeed, scholars have found there is little agreement on which skills to assess or even what to call them (Bawden, 2001; Scolari, 2019; Sillat et al., 2021). In Sillat et al., (2021) a review of 40 published studies, they found that 30 were based on a "localized" framework, meaning that they were not part of a recognized international framework, though they may be based on one.

IT assessment at our college is certainly localized, but it was created following established methodology. Merry and Gary McDonald (1999) reported their progress in creating an assessment for their Computer Science program. This assessment involved creating Mastery, Familiarity, and Exposure topics was based on faculty input on students' expertise development. Bradlow et al., (2002) followed a similar process in developing an assessment, designing questions placed in "subdomains," such as terminology, file management, word processing, spreadsheets, databases, printing, email, internet, and information search.

At our college, assessment was ultimately developed based on a survey administered to faculty across campus to learn what kinds of IT skills they wanted students to learn and use in their courses. This survey information was then used to create a new curriculum for our general education Introduction to Computing course based on a collection of new subdomains. After redesigning the course, we used the new course content to create subdomains for our new assessment as well, some of which are similar to those in Bradlow et al. (2002). From here on, we will refer to those subdomains as topics. The assessment itself is designed to target those same college-level IT literacy skills that students have found to be lacking. Arguably, it makes the most sense to do this locally; students at our institute come from different demographic groups than, say, R1 universities. Because IT competency varies by

demographic groups, it makes the most sense to develop an assessment targeted to our students, even if it limits its value as a means of comparing across colleges (Warschauer et al., 2010).

# The Assessment Design

## Institution Description

Georgia Gwinnett College (GGC) is an open-access institution located in Lawrenceville, GA, with a population of more than 12,000 students. The student body is diverse, with students representing 33 U.S. states and 113 countries. Approximately 64% of students are enrolled full-time, while 36% are enrolled part-time. 40% of the student body is male and 60% is female. 40% are first-generation students, and 10% are considered non-traditional-aged students. The college's student population is ethnically diverse, with a significant representation of Black/African American (34%), Hispanic (29%), and White (20%) students (GGC Facts, 2024). GGC's diversity is also reflected in its designations as a Minority Serving Institution (MSI), Hispanic Serving Institution (HSI), and Asian American and Pacific Islander Serving Institution (AAPISI) (Georgia Gwinnett College, 2023).

## Course Description

The Introduction to Computing course is a general education introductory computing course taught by our Information Technology (IT) faculty that introduces students to computing concepts and productivity software. The course outcomes for this class can be found in Table 1.

Within the college's general education curriculum, Introduction to Computing holds a unique and critical position. An institution of the University System of Georgia (USG), our college's general education curriculum adheres to the seven-domain IMPACTS framework established by the USG. The first domain is an "Institution-specific" priority; our priority domain is information technology efficacy. Introduction to Computing is the only course at our college that fulfills this general education requirement and sets the tenor and orientation of the entire curriculum's assessment of one of our eight collegewide core curriculum integrated educational experiences learning outcomes, IEE3, "Demonstrate effective use of information technology." The course curriculum is intentionally designed to embed course, program, general education, and college core curriculum learning outcomes assessment. This course, therefore, sees massive semesterly enrollments - of the 12,000 students, approximately 13% (1,500 or more) take this course each semester.

The foundational computing content is taught using McGraw Hill's Connect (Connect, 2004) platform and the productivity software, in this case Microsoft Office, is taught using McGraw Hill's SIMnet (SIMnet, 2004) platform. The original design for the course had six Connect chapters: hardware, software, internet, networking, security, and emerging technologies. Each chapter requires students to complete an adaptive learning assignment, a quiz, and at least one active learning assignment. The SIMnet content includes four Microsoft units: Word, Excel, PowerPoint, and Access. For each MS Office application unit, there are four chapters and a cumulative test at the end of the unit. Each chapter includes an adaptive learning module (SIMpath) and a project.

## Redesign of the Course

Based on faculty feedback via the survey discussed above, the course was redesigned to include more practical and useful material. We broke down this material into 10 topics, which were mapped to our course learning outcomes, as shown in Table 1. These topics were divided into 10 smaller chapters in Connect that are easier for the students to digest and contain more material that is applicable to their success in college.

