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In the Context of Online Communication and Education, the Provision of Assistance to Students Who have Disabilities

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Abstract

Virtual reality (VR) refers to a variety of technological advancements that make it possible for people to interact and interact with three-dimensional "worlds" or "environments" that have been generated by a computer. The incorporation of molecular structure models or computer-generated reconstructions of metropolitan streets, buildings, and landscapes are two examples of potential upgrades that may be made to these digital settings. At the beginning of the 1990s, discussions began to take place regarding the potential incorporation of virtual reality (VR) into educational settings. According to Bricken (1991), during that time period, there was a widespread belief in the production of distinctive and influential learning environments that were unmatched by any other environments. Bricken's assertion is supported by others. After then, an increasing number of academics who specialize in virtual reality (VR) have been working to study the potential benefits of this technology in a variety of educational settings, including both fundamental and advanced modes of learning. This article provides a concise discussion on the potential advantages that could be gained by using virtual reality (VR) technology into educational environments. Individuals are able to improve their interpersonal communication skills in both safe and regulated contexts by participating in extremely realistic simulated scenarios through the use of virtual reality (VR), which allows them to participate in these scenarios. The purpose of this article is to present a detailed analysis of four experiments that were conducted in the field of special needs education by the Virtual Reality Applications Research Team and their related colleagues. The essay focuses specifically on the latter application. Beginning in 1991, the investigations were carried out into the matter. The construction and evaluation of applications that are designed

expressly for usage in virtual environments is the primary concentrate of this area of research. The primary purpose is to enhance the level of independence that individuals who struggle with learning and communication need in their day-to-day lives.

Keyword- Online Communication, Education, Assistance to Students & Disabilities

Introduction

Numerous distinctions exist between conventional computer programs and virtual environments (VEs). An essential distinction is that users are not restricted to a predetermined path when traversing the VE. Furthermore, virtual reality (VE) offers users personalized displays that heighten the sense of immersion by simulating physical presence within the VE. Additionally, keep in mind that the virtual universe consists of three dimensions, not two. According to Cobb, Neale, Crosier, and Wilson (2002), certain characteristics of virtual environments (VEs) have demonstrated benefits within educational settings. The subject matter being examined pertains to the depiction of objects and environments within a specific environment. The illustrations have the capacity to portray a wide range of concepts, including hypothetical or imperceptible entities such as molecules or particles, as well as tangible phenomena like tangible objects. Individuals are capable of assuming various positions, thereby enabling them to engage with the virtual environment (VE) through diverse means. As an illustration, the user of a wheelchair would maintain a seated position with their eyes leveled down, resulting in a range of motion predominantly restricted to linear movements, with minimal capacity for rotation. By utilizing six degrees of freedom, the viewpoint can navigate the virtual environment with the agility of a helicopter pilot. A distinction can be made between reality and super-reality: individuals have the ability to engage in activities that are physically unattainable through the use of a Virtual Environment (VE). To acquire a deeper understanding of the inner mechanisms of a virtual apparatus, one might, for instance, simulate the action of "flying" within it. Virtual environments (VEs) are accessible through a multitude of devices, such as projection displays, desktop computers, and headsets. The utilization of the aforementioned technology is restricted to the exclusive use of a head-mounted display to perceive the virtual world. Their erratic head movements indicate that they are visually inspecting the virtual environment. Single-user virtual

environments (SVEs) assign the responsibility of mobility control and interaction with the environment's various components to a single user. When a significant number of individuals engage with a communal virtual environment, they typically indicate their presence through the utilization of custom-made digital avatars that manifest on the screen. Individuals are capable of communicating with one another and interacting with virtual objects by donning headphones with integrated microphones. Internet-based learning systems refer to educational frameworks that utilize the internet to disseminate instructional materials and facilitate learning activities. These technologies leverage the capabilities of the internet in order to provide In the early 1990s, discussions commenced regarding the potential utilization of virtual reality (VR) as a foundational component of traditional education. The discussion has centered on virtual reality (VR) learning environments and their potential to offer educational opportunities that are unattainable via conventional media. The unique attributes of virtual reality (VR), including the capability to intuitively navigate a virtual environment and investigate conceptual information, account for this (Bricken, 1991). Extensive research was conducted in the 1990s regarding the potential applications of virtual reality (VR) in educational settings, with particular attention given to students who exhibited exceptional performance or lack thereof. An abundance of publications on this subject have been featured in a number of scholarly journals, academic forums, and the Virtual Reality in Education and Training conference (VRET, 1997; Virtual Reality in the Schools; Auld & Pantelidis, 1995; a special issue of Presence: Teleoperators and Virtual Environments (1999). Virtual reality (VR) has been the subject of exploration in numerous scholarly works, including those by Salzman, Dede, Bowen Loftin, and Chen (1999), Bricken and Winn (1992), Byrne and Furness (1994), and Dede, Salzman, and Bowen Loftin (1996, 1999). In 1998, a comprehensive analysis of the prospective educational applications of virtual reality was published.

