Piloting a Groundbreaking Virtual Continuing Competency Platform: Results and Recommendations

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ABSTRACT

The National Board for Certification in Occupational Therapy (NBCOT®), the national certification body for occupational therapy professionals in the United States, embarked upon a novel project to employ a virtual continuing competency platform. The genesis for the innovative virtual product was the result of a practice analysis study - the goal of which was to gain evidence-based direction for individualized programs of continuing professional development. The study identified six key areas for focus: providing client-centered care, working in interprofessional teams, employing evidence-based practice, applying quality improvement, utilizing informatics, and promoting professional responsibility. The virtual platform targets certificants' needs related to maintaining knowledge for current practice as well as supporting career enhancement and growth. With neither an existing platform nor content to meet its needs, NBCOT took on the task of designing, developing, pilot testing, and delivering the virtual platform and all of its supporting content from initial concept through deployment. The live system includes a web-based assessment delivery engine, certificant dashboard, and interfaces that support self-reflective assessments, multiple-choice practice knowledge assessments called mini practice quizzes, animated case simulations, and games as educational experiences. Prior to the full implementation of the new virtual continuing competency platform, a pilot test including 512 unique testers accessing 6,561 assessment tools was conducted. This paper will introduce the program at a high level and discuss the design process to frame discussion and then share the descriptive results of the user pilot study. While this specific program targets occupational therapy certificants, the virtual platform, focus areas, and lessons learned regarding use of a large scale virtual assessment program apply to other domains. The team will share generalized recommendations for future design and development of advanced technology-enabled assessment, certification, and educational experiences based upon our findings.

ABOUT THE AUTHORS

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Paul Grace is the President and Chief Executive Officer of the National Board for Certification in Occupational Therapy Inc. (NBCOT®). Paul has over 2 decades experience in personnel certification and accreditation. Paul has served as Chair of the National Commission for Certifying Agencies (NCCA) and two terms as President of the Institute for Credentialing Excellence (ICE), was awarded ICE's Leadership Award in 2002, and ICE's Lifetime Achievement Award in 2014. In 2012, he received the Citizen Advocacy Center's Ben Shimberg Public Service Award. Paul received undergraduate and graduate degrees from West Virginia University. He is a Certified Association Executive (CAE) by the American Society of Association Executives.

Margaret Bent is the Managing Director for Competency Assessment at the National Board for Certification in Occupational Therapy Inc. (NBCOT®). With over a decade of certification industry experience, the scope of her responsibilities include overseeing the planning, development, deployment and management of products and services for initial and on-going competency assessment. In this capacity, Margaret manages a team of professionals who are involved in the development of competency-based assessment tools for the OTR and COTA credentials. Dr. Bent attained her PhD in Post Compulsory Education from the University of Sheffield in the UK, she has presented and published nationally and internationally on research concerning professional competence and educational methodologies.

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COMPETENCY, CERTIFICATION, AND GAMES

The National Board for Certification in Occupational Therapy, Inc. (NBCOT®) is a not-for-profit credentialing agency that provides certification for the occupational therapy profession. Above all else, NBCOT's mission is to serve the public interest by advancing client care and professional practice through evidence-based certification standards and the validation of knowledge essential for effective practice in occupational therapy. NBCOT offers two distinct certification credentials: the Occupational Therapist Registered (OTR®) and the Certified Occupational Therapy Assistant (COTA®). To date, more than 214,000 occupational therapy professionals have earned the OTR and COTA credentials. These certification programs are accredited by the American National Standards Institute (ANSI) and the National Commission for Certifying Agencies (NCCA).

OTR and COTA certificants are healthcare professionals who are committed to providing safe and effective occupational therapy services to clients across the lifespan. Through occupational therapy, clients engage in interventions to help recover or develop skills to participate in activities of daily living including self-care, work, and leisure. To be eligible for initial certification, the OTR or COTA candidate must meet specific eligibility requirements which include passing the NBCOT OTR or COTA certification examination. In order to maintain the credential, the professional must renew the certification on a three-year cycle by satisfying the continuing competency requirements and agreeing to abide by the NBCOT Practice Standards/Code of Conduct.

