

Standards for Implementing Virtual Humans: Inculcating Metacognition and Critical Thinking

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Abstract: *This paper reviews the need of and opportunities for standards for virtual human implementations to enhance metacognition and critical thinking in today's DoD personnel. It identifies some current constraints on effectively addressing those issues, and reports on advances in virtual human interfaces that can enhance efforts to augment current educational approaches. The authors assert that these new techniques would be beneficial to Warfighters and they present their case that instantiating these pedagogical approaches would be best served by the use of emerging, but prenascent, proactive conversational computer agents using Natural Language Processing. The paper opens with a view of the need for both metacognition and critical thinking skills in today's defense environment and a report on the number of leaders, analysts, and staff who decry the current state of those abilities. The capability and need to begin this educational process early with the Warfighters is advanced. Then, a review of the recognized pedagogical approaches to improving these proficiencies is countered by an explication of the many personal, organizational, and social hurdles to implementing these approaches. The last major section is a description of recent advances in the modeling and simulation community leading to the availability of conversationally facile virtual humans and other computer agent avatars with the capability of counteracting the obstacles currently hampering the education required. Some of the obstacles addressed are classroom scheduling, operational schedule overloads, geographic isolations, and personal characteristics of both educator and student. Recent research outcomes are offered as examples of current capabilities and future research efforts are outlined, offering design concepts and previewing some capabilities of new tools that will soon be available to the professionals in this discipline. These capabilities are described with sufficient detail to allow the reader to see if these programs might be applicable in their own work, either now or in the years to come.*

Authors' Biographies

DAN M. DAVIS is now a consultant for the University of Southern California, focusing on large-scale distributed DoD training, education and avatar mentors. Pre-retirement, he was the Director of USC's JESPP project for JFCOM for a decade. As the Assistant Director of the Center for Advanced Computing Research at Caltech, he managed Synthetic Forces Express, bringing HPC to DoD simulations. Prior experience includes serving as a Director at the Maui High Performance Computing Center and as a Software Engineer at the Jet Propulsion Laboratory and Martin Marietta. He has served as the Chairman of the Coalition of Academic Supercomputing Centers and has taught at the undergraduate and graduate levels. As early as 1971, Dan was writing programs in FORTRAN on one of Seymour Cray's CDC 6500's. He saw duty in Vietnam as a USMC Cryptologist and retired as a Commander, Cryptologic Specialty, U.S.N.R. He received B.A. and J.D. degrees from the University of Colorado in Boulder.

FREDERICA J. STASSI, ED.D. is a Science Education Analyst, working in the Central Coast of California. Her background includes research for the National Science Foundation in which she was funded to study pedagogies and efficacies in U.S. Science museums. This research involved museums from the East Coast to O'ahu in Hawai'i. Her doctoral research was conducted with the advice of Professor William McComas and focused on the development of science standards for the State of California. She received a B.A. degree from Tabor college Hillsboro, Kansas as well as an M.A. Degree and an Ed.D., both from the University of Southern California in Los Angeles.

MARK C. DAVIS, PH.D. is currently retired after careers in the US Navy and as a computer design engineer for both IBM and Lenovo. Rising to the level of Distinguished Engineer at Lenovo, he was responsible for the design of laptop computer cross-disciplinary technology, including PC architecture, embedded systems, open source and virtualization. Previous work was with IBM in the areas of software development and architecture involving security, storage and virtualization. Dr. Davis has been granted well over fifty patents that were filed during his service at both companies. He is a graduate of the Duke University NROTC program and was commissioned as an Ensign, attended nuclear power school, and served as a Submarine Officer for twelve years, including one duty tour as a classroom instructor. He left the service as a Lieutenant Commander to pursue a PhD. Mark holds a BSEE degree from Duke University and a PhD in Computer Science from the University of North Carolina, where his advisor was Professor Fredrick P. Books.

KAREN J. RISTUCCIA, D.MIN. is the Dean of Instruction at The Wilberforce School, a classical education private academy in Princeton New Jersey. Her pedagogical interests have been in the benefits of an education founded in the approaches advocated by Charlotte Mason. Her professional duties allow her to see students grow as writers and thinkers as well as to mentor teachers as they develop as scholars and leaders. Her Doctoral research produced a Dissertation entitled: "Way to look, way to live": a Youth Worldview Curriculum and Teacher's Manual. Karen received a B.A. from Princeton University, then an M.S. from Cairn University, and finally both an M.Div. and a D.Min. from the Gordon Conwell Seminary.