Drawing from an extensive review of more than fifty scholarly works, Youngblut (1998) concluded that the implementation of virtual reality (VR) could potentially enhance the learning outcomes of students. Science Space has developed several virtual environments (VEs) that primarily focus on the subjects of chemistry, electricity, and

physics. These VEs include Pauling World, Maxwell World, and Newton World, which correspond to their respective scientific disciplines. A comprehension assessment was administered to a group of eighteen high school students enrolled in a physics course subsequent to their utilization of the Maxwell World simulation to review the course material.

Facilitating interactive role-play in simulated environments, such as the ExploreNet 2D collaborative improvisational theater simulation (Moshell & Hughes, 1996), is one method to support contextual learning. The establishment of collaborative exercises wherein pupils jointly construct virtual models can serve to enhance the constructionist learning milieu. An illustrative instance is the development of a solar system model that can be employed to demonstrate the process of eclipses (Barab et al., 2000). The methodology put forth by Crosier, Cobb, and Wilson (2000) is applicable for evaluating the shielding characteristics of diverse materials in the presence of an extensive array of radioactive sources.

The initial symposium on virtual reality and disability (Murphy, 1993) facilitated an extensive discourse regarding the potential applications of this technology. The applications encompassed a diverse array of subjects, such as mobility enhancement, education facilitation, rehabilitation support, and evaluation tool provision. A number of these findings were showcased at the 1996 European Conference on Disability, Virtual Reality, and Related Technologies (ECDVRAT), an esteemed scholarly gathering dedicated to the discourse surrounding these subjects. Cobb and Sharpey (2007) assert that an increasing body of evidence supports the notion that virtual environments (VEs) and virtual reality (VR) technologies are being implemented across various domains. The proliferation of multimodal digital media has stimulated the development of assistive devices and display systems for a variety of applications, including diagnosis and rehabilitation, behavior therapy and phobia treatment, training and education, and more. The substantial benefits of using virtual environments (VEs) for the instruction and training of individuals with intellectual disabilities are highlighted in Standen and Brown's (2005) review. One instance of an activity that can be replicated in a virtual environment (VE) prior to its implementation in reality is the preparation for a court appearance. Prior research has

demonstrated that providing training opportunities for students with intellectual disabilities through the use of virtual environments (VEs) is effective. Rose, Brooks, and Attree (2000), for instance, found that VEs were beneficial in assisting this demographic with culinary instruction. Mendozzi et al. (2000) reported positive outcomes resulting from the utilization of VEs for the purpose of instructing individuals with intellectual disabilities in protected domains.

Virtually realized artwork pertains to the development and participation in a virtual environment through the creation of artistic works.

The University of Nottingham in the United Kingdom established the Virtual Reality Applications Research Team (VIRART) in 1991 with the purpose of exploring and developing novel applications for virtual reality (VR) technology. VR has garnered significant attention from researchers due to its potential applicability within educational environments.

According to VIRART (2007), demonstration initiatives encompass a diverse range of academic programs, including rehabilitation, special education, industrial training, and general education. A challenge encountered during the development of virtual environments (VEs) catering to individuals with special educational needs (SEN) was the absence of all-encompassing design principles governing interfaces and content. This article examines four distinct programs designed to enhance the communication and learning abilities of SEN students. In addition, this population lacked an adequate understanding of the mental and affective processes involved in identifying and relating to VEs.

In order to ensure that the virtual environments produced adequately catered to the requirements of both educators and learners, user-centered design methodologies were implemented and enhanced. During this phase of application development and research, our team has concentrated on the following research objectives:

the procedure of constructing and modifying virtual environments (VEs) to meet the needs and preferences of particular user groups.