Concept of Continuing Competency

Underpinning its mission, NBCOT views certification as a lifelong tool for the development of occupational therapy practitioners. Currently, certification renewal requires the accrual of 36 Professional Development Units (PDU) over a three-year renewal cycle. The PDU can be earned from a range of continuing competence activities including: professional service; educational workshops/courses/independent learning; professional presentations; fieldwork supervision; and professional publications. Certificants maintain a portfolio of verification documentation for the completion of the PDU and are subject to a random audit at the end of the certification cycle.

While the goals for certification renewal are based on the premise that the credential "*meets a rigorous, consistent standard of competency that reflects current practice*" (NBCOT, 2008 p.72) NBCOT, like other healthcare professions, recognizes its certificants face ongoing pressures of accountability and advances in practice environments. This in turn necessitates the ongoing need for skill development and demonstrated continuing competence throughout the certificant's career. The notion of continuing competence for the health professions was most notably first voiced in the Pew Health Profession Commission Reports of 1995 and 1998, where the Commission argued that the accumulation of continuing education credits and the activities of disciplinary boards do not ensure competence. Against this background and in response to the Institute of Medicine (IOM) reports, *Health Professions Education: A Bridge to Quality, 2003* and *Redesigning Continuing Education in the Health Professions (Committee on Planning a Continuing Health Professional Education Institute, 2010)*, NBCOT embarked on a comprehensive review of its certification renewal program in 2012. The core vision of the IOM reports was for education of the health professions to demonstrate a commitment to meeting patients' needs:

> *All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics. (IOM, 2003 p. 3)*

Evolution of Continuing Competency Requirements

The aim of the certification renewal program review was to identify opportunities for certificants to engage in a process of continuing competency, including critical reflection, validation of current practice, and interpretation and consideration of new avenues of professional knowledge (NBCOT, 2012). The goal, in essence, was to find a way to provide experiences for certificants to translate new knowledge into practice, which would become embedded into performance and lead to improved outcomes for recipients of occupational therapy services (NBCOT, 2012).

A major component of the review included completion of a Certification Renewal Practice Analysis Study (CRPAS). Practice analysis is the systematic study of an occupation to describe the job responsibilities of those employed in the profession. A large scale survey was designed to gather information about the major practice responsibilities and skills OTR and COTA certificants need to demonstrate at the level of certifiation renewal. A sample group of 3,904 OTR and COTA certificants were invited to participate in the CRPAS survey. Over a six week period, the survey was completed by 1,929 OTR and 1,047 COTA certificants representing a 76% response rate. Through this CRPAS, the data validated the major practice domains for OTR and COTA certificants engaged in certification renewal. These include: (1) Provide patient-centered care, (2) Work in interprofessional teams, (3) Employ evidence-based practice, (4) Apply quality improvement, (5) Utilize informatics, and (6) Professional responsibility. Furthermore, the findings supported the utility of the data to provide a basis for making decisions about the next evolution of the certification renewal program.

Selecting Gaming Technology for Certification

Given the desire to infuse experiences for certificants to translate new knowledge into practice within its certification renewal program, we set out to use the results from the CRPAS to create a series of new evidence-based assessment tools to support certificants' continuing competency needs. Rather than developing new tools using traditional delivery formats such as attendance at in-person or online seminars and workshops, or completion of workbooks and study courses, we wanted to create an innovative and dynamic delivery platform—a platform that certificants could access at any time and any place via an internet connection. Along with the need for a dynamic delivery platform, there was a desire to provide a structure that certificants would find fun and engaging, as a way to support motivation for assessment of practice knowledge. Through our research NBCOT came across "serious gaming": an industry that promotes education and training of professionals through simulations and games. We found many examples of organizations across industries including defense, homeland security, corporate, education, (McNamara, Smith, Smith, & Gritton, 2012) and more recently healthcare (Hodges, 2008; Johnston, Boyle & MacArthur, 2013) using serious games for education and training purposes. However, there is very little literature regarding the use of serious games solely for assessment, and none regarding its use for certification. Extending this model of professional education seemed to offer potential application for certification, and prompted us to embark on a groundbreaking journey to pioneer the development and delivery of a virtual continuing competency assessment platform - the first of its kind within the healthcare arena.