**Table 1**

*Course learning outcomes and course topic mappings*

| Course Learning Outcome | Topic |
|---|---|
| LO1: understand the evolution of information technology and future trends | All Topics |
| LO2: describe the ethical issues surrounding the uses of digital information | Ethics, Social Media |
| LO3: demonstrate proficiency in the use of various personal productivity software | Software, File Management |
| LO4: understand the functionality and interaction among the main hardware components of a computer and appropriate terminology | Hardware, Mobile Devices |
| LO5: acquire basic knowledge of computer security, protection mechanisms and privacy threats on the Internet | Security, Social Media |
| LO6: understand the role of computing tools in supporting collaborative projects | Software, Social Media |
| LO7: understand the principles of computer networking | Networking |
| LO8: understand different types of systems and application software | Software, Operating Systems, Internet Research, Mobile Devices, Social Media |

The 10 chapters are based on the topics mentioned above and include hardware, software, MacOS, networking, security, Windows 11 OS, file management, internet research, programming, mobile devices, and ethics. We did not eliminate emerging technologies from the course; rather, emerging technologies are included in each chapter as they relate to that topic.

## Redesign of the Assessment

Our previous IEE3 assessment tool had become outdated, so we redesigned the assessment tool based on the new course content in 2022. Over 1,000 questions from the course test bank (Connect, 2004) were evaluated by IT faculty and reduced to 10 questions per chapter based on difficulty and applicability for a general technology assessment. Any question that was too specific to any one topic was eliminated. For example, we removed the question “An AUP is a written document that provides a

framework of rules to be followed by computer users. AUP stands for _____." The reduced question set was then evaluated by a multi-disciplinary committee consisting of seven members from disciplines such as IT, Biology, History, and English to ensure that all questions were easy to read and were applicable to all disciplines.

Committee members were asked to rank each question on a scale of 1 to 3, where 1 is for No, 2 is for Maybe, and 3 is for Yes. Any question where all committee members answered No was removed from the assessment pool. And any question where all committee members answered Yes was kept in the pool. The remaining questions were ranked by their scores and discussed by the committee. Our goal was to equally assign questions in each topic; however, the committee determined that some of the topics had more content or were more important for demonstrating the effective use of information technology, so the number of questions in each topic ranged from 2 to 12 questions. The final assessment consisted of 50 questions, all approved by the multi-disciplinary committee.

## Results

The new assessment is administered as a pre/post-test in our Introduction to Computing course, using the Class Climate (Class Climate, 2004) survey system for administration and data collection. IT faculty members are asked to assign the IEE3 assessment during the first 1-2 weeks of the semester, then again within the final two weeks of the semester, allotting fifty minutes to complete the assessment each administration.

Additionally, each spring semester, the assessment is administered at the end of the semester to a group of seniors who have already passed Introduction to Computing. This additional assessment provides a cross-sectional snapshot of learning and assesses the retention of the knowledge and skills of this course. However, the analysis of that data is not part of this paper.

