

Proceedings of the 2023 Global Polytechnic Summit, Technology Talent: Advancing a Comprehensive and Global Strategy

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Introduction to the 2023 Global Polytechnic Summit Conference Proceedings

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Summit Organizer

On behalf of the Global Polytechnic Education Alliance (GPEA), it is with great pleasure and pride that I introduce the publication of the “Proceedings of the 2023 Global Polytechnic Summit,” held June 4-7, 2023 at Utah Tech University, St. George, Utah (USA). These proceedings are a comprehensive compilation of the exceptional research and contributions presented during our successful Summit.

As the organizer of this year’s Summit, I am thrilled to witness the culmination of our collective efforts materialize into this collection of Summit proceedings. The 2023 Global Polytechnic Summit brought together a diverse group of passionate researchers, scholars, and experts from various disciplines and nations, fostering an atmosphere of intellectual exchange and innovative thinking.

This volume stands as a testament to the dedication and brilliance of each participant who enriched the Summit with their insightful presentations and engaging discussions. Within these pages, readers will encounter a wealth of cutting-edge research, innovative ideas, and thought-provoking insights, representing the forefront of knowledge in their respective fields.

The primary aim of our conference has always been to provide a platform for the dissemination of knowledge, the exchange of ideas, and the establishment of valuable connections among researchers from around the globe. The abstracts contained in this special edition of *Curiosity: An Interdisciplinary Journal of Research and Innovation* reflect the depth and diversity of research that was presented during the Summit, covering a wide array of topics ranging from technology talent development to K-12 STEM pipeline programs to curriculum design to the role of humanities and social sciences in expanding the global supply of technology talent.

I extend my sincere gratitude to all the authors who have contributed their work to this publication. Your unwavering commitment to advancing the frontiers of knowledge has not only enriched this book but has also played an instrumental role in shaping the discourse of your respective fields.

I would also like to express my heartfelt appreciation to the GPEA members, session chairs, reviewers, and everyone else involved in the successful execution of the 2023 Global Polytechnic Summit. Your tireless efforts and dedication were instrumental in making this event a resounding success.

As we openly share these Summit proceedings with the academic community and beyond, I have no doubt that they will serve as a valuable resource and source of inspiration for researchers, educators, and students

alike. Moreover, they will forever stand as a testament to the remarkable collaboration and intellectual camaraderie fostered by the 2023 Global Polytechnic Summit.

Once again, I extend my sincere thanks to all the contributors, participants, and supporters of the 2023 Global Polytechnic Summit. I am confident that this book of Summit proceedings will leave a lasting impact on the academic landscape and contribute significantly to the advancement of knowledge in our respective fields.

The Patent and Trademark Resource Center at Utah Tech University

Librarian John C. Burns

Utah Tech University, St. George, Utah, USA

Category: Applied and Use-inspired Research

The Patent and Trademark Resource Center at Utah Tech University is a special designation and resource made available by the United State Patent and Trademark Office. Utah Tech University applied to become a PTRC and was granted this amazing designation. It allows us to provide space and resources in the library to help entrepreneurs search for patents and trademarks in databases provided by the USPTO, namely Patent Public Search and TESS, Trademark Electronic Search System. Come learn more at this session.

From Research Inventions to Market Innovation

Prof. Dr. Stephen Wittkopf

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Category: Applied and Use-inspired Research

This paper presents a case study of knowledge and innovation transfer at a Swiss university of applied sciences, namely the Lucerne University of Applied Sciences and Arts. It is about colored photovoltaics for the built environment, an interdisciplinary research topic that combines aspects of architectural design with those of electrical energy with photovoltaics (PV) and digital printing technology. As a result, a new type of PV module has emerged, PV modules with individual color and pattern on their front glazing, which are more aesthetically pleasing than the normal dark panels. This is due to a special situation in Switzerland, where high targets are set for electricity generation through photovoltaics, but where there are also high barriers to widespread use. Ordinances prevent large PV installations in rural areas; therefore, PV must be integrated into building surfaces. But there they face resistance due to their appearance. The majority of the public and local authorities oppose proposals for buildings with dark and bulky PV modules on the facade or roof. Colored PV could be a solution; here, electricity can be produced beautifully, efficiently, and economically. This paper summarizes a ten-year journey from initial idea to market, highlighting the various stages from disclosure of invention, patenting, creation of new business, transfer to industry and teaching, and to market application. It concludes with some personal comments on the creation and commercialization of intellectual property at Swiss institutes of higher education.

Enhancing the Computation of Barrier-free Routes via Crowdsourcing

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Category: Applied and Use-inspired Research

On the basis of Open Street Map (OSM) routing material, we have developed the mobility app WheelScout, which computes barrier-free routes for mobility impaired users using their individual mobility profile, as well as barrier information which is extracted from existing information in OSM but also from information on barriers which have been included into the material by our users. This barrier information is included into the app manually, but also automatically via data which the sensors in the mobile phones gather. Using the example of inclines, which can be problematic to mobility impaired users, we will demonstrate how we automatically compute the information of this barrier by gathering information on barometric altitude data of certain geolocations and using those to compute the incline and, therefore, the barrier.

