

Undergraduate Research Symposium May 18, 2012 Mary Gates Hall

Online Proceedings

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MCNAIR SESSION - ACCESS AND TECHNOLOGY

Session Moderator: Eve Riskin, Electrical Engineering

Mary Gates Hall 287

3:30 PM to 5:00 PM

* Note: Titles in order of presentation.

Can the Retention Rate for First-Generation, Low-Income College Students Improve by Changing the Way the Universities Teach Them?

*Lisa Golding, Senior, BADM/Marketing, Heritage College
McNair Scholar*

Mentor: Kathleen Ross, ISIS, Heritage University

I am one of four research assistants working with Dr. Kathleen Ross. Dr. Ross is committed to establishing an institute for student identity and success (ISIS) at Heritage University. The institute will focus on first-generation, low-income college students as their retention rates are lower. First-generation, low-income post-secondary students are the fastest growing college population. We feel there is adequate research information available to improve the graduation rates of these new majority students. The research we use will be in the form of books, articles and websites along with interviews from faculty and students. In the past 30 years our country has experienced a downturn in college graduation rates per capita. As a result of this trend we now have this new majority of students. More than 50% of PhD's working in America today are foreign born. If our country is to regain its educational excellence, this new majority must have higher graduation rates. Through research, we are compiling a list of changes that need to be considered in university policy and practices of the new majority. Through our research we have discovered many studies and surveys that contain invaluable information. We are conducting focus groups of our own, interviews with faculty and staff and surveys of our student body. We hope to identify the key issues that impede success. We will then be able to establish an institute to help any faculty member better serve the new majority.

Social Network Index and Life Outlook: Examination of Demoralization, Life Satisfaction, and Depression in College Students

Ronald Thomas, Senior, Psychology, University of North Texas

McNair Scholar

Mentor: Sharon Rae Jenkins

The Social Network Index (SNI) (Berkman & Syme, 1979) has been used to demonstrate that people who are more involved with their networks have lower levels of negative emotional effects, such as depression and stress, and fewer occurrences of physical ailments, such as flare-ups of diseases. Demoralization (Dohrenwend, ShROUT, Egri, & Mendelsohn, 1980) measures the general physical and mental response of stress. The college age group is underrepresented in SNI research, which added some difficulty interpreting the results. There were four hypotheses: 1- Is SNI related to demoralization experienced by college students? 2- Does the first generation student population have a different average on SNI, demoralization, life satisfaction, and depression than non-first generation students do? 3- Is SNI related to levels of life satisfaction? 4- IS SNI related to self-reported levels of depression? Participants took an online survey for class credit, N=969 usable. Ages ranged from 16 to 47, mean= 21. There were 341 males and 628 females, and 42.5% were first generation college students. We found that those with higher values on the SNI had lower levels of depression($r=-.24$) and demoralization ($r=-.27$), and had higher levels of life satisfaction($r=.32$). When comparing the first generation population to the non-first generation student population, we found that only SNI differed significantly, although this small effect is of little practical importance.

Digital Inclusion: An Action Plan for the City of Seattle

Bryan Dosono, Senior, Informatics

McNair Scholar

Mentor: Ricardo Gomez, Information School

Digital inclusion is the ability of individuals and groups to access and use information and communication technologies. Despite the City of Seattle being home to a thriving technology sector, many disadvantaged and underserved residents are excluded from participating in its digital economy. This negatively impacts their ability to find jobs, succeed in education, and access vital services and information. High-tech cities like San Francisco, Philadelphia, and Chicago already have digital inclusion plans adopted by their municipal government, whereas the City of Seattle has yet to create its own. This research extends the University of Washington Technology & Social Change Group's framework for building digitally inclusive communities to create a digital inclusion plan for the City of Seattle. This project involves reviewing literature on existing municipal plans, interviewing relevant city officials, evaluating metrics of success, and inquiring how a municipal plan intersects with state and federal strategies. The developed plan will be presented to the Mayor and City Council for hopeful adoption and to offer improved direction for citywide businesses and institutions to fully participate in the City of Seattle's 21st century digital economy.

Home Monitoring for Parental Control

Jorge Sosa, Junior, Electrical Engineering, St. Mary's University

Presidential Scholar

Mentor: Wenbin Luo, St. Mary's University

Preventing a child from accessing a self-defense weapon in the parents closet when home alone is difficult if the parent does not even know that the child has tried to acquire it. Designing a home monitoring system that can alert parents when children access restricted areas around the home even when they are away from the home could help prevent the child from harming himself or others. To achieve this goal, an Internet connected microcontroller and sensors were used in congruence to detect the presence of a child in a restricted room. The system consists of an Arduino microcontroller connected to a PIR (passive infrared) sensor that could detect when there was motion. Using an internet connection, the microcontroller can send a twitter post to a dedicated twitter account. The twitter account can be linked to a smart phone and alert parents even when they are not around the house. A smart phone could be configured to automatically retrieve the post within minutes of the child's breaching into the restricted area, notifying parents of the breach. A system like this would be a great way to monitor a child's activities at home and help parents control what their child is doing.

Use and Allocation of Colors in Display Design

Alma Emadi, Senior, Industrial Engineering, Mathematics

NASA Space Grant Scholar, Presidential Scholar

Mentor: Magnus Feil, School of Art/Division of Design

Displays in general are designed objects meant for communication and notification. The display design has become even more important as the necessity of such information communication increases, such as displays used in control rooms and in manufacturing systems. The ineffectiveness of such displays can lead the operator to make costly errors. While there have been many advancements in the physical configuration of displays, the use of color in designing such objects has not been studied excessively. Moreover, with regards to the selection of colors and allocating them on the display, no general solution exists. This research will place an emphasis on finding a methodology for the use and allocation of colors in display design and will be an innovative contribution to the field of display design and, more generally, human factors engineering. Our research question is divided into two parts: determining if incorporating colors into displays is effective in reducing recognition time and increasing accuracy of signals, and, investigating how colors should be allocated, as well as successful methods of color-coding. Our research hypothesis is that use of colors will yield higher accuracy rate and lower detection time; however, we will weight accuracy more strongly than speed. In that matter, we believe that using colors as an additional tag of data will improve both priorities. The form of this study would be similar to a simulation game. We have designed a display using a simulation program called NetLogo. The display has multiple elements. It is programmed in a way that would automatically simulate a thermodynamic reaction when activated. Human subjects will be used to detect the signals in a timely manner and respond to prompts appearing on the screen. The simulation game will record the time and accuracy of the responses. These data will be analyzed and conclusions will be drawn.

The Relationship of Young's Modulus to Porosity in 3DP Stoneware Ceramic: A Complete Analysis

Alexandra Patricia Kanoelehua (Alex) Gramling, Senior, Mechanical Engineering

McNair Scholar

Mentor: Mark Ganter, Mechanical Engineering

Mentor: Grant Marchelli, Mechanical Engineering

Three dimensional printing (3DP), a subfield of additive manufacturing, has experienced many novel advancements by way of innovative material development over the past few years. With the recent expansion in capability, information regarding the mechanical integrity of these new material systems is generally lacking. In an effort to fill this informational void, the present study examined the relationship between Young's modulus and porosity in 3DP stoneware ceramic test specimens. During this experiment, the ceramic specimens or "pucks" were printed using a three dimensional powder printer and measurements of height and diameter were taken to map the variation in subsequent kiln firing operations. The pucks were kiln sintered according to a predetermined

schedule, which involved strategically placed ramp rates and isothermal soaks for varying time periods. After sintering, Archimedes Method was used to determine the porosity and bulk density of the specimens. The pucks were then crushed using an Instron Universal Tester resulting in a measure of the 3DP stoneware's stiffness versus porosity. It is expected that as the porosity of the pucks increases Young's modulus will decrease. The aim of this research is to provide the first experimental relationships of porosity and stiffness resulting from sintering parameter modification as well as to investigate the possibility of producing 3DP ceramics that are comparable to those that are conventionally manufactured.