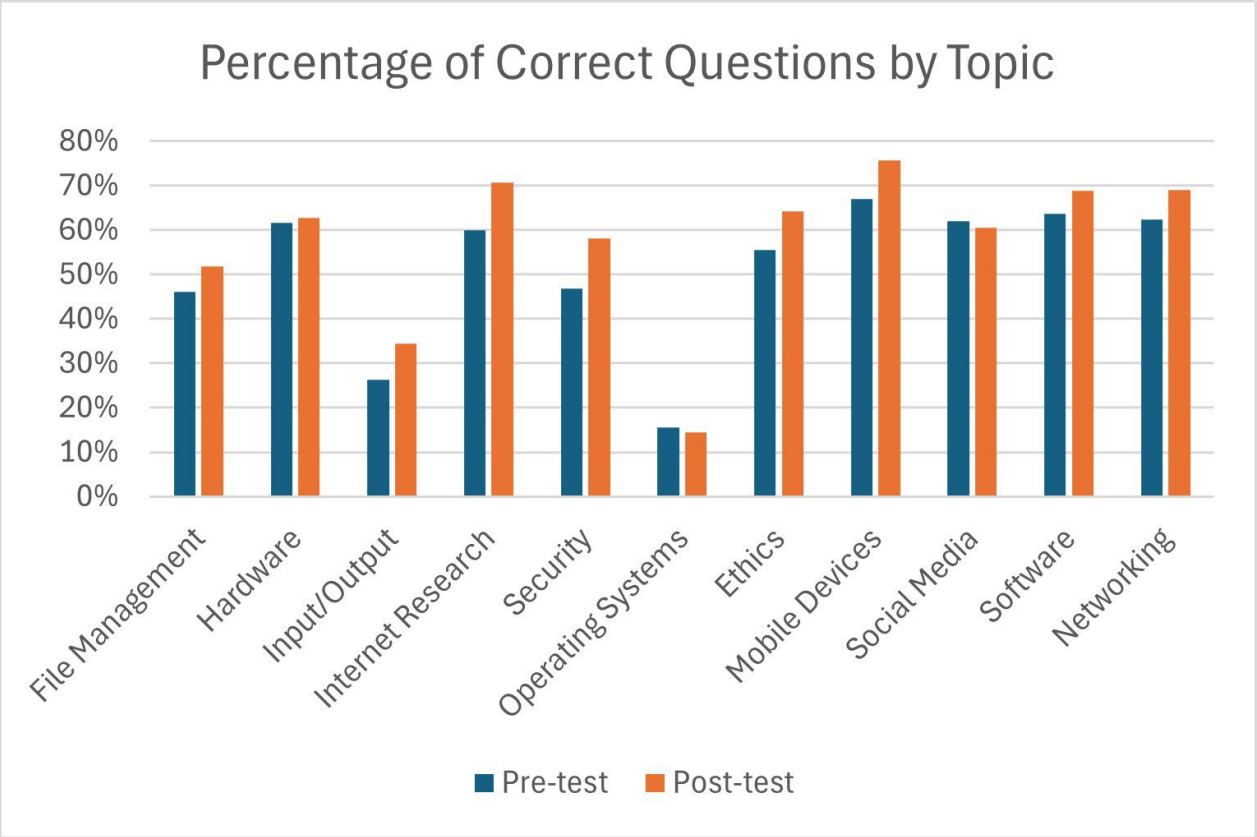
### Fall 2023 Assessment Data

During the Fall 2023 semester, we had 64 sections of the Introduction to Computing course being taught by 33 faculty members. There were 1,658 students enrolled in our course that semester. Of those 1,658 students, 672 completed the pre-test and 326 completed the post-test.
Figure 1 shows a comparison between pre-test and post-test scores broken down by topic. We used percentages to showcase the data and assumed that those percentages would show the general trend for each topic. We found that student knowledge in eight of the ten topics increased, and those increases ranged between 1% and 11%. We saw the highest increase in Internet Research and Security, both with an 11% increase. In addition, Ethics and Mobile Devices both increased by 9%, Networking increased by 7%, File Management increased by 6%, Software increased by 5%, and Hardware increased by 3%. However, student knowledge in the topics of Operating Systems and Social Media each decreased by 1%. Using a paired t test via the GraphPad (2024) online tool, we found that our results were statistically significant (the 2-tailed *p* value = 0.0033, t = 3.9639, df = 9), meaning the mean of our post-test percentages are statistically higher than the mean of our pre-test percentages. We obtained the value of Cohen's d = 0.340552 and the effect-size correlation, r = 0.16786, using means and standard deviations of the post and pre groups; for these calculations we used Dr. Becker's

from University of Colorado, Colorado Springs (UCCS), online tool for calculating the effect size available at https://lbecker.uccs.edu/. Positive d and r show that our results are in the predicted and desired direction, higher in the post than in the pre group. This shows our students' knowledge of information technology topics improved significantly over the semester.

**Figure 1**

*Fall 2023 IEE3 Question Data by Topic (Pre-test n=672, Post-test n=326)*




## Discussion

The results of this study show promising insights into assessing our IEE3 goal, demonstrating effective use of information technology.

Our multi-disciplinary committee has accomplished several goals. The assessment that we created has been well received on campus and has been recognized for its innovative design. One of its biggest perks is that creating and administering it requires no cost for our institution. This is a big win because many assessments charge a fee per student. Also, standardized assessments assume a different level of knowledge that many of our students do not possess at our open-access institution; therefore, by creating the assessment ourselves, we are able to cater the content to our student population, making

the results even more insightful. In addition, creating the content ourselves allows us to modify and update it at any time.
One of the most unique things about the assessment was that we designed it with the intent of being able to observe student learning in the various topics evaluated on the assessment. So, rather than just getting an overall score, we can see where students are struggling with specific IT topics. This is a powerful set of data because it allows us to directly measure course outcomes and make modifications to our course content when needed.

