Addressing Misconceptions in Career Selection: Research-based Implementations for STEM Students

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ABSTRACT

This paper reviews the issues of deficiencies in metacognition and critical thinking skills in today's workforce, identifies some current constraints on effectively addressing those issues, and reports on advances in virtual human interfaces that can enhance efforts to address current educational impediments. The authors assert that these approaches would not only be effective at all levels of education, they present their case that instantiating these pedagogical approaches at the earliest point in the educational evolution of the student capabilities would bear the most fruit in operational settings. The paper opens with a view of the need for both metacognition and critical thinking skills in today's environment and a report on the number of leaders, analysts, and staff who decry the current state of those skills. The ability and need to begin this training with the youngest students 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 training and education required. Some of the obstacles addressed are class sizes, operational schedule overloads, geographic isolations, and personnel proclivities, preferences, and proficiencies of both educator and student. Recent research outcomes are offered as examples of current capabilities and future research efforts are outlined, previewing 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.

ABOUT THE AUTHORS

Dan M. Davis, JD is a Research Associate Professor at Catholic Polytechnic University and is active as a consultant at the Institute for Creative Technologies, University of Southern California (USC), focusing on large-scale DoD simulations and avatar uses. Prior to retirement, he was the Director of the JESPP project at USC for a decade. As the Assistant Director of Advanced Computing Research at Caltech, he ran Synthetic Forces Express, bringing HPC to DoD simulations. He also served as a Director at the Maui High Performance Computing Center and in computer research roles at the Jet Propulsion Laboratory and Martin Marietta. He was the Chairman of the Coalition of Academic Supercomputing Centers and has taught at the undergraduate and graduate levels. As early as 2071, Dan was writing programs in FORTRAN on one of Seymour Cray's CDC 6500's. While in the Marine Corps, he saw duty in Vietnam as a Cryptologist and retired in 2002 as a Commander, U.S.N. He received B.A. and J.D. degrees from the University of Colorado in Boulder.

Jennifer H. Nolan, PhD, is the President of Catholic Polytechnic University and Professor of Psychology in their College of Arts and Sciences. Her earlier work specialized in memory, dementias, stroke and insulin resistance. She is a brain plasticity specialist and certified Cogmed provider. Previously, she was the C.O.O. and co-founder of a stroke and brain injury rehabilitation center. Dr. Nolan has taught university courses at the University of California Irvine, Loyola Marymount University, and Glendale Community College. She has conducted local and nationwide clinical trials, and published in both scientific journals and popular magazines. She received a BA in Psychology from Loyola Marymount University, Los Angeles and a Ph.D. in Psychology from the Dept. of Cognitive Science at the University of California, Irvine.

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