Knowledge conversion is the process of enhancing organizational learning and innovation by transforming individual and collective knowledge into various formats.

Evidence of learning outcomes or other beneficial outcomes; the degree of user

involvement with the virtual environment; and the level of user familiarity with the technology and its depiction are the determinants.

Table 1 provides a comprehensive summary of the chosen projects, highlighting their principal research areas of focus, significant findings, and the virtual environments (VEs) that emerged as a consequence. It is recommended that individuals interested in gaining further insights into these undertakings consult the previously published resources that are enumerated in Table 1. Educational institution based in the United Kingdom, The Shepherd School specializes in providing services for students who have severe and profound learning disabilities. This establishment was indispensable for the development and functioning of the initial three initiatives.

The integration of immersion virtual environments (VEs) has enabled instructors to incorporate real-world experiences into the learning environment, thereby connecting students to the outside world.

Educators regarded this discovery as potentially valuable for pedagogical and academic purposes within the domain of Makaton, an all-encompassing collection of visual aides and gestures utilized to facilitate communication throughout an entire school. Grove and Walker (1990) estimated that the Makaton library contains approximately 350 visual symbols. The educational methodology utilized to instruct Makaton is the "association" approach. It involves verbally introducing and naming an object, visually representing the corresponding Makaton symbol, and subsequently performing the associated sign. A concern was raised regarding the prohibition of incorporating associations with tangible objects such as structures and automobiles in an academic environment. Educators made do-it-yourself reproductions or visual aids that resembled tangible objects as a means of compensating; however, they were concerned that pupils would gain little understanding of the objects' functions without the opportunity to inspect and interact with them firsthand. It seems logical to accomplish this objective by employing virtual reality (VR) technology to facilitate student engagement with a virtual environment (VE) and impart knowledge regarding the functionality of virtual products via interactive experiences.

The Makaton initiative implemented a form of user interface design known as the "split screen," which consists of two main components. On the left side of the screen, an

interactive virtual signer and the Makaton symbol for the focal item were both displayed continuously. The right-hand side of the interface showcased an extensive assortment of virtual objects within a virtual environment (VE). As shown in Figure 4, the "boat warehouse" is one of the four components comprising the transport vehicle. The virtual environment (VE) affords the student the opportunity to autonomously investigate and analyze three-dimensional objects from various perspectives. Additionally, they have the ability to engage with interactive elements, such as the canoe that traverses the VE. A matching audio excerpt was initiated when the cursor was positioned within the box, mirroring the Makaton sign displayed on it. In this instance, the word "boat" was rendered as an example. The virtual environment portrayed in Figure 4 consists of a signer articulating a Makaton symbol. The "boat" icon would specifically come into focus when the cursor was positioned within the container housing the manikin. In order to sustain articulation, the learner need only engage in conversation with the signer if auditory repetition is required.

Multiple metrics were employed to evaluate the efficacy of the Makaton curriculum. Their multiple activity study revealed that instructors were not obligated to encourage student-teacher interactions, as determined by Neale et al. (1999).

While a negligible proportion of students encountered difficulties while utilizing the mouse, the overwhelming majority demonstrated proficiency with the apparatus.

Furthermore, indications of impromptu peer tutoring were present.

The teacher observes from within the classroom that an elder, more experienced student was providing Makaton tutoring to a younger, less proficient student. As part of this assistance, I was required to instruct the younger child in the proper use of hand signals and the word that corresponds to each symbol. There are substantial advantages to both alternatives.

Students would benefit from the "practice makes perfect" aspect of virtual world inquiry and participation, according to the hypothesis. The Life Skills Education project was a community-based research initiative that sought to provide instruction and training in critical life skills to at least 16-year-old students who were identified as having specific learning disabilities (SLD). The research endeavor was constructed upon the conclusions drawn by Brown et al. (1999). The primary objective of this

program was to furnish these students with the knowledge and practical expertise required to live independently. A virtual residence, grocery store, and café, in addition to a virtual transportation system, served as the foundation of a virtual city.