Collaborating Across Disciplines: The Key to Solving Society's Challenges

Vinodh Chellamuthu

Utah Tech University, St. George, Utah, USA

Category: Applied and Use-inspired Research

Institutionalizing research programs that blend practical and theoretical learning is essential to prepare students for future career demands. By participating in projects with businesses, industries, or government agencies that tackle real-world problems, students can apply their classroom knowledge to relevant situations, enriching their learning and benefiting society. Interdisciplinary collaboration is crucial to student success, as students from different academic backgrounds can broaden their perspective, gain a deeper understanding of problems, and generate innovative solutions. This type of collaboration also prepares students for diverse and cross-functional work environments. The presentation will showcase how students from Utah Tech University successfully addressed real-world problems coming directly from Southern Utah industries through interdisciplinary collaboration; and discuss the benefits, successes, and challenges of mentoring student teams in authentic learning environments.

Supporting Interior Design of Restaurants through Use-inspired Primary Source Research

Dr. Heather J. Stecklein and Nicolette Brehm

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Category: Applied and Use-inspired Research

At the University of Wisconsin-Stout, Interior Design Studio 3 students apply their interior concept developments within the physical constraints, building codes, and accessibility requirements of a typical commercial building. To explore the variety of resources that inform this type of interpretation within professional contexts, Interior Design professor Nicolette Brehm partnered with University Archivist Heather Stecklein to engage students in use-based primary source research. The collaborative project challenges students to interpret local and open source resources within one of four major restaurant styles: small plates, supper club, tea room, and pop-up. The resulting projects interpret local and historical imagery, recipes, legends, and archival narratives to create themes, textures, color palettes, and furniture selections for a restaurant interior. Each students' interpretation incorporates their artistic vision within the project's regulations, seating quotas, required usage zones, and other uniform project constraints.

Nicolette Brehm will describe the scope of the project including how she developed the conceptual design options for the simulated restaurant and selected the regulations and constraints that the students encountered. Heather Stecklein will demonstrate how she and Brehm engaged students with the archival and library resources implemented during the project, and she will offer insight into creating similar collections of research for applied design projects.

The presentation will conclude with examples of completed student projects and student reactions to their experiences developing their designs.

Applied Research toward Facile Manufacturing of p-type Oxides and Oxide-based Bipolar Applications

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Category: Applied and Use-inspired Research

Despite the significant progress in oxide electronics, the majority of oxide semiconductors are n-type oxides, which limits the current applications to unipolar devices. This limitation ultimately stunts the development of oxide-based bipolar applications such as p-n diodes and complementary metal–oxide–semiconductors.

The goal of this research is to address the technical questions, preventing the realization of low-temperature processed p-type oxides and oxide-based bipolar devices showcasing high device performance, such as low-voltage switching.

The current study is unique in that:

1. Unlike previous reports on oxide p-n junctions fabricated exploiting an epitaxial-growth technique or a high-powered laser-beam process that requires ultra-high vacuum conditions, high power, and, therefore, is limited for large-area processing, we demonstrate oxide-based p-n heterostructures that consist of sputter-synthesized p-SnOx and n-IGZO of which the manufacturing routes are in-line with current manufacturing requirements.
2. The synthesized p-SnOx films are devoid of metallic Sn phases with carrier density tuneability and high carrier mobility ($> 2 \text{ cm}^2/\text{Vs}$).
3. The charge-blocking performance of the metallurgical junction is significantly enhanced by the engineering of trap/defect density of n-IGZO, which is identified using photoelectron microscopy.
4. The resulting oxide-based p-n heterojunction exhibits a high rectification ratio greater than 10^3 at $\pm 3 \text{ V}$ (highest among the sputter-processed oxide junctions), a low saturation current $\sim 2 \times 10^{-10} \text{ A}$, and a small turn-on voltage $\sim 0.5 \text{ V}$.

The outcomes of the current study are expected to contribute to the development of p-type oxides and their industrial device applications such as p-n diodes through cost-effective manufacturing.

Introduction to Hail Awareness Spatial Analysis Toolkit (HASAT)

Haoruo Fu, Joseph Hupy, Chien-tsung Lu, and Zhenglei Ji
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Category: Applied and Use-inspired Research

The National Airspace System (NAS) is a complex network of air traffic control, navigation, and communication systems that support the safe and efficient flow of air traffic in the United States. However, severe weather conditions like hails have been a significant threat to flight safety. Hail consists of frozen precipitation that can cause damage to aircraft, disrupt flight operations, and pose a threat to the safety of passengers and crews. Aviation organizations have implemented various safety measures to minimize hail-related risks, such as improved weather forecasting, enhanced aircraft design, and better aeronautical decision-making (ADM) training. Additionally, the NAS provides air traffic control and flight management systems to help pilots navigate around areas of severe weather and ensure the safety of passengers and crews. Despite these efforts, hail continues to pose a significant threat to the aviation industry, and continuous studies are necessary to further sustain aviation safety in the face of the severe weather phenomenon. This research used Esri's ArcGIS as a mapping software for geospatial analysis of the severe weather's impact on the NAS. The Hail Awareness Spatial Analysis Toolkit (HASAT) is developed to discover the hail-affected airspace in the contiguous United States. The result shows that Texas, Oklahoma, Kansas, and Nebraska have been mostly affected by hail from 1951 to 2021. HASAT can also provide local hail data to pilots for safety and better decision-making.

