

PROMOTING A SAFE CLINICAL ENVIRONMENT THROUGH THE USE OF AN EVIDENCE- BASED PROTOCOL TO REDUCE ALARM FATIGUE

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Background. Alarm related deaths are increasing. As complexity in the clinical environment increases, many facilities transmit an array of patient notifications to clinicians as an approach to prevent adverse events. Each notification must be analyzed for actionability by a clinician. This increase in stimulation can lead to clinician desensitization and potentiate an unsafe environment.

Background. Alarm related deaths are increasing. As complexity in the clinical environment increases, many facilities transmit an array of patient notifications to clinicians as an approach to prevent adverse events. Each notification must be analyzed for actionability by a clinician. This increase in stimulation can lead to desensitization and potentiate an unsafe environment. **Purpose.** To promote a safe patient environment through an evidence-based project to increase awareness and reduce potential adverse effects of clinical alarm fatigue. **Implementation.** A series of focus groups and observational assessments were conducted in an acute care hospital. Clinical interactions were tabulated including types, frequency and audibility of alarms. Nurses were trained to adjust alarm parameters according to patient condition. Monitoring software was modified to decrease printing of unnecessary strips and increase in-room alarm audibility. **Results.** Participants revealed themes of constant interruption of central station alarms, telephone calls and the increase of clinical interactions due to patient volumes.

Participants also expressed need for a clear, concise alarm management policy. There were 829 interactions within a 36 hour period (276 interactions per shift; one interaction every three minutes). Of those interactions, the top three categories included physiologic monitor (30.88%); clinical interactions (25.94%); and portable ventilator machine (13.99%) alarms. Approximately 70% were actionable. For the same period, clinical alarms totaled 256 (85 alarms per shift; seven alarms per hour). Of the three alarm types, yellow (urgent) alarms represented 78% of all physiologic alarms, with 87% being actionable. As a result of these findings, a proposed policy and staff educational plan was developed pending facility adoption and implementation. **Discussion.** Although alarms are significant warning signs in the clinical environment, their over use can lead to clinician desensitization. This evidence-based project identified potential patient safety issues and possible solutions in an effort to decrease excess alarms and increase actionability of alarms.

MAKING THE "ROPE" PROCESS REAL: USING TIME CARDS TO ANALYZE STUDENT KNOWLEDGE AND IMPLEMENTATION OF THE ROPE PROCESS IN THE PUBLIC RELATIONS AND ADVERTISING CAMPAIGN CLASS

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In many universities, a public relations or advertising campaigns course serves as the senior-level capstone course for majors specializing in those areas. Prior to reaching this final stage in their education, many faculty introduce students to the concepts of Research, Objectives, Programming and Evaluation (the ROPE acronym) to describe the process of public relations. Only limited research has been completed to: 1) further our understanding of how future practitioners (current students) understand and conceptualize the steps in the ROPE process; and 2) determine how much time is allotted to these steps in campaigns classes (in which students either create and implement their own campaign or create a campaign for a client) as compared to the recommended time allocations. The purpose of this project is two-fold: 1) to examine how students perceive the ideas contained in the four-letter process and; 2) to determine how students are using their time while creating these campaign plans.

PERCEPTIONS OF ONLINE COURSES AT MTSU: A FACULTY TO STUDENT COMPARISON

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Kim Sadler, Faculty, Biology; Ryan Otter, Faculty, Biology

The use of online courses on college campuses has grown substantially in recent years, despite limited information on how these courses are perceived by faculty and students, compared to traditional (classroom) classes. In this study, two separate, but equivalent, surveys were developed to compare the perceptions of MTSU faculty who have taught the same course using online and traditional formats ($n=99$) to the perceptions of MTSU students who have taken online courses ($n=715$), using a series of 7-point Likert scales. Both surveys measured: 1) perceptions of online versus traditional courses, 2) perceptions of students who take online courses and students' motivations for taking online courses, 3) perceptions of faculty members who teach online courses; and 4) demographic characteristics. Of the 25 questions investigated in this study, 12 showed significant differences between faculty and student perceptions ($p<0.001$). Significant findings from this research showed that compared to faculty perceptions, students tend to see online courses as more self-directed and believe that online students must be more willing to teach themselves. Students in online courses feel more disconnected from professors and fellow students than professors believe them to be. In addition, faculty tend to see the role of the professor as more critical to the success of online courses than students do. This research was conducted by a group of MTSU faculty members representing various disciplines across campus who are participating in a faculty learning community sponsored by the Learning, Teaching, & Innovative Technology Center.

LEARNING TO CLICK: STUDENT PERCEPTIONS OF LEARNING WITH RESPONSE DEVICE TECHNOLOGY IN COLLEGE BIOLOGY COURSES

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The use of student response device technology in biology lecture and laboratory settings has increased in popularity among instructors and students for a multitude of reasons. Using well designed and strategically placed questions, this technology provides immediate feedback to a specific question that supersedes a “show of hands” in classroom settings. Responses can allow instructors to make adjustments quickly to avoid for example, teaching a concept that most students are familiar. Student responses can be saved to create a record that can be used for tutoring, review, or discussion sessions. Preliminary analyses of data show students report a positive perception of learning and other positive outcomes with response device technology.

MODULES FOR TEACHING STATISTICS WITH PEDAGOGIES USING ACTIVE LEARNING

Lisa Green, Faculty, Mathematical Sciences; Scott McDaniel, Faculty, University Studies; Nancy McCormick, Faculty, Mathematical Sciences; Jeremy Strayer, Faculty, Mathematical Sciences; Ginger, Holmes Rowell, Faculty, Mathematical Sciences; Natasha Gerstenschlager, Graduate Student, Mathematics and Science Education, Brandon Hanson, Graduate Student, Mathematics and Science Education

The American Statistical Association endorses the recommendations for "Guidelines for Assessment and Instruction in Statistics Education" (GAISE; Aliaga et al. 2005), which include using active learning to teach concepts in introductory statistics effectively. With the support of an MTSU Instructional Technologies Development Grant, MTSU faculty are developing Modules for Teaching Statistics with Pedagogies using Active Learning (MTStatPAL), a package of technology-facilitated learning materials designed to help instructors effectively use active learning to teach important concepts in introductory statistics. The MTStatPAL project team is researching how the elements of the introductory statistics learning ecology (tasks students solve, kinds of classroom discourse, norms of participation, tools used for learning, and the practical ways the teacher orchestrates relations between these elements) are impacted by the implementation of the MTStatPAL modules. Data were collected using the Reformed Teaching Observation Protocol (RTOP), student surveys, teacher interviews, and pre- and post-test results. This poster focuses on results from class-testing Regression on the Rebound, a descriptive regression module, in MTSU's MATH 1530 Applied Statistics during the Fall 2012 and Spring 2013 semesters. During the observation of the regression lesson, students were engaged in statistical decision-making, asked statistical questions of one another, and discussed and resolved data collection difficulties.

THE SPATIAL EFFECTS OF RATE OF ECONOMIC GROWTH: EVIDENCE FROM SUB-SAHARAN AFRICA

Bichaka Fayissa, Faculty, Economics and Finance; Christian Nsiah, Faculty, Baldwin Wallace University; Chen Wu, Faculty, Black Hills State University

