Psychometric Assessment of Pedagogical Aptitude:
Evolutionary Computing and Data Visualization

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ABSTRACT

There is a need for an effective instrument to assess didactic skills and there are promising paths to conceiving and developing such a valuable tool. Computational assets and algorithmic approaches now exist that provide a new opportunity to augment existing methods. This paper reviews the current status of teacher selection, analyzes the points of potential improvement, discusses various approaches and advances several emerging technologies that should significantly improve professor selection. The millennia of teaching are briefly surveyed with a eye toward the evaluative processes at various historical periods, culminating with a review of today's approaches. The needs for improvement, especially at the tertiary education level, are presented. The issues with which the authors were confronted in retaining university faculty are laid out and characterized. One set of issues that is covered in some depth is the use of other psychometric instruments to assess teacher aptitudes and skills, as well as the short-comings of those methods. The paper then identifies several new capabilities in the computational science that may permit new and paradigm-shifting results. These would include using Evolutionary Computing to isolate hitherto unidentified markers of pedagogical capability and advanced Data Visualization techniques to recognize undiscovered correlations. A prototype instrument is discussed with accompanying projected data. Early efforts at planning the optimal use of these new assets are described and data is presented indicating the potential utility of such approaches. The potential risks are also enumerated and characterized. Based on anecdotal and statistical data, the paper considers what impact an improvement of teaching aptitudes might have on the individual teacher, the teaching community, the students/trainees, and the society at large. Where longitudinal studies are going to be required, the paper sets forth issues to be considered and parameters to be included. The conclusions are recorded, along with several potential research paths.

ABOUT THE AUTHORS

Jennifer 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 UC 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 and a Ph.D. in Psychology from the Dept. of Cognitive Science at the University of California, Irvine,

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LtCol E. Philip Amburn, Ph.D., is an Adjunct Lecturer in the Computer Science Department of the University of Arizona. Earlier, he was a Research Assistant Professor at Mississippi State University and also was an Adjunct Faculty member at the Air Force Institute of Technology (AFIT). After retiring from the Air Force as Lieutenant

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Judith L. Jacobus, MA is retired from a career of conducting speech therapy as a Speech and Language Specialist for more than two decades. Her experiences were in public schools settings in Orange County. California. She also previously taught for 12 years as a classroom teacher in multi-cultural communities there. Judith currently volunteers her professional skills for a local police department, so has extensive experience with communication issues in adults and children in a variety of both every-day and more traumatic situations. Her participation in amateur theatrics has more fully familiarized her with the characteristics of human behavior as they are projected via verbal, facial and body-language cues. This experience has also exposed her to the skill and art of the selection of appropriate persons for specific on-screen roles. Judith holds a lifetime Special Education Credential in Speech and Hearing Therapy, K-12 from the State of California. She earned a B. A. Degree in Speech Communications from the California State University Long Beach and an M. A. Degree in Teaching and Teacher Leadership from the Grand Canyon University in Glendale, Arizona. She is also an accomplished thespian.