We implemented this school-wide assessment in 64 sections in Fall 2023. 41% of the Introduction to Computing students participated in the pre-test and 20% in the post-test (but this does not account for the 235 students that withdrew or stopped attending the course). This is the first time academic assessment has been done as a pre- and post-test at our institution and we are collecting valuable data that we have never collected before.

We found that the mean scores on the post-test are significantly higher than the mean scores on the pre-test. We found increases of 5% or more in six of the ten topics. The large increases in internet research and security are not surprising. Security is a hot topic today, and people are more aware of how to protect themselves online. As a college student, internet research is an extremely important skill; therefore, our students were very interested in learning those skills and applying them in their other classes on a regular basis. In contrast, we found lower scores on the operating system and social media topics. It is not surprising that the operating systems questions had low scores. This is a difficult topic, and very few students have an interest in learning about this material. However, social media also decreased slightly, which is surprising in this digital age. The students taking this assessment are frequent users of social media, so we did not anticipate these results. More in-depth analysis of these questions is required.

There were a few limitations to our study. First, faculty members treat administering this assessment differently. Some offer extra credit, while others barely advertise it in their classes. Some students were able to take the assessment at home (synchronous online, asynchronous online, and students in classes where the professor did not want to use class time to administer it). These variations in instructor support and delivery modality influence the number of responses and therefore the results. Second, we saw much smaller post-test numbers than we did pre-test numbers. While there will be some reduction in post-test participants because of students who withdrew from the class, we saw a larger reduction (50% less than the pre-test submissions), and we are not sure why this occurred. We can only assume that the professors were not advertising or encouraging the assessment as much as they were at the beginning of the semester. Because of this reduction in numbers, we used percentages instead of numbers to analyze our data. However, since our population of post-test participants was 326, we assumed that the population was large enough to reflect the trend of our entire student body.

Finally, given the number of participants and the amount of data points, we are just starting to analyze the data. The data presented in this paper is very preliminary. For example, we did not match pre-test and post-test data to see trends in the same population of individual students. This is something we

plan to do in the future. In addition, we are only looking at the data from Fall 2023 even though we have been collecting data every fall and spring semester since then. We plan to analyze data over several years to gather deeper and more significant insights.

Regardless of these limitations, we still believe that what we did is noteworthy. We have designed a novel way to assess school-wide IT knowledge, and we have the potential to gather a significant amount of data, which not only allows us to assess our students in a meaningful way but also allows us to continue to refine and improve this assessment tool. While other tools at other schools are designed to assess general computer science or information technology knowledge, our tool is customized for our students' needs and skills. Our goal is to share our insights and the process we took to design a customized assessment tool for school-wide assessment.

## Future Work

As we already stated, we are just beginning to analyze the data from Fall 2023. We have also collected data from the Spring 2024, Fall 2024, and Spring 2025 semesters and plan to administer this test every semester for the unforeseeable future. We plan to match pre-test and post-test data for these datasets and combine that data with demographic information to analyze trends and look for ways to enhance the IT skills of our students.

In addition, we plan to revise the assessment. Unlike many other disciplines, the technology disciplines change at a rapid rate, and this will require us to refine our assessment on a regular basis. For example, with the rapid emergence of Artificial Intelligence (AI), we plan to modify our assessment for Spring 2026 to include questions on AI, and at this time, we will also re-evaluate any other emerging technologies that should be included.

## References

Aesaert, K., Voogt, J., Kuoper, E., & van Braak, J. (2017). Accuracy and bias of ICT self-efficacy: An empirical study into students' over- and underestimation of their ICT competences. *Computers in Human Behavior, 75*, 92-102. http://dx.doi.org/10.1016/j.chb.2017.05.010

Bawden, D. (2001). Information and digital literacies: A review of concepts. *Journal of Documentation, 57*(2), 218-59. https://doi.org/10.1108/EUM0000000007083

Bradlow, E. T., Hoch, S. J., & Hutchinson, J. W. (2002). An assessment of basic computer proficiency among active internet users: Test construction, calibration, antecedents and consequences. *Journal of Educational and Behavioral Statistics, 27*(3), 237-253. https://doi.org/10.3102/10769986027003237

Class Climate (2004). Class Climate Scantron: https://www.scantron.com/resources/cc-education/ Retrieved June 10, 2025.

Connect (2004). Connect. McGraw Hill. https://www.mheducation.com/highered/connect.html Retrieved May 15, 2025.

García, F., Salguero, F., Fernández-Sanchez, M., & del Camp, J. (2022). "'Dis-Connected University Students?' Knowledge and Use of Digital Technologies Among University Students." *Journal of Educators Online, 19*(2). https://doi.org/10.9743/JEO.2022.19.2.10.

Georgia Gwinnett College. (2023). *Strategic Plan 2023-2025*. https://www.ggc.edu/sites/default/files/2023-10/GGC_2023-2025_Strategic_Plan.pdf

GGC Facts (2024). GGC Facts. Georgia Gwinnett College. https://www.ggc.edu/about-ggc/ggc-at-a-glance/ggc-facts Retrieved June 10, 2025.

GraphPad (2024). T Test Calculator. GraphPad. https://www.graphpad.com/quickcalcs/ttest1/ Retrieved May 1, 2025.

Lucas, M., Bem-haja, P., Santos, S., Figueiredo, H., Diaz, M., & Amorim, M. Digital proficiency: Sorting real gaps from myths among higher education students. *British Journal of Educational Technology, 53* (6), 1885-1914. https://doi.org/10.1111/bjet.13220

McDonald, M., & McDonald, G. (1999). Computer science curriculum assessment. *ACM SIGCSE Bulletin, 31*(1), 194-197. https://doi.org/10.1145/384266.299751

Nelms, K. (2015). Technology knowledge self-assessment and pre-test performance among digital natives. *Journal of Learning in Higher Education, 11*(1), 99-107.

Panadero, E., Brown, G. T., & Strijbos, J. W. (2016). The future of student self-assessment: A review of known unknowns and potential directions. *Educational psychology review, 28*(4), 803-830. https://doi.org/10.1007/s10648-015-9350-2

Prensky, M. (2001). Digital natives, digital immigrants. *On the Horizon, 9*(5), 1-6. https://doi.org/10.1108/10748120110424816

Ravishankar, V., & Zeitz, J. (2024, March). Student (Self) Assessment, Feedback, and Relatability in CS-2 Game Programming Assignments. In *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 2* (pp. 1790-1791). https://doi.org/10.1145/3626253.3635531

Scolari, C. (2019). Beyond the myth of the "digital native:" Adolescents, collaborative cultures and transmedia skills. *Nordic Journal of Digital Literacy*, 14(6), 164-174. https://doi.org/10.18261/issn.1891-943x-2019-03-04-06

Sillat, L. H., Tammets, K., & Laanpere, M. (2021). Digital competence assessment methods in higher education: A systematic literature review. *Education Sciences, 11*(8), 1-13. https://doi.org/10.3390/educsci11080402

SimNet (2004). SimNet. McGraw Hill.https://www.mheducation.com/highered/simnet.html Retrieved May 15, 2025.

Warschauer, M., Matuchniak, T., Pinkard, N., & Gadsden, V. (2010). New technology and digital worlds: Analyzing evidence of equity in access, use, and outcomes. *Review of Research in Education, 34*(1), 179-225. https://doi.org/10.3102/0091732X09349791

## About the Authors

Cindy Robertson, Associate Professor of Information Technology, Georgia Gwinnett College, crobertson2@ggc.edu

Anca Doloc-Mihu, Associate Professor of Information Technology, Georgia Gwinnett College, adolocmihu@ggc.edu

Mia Malloy, Associate Professor of Biology, Georgia Gwinnett College, mmalloy@ggc.edu

Jared White, Assistant Professor of English, Georgia Gwinnett College, jwhite38@ggc.edu

Patrick Ludolph, Associate Professor of History, Georgia Gwinnett College, pludolph@ggc.edu

Daniel Butler, Lecturer, English, Georgia Gwinnett College, dbutler1@ggc.edu

Mark Iken, Associate Professor of Information Technology, Georgia Gwinnett College, markiken@ggc.edu

Thomas Lilly, Assistant Provost for Academic Assessment and Accreditation, Georgia Gwinnett College, tlilly@ggc.edu