The Use of Virtual Reality to Enhance the Quality of Industrial Training

Master Student Peter Soudah, Ph.D. Student Israa Azzam, and Assistant Professor Farid Breidi

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Category: Applied and Use-inspired Research

Virtual reality (VR) has emerged as an effective training tool in various industries due to its ability to simulate real-world scenarios and provide a safe and controlled learning environment. VR training allows users to experience high-risk situations without endangering themselves, and it also provides a platform to practice and master skills without the need for expensive equipment or resources. Additionally, VR training can be customized to meet the specific needs of individual learners, making it a highly effective instructional tool. The ability to provide immersive and engaging experiences also makes VR an excellent tool for instructional campaigns that aim to educate the people working in any industrial field or even the public on various topics. The VR modules may include realistic 3D models, animations, and interactive simulations that provide hands-on training and practice, which can be developed using Unity packages, and may also include audio and visual feedback to guide users through each step of a process or procedure. Virtual reality instructional modules can be customized to a wide range of technical topics, including manufacturing, engineering, healthcare, and more. To conclude, the use of VR as a training tool in the industry and instructional campaigns has the potential to revolutionize the way we learn and prepare for various scenarios. This work presents the use of VR as a tool to demonstrate a full mechanical suspension system, which can be utilized to enhance the training campaigns in the automotive sector, or even in simple technical maintenance centers.

Employ Human-AI Interaction for Forestry Measurement

Sun Su, Yawen Lu, Dr. Zhenyu Qian, Dr. Songlin Fei, and Dr. Yingjie Victor Chen

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Category: Applied and Use-inspired Research

Forests are a valuable natural resource. Forest landowners are in urgent need of convenient and accurate tools to estimate the value of their trees. The advance of deep-learning-based AI techniques can accurately recognize and segment objects in photos and videos and reconstruct the scene digitally. Smartphones have enough computing power to run an AI algorithm to analyze a high-resolution video taken by the phone. These techniques can potentially provide landowners with convenient ways to survey their trees. However, due to the natural limitation of optics, most AI techniques can only reconstruct the scene on a relative scale, similar in geometry but not the accurate dimensions. Accuracy is a major challenge for applying these AI technologies in real-world applications, especially on forestry surveys. We developed a new technology to solve this issue that can complement AI algorithms to provide an accurate sampling estimation of the forest. The technology integrates easy-to-carry hardware, deep-learning AI algorithms, and computer graphics algorithms, allowing a landowner to use a smartphone to survey all the standing trees within a 1/10 acre circular sampling plot (about an 11-meter radius). We designed the hardware and developed corresponding algorithms. The user takes a full round (360-degree) video with the help of our developed stand. The app will count the trees, and compute the trees' diameter at breast height (DBH) and locations within the plot range. The method is easy to operate and accessible for landowners and forestry researchers, and can conduct forestry measurements with high efficiency and satisfactory accuracy.

Teaching Field-work with Constraints: Lessons in Outdoor Research at a PUI

Dr. Geoffrey D. Smith

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Category: Applied and Use-inspired Research

Field work is fundamental to many scientific disciplines, but has requirements unlike other research activities. There are technical skills that can be difficult to simulate in a laboratory, so researchers must learn on-site. Some areas have hazards absent from the classroom, such as cliffs, extreme hot and cold, fast-moving water, and venomous animals. However, learning the technical aspects of field work can be rewarding and instill in students problem-solving capabilities that might not emerge indoors. Team-building outdoors is also uniquely powerful. Unfortunately, the constraints of limited class times and the inherent risks of outdoor research often dissuade instructors from taking students out of the class or lab. I have taught a field-techniques course at a PUI for two years now and have found a few ways that have made the process easier for me. Briefly, students are more capable, resilient, and creative than I had initially expected, and it is my opinion that field-techniques courses are under-taught at PUIs.

Picking Up Crumbs to Make a Pie: Utilizing Public Genetic Databases to Perform Bioinformatics Research at a Teaching-focused PUI

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Category: Applied and Use-inspired Research

Compared to research-centered institutions, many teaching-focused PUIs understandably face challenges to accessing resources necessary for diverse research programs in the biological sciences. Some creative scientists find their way around this by developing collaborations at other institutions and/or designing projects that don't require expensive equipment/reagents. While research involving genomics can be expensive, the current wealth of data available on public databases along with collaborative high-performance computers makes tackling questions in genomics a feasible task at institutions with limited equipment and research-designated funding. Students involved in genomic research acquire concrete skills that prepare them for graduate school and the biotech workforce.