The participants were assigned the responsibility of task execution and decision-making within a simulated work environment. This entailed, among other things, organizing a bus excursion to the supermarket and compiling a comprehensive shopping list. In order to ensure that passengers were allocated to the correct buses, it was necessary to perform a cross-reference between the name presented on the front of the bus and the corresponding information shown in the lower portion of the screen (see Figure 5). The students were able to navigate the purchasing cart within their immediate vicinity while exploring the virtual supermarket, as illustrated in Figure 6, due to the fixed viewpoint. The split-screen design facilitates the ability of customers to view their shopping lists in full screen mode with simplicity. Additionally, it aids in the identification of individual items (refer to Figure 7).

A graphical representation of the spatial arrangement of a bus station is provided in Figure 5.

The layout of a supermarket is illustrated in Diagram 6.

Meakin et al. (1998) posit that the implementation of a user-centered design methodology facilitates user engagement in decision-making processes pertaining to virtual environments (VEs), including the selection of learning scenarios and the evaluation of VE interfaces. The learning situations were structured and designed in accordance with the insights and expertise of training specialists and educators.

An empirical investigation was conducted to compare studies that examined the subjective pleasure derived from utilizing a particular entity with those that examined its efficacy.

Observational analysis, interviews, and surveys were utilized to determine the levels of utility and satisfaction of the staff.

References

Auld, L. W. S., & Pantelidis, V. S. (Eds). (1995, June). VR in the Schools, 1(1). Barab, S. A., Hay, K. E., Squire, K., Barnett, M., Schmidt, R., Karrigan, K., et al. (2000). The virtual solar system: Learning through a technology-rich, inquiry-based, participatory

learning environment. Journal of Science Education and Technology, 9(1), 7–25. Bell, J. T., & Fogler, H. S. (1995, June). The investigation and application of virtual reality as an educational tool. Paper presented at the annual conference of the American society for Engineering Education, Session No. 2513, Anaheim, CA. Bricken, M. (1991). Virtual reality learning environments: Potentials and challenges. Computer Graphics, 25(1), 178–184. Bricken, W., & Winn, W. (1992). Designing virtual worlds for use in mathematics education: The example of experiential algebra. Educational Technology, 32, 12– 19. Brown, D. J. (1994, September). Special computers for special children. Open Learning Systems News, pp. 7–8. Brown, D. J., Cobb, S. V., & Eastgate, R. M. (1995). Learning in virtual environments (LIVE). In R. A. Earnshaw, J. A. Vince, & H. Jones (Eds.), Virtual reality applications (chap. 14, pp. 245–252). San Diego, CA: Academic Press. Brown, D. J., Kerr, S. J., & Bayon, V. (1998, September 10- 11). The development of the virtual city: A user centred approach. In Proceedings of 2nd European conference on disability, virtual reality and associated technologies (pp. 11–16). Skovde, Sweden: Mount ¨ Billingen. . Brown, D. J., Kerr, S. J., & Wilson, J. R. (1997). Virtual environments in special-needs education. Communications of the ACM, 40(8), 72–75. Brown, D. J., Neale, H. R., Cobb, S. V., & Reynolds, H. (1999). Development and evaluation of the virtual city. International Journal of Virtual Reality, 4(1), 28–41. Brown, D. J., Stewart, D., & Mallett, A. (1997, Spring). Virtual rooms. The SLD Experience, 17, 15–16. Byrne, C., & Furness, T. (1994). Virtual reality and education. IFIP Transactions, Computer Science and Technology, 58, 181–189. Clancy, H. (1996). Medical field prescribes virtual reality for rehabilitation therapy. Computer Reseller News, 698, 76. Cobb, S., Beardon, L., Eastgate, R., Glover, T., Kerr, S., Neale, H., et al. (2002). Applied virtual environments to support learning of social interaction skills in users with Asperger's syndrome. Digital Creativity, 13(1), 11–22. Cobb, S. V. G., & Sharkey, P. M. (2007). A decade of research and development in disability, virtual reality and associated technologies: Review of ICDVRAT 1996–2006. International Journal of Virtual Reality, 6(2), 51–68. Cobb, S. V. G., Neale, H. R., Crosier, J. K., & Wilson, J. R. (2002). Development and evaluation of virtual environments for education. In K. Stanney (Ed.), Virtual environment handbook (chap. 47, pp. 911– 936). Hillsdale, NJ: Erlbaum. Cobb, S. V. G., Neale, H. R., & Reynolds, H. (1998, September