Many studies have investigated the determinants of economic growth rate of African countries with mixed findings (some positive and others negative) without taking into account the impact of space on economic growth. In this study, we present a spatial model of growth for Sub-Saharan economies with spatial correlations in the dependent variable and the error terms. Specifically, our study explores how the economic growth rate of one country affects the growth rate of other countries in its proximity. This research builds upon recent economic geography literature, which suggests that the geographical location of economic agents (countries in this case) do influence one another. Our results can be summarized into two main parts. First, our research indicates that without correcting for spatial linkages in determining growth rates, the results may be biased downward. Specifically, we find statistically significant spatial linkages in both the dependent variable and the error term, indicating that geographically proximate sub-Saharan African countries experience similar levels of economic growth. This is indicative of positive spillover effects. Second, we find that while the impact of foreign direct investment (FDI) on sub-Saharan African economies is positive, it is not statistically significant. This result may be due to several factors, including the fact that FDI inflow into this region is mainly focused outward (the extraction and export of natural resources, leading to minimal added value to the domestic economy). Furthermore, the channel for the extraction of natural resources tends to be highly specialized and as such limits the possibility that recipient economies will experience positive spillover effects. Another possibility is the non-effectiveness of an institutional framework and "culture" necessary to foster and harness the potential benefits of FDI inflows to the sub-Saharan African region.

PREDICTING VAN DER WAALS INTERACTIONS VIA TOPOLOGICAL ANALYSIS OF THE LAPLACIAN OF THE TOTAL ELECTRON DENSITY

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In chemistry, the total electron density is one of the fundamental concepts for the explanation of various phenomena. It reveals, but also hides a wealth of chemical information. The Laplacian of the electron density acts as a magnifying glass to reveal chemical features that are not evident in the total electron density. It provides the physical basis for the valence-shell electron-pair repulsion (VSEPR) model, and leads to a complementarity principle that is useful in predicting sites of nucleophilic and electrophilic attack, as well as those of van der Waals interactions that dominate biomolecular interactions. Herein, we report the results of a detailed analysis of the Laplacian of the electron density at critical points associated with reactive sites in nucleophilic and electrophilic attack, as well as in hydrogen bonding interactions. The dependence of the topological properties of the Laplacian of the electron density on basis sets and theoretical methods employed are extensively explored. All the analyses of the Laplacian of the electron density were conducted using an in-house Fortran code, Denprop, developed for a comprehensive post-processing analysis of quantum chemical electron densities. Financial support for this research was provided by the Office of Science, U.S. Department of Energy.

MATHEMATICS AS A FIRSTSTEP TO SUCCESS IN STEM

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The Middle Tennessee State University (MTSU) FirstSTEP program focuses on retention of freshman and sophomore Science, Technology, Engineering, and Mathematics (STEM) majors who do not have a strong background in mathematics prior to coming to MTSU. FirstSTEP recruits a cohort of up to 50 STEM majors whose mathematics ACT is between 19 and 23, inclusive, and provides these students with a set of experiences to help prepare them for success in STEM. Activities focus on mathematics preparation but include life and college skills as well. Before they begin their freshman year in college, the cohort spends two weeks in a summer mathematics bridge program that assesses and addresses their deficiencies in mathematics. Believing that providing context for learning is important, students also learn how mathematics is used in their discipline. During the Fall and Spring semesters of their freshman and sophomore years, each student enrolls in a one-credit pass/fail seminar to help them stay on track in mathematics and to learn more about skills for being successful in life and college. As a part of these seminars, the participants also complete required tutoring in mathematics each week. The students are engaged in an in-depth, introductory, team-based research experience in the summer before their sophomore year to provide a deeper understanding of one STEM area. The PIs observed positive changes in the participants' subject knowledge, research ability, and self-discipline by the end of their summer introductory research experience. This project has collected data on the effectiveness of the mathematics summer bridge, the academic year seminars, and the summer introductory research experience to assess students' progress toward improved retention in STEM. Data will also be presented on how these project components improve the students' motivation and academic success. The ultimate goal of this project is to improve STEM graduation rates at MTSU.

THE EFFECTIVENESS OF MICROSOFT FLIGHT SIMULATOR AS A TRAINING AID FOR PRIVATE PILOT TRAINING AND PROFICIENCY

Wendy Beckman, Faculty, Aerospace

The debate over the effectiveness of computer-based software for pilot training and proficiency has been ongoing since such software first became available. While studies on the efficacy of such software have been and continue to be conducted, pilots are in large number utilizing such packages. A nationwide survey was conducted to determine how the Microsoft Flight Simulator (MFS) software package is being used by pilots for both initial private pilot training and for maintaining proficiency once certificated. Over 650 survey respondents evaluated the effectiveness of MFS in 14 areas of pilot operations, including: procedures and checklists, systems operations, basic maneuvering flight, stalls, steep turns, ground reference maneuvers, pattern work and landings, VOR navigation, GPS navigation, cross country flight, instrument/equipment failures, basic attitude instrument flight, radio procedures, and aeronautical decision making. It was found that the six skills practiced in training having a combined Very Effective and Effective rating greater than 75% included: interpreting flight instruments (97%), VOR set up and usage (91%), basic attitude instrument flight (90%), general cockpit familiarization (81%), cross country navigation (81%), and basic maneuvering flight (76%). It was found that the five skills practiced for proficiency having a combined Very Effective and Effective rating greater than 75% included: basic attitude instrument flight (92%), VOR set up and usage (91%), cross country navigation (82%), GPS set up and usage (78%), and previewing unfamiliar airports (76%). In addition, it was found that almost 50% of respondents used the software package during their private pilot training, and that 85% of respondents now use the software package to help maintain their proficiency. The average use of MFS among respondents that use the package was 10 hours per month. These findings indicate that pilots have embraced MSFS as a useful training and proficiency aid.

THE ROLES OF PARTISANSHIP, CONSERVATIVE MEDIA DIET AND EDUCATION IN BELIEF GAPS ABOUT PRESIDENT OBAMA'S BIRTHPLACE: A CONDITIONAL PROCESS MODEL

Ken Blake, Faculty, Journalism; Jason Reineke, Faculty, Journalism

Several studies have supported Hindman's (2009) proposition that "belief gaps" can develop among ideologically disparate groups of people regarding politically contested facts – for example, facts about the existence and causes of global warming. Given this proposition's roots in the knowledge gap hypothesis (Tichenor, Donahue & Olien, 1970), these studies have considered education as a factor but generally have modeled it and ideology as competing moderators of belief. These studies also have found some support for the idea that attention to conservative cable and radio news media plays a moderating role in the relationship between ideology and belief. The possibility of more complex interactions between education and attention to conservative news media has been less well explored. Based on an analysis of data from an April 2011 Pew Research Center survey of 1,432 U.S. adults, this paper finds support for a conditional process model in which attention to partisan media plays a causal role in the link between political ideology and belief that Obama was born outside the U.S., while education moderates this link by amplifying partisan media's influence among better-educated individuals who are inclined to pay attention to them. The findings also suggest, perhaps discouragingly for some, that education is not necessarily a cure-all for misguided thinking about public affairs. Under some circumstances, it appears that education merely enhances one's ability to become misguided by enhancing one's ability to absorb content from parochial or outright erroneous media outlets. The better antidote, it seems, may be to promote education that emphasizes critical thinking informed by a variety of media outlets. Incidentally, data for the study were collected just prior to the release of Obama's long-form birth certificate, which settled the question of his citizenship for most Americans.

IMAGINE: A NEW BEAMLINE FOR NEUTRON DIFFRACTION STUDIES ON SINGLE-CRYSTALS

Parthapratim Munshi, Postdoctoral, Chemistry; Tibor Koritsanszky, Faculty, Chemistry

IMAGINE, a state-of-the-art, quasi-Laue neutron crystallography beamline, was developed at the High Flux Isotope Reactor at Oak Ridge National Laboratory. The acquisition and installation of IMAGINE was proposed to the National Science Foundation by a group of researchers at Middle Tennessee State University (Tibor Koritsanszky), North Carolina State University (Flora Meilleur), Hauptman-Woodward Medical Research Institute (Robert Blessing) and Oak Ridge National Laboratory (Bryan Chakoumakos and Dean Myles), with thirteen additional user participants from US industry and academic facilities. The National Science Foundation funded the proposal in July 2009 in the amount of \$1,831,600.00. This high intensity instrument enables neutron protein and supramolecular structures to be determined at near atomic resolutions (1.5 angstroms) from crystals with volume ~ 1 cubic millimeter and with unit cell edge of < 100 angstroms. We will summarize the first set of results obtained from this brand new instrument.

R&D EXPENDITURES AND IMPORT COMPETITION: RECENT EVIDENCE FOR THE U.S.

Bichaka Fayissa, Faculty, Economics and Finance; Kevin Zhao, Faculty, Economics and Finance

The large and growing United States (U.S.) trade deficit since the 1980s has sparked some interests in the determination of the impact of trade (foreign imports) on research-and-development expenditures response (to slow down the rising U.S. imports of goods and services and to reduce the trade deficit). Using a panel dataset over the 2000-2010 period for a cross-section of twenty two-digit Standard Industrial Classification industries, we estimate the effects of import competition and some control variables (real exchange rate, real income, unit labor cost, and shipment of goods and services) on the share of research-and-development expenditures to net sales in low and high-tech U.S. manufacturing industries. Preliminary findings suggest that the rise in import competition continues to elicit increased research and development (process and product) expenditures response for the high-tech industries, but not for the low-tech industries.

CROSS-CULTURAL PERCEPTIONS OF MATERIALISM AND WELL-BEING

Sandra Poirier, Faculty, Human Sciences; Mary Ann Remsen, Faculty, Early Childhood and Elementary Education, Murray State University; Tom Brinthaup, Faculty, Psychology; Hyun Ju Kwon, Faculty, Human Sciences; Elowin Harper, Adjunct Instructor, Middle Tennessee State University; Dr. Uma Iyer, Chair, Psychology, Austin Peay State University

This research explores how the consumption of material possessions is related to subjective well-being across cultures. Although materialism has been found to be negatively associated with life satisfaction according to well-being measures, the individual value of material possessions across cultures is not well understood. Exactly how perceptions of well-being and consumption of material possessions interact with social, cultural, and economic factors is not clear. While people from many societies share the belief that having material possessions leads to happiness and life satisfaction, research suggests that materialistic behavior negatively effects may have negative effects on self and identity (Shor, 1998). In an examination of consumer behavior and life satisfaction, Belk (1985) proposed conceptual domains of possessiveness, non-generosity, and envy as materialistic traits representing an individual's relationship to material objects. Although research provides information about the influence of materialism on aspects of well-being, research has not addressed how cultural values and shifts in economic resources interact to influence individual perceptions of well-being and materialism. Cross-cultural research will provide insight into the development of conceptual framework for conceptual, methodological, and measurement clarity in order to best address research questions pertaining to the relationship between materialism and well-being.

Q METHOD ANALYSIS OF WEB DESIGN

Philip Loubere, Faculty, Journalism

Q Methodology, first developed by psychologist William Stephenson in the 1930s, is a way to quantify and analyze people's subjective opinions or responses. When analyzing response to visual images, the usual procedure is to set up a grid and have the subject arrange images according to how much he/she identifies with each image on a scale from lowest to highest. This method has been found to yield more reliable results than simple polling or questionnaires. This study focuses on the visual appearance of websites to see if there is a more favorable reaction to certain color schemes, choice of typefaces, and layout. Identifying patterns in response to these qualities could provide useful guides for the design of websites in order to increase visitor retention and engagement. Lindgaard (2006) found that people form an impression of a website within 50 milliseconds, and Noam Tractinsky's studies (2000) demonstrated a measurable correlation between aesthetics and usability in websites. The images that subjects arrange on the grid are an assortment of website mockups containing variations in the above categories. In order to not have content associations unduly influence test subjects, the sites were created with generic images and text. This presentation incorporates a visual depiction of the test procedure, including examples of the websites, and charts of our results.

THE APPLICATION OF SOCIAL PRESENCE TO IMPROVE RETENTION IN ONLINE PROBLEM-BASED COURSE

David Gore, Faculty, Engineering Technology; Wesley Benson, Undergraduate,
Engineering Technology

The primary factor that contributes to retention in an asynchronous online course is student self-discipline. Engineering Economy, a problem-based course, has been taught as both an “on-ground” (in-classroom) and as an online course. Very early after the course changed to an online format, the student dropout rates increased significantly. Students have stated their primary issue in the online course format was the need for self-discipline to meet the course deadlines for assignments and tests to keep from getting behind. The use of online video meetings has increased the “social presence” of students with each other along with the instructor and has had a positive impact on those students needing more social presence to bolster self-discipline as attested to by the undergraduate co-presenter. Most studies in this area of social presence involve student surveys as a measure of overall course satisfaction based on classroom collaborative learning versus online collaborative learning. This study differs in that results-based retention (or dropout) data is collected and statistically analyzed over a six-year period.

BUILDING MATERIALS RESEARCH FOR ASSOCIATED GENERAL CONTRACTORS

Thomas Gormley, Faculty, Engineering Technology

The Associated General Contractors of Middle Tennessee (AGC) challenged student chapters to research appropriate construction materials as well as design and build table centerpieces for flower displays using building materials. The centerpieces, displayed at their Annual Banquet and Awards Ceremony, were judged as part of the event. Several students participated in the project as part of our construction materials class. This gave the students the opportunity to research applications for materials as well as a chance to attend the Banquet for networking in the industry. The AGC provided the specifications and a \$100 prize for the winner as selected by the guests at the dinner. Students researched different building materials and products that would be structurally stable, capable of holding multiple flowers and interesting or innovative to engage the dinner guests. Several materials were evaluated including wood, reinforced concrete, brick, concrete block, copper gutter and pipes and ceramic tile. Students drew different designs and evaluated which material would meet the requirements at minimal cost that could be built by them in the lab. Four teams of two worked together to identify the materials and make the center pieces. Trips to Home Depot and on-line research were required. One of the MTSU Commercial Construction models received first prize. It was constructed of a copper gutter section with insulating foam used to support copper pipes to hold the flowers. Students benefitted from the research by learning how materials perform in different applications and through hands-on experience making the pieces.

"WE JUST HAVE THIS ONE BREASTFEEDING BROCHURE" (SPONSORED BY ENFAMIL): EXPLORING BREASTFEEDING RESOURCES AND AGENDA-SETTING IN PEDIATRICIANS' OFFICES, WIC, LLL AND THE COMMUNITY HOSPITAL

Katherine Foss, Faculty, Journalism; Reyna Gordon, Faculty, Vanderbilt University

Studies of breastfeeding promotion in the United States have focused on low-income women, ethnic minorities, or other subpopulations, overlooking an exploration of available resources in a specific community—across ethnicity, income, and educational levels. A textual analysis was conducted on breastfeeding materials from local health sites in Murfreesboro, Tennessee. While the lactation boutique, Women Infants and Children (WIC) office, and La Leche League (LLL) provided information, the pediatrics clinics lacked materials, and some offered formula company-sponsored packages. Such mixed messages can lead to confusion and early weaning, and may indicate resistance in local providers. The scarcity of breastfeeding resources may give insight into Tennessee's low rates. As modeled by successful campaigns, local breastfeeding promotion needs to become multi-faceted in order to overcome current resistance from health professionals and promote agency for breastfeeding women.

SYNTHESIS OF NON-HALOGENATED PHOSPHORUS FLAME RETARDANTS FOR ENGINEERING RESINS

Dwight Patterson, Faculty, Chemistry; Phillip Mnirajd, Graduate student, Chemistry

Synthetic polymers are used in various applications in society, ranging from computers to televisions to automobiles. With the widespread use of synthetic polymers, certain physical properties are taken into account. One such property is the flammability of the polymer being used. Fire prevention and safety is an important issue, as fires lead to civilian deaths and large amounts of property loss. Many polymers are inherently flammable; therefore measures are taken to inhibit or decrease polymer combustion by the use of flame retardants (FRs). FRs work by disrupting the combustion cycle of the polymer. The most prevalent FR consists of halogenated compounds. However, current research has shown that halogenated FRs can have a detrimental effect to the environment. Because of the environmental concerns, government agencies have created stricter guidelines to legislate the use of halogenated FRs. Therefore the polymer industry has adapted to the changes in regulations by emphasizing the development of non-halogenated flame retardants. One such FR alternative is phosphorous based compounds. In this study, non-halogenated solid phosphorus FRs are developed, with the goal of creating a high molecular weight phosphorus compound to impart flame retardancy. The advantage of having a high molecular weight molecule is increased thermal stability, ease of handling, and less loading percentages to achieve flame retarding efficiency.

Compounds were synthesized using trimesic acid and phosphate monomers to yield a brittle solid. The products were characterized using nuclear magnetic resonance, Fourier-transform infrared spectroscopy, and differential scanning calorimetry. To test for flame resistance, the product was incorporated in to a polycarbonate sample and tested using thermogravimetric analysis (TGA). In addition, samples were heated at varying temperatures and the char surface was analyzed. Results show that the synthesized FR additive affects the degradation behavior of the polymer sample.

SELF-SUSTAINING ENVIRONMENTALLY RESPONSIBLE DISASTER RELIEF SHELTERS FOR RAPID DEPLOYMENT TO UNDERDEVELOPED OR DAMAGED INFRASTRUCTURE ENVIRONMENTS.

Douglas Chelson, Faculty, Engineering Technology-Construction Management

Natural or man-made disasters precipitate the need to shelter inhabitants and response personnel that cannot be easily met when there is a limited infrastructure available. Displaced persons are emotionally stressed as well as in need of shelter such that providing a secure and sanitary environment quickly is needed to reduce stress. The current method of disaster response is to direct people to any place still standing that will accept people. Temporary houses are typically unsafe, offer limited privacy and provide little sanitary comforts. Trailers, manufactured homes, hotel rooms and relocating persons to a different region are common responses and do not satisfy most emotional needs of the people affected while costing a large amount of money. One solution is to provide a compact structure that has bathing, toilet and kitchen included that can be brought to a disaster site almost immediately after the incident. The shipping size must be small so roads, harbors, airports or other infrastructure could handle the units. The structure should be self-supporting but also be able to work on a semi-permanent basis in a cost-effective manner once appropriate infrastructure is available to support potable water, septic and energy needs. Environmental responsibility is imperative since the unit is supposed to use less to make it more affordable in operation. For developing countries the structure becomes a permanent home for those who probably did not have sanitary conveniences prior to the disaster. Ultimately, the goal is for these units to be produced by and for developing countries such that sanitation and living conditions improve for the more impoverished elements of these countries. The solution offered here meets the requirements and could be implemented on a cost-effective manner compared to current government response formats.

WASTE WATER RECLAMATION FROM EMERGENCY RESPONSE SHELTERS

Douglas Chelson, Faculty, Engineering Technology, Construction Management

Environmentally friendly emergency response shelters are intended to be a semi-permanent solution to relief to those individuals who have suffered displacement due to natural or man-made disasters. Rapid deployment for immediate relief to the suffering is intended to provide sanitary living and operating conditions that can be used before infrastructure services such as potable water, electricity, gas or sewer service is restored. Once installed the units could be connected to the infrastructure components so that operating costs would diminish. The design of the structure relies on the concepts of reduce and re-use rather than using recycle as the means to reducing carbon footprint. Part of the "reduce" component of the shelter is limiting the amount of water that the occupants will use by proper design and life style training and also by the use a novel toilet, which uses significantly less water than standard units. The "re-use" part of the water system is to convert grey water from the unit to irrigation water for small on-site gardens, which are used to help support food needs for the inhabitants. The toilet effluent is diverted into a separate tank and can be either treated as conventional sewer or could be converted to soil/fertilizer to aid in crop production. This research will explore the options available for these "re-use" strategies and recommend the most cost-effective solutions given various environments in which the shelters may be used.