Smooth Hydrodynamic Particles to Study Dynamic Behavior of Spool Valves

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Category: Applied and Use-inspired Research

The computational fluid dynamic medium has been proven to be a powerful resource when it comes to analyzing fluid flow inside machines. The most common technique is to discretize the Navier-Stokes equation using an Eulerian approach; the method reproduces, faithfully, any phenomenon related to any hydraulic machine. Despite the high accuracy of the results obtained from CFD, the method becomes unaffordable for huge domains. Fortunately, the Eulerian approach is one of the two techniques to model fluids. The Lagrangian approach is a meshless method for fluid simulation. This approach consists of tracking a set of particles to emulate the fluid properties; there is no need for a computational domain. However, this method is suitable for external flow, which implies that special treatment is implemented to run a simulation for inner flow. This study focuses on the application of a Lagrangian approach called Smooth Hydrodynamic (SPH) for hydraulic components, a spool valve. This device has been studied before by means of CFD. However, adjusting any simulation where the mesh is dynamic and deforming simultaneously is a demanding task in terms of computational power requirements. SPH does not deal with this drawback, mesh deformation, which makes this method appropriate for hydraulic components with moving parts. Moreover, in this study, it is possible to establish a solid methodology for the correct set-up of the inlet-outlet boundary conditions, and how to set SPH parameters for accurate results according to the SPH counterpart, CFD.

Machine Learning for Fault Diagnosis and Operation Mode Detection in Hydraulic Cylinders

Jose A. Solorio, Gina Catalina Baquero, and Dr. Jose M. Garcia-Bravo
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Category: Applied and Use-inspired Research

Applications of hydraulic systems are found today in a wide variety of devices, mostly in industrial and mobile machines. When extending the life and ensuring the correct operation of these machines is critical, analytical tools that provide more accurate information about the functioning and operation of these systems must be integrated to make proactive decisions. In industrial and mobile applications, there are many sensors and methods for measuring and determining the state of process variables (e.g., flow, pressure, force). However, little has been done to implement a system that can provide users with equipment status information related to on-machine hydraulics status. Implementing artificial intelligence (AI) technology and machine learning (ML) models in hydraulic system components is presented here as a solution to the challenges many industries face today, optimizing processes and making them safer and more efficient. This research paper presents a solution for characterizing and estimating anomalies in one of the most versatile and widely used devices in fluid-powered systems, hydraulic cylinders. This work describes AI and ML models implemented to determine the operating state of these hydraulic components and whether they function normally, in specific failure modes, or in abnormal conditions that can be predicted before a catastrophic failure occurs. The models implemented demonstrated an over 95% level of accuracy in predicting the failure of the component studied and presented in this work.

Dynamic Simulation of a Three-dimensional Gate Valve Using CFD and Turbulence Models.

Anokhi Sachin Sangamnerkar, Jose Garcia-Bravo, and Marvin Durango-Cogollo

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Category: Applied and Use-inspired Research

DCVs, also known as directional control valves, are crucial parts of hydraulic and pneumatic systems. They are linear-motion isolation valves and have a flow-stopping and flow-allowing function. In Ansys and SOLIDWORKS, fluid behavior is investigated to calculate stress and heat transfer. In earlier research, the inclusion of both three dimensions and dynamic analysis was occasionally overlooked. This work offers a way to integrate dynamic analysis in three dimensions because fluid flow can display complex behavior, such as turbulence, vortices, and secondary flows, which are best captured in 3D simulations. Incorporating complicated boundary conditions can result in more precise forecasts of pressure drop, flow rate, and other flow parameters. The model was used to characterize a commercial gate valve in a transient state using CFD, and to focus on the response of fluid by analyzing the flow forces, geometric characteristics, and pressure gradients. This article includes the findings and analysis of a CFD simulation study on the dynamic behavior of a gate valve.

An Innovative Approach for Controlling Hydraulic Systems Using Extended Reality

Marvin Durango-Cogollo, Jose Alejandro Solorio, Gina Catalina Baquero, Andres Rincon, and Jose Garcia-Bravo

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Category: Applied and Use-inspired Research

The goal of this project is to explore the application of Mixed Reality technology for controlling hydraulic systems. The proposed system uses a combination of virtual and physical elements to provide users with an interactive and immersive experience with the HoloLens2, a head-mounted device that overlays digital information onto the real-world environment, allowing them to control components in real-time through a computational model developed through the Unity game engine. Visual Studio, and Windows 11 SDK are the other tools implemented to generate a digital twin that can be used to manipulate a hydraulic system.

In this system, the user can receive immediate feedback from the actions performed by the system while displaying process variables (e.g., pressure and flow). The project includes a physical component in the form of a hydraulic cylinder, which serves as the output of the mixed reality control system. In this system, it is required to establish a bilateral connection between the HoloLens2 and the microcontroller, for example an Arduino board. Therefore, the electronic hardware will communicate wirelessly using Wi-Fi network connection (APIs). Additionally, the proposed interface is designed to be intuitive, easy to use, and versatile, allowing for a wide range of hydraulic system applications (e.g., manufacturing, mobile, industrial, and robotics). The project demonstrates the potential of mixed reality technology for enhancing the way humans interact with machines and equipment in the real world. The inherent traditional risks of using hydraulic technology will be mitigated by allowing the user to work in a safe and controlled environment.