DESIGN OF THE PORTAL AND ASSESSMENT TOOLS

Goals of the System

From the initial concept of developing a virtual based continuing competency platform, a goal was set to create a portal and a series of assessment tools to target certificant competencies that provide authentic and engaging assessment environments that expand beyond current assessment capabilities. From the results of the CRPAS, a matrix was created recording the study's domain areas and primary practice settings. This matrix, see Table 1, is used during content development to identify the assessment topics and tool type to include in the platform.

Table 1: Coverage Across All Occupational Therapy Practice Areas and CRPAS

	Practice Areas												CRPAS					
Tool Name	**Pediatrics**	**School Systems**	**OT Education / Research**	**Administration / Management**	**Work and Industry**	**Mental Health**	**Rehabilitation**	**Geriatrics**	**Orthopedics**	**Acute Care**	**Skilled Nursing Facility**	**Home Health and Wellness**	**Provide Client Centered Care**	**Work in Interprofessional Teams**	**Employ Evidence-Based Practice**	**Apply Quality Improvement**	**Utilize Informatics**	**Professional Responsibility**
Fine Motor Skills Delay	X	X											X	X	X			X
DeQuervain's									X				X		X			
Pediatric Autism	X												X		X			X
Traumatic Brain Injury Inpatient Rehab							X						X	X	X			X
Early Intervention	X												X		X			X
Stroke Inpatient Rehab							X						X		X			
Adolescent Concussion	X	X					X						X		X			
Clinical Reasoning						X			X				X	X	X			X
PICO													X		X	X		
Balloon Match	X	X				X	X	X	X	X	X	X	X					
Mini Practice Quizzes	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Portal Design

The NBCOT Navigator™ is the portal providing access to and completion tracking for the virtual tools. The portal is designed to be very flexible, to serve several potential user types:

1. OTR and COTA certificants
2. Certificants renewing certification in their current practice area
3. Certificants renewing certification with an interest in exploring a new practice area

Certificant profiles and responses to a self-reflection questionnaire establish each user's focus and result in a list of recommended tools for certificants to take. The recommended tools populate a "Your Tools" tab in the Navigator for ease of access and tracking, see Figure 1. The portal also allows the certificant to view, search, and select virtual assessment tools from the home page choosing from thumbnail images representing each practice area directly to a filtered list of all relevant tools for the selected practice area or they can select tools of their own choice from the all tools list.

From the "Your Tools" tab, for each tool, the portal provides information classifying it as a Mini Practice Quiz, Case Simulation, or Game; a unique descriptive name for the tool, a list of relevant practice areas for the tool; PDU earned by tool; and the ability to start or remove the tool from the list. Selecting any tool opens an expanded description, see Figure 1. In addition to providing information on accrued PDU by tool in this tab, an overall dashboard details the certificant's progress towards their next certification renewal whenever the Navigator is accessed.

The portal also provides access to the certificant's reading list populated automatically with relevant study material based upon certificant performance with the assessment tools. After completion of each tool, certificants are provided with references to supporting evidence-based journal articles or database search string terms to complete additional learning about the topic.

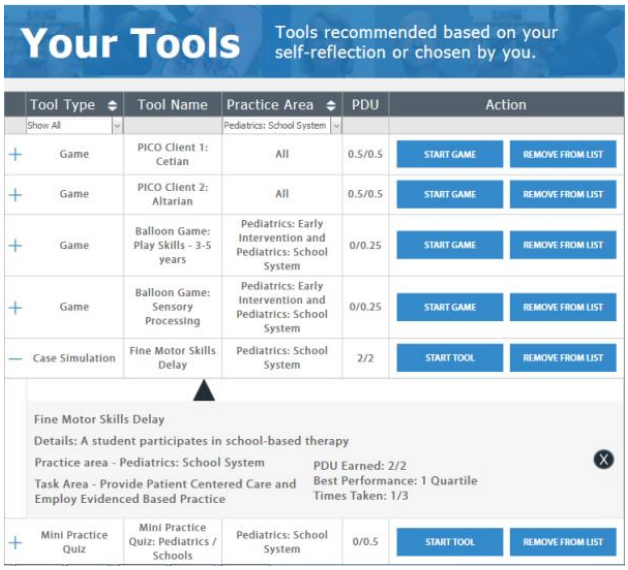

Figure 1: Navigator Your Tools List

The Use of Serious Games for Certification

Serious games have been used for decades for training purposes including management, teamwork, leadership, problem solving, communication, job-specific knowledge, and social skills in industries spanning medical, military, homeland security, and general business; and across general education subjects including science, technology, engineering, and mathematics (STEM) (McNamara, Smith, Smith, & Gritton, 2012; Greco, Baldissin, & Nonino, 2013; Lopes, Fialho, Cunha, & Niveiros, 2013; Michael & Chen, 2006). In addition to training, serious games have also been used to attract and retain customers, orientate employees, launch new products, enhance job performance, and attract potential job candidates (Donovan, 2012). While many organizations have turned to game and simulation based interactions for training and other emerging needs, the assessment and certification communities have been slower to adopt these technologies.