10–11). Evaluation of virtual learning environment. In: The 2nd European conference on disability, virtual reality and associated technologies (pp. 17–23). Skovde, Sweden: University of Reading. Cobb, S. V. G., Neale, H. R., & Stewart, D. (2001, August 8– 10). Virtual environments—Improving accessibility to learning? In Proceedings of 1st international conference on universal access and human computer interaction (pp. 783–787). New Orleans, LA: Erlbaum. Crosier, J. (1996). Experimental comparison of different input devices into virtual reality systems used by children with severe learning disabilities. Unpublished dissertation, University of Nottingham. Crosier, J. K., Cobb, S. V. G., & Wilson, J. R. (2000). Experimental comparison of virtual reality with traditional teaching methods for teaching radioactivity. Education and Information Technologies, 5(4), 329– 343. Dede, C., Salzman, M., & Bowen Loftin, R. (1996). ScienceSpace: Virtual realities for learning complex and abstract scientific concepts. Paper presented at the Proceedings of Virtual Reality Annual International Symposium (VRAIS) 1996. pp. 246–253. ECDVRAT. (1996, July 8–10). Paper presented at the 1st European conference on Disability, Virtual Reality and Associated Technologies Maidenhead, UK. Retrieved from www.icdvrat.rdg.ac.uk/archive.htm Grove, N., & Walker, M. (1990). The Makaton vocabulary: Using manual signs and graphic symbols to develop inter-personal communication. AAC Augmentative and Alternative Communication, 15–28. Hall, J. (1993). Explorations of population expectations and stereotypes with relevance to design. Unpublished dissertation, University of Nottingham. Jonassen, D. (1994). Thinking technology? Towards a constructivist design model. Educational Technology, 34(4), 34–37. Kerr, S. J., Neale, H. R., & Cobb, S. V. G. (2002). Virtual environments for social skills training: The importance of scaffolding in practice. In: Julie Jacko (Ed.), The 5th international ACM conference on Assistive Technologies (ASSETS 2002) (pp. 104–110). ACM Press. Meakin, L., Wilkins, L., Gent, C., Brown, S., Moreledge, D., Gretton, C., et al. (1998, September 10–11). User group involvement in the development of a virtual city. In P. Sharkey, D. Rose, & J. I. Lindstrom (Eds.), The 2nd European conference on Disability, Virtual Reality and Associated Technologies (pp. 1–9). Skovde, Sweden: University of Reading. Mendozzi, L., Pugnetti, L., Barneiri, E., Attree, E. A.,

A generic productive process to train persons with disabilities. In Proceedings of the 3rd international conference on Disability, Virtual Reality and Associated Technologies (ICDVRAT) (pp. 115–122). Sardinia, NY. Mitchell, P., Parsons, S., & Leonard, A. (2007). Using virtual environments for teaching social understanding to adolescents with autistic spectrum disorders. Journal of Autism and Developmental Disorders, 37, 589–600. Moshell, J. M., & Huges, C. E. (1996). The virtual academy: A simulated environment for constructionist learning. International Journal of Human–Computer Interaction, 8(1), 95–110. Moshell, J. M., & Hughes, C. E. (2002). Virtual environments as a tool for academic learning. In K. Stanney (Ed.), Handbook of virtual environments, design, implementation and applications (pp. 893– 910). Hillsdale, NJ: Erlbaum. Murphy, H. J. (1993, June). Virtual reality and persons with disabilities. Proceedings of the first annual conference: Virtual reality and persons with disabilities. Northridge: California State University Center on Disabilities. Neale, H. (1997). A structured evaluation of virtual environments in special needs education. Unpublished dissertation, University of Nottingham. Neale, H. R., Brown, D. J., Cobb, S. V. G., & Wilson, J. R. (1999). Structured evaluation of virtual environments for special needs education. Presence: Teleoperators and Virtual Environments, 8(3), 264– 282. Neale, H., Cobb, S., & Kerr, S. (2003, March 25–28). An inclusive design toolbox for development of educational virtual environments. In Include2003 (pp. 230–235). London: Royal College of Art. Neale, H. R., Cobb, S. V., Kerr, S., & Leonard, A. (2002, September). Exploring the role of virtual environments in the special needs classroom. In Proceedings of the 4th international conference on disability, virtual reality and associated technologies (ICDVRAT) (pp. 259–266). Veszprem, Hungary: University of Reading. Neale, H. R., Cobb, S. V. G., & Wilson, J. R. (2000, September 23–25). Designing virtual learning environments for people with learning disabilities: Usability issues. In Proceedings of the 3rd international conference on disability, virtual reality and associated technologies (ICDVRAT) (pp. 265–272). Sardinia, NY: University of Reading. Neale, H. R., Cobb, S. V. G., & Wilson, J. R. (2001). Involving users with learning disabilities in virtual environment design. In Proceedings of universal access in HCI (pp. 506–510). New Orleans, LA: Erlbaum. Parsons, S., Beardon, L., Neale, H. R., Reynard, G., Eastgate, R., Wilson, J. R., et al. (2000). Development of social skills

amongst adults with Asperger's syndrome using virtual environments: The AS interactive project. Paper presented at the 3rd international conference on Disability, Virtual Reality and Associated Technologies (ICDVRAT), Sardinia, NY, September 23–25, 2000, pp. 163–170. Parsons, S., & Mitchell, P. (2002). The potential of virtual reality in social skills training for people with autistic spectrum disorders. Journal of Intellectual Disability Research, 46(Pt. 5), 430–443. Parsons, S., Mitchell, P., & Leonard, A. (2004). The use and understanding of virtual environments by adolescents with autistic spectrum disorders. Journal of Autism and Developmental Disorders, 34(4), 449– 466. Parsons, S., Mitchell, P., & Leonard, A. (2005). Do adolescents with autistic spectrum disorders adhere to social conventions in virtual environments? Autism, 9(1), 95–117. Rose, F. D., Brooks, B. M., & Attree, E. A. (2000). Virtual reality in vocational training of people with learning disabilities. Paper presented at the 3rd international conference on Disability, Virtual Reality and Associated Technologies (ICDVRAT), Sardinia, NY, September 23–25, pp. 129–135. Rutten, A., Cobb, S., Neale, H., Kerr, S., Leonard, A., Parsons, S., et al. (2003). The AS interactive project: Single-user and collaborative virtual environments for people with high-functioning autistic spectrum disorders. Journal of Visualization and Computer Animation, 14, 233–241. Salzman, M. C., Dede, C., Bowen Loftin, R., & Chen, J. (1999). A model for how VR aids complex conceptual learning. Presence, 8(3), 293–316. Standen, P. J., & Brown, D. J. (2005). Virtual reality in the rehabilitation of people with intellectual disabilities: Review. Cyberpsychology & Behaviour, 8(3), 272– 282. Standen, P. J., Cromby, J. J., & Brown, D. J. (1998). Playing for real. Mental Healthcare, 1, 412–415. Standen, P. J., & Low, H. L. (1996). Do virtual environments promote self-directed activity? A study of students with severe learning difficulties learning Makaton sign language. Paper presented at the 1st European conference on Disability, Virtual Reality and Associated Technologies, Maidenhead, UK, July 8–10, pp. 123–127. Standen, P. J., Brown, D. J., Anderton, N., & Battersby, S. (2004). Problems with control devices experienced by people with intellectual disabilities using virtual environments: A systematic evaluation, 2004. Paper presented at the 5th international conference on Disability, Virtual Reality and Associated Technologies (ICDVRAT), Oxford, UK, September 20–22, 2004, pp. 299–304. Strickland, D. (1996). A virtual reality application with autistic

children. Presence, 5, 319–329. VIRART (2007). Available from Virtual Reality Applications Research Team, University of Nottingham, UK, Web site: www.virart.nottingham.ac.uk

Virtual reality and education. (1999, June). Presence: Teleoperators and Virtual Environments, 8(3, Special issue). VRET (1997). Proceedings of Virtual Reality Education and Training, University of Loughborough, U.K. Retrieved from http://www.vrnews.com/vret97.html. Wiederhold, B. K. (2004). Virtual healing. San Diego, CA: Interactive Media Institute. Wing, L. (1996). Autistic spectrum disorders. British Medical Journal, 312, 327–328. Winn, W. (2002). Current trends in educational technology research: The study of learning environments. Educational Psychology Review, 14(3), 331–351. Youngblut, C. (1998). Educational uses of virtual reality technology (Tech. Rep. No. D-2128). Alexandria, VA: Institute for Defense Analysis.