Fostering Inner Creativity: The Benefits and Challenges of Encouraging Student-led Projects Based on Class Curriculum

Dr. Md Sazib Hasan

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Category: Applied and Use-inspired Research

The purpose of the talk is to present the significance of projects that involve students utilizing their own ideas following exposure to the class curriculum. The students' ideas are indicative of their creativity, authenticity, diversity, and the quality of their cognitive processes. This pedagogical approach was applied in various classes throughout the semester, resulting in the development of students' inner creativity. The talk will discuss the benefits, challenges, and rationale behind this approach, as well as its impact on the students' learning process in an authentic learning environment. Additionally, the talk will showcase some exemplary projects that were created by the students as a final group project, emphasizing the need for building a collaborative environment within the classroom.

Best Practices for Developing Engineering Career Readiness Using the Capstone Course

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Category: Curricular and Co-curricular Talent Development

The core undergraduate mechanical engineering curriculum trains students in many areas, including the understanding of mathematics, physics, statics, dynamics, materials, machinery, fluids, heat transfer and fabrication methods. Many of these classes focus on problem-solving in lectures, homework, and exams. The inputs for the problems are provided and the scope of the problems is limited such that the problems can be solved in less than an hour. In contrast, practicing engineers often work on projects that require days, weeks, or months of effort; have incomplete and uncertain project inputs; and require the selection and development of problem-solving techniques. Of course, the employer of a newly-graduated engineer will not expect the engineer to complete a complex project independently, but the new engineer will become a competent engineer more quickly by independently performing the tasks of a project before graduation. The senior-class-level capstone course can serve as a bridge between the scripted environment of earlier engineering courses and the less-scripted environment of the workplace. Note that one of the less-scripted future environments could be graduate school. Developing learning activities and assignments that serve as a proper bridge to career readiness is the challenge of developing an effective capstone course. The motivation for reduced scripting has been presented, but at the same time, too little scripting can make the students uncomfortable and distract from their learning. Some lack of comfort is appropriate, but it should not be excessive. The presentation explains the best practices used in the engineering capstone class at Utah Tech.

Expanding Professional Mentoring Opportunities between Students and Practitioners with Collaborative Skill-based Projects

Prof. Nancy J. Rasche and Mengyu Wun
Purdue University, West Lafayette, Indiana, USA

Category: Curricular and Co-curricular Talent Development

Many students must gain professional work experience, such as an internship, as part of their plan of study graduation requirements. This requirement can create barriers for certain student groups in our college, including but not limited to international students, students with socioeconomic concerns, and/or students with majors in entertainment-related fields that have low internship offerings. Our goal was to understand what industry practitioners and students are wanting from mentoring opportunities and leverage this knowledge to develop a virtual program that would place students on two to three short collaborative projects, designed and led by industry practitioners, which they would collaboratively complete throughout the academic year. In this presentation, we will share our learnings from survey and interview data about the motivations and preferences of students and practitioners for successful mentoring experiences. We will discuss how we learned that practitioners are intrinsically motivated to mentor and participate in the process of helping students succeed. They also wish to gain reciprocal learning and refreshed perspectives from students while they teach them skills that they wished they knew before they started their career. Students seek mentoring opportunities on real-world projects from experienced professionals to enhance their job-ready skills. Students want to get suggestions about how to be successful on their aspirational career path and to improve their networking abilities from practitioners. Lastly, we will describe our progress toward applying our learnings in the design of our “mini-internship” program.

Developing Nursing Students' Clinical Judgement Through Active Learning in the Simulation Lab

Dr. Carolyn C. Lewis

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Category: Curricular and Co-curricular Talent Development

Nursing students who attend Utah Tech University participate in four semesters of active learning through simulation. The simulation experiences provide hands-on experience with low- and high-fidelity mannequins to help the students develop and solidify important clinical judgement skills that are tested on the National Council Licensing Examination for Registered Nurses (NCLEX-RN), and that are also essential to the nurse's success in the clinical practice setting.

This presentation will describe the six facets of clinical judgement, and will discuss the specific hands-on simulation activities that are used to target development in each of the six areas of clinical judgement.

Nursing clinical judgment skills are categorized into six main areas: 1) Recognize Cues; 2) Analyze Cues; 3) Prioritize Hypotheses; 4) Generate Solutions; 5) Take Action; and 6) Evaluate Outcomes. During each semester of the nursing program, students take care of simulated patients experiencing "real-to-life" clinical problems. The faculty control the patient simulators out of sight behind a two way mirror. The high-fidelity mannequins can speak and manifest real signs of distress including adventitious breath sounds, irregular heart rhythms, thready pulses, pupillary changes, etc.

During simulation, students are required to assess the patient, recognize problems, take actions to address the problems, call the physician for medical orders, gather supplies, manage their patient's care, and document their interventions in a time-pressured environment that simulates a real patient care setting. After the simulation experiences, students have a chance to debrief and complete self-reflection and goal setting.