Serious games naturally lend themselves to training and education, often credited for their strengths including: providing goal driven, contextually relevant, interactive experiences under a learner's control, while receiving situated, realistic feedback contributing to motivation and learning (Hussain et al., 2009). However, the needs and requirements of a constrained, valid, and reliable assessment and certification environment differ from the more open experiential learning and training environments. The application of serious games and simulations for assessment is potentially appealing for a number of reasons. Firstly, for achieving the goal of stealth assessment, which refers to embedding assessments in a game-like environment where players become so engaged in playing the game, that they lose focus on the fact they are being assessed (Shute & Ventura, 2013). And secondly, it is postulated that serious games and simulations can facilitate flow-state engagement (Csikszentmihalyi, 1990) to assess learners at their optimum level of participation with a subject. We propose that one of the reasons games have not been leveraged more broadly for assessment and certification purposes is due to a struggle between the nature of games to provide constant performance feedback and the nature of assessment and certification where feedback that would influence the certificant's performance in the assessment item is withheld to attain valid and reliable assessment of competence. Our experience in adapting simulations and games for assessment discussed here offers an early look into the application of serious games for certification.

Assessment Tool Requirements and Design

In 2013, the design team embarked upon the task of creating the assessment tools. A series of meetings with NBCOT staff and a Continuing Competency Product Development Taskforce (CCPDT) consisting of OTR subject-matter-experts identified goals for the assessment tool design. This group's task was to create virtual assessment tools that are: simple to play, engaging, provide meaningful completion in one session (less than 30 minutes), deliver feedback only after tool completion, collect and report performance metrics, and link to recommended evidenced-based readings/resources. These principles drove reliance on new design concepts versus training game

experience (for best practices see Hussain & Coleman, 2014; McNamara and Smith, 2013).

Three categories of assessment tools were created: mini practice quizzes, case simulations, and games. As illustrated in Table 1, the tools were created to provide assessment opportunities across the spectrum of occupational therapy practice areas and CRPAS topics.

Mini practice quizzes pose between 15 and 20 multiple choice questions covering a broad range of occupational therapy subjects. They reflect contemporary practice and are grounded by evidence-based literature.

Case simulations bring occupational therapy practice to life with a focus on clinical reasoning, see Figure 2. Each simulation starts with an opening scene providing background information to the scenario. This is followed by a series of modules where the certificant is engaged in performing virtual occupational therapy tasks with a virtual client including: client interviews and chart reviews, selection of appropriate screening and assessment tools, completion of evaluations, interpretation of assessment results, interprofessional team discussions, intervention planning, provision of intervention services, and discharge planning.

Figure 2: A Module from a Case Simulation

Games offer assessment of specific practice knowledge. Each game is uniquely designed for its specific topic. Initial games include: a stylized matching game called "Balloon Match" covering broad occupational therapy knowledge, see Figure 3 left, an applied evidence-based research game based in outer space called PICO Station graded across four levels of difficulty, see Figure 3 right, a game where the user becomes a clinic manager called Management Challenge, and specialized skill games including physical agent modalities and orthotics.

Figure 3: Balloon Match and PICO Game Examples

Scoring, PDU Earning, and Feedback

All assessment tools are normatively scored with variable PDU values available dependent on tool type. In the new certification renewal program - launched in June 2015, certificants can earn up to 18 of the required 36 PDU for certification renewal from any of the virtual interactive tools contained in the Navigator.

The certificant receives quartile feedback on their performance compared with the performance of their peers. While no tool produces a complete record of correct and incorrect responses for the certificant, other types of feedback are provided both during play and after completion. The feedback presented to the certificants varies across tool types and is enumerated in Table 2. The goal of the feedback is to provide an assessment of competence and guidance

towards further resources for study. When a certificant completes an assessment, he or she is provided with quartile feedback on performance compared with the performance of peers. For the games, the certificant receives a final score. All tools direct the certificant to literature related to the assessment tool's subject matter by either providing direct links to articles or providing an appropriate search string to be used in ProQuest[1] to find related study materials. The case simulations each cover a number of different skill areas within a single case. To provide meaningful feedback on a certificant's areas of strength and areas for improvement, awards are provided for the skills where mastery was demonstrated. Unearned awards are illustrated but grayed out, providing certificants with information about where there may be need for further skill development. Implicit indication of incorrect responses is provided in the case simulations as the certificant receives the results of his or her decisions on specific actions. For example, if the certificant selects an inappropriate client evaluation tool it yields results that are not useful in working with the client in the case simulation. The games provide more explicit indication of incorrect actions, for example when incorrect categories are matched in the Balloon Match game the balloons pop as feedback.

Table 2: Feedback Provided to the Certificant by Tool Type

Tool type	PDU Earned	Performance Quartile	Score	Recommended Readings	Search Strings for Reference Searches	Awards by Skill Area	Explicit Indication of Incorrect Response	Implicit Indication of Incorrect Response
Mini practice quizzes	X	X		X				
Case Simulations	X	X		X		X		X
Balloon Match	X		X		X		X	
PICO Station	X		X	X			X	

PILOT TEST

With eighteen months of tool development completed, a pilot phase was scheduled to take place during the last quarter of 2014. The goal of the pilot was to obtain performance data and certificant feedback on the tools prior to launch of the full NBCOT Navigator suite slated for summer of 2015. This descriptive study and results are presented here.

Two thousand certificants from the 2014 certification renewal class were invited to take part in the pilot. The invitation was sent to a purposeful sample ensuring representation from all major practice areas, geographic locations, and length of certification. Certificants were informed that upon successful completion of all pilot assignments, they would receive verification for 5 contact hours meeting criteria for PDU obtained through volunteer service to use toward the next certification renewal. Of the 2,000 certificants, 89% agreed to take part in the testing.

Certificants were provided with instructions and access to the NBCOT Navigator suite housed on a production server. In addition, certificants were told how to record and report bugs and functionality issues. Each certificant was asked to complete a set of pilot assignments in full, see Table 3 for the assignments.

The pilot phase ran for a period of 66 days from October 28, 2014 through January 2, 2015. In total 512 certificants, or unique users, accessed a total of 6,561 tools – Table 4 shows a breakdown of tool use. A total of 512 unique users registered and utilized some pilot tools while 274 completed all requested tools including the post pilot test survey.

[1] ProQuest is an allied health source database providing direct links to millions of citations, full-text titles and dissertations sourced from hundreds of renowned publications in the fields of science, medicine, and technology. Access to ProQuest is a free resource available to all current NBCOT certificants

The data collected across all tools provided sufficient data and met the goals for the pilot.

Table 3: Pilot Assignments for All Participants

Pilot Assignments	Criteria for Completion
3 Case Simulations (8 cases)	Choose own practice area or any area of your choice
4 Mini Practice Quizzes (25 quizzes)	• 1 quiz from your current or most recent practice area • 2 quizzes from list allocated to you • Any of the following quizzes: Employ evidence based practice, apply quality improvement/utilize informatics, professional responsibility, patient centered care OR work in interprofessional teams
3 Balloon Match (21 games)	Choose own practice area or any area of your choice
PICO Station (4 games)	Complete all 4 games
End of Test Survey	Complete survey

Table 4: Pilot Tool Use

Count	Tool Type
1,069	Case simulations
1,501	Mini practice quizzes
2,908	Knowledge match games "Balloon Match"
1,083	PICO Station
6,561	**Total number of tools completed**

Performance data was collected for psychometric analysis of key validation, discrimination, and difficulty levels. This data was also used to conduct norming calculations to provide certificants with feedback on their tool performance in terms of quartile scoring relative to how other certificants performed on the same tools. A user experience survey reported data relating to relevance of the tools for continued competency development, likelihood of tool uptake in the future, and suggested practice areas for additional tool development. E-mail comments and bug reports were used to gather data relating to specific functionality issues.

PILOT STUDY DATA PRESENTATION AND ANALYSIS

Demographics of Pilot Participants

The pilot test survey received 274 responses. The participants were representative of the occupational therapy professional community. Ninety-three percent of the participants were female and 7% were male, which mirrors the actual gender distribution for the profession (AOTA, 2010). Fifty percent of the certificants were between the ages of 31 and 45 years. Seventy percent of the certificants have been credentialed for over 11 years. The full distribution of respondent ages and number of years holding certification are shown in Figures 4 and 5.

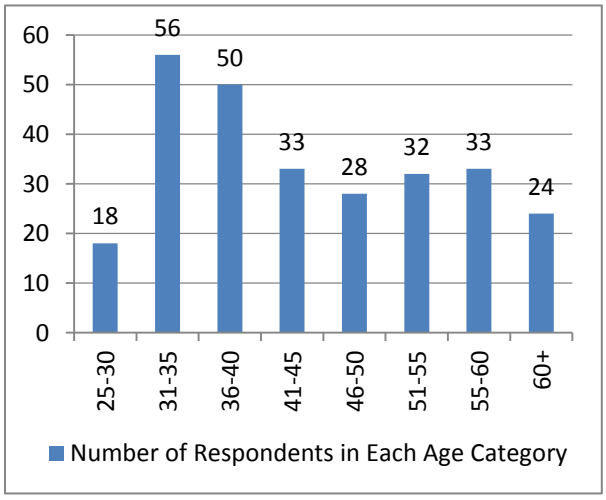

Figure 4: Age of Participants

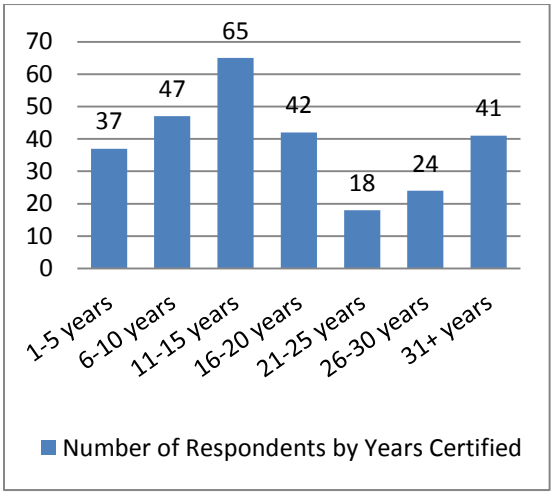

Figure 5: Participant Number of Years Certified

Overall Survey Response

Overall, 75% of the respondents felt the tools enabled them to identify areas of interest for continued competency development and over half (57%) said they were likely to read the references provided after tool completion. When asked whether they would consider each tool type to earn PDU toward their next renewal cycle and whether they would recommend the tools to a colleague, respondents were equally likely (around 84%) to use and recommend the mini practice quizzes. Respondents were slightly more likely to recommend case simulations to a colleague (75%) versus take them themselves (69%) and similarly they would recommend games slightly more to a colleague (66%) than take them themselves (62%).

On a five-point Likert scale from Very Important to Very Unimportant, certificants were asked to: "rate the tool features based on how important they are to you." Eighty-six percent of users rated "Useful to set competency goals" as Very Important and 72% rated "24/7 availability" as Very Important. Only 38% of certificants considered "Dynamic, interactive, fun to take" as Very Important. Interestingly, all features were rated at least "important" by a majority of certificants: "Relevant to practice" (100%); "Available 24/7" (98%); "Useful to set competency goals" (95%); "Short, quick to complete" (94%); and "Dynamic, interactive, fun to take"(88%).

Table 5 shares a summary of survey questions and responses to each, collapsed from 5 point scales to 3 categories for ease of interpretation.

Table 5: Survey Questions and Responses

Overall, do the tools enable you to identify areas of interest for your continued competency development?		
Yes 75% Somewhat 24% No 1%		
How likely are you to read the references recommended to you after completing the tools to support your continued competency development?		
Very Likely / Likely 57% Undecided 28% Unlikely / Very Unlikely 15%		
How likely are you to use these tools in the future to earn PDU toward *your* next NBCOT certification renewal?		
Mini Practice Quizzes: Very Likely/Likely 83% Undecided 10% Unlikely/Very Unlikely 7%	Case Simulations: Very Likely / Likely 69% Undecided 17% Unlikely/Very Unlikely 14%	Games: Very Likely/Likely 62% Undecided 21% Unlikely/Very Unlikely 17%
How likely are you to recommend using these tools to an OTR *colleague* in the future?		
Mini Practice Quizzes: Very Likely/Likely 85% Undecided 7% Unlikely/Very Unlikely 8%	Case Simulations: Very Likely / Likely 75% Undecided 15% Unlikely/Very Unlikely 10%	Games: Very Likely/Likely 66% Undecided 16% Unlikely/Very Unlikely 17%
Please share any feedback you have regarding your experiences using these tools:		
Open ended feedback provided by 81% of certificants		

Open Ended Feedback

Eighty-one percent of the total survey certificants provided comments in the open ended feedback section of the survey. These free responses were analyzed for recurring comments and then coded to track trends. First, we coded whether or not the overall comment was positive (23%), a combination of positive and negative feedback (29%), or negative (29%) (all stated as a percentage of total certificants). The most common concerns receiving negative comments related to: a lack of explicit feedback on correct and incorrect responses (28%), technical issues including slow loading times, failure of the portal to track data, issues with screen size and game/ case simulation displays, etc. (23%), and specific notes on content the respondent felt should be reviewed (18%).

Fifty-four percent of the certificants made comments on at least one specific tool category: mini practice quiz, case simulation, or game as part of their feedback. Thirty eight percent of total certificants made comments about case

simulations, of these, 70% of the comments praised the applications, for example "*Mimics actual practice – amazing*" and 30% offered constructive feedback for example, "*difficult to navigate*." Forty-two percent of total certificants made comments about games, of these 58% valued the game elements, "*Out of this world content helped avoid any subconscious biases or assumptions – only focus on PICO method*" and 42% said they disliked some of the game elements, "*Difficult to relate to alien theme*." Only 7% of total certificants offered comments about the mini practice quizzes and of these most comments related to functionality. Twenty-four percent of certificants had negative comments about one type of tool and balanced them with positive comments on at least one other type of tool. For example, one respondent noted:

> "*I really disliked the Balloon Match. They were slow and meaningless. The case simulation … was interesting, but the graphics were a bit disturbing. I think it could have been better with more realistic looking people, …. However I liked the way it was set up with information in a record, and being able to go back and forth between things. …. The PICO one on research was fun, informative, and interesting*."

And another explained:

> "*I felt the most stimulated by the PICO games and made me realize how much I enjoy using evidence based practice…The mini tests were very easy to use and a quick way to review skills. I realized that I am very comfortable with the case simulations involving Autism but do not have very much experience with early intervention feeding. It encourages me to set goals to learn more about areas that are weaknesses for me. The Balloon Match games seemed like they would be fun but because of the speed element I felt that I wasn't really learning or processing the information.*"

This tendency by certificants to praise one tool type while expressing less interest in another indicates that preference for particular tool types are complex issues to extrapolate. It suggests that the development of a variety of tool types will meet particular experience preferences across the user base.

Eleven percent of certificants found game elements (i.e., fantasy storyline using aliens) to be *"distracting, juvenile or non-professional,"* while an equal number (12%) of certificants enjoyed the game elements and focused on the value of fun and engagement in the activity. Eleven percent of total certificants mentioned the speed in the Balloon Match game to be problematic, but this group was split between whether they reported the Balloon Match as moving too fast, too slow, or not liking the game element of increasing speed. Surprisingly, while 3% of the certificants discussed liking or disliking audio elements, for example the spoken dialogue during case simulations, the PICO Station alien jibberish, and action-based sound effects, only 1% of the certificants mentioned the quality of the graphics finding them too "like The SIMS™," "creepy," and indicating a preference for more realistic characters.

NAVIGATOR MODIFICATIONS AND GENERALIZED RECOMMENDATIONS

How We Addressed the Results

From the complete list of issues identified by the pilot testers summarized above, a triaged list of priority changes was created and modifications were then completed in preparation for the full launch.

A majority of the certificant comments requested a desire for more feedback, specifically wanting to know the correct answers after they had made incorrect answer selections. However, providing this level of feedback would explicitly violate the intended design and use of the tools for assessment purposes. To address this issue, the team revisited the instructions and feedback contained throughout Navigator to ensure the intended purpose of the assessment tools was clear. Other pilot driven changes included: (1) decreasing the number of recommended readings; (2) adding a speed selection in the Balloon Match games; (3) separating PICO Station into individual games rather than requiring completion of all four levels in one game; (4) adding a mute feature to allow user control of audio; and (5) addressing all platform and tool specific technical or content issues.

Recommendations for Developers of Assessment / Certification Systems

Clearly for this population a desire for relevant, accessible tools was the priority. This is an interesting finding because typically when organizations turn to simulations and games they cite dynamic and engaging content as their top priority. Our pilot results caution against losing focus on relevance and accessibility in favor of fun.

Where reasonable, provide as much feedback as possible. Against the backdrop of this being an assessment system, users reported frustration from not being told the correct answers in order to learn from their mistakes. The designers feared that providing this additional feedback could potentially compromise test integrity and distract from the assessment goals of the system. As a designer, you should consider the types of feedback you can provide/allow and make it as actionable as possible. If you direct certificants to readings, provide specific topic resources rather than broad information – for example, identify specific article sections and search strings. The tradeoff between providing feedback and maintaining test integrity is a challenge for all developers of automated assessment systems; however, introducing more interactive experiences may have increased the end users' expectation for more specific and actionable feedback over the requirements of more traditional assessment/certification methods.

While game elements (i.e., story, audio, speed, art styles) can enhance interactive experiences, user preferences ran strong in relation to their use. It is important therefore to collect playtest data on game elements. Our certificant population included a significant number of non-traditional gamers and as a result traditional game balancing activities were not sufficient to meet their needs. Our certificants consistently offered polarized views regarding game elements leading us to develop a policy of offering end user customization of the game elements as much as possible without invalidating the assessment or causing too much need for additional instructions. Interestingly, for example, once we added the speed selection in Balloon Match, new testers reported confusion with how the speed influenced their scores (it didn't and that was explained right above the speed options) and thought it was confusing and should be removed. This makes feature decision making complex and requires the development team to consider a variety of solutions. In our pilot, the game developers and subject experts interpreted and reacted to the user feedback differently. It is important to build a team across the content experts, designers, and developers to gain a shared understanding of tradeoffs in responding to user experiences.

While the percent of certificants commenting on graphics and audio was low overall (1% and 3% respectively) the comments could indicate that people have a tendency to be more distracted by audio than visual elements in the game. Further exploration of these issues is recommended especially given prior research recommending that audio should be integrated into serious games and indicating personal audio preferences didn't seem to matter (McNamara and Smith, 2013) and the obvious and intentional disparity between entertainment and serious game graphical fidelity which controls development costs and allows game access online and with lower-end hardware but is often questioned by organizations embarking on serious game efforts.

Our experience underscores the importance of providing a range of tool types for your end users wherever possible. Individual preferences do exist. By offering a mix of mini practice quizzes, case simulations, and different styles of games complimenting traditional PDU opportunities, we were able to ensure a diverse set of end users could find an experience they were comfortable with and engage them appropriately to support their continued competency efforts. Looking at the number of certificants who expressed not liking one type of tool only to embrace another, it is clear that more organizations should consider addressing user needs via multiple types of interactive experiences.

Interestingly, the findings in this pilot test that focused on the use of gaming for assessment mirror several of the best practice recommendations made by McNamara and Smith (2013) for using gaming for learning activity purposes. This assessment game pilot specifically echoed the following:

(1) designers must ensure that gameplay does not interfere with the instructional intervention itself,
(2) unneeded game elements should be removed
(3) game-specific jargon/fiction should be explained in narrative to avoid confusion,
(4) pressure is important but the game play should not be too hard to achieve the tool goal,
(5) strive for clean and consistent graphics that match the game style, do not worry about producing AAA entertainment title level quality,
(6) pay attention to the incorporation of appropriate sound, but personal taste is not as important,
(7) some players pay attention to external supporting materials and instructions, so include as much guidance as possible, and
(8) if there is a need for clear instructions on how to use serious games, provide them.

This lends support that the principles from using gaming for learning may extend to the development of tools and games for assessment and certification. This potential finding is significant and warrants further exploration. A more detailed analysis of specific strategies known to be successful in gaming learning environments and a comparison of strategies incorporated into assessment tools built on a gaming platform would provide valuable guidance to designers involved in future assessment game development.

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