Talent Development through Employee Ownership

Asst. Professor of Practice Danny A Wyman
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Category: Curricular and Co-curricular Talent Development

In our business environment today, it has become more of a challenge to attract and retain talented employees; research has begun to study ways to achieve this. Employee ownership is one business strategy companies have found to help attract and retain long-term employment. The initial idea was designed to increase wealth after retirement and develop a culture that allows employees the opportunity to be active and engage in company strategies. The focus of this paper will be to show how successful Employee Stock Ownership Plans (ESOPs) impact employee retention, productivity, and engagement in becoming the employers of choice.

An ESOP is the most popular type of employee ownership plan where you acquire, and own shares of company stock funded by a profit-sharing plan. You must be an employee to own company stock and then be allowed to become vested in two to five years (depending on the company). This type of business started to increase in popularity in the 1980s. The growth of ESOPs went from 250,000 to 14 million plan participants from 1975 to 2020. ESOP companies tend to lead the way and are four times more likely to allow employees the opportunity to be active and offer solutions to make the company a better place to work. My research includes data collected from 100 surveyed employee owners and ten interviews with respondents.

The research shows how a positive employee attitude towards ownership will lead into a long career, all the way to retirement.

Strategies for Expanding Visibility of Student Team Project Results

Dr. Thomas Schumann

Darmstadt University of Applied Sciences, Darmstadt, Germany

Category: Curricular and Co-curricular Talent Development

The International M.Sc. program in Electrical Engineering and Information Technology (IMSEIT) of Darmstadt University of Applied Sciences, established in 1998, is one of the first and most renowned international master programs in Germany. A mandatory part of this master program is the “Team Project.” In this course, the students execute a practical project, starting from requirements engineering, over system design, towards implementation and testing.

In this paper, we propose an approach to how visibility of the results of the “Team Project” can be enhanced to the benefit of the students. This approach shows a success rate of over 30% within the last two years of evaluation. However, this approach can be applied to other polytechnic universities within their academic program.

Presentation of the project results is one the main competencies the students gain from the “Team Project.” Besides the oral presentation to the faculty and the mandatory written report, we asked the students if they are willing to publish their results using the following three channels:

- newsletter of the faculty
- poster for academic fairs
- paper submission to international technical conference

Evaluation (2020-2022) shows that over 30% of the students within the major “Embedded System” were picking one of the three channels, with 5% contributing to the newsletter, 20% designing a poster, and 10% submitting a paper to an international technical conference. This shows that an international publication can be a huge motivation to increase the visibility of the project results.

The Role of Career Services in Supporting Talent Development at a Polytechnic University

Director Bryan Barts

University of Wisconsin-Stout, Menomonie, Wisconsin, USA

Category: Curricular and Co-curricular Talent Development

University of Wisconsin-Stout, Wisconsin's Polytechnic University, has established a clear distinction by outlining three tenets – Applied Learning, Career Focus, and Industry Collaboration. Each tenet can be seen as supporting future talent and workforce. While many Career Services offices can be connected to such topics, at UW-Stout, Career Services is a central focus and driving force. Whether that is building external relationships with industry, leveraging outcome data to support enrollment, managing applied-learning programs to build talent pipelines, delivering student retention programs to strengthen program outcomes, or collaborating across campus to provide career readiness, UW-Stout Career Services is central to all facets of UW-Stout's talent development.

The Career Services teams at UW-Stout, Wisconsin's Polytechnic University, has a developed mission statement that is focused on engagement, education and empowering career growth. In addition, a clear vision and a list of values was developed through strategic planning to help guide the direction of the office and its teams through future engagement and industry support efforts.

These efforts have led to significant collaboration and state-wide program recognition, as well as national awards and attention as a leader in both student career development and applied-learning programs, all of which drive the talent attraction and support of industry needs.

In this session, several examples will be highlighted, including the development and delivery of career readiness and recruitment programming; the engagement and participation in state-wide efforts within UW-System and support of regional economic development partners; and the infusion of best practices in services, technology, events, and resources.

Practicing Integrated STEM in Middle Schools: Exploring Teachers' Perspectives

Dr. Paul Asunda, Ms. Fatima Perwaiz, and Mr. Hillary Ongoyo Omoze
Purdue University, West Lafayette, Indiana, USA

Category: Curricular and Co-curricular Talent Development

The current STEM pipeline problem with decreasing STEM graduates has posed a serious challenge to the U.S. education system. Considering integrated STEM (iSTEM) as a way to overcome the issue, this study explored middle school teachers' perceptions of iSTEM. As participants, 17 teachers from different schools and districts in a midwest state took part in the study. An instrumental case study, utilizing a phenomenographic lens, was used to explore the research questions guiding this study. Data were collected through classroom observations, photo documentation, and teacher interviews.

Learning Myths that Hinder Effective Student Learning

Dr. Bruce R Harris and Ms. Diana J Maughan
Utah Tech University, St. George, Utah

Category: Curricular and Co-curricular Talent Development

Faculty in higher education are clearly subject-matter experts in their field; however, many do not necessarily know a lot about evidence-based teaching methods. As a result, they may adopt some teaching ideas and practices that hinder exceptional student learning and success.

The proposed presentation will explore several learning myths that have been widely accepted and perpetuated for many years, often leading to ineffective teaching methods and limiting students' potential. Below are common learning myths that will be examined.

- Students have different learning styles, whether it's visual, auditory, or kinesthetic, and faculty should tailor their instruction to a student's particular learning style.
- You're either "right-brained" or "left-brained" and left-brained people are more logical, analytical and methodical, whereas right-brained people are more creative and artistic.
- People remember 10 percent of what they read, 20 percent of what they hear, 30 percent of what they see, 50 percent of what they see and hear, 70 percent of what they say and write, and 90 percent of what they do or teach others.
- Go with your gut—you should always stick with your first answer.
- Learning gets harder as you grow older.

This presentation will also discuss practical strategies that educators can implement to dispel these myths and promote a more inclusive, effective, and engaging learning environment. By understanding how these learning myths hinder effective student learning and taking steps to combat them, we can help students reach their full potential and achieve their academic and personal goals.

Building a Culture of Active and Applied Learning at a New Polytechnic University: Lessons Learned

Dr. Bruce R Harris and Dr. Michael Lacourse

Utah Tech University, St. George, Utah

Category: Curricular and Co-curricular Talent Development

Several years ago, administrators and faculty leaders at Utah Tech University (UT) developed a plan to build a culture of teaching and learning focused on active/applied learning at the university. At the beginning of this initiative, baseline data was used to determine that 76% of the faculty members were using traditional, teacher-based teaching strategies such as lecture. In a recent survey, 75% of the faculty indicated that they used predominantly active learning strategies.

The primary objective of the proposed presentation will be to share how we have built a culture of active/applied learning over the last several years and to discuss lessons learned. For example, below are some of the key strategies used in this initiative:

- Adopted the motto and tagline “active learning. active life” for the entire university.
- Involved all faculty, staff, and students in developing a shared definition and vision of active learning at UT.
- Developed an instructional model for implementing active learning at the university titled the Personalized Active Learning Model (PALM).
- Developed a white paper to define a vision of learning at UT.
- Established an annual one-day Teaching & Learning Conference, summer retreat, and a training summit before the new academic year focused on how to promote active and applied learning.
- Revised the university policy on Retention, Promotion, and Tenure Criteria to evaluate student learning and success (rather than just focusing on teaching).
- Required newly hired full-time faculty members to complete several onboarding courses focused on evidenced-based teaching methods involving active and applied learning.

Technology Enhanced Hands-on Learning of Sonographers or Medical Doctors for Ultrasound Procedures

Mr. Byung Wook Kim¹, Mr. Deepak Raina^{1,2}, and Prof. Richard Voyles¹

¹Purdue Polytechnic Institute, West Lafayette, Indiana, USA.

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Category: Curricular and Co-curricular Talent Development

Clinical ultrasound skills are essential for providing accurate patient diagnosis. Existing skill assessment tools evaluate the practitioner based on the accuracy of acquired imaging, ultrasound equipment function and understanding, selection of appropriate transducer and machine presets, patient interaction, and time-to-completion. The combination of these assessment tools may be the best way to measure competency, however, it requires the availability of trained examiners, which are available in limited capacity. However, with the use of technology, the apparent limitation of this assessment can be eliminated, thereby enhancing the hands-on learning process for the ultrasound procedures. We propose a new additional performance metric, named as path tortuosity, for assessing the skill of sonographers and medical doctors. It will evaluate the degree of the smoothness of the resulting motion of the probe and would be a good indicator of patients' safety during physical interaction. The path tortuosity can be evaluated using either wrist-mounted sensors or trackballs on the hand of the practitioner while performing the ultrasound procedure. The benefits of this approach include increased access to training, consistent and standardized learning experiences, and the ability to practice complex or rare procedures without risk to patients and without requiring an expert examiner. Further, it has a direct application for evaluating the forthcoming collaborative robotic ultrasound systems for evaluating the human-robot teaming effectiveness over manual procedures. With continued research and development, this evaluation framework has the potential to transform the way ultrasound learning will be conducted in the future.

Online VR Lab Learning - For Students, By Students

Jordan Ellsworth, Dr. Xin Wang, and Marc Lundstrom
Utah Tech University, St. George, Utah, USA

Category: Curricular and Co-curricular Talent Development

Lab courses are rarely offered online because they often require hands-on learning that can be difficult to do online. To reduce this barrier and provide more flexibility for students, Utah Tech University is developing online lab experiences using immersive virtual reality (VR) technology for a fully online physics course.

Consistent with the polytechnic mission of Utah Tech, the development of these VR labs also serves as an active, applied learning experience for the eight Utah Tech students who are members of the VR design team, including student software developers and 3D animators. In this presentation, we'll share details about the two major elements of this project: 1) How these labs provide engaging and meaningful online lab learning experiences, including some examples of the immersive VR experiences we've created and an overview of our design process, and 2) How student app developers and animators simultaneously gain invaluable career, collaboration, and technology skills along the way.

From the Classroom to Career: What Role Does Microcredentialing Play?

Dr. Tiffany D. Vickers¹, Dr. Kristal May²

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Category: Curricular and Co-curricular Talent Development

Workforce preparedness and educational outcomes are scrutinized by universities and employers alike. In a 2020 employer survey conducted by the Association of American Colleges and Universities, executives and hiring managers were surveyed to explore what employers believe constitutes job readiness. In most cases, employers in the U.S. have confidence in higher education. They believe a liberal education provides the skills necessary for students to experience success in entry-level positions. Still, employers were less likely to believe that a liberal education would lead to promotions or long-term career success without additional skills training (Finley, 2021).

The skills viewed as “very important” by employers include teamwork, critical thinking, the ability to analyze and interpret data, the application of knowledge, and digital literacy (Finley, 2021). In addition to these skills, employers found it very important for graduates to possess certain mindsets (Finley, 2021). These include a strong work ethic, an ability to take the initiative, and self-confidence. When these skills, mindsets, and aptitudes unite, you have a well-rounded student ready to enter the workforce, but are they prepared for long-term career success?

This presentation will discuss the benefits of micro-credentials in job preparation. Attendees will gain insights into how micro-credentials, combined with a liberal education, allow students to learn industry-driven skills that will help students qualify for higher-paying middle-skill positions at the entry-level. Students are more competitive applicants at graduation and are more likely to be promoted. As a result, micro-credentials help universities remain relevant to employers and students.

Bringing Student-Driven, Faculty-Mentored Research to the Classroom

Dr. Jeremy W. Bakelar

Utah Tech University, St. George, Utah

Category: Curricular and Co-curricular Talent Development

Early exposure to research provides students with an important foundation of knowledge, tools, and resources necessary for success in STEM-related careers. However, incorporating student involvement in original research at undergraduate institutions is often challenging. Some of the obstacles that are often encountered include lack of resources, instructor time constraints, project funding, and stimulating student interest. To address these challenges, we have developed a CURE (Course-based Undergraduate Research Experiences) approach in a research laboratory course setting. The course has provided a terrific opportunity for students to address prevailing research questions and develop a range of critical skills that are often unapproachable in typical undergraduate courses. Additionally, the course has facilitated an opportunity for faculty to integrate teaching responsibilities and their research efforts, while circumventing challenges often faced by researchers at smaller institutions.

Enhancing Reflective and Experiential Learning

Dr. Meenakshi B. Iyer

Utah Tech University, St. George, Utah, USA

Category: Curricular and Co-curricular Talent Development

Polytechnic Universities, with their emphasis on job-readiness, generally promote experiential learning as the key to successful employment readiness. The goal is to provide students the hands-on learning opportunities that help them transition to employment, thereby addressing employers' needs for new graduates to "hit the ground running." To this end, students are exposed to authentic demands that improve their employability, interpersonal skills, and transition to the workforce. However, without knowledge of the student's reflections on an experience, we cannot be certain of what learning occurred or what meaning learners gathered from the experience. Thus, the development of reflective skills is crucial for personal and professional development within a discipline, and is a core component of polytechnic education.

Reflection is a learned skill and students need to be guided from superficial to deeper reflective skills through a scaffolded approach, wherein each level of reflection builds on the previous to enhance personal and discipline-specific critical thinking skills. Additionally, graded reflection-based assessments are necessary for all experience-based education to capture the student's understanding of the learning that took place and to provide feedback. This presentation focuses on reflective-experiential learning and:

- Explores teaching and learning strategies that enhance the learners' reflective skills.
- Examines processes to evaluate reflection.
- Authenticates the transformative power of 'learning' that is grounded on reflection of experience.

An Interdisciplinary, Problem-Based Curriculum for STEM Students

Dr. Aaron Davis, Dr. Wendy Schatzberg, Dr. Vinodh Chellamuthu, and Dr. Alex Tye

Utah Tech University, St. George, Utah

Category: Curricular and Co-curricular Talent Development

Interdisciplinary collaboration in STEM education is crucial as it addresses complex problems, encourages innovation, prepares students for careers, and enhances the overall learning experience. The Innovative Scholars Program for Interdisciplinary Research (INSPIRE) developed at Utah Tech integrates interdisciplinary student teams into problem-based learning to achieve authentic learning gains within STEM majors. This NSF funded program incorporates three sequential lab-based courses to train students in research, design, product development, and entrepreneurship over three semesters. Student teams identify a real-world problem, design and prototype a solution, and learn entrepreneurship as they market their product. This format for mentoring students fosters interdisciplinary collaboration, achieves high learning gains, and requires relatively low faculty workload, making it ideal for institutions where teaching is the primary focus and faculty generally have less time for mentored student research. We present an update on this multi-year program and discuss future directions.

STEM through VEX Robotics: Soft and Hard Skills that will Shape Students for their Future

Jordan L. Bartholomew
Vista School, Ivins, Utah, USA

Category: Curricular and Co-curricular Talent Development

This presentation will show how using robotics to teach STEM is a powerful tool in preparing students for future careers in STEM and the benefits of competition coupled with classroom instruction. This will be an informative session with resources to use the VEX robotics continuum in and out of the classroom for K-12 educators.

Transformation of a School of Engineering Technology Gateway Experience

Dr. Rustin D. Webster

Purdue University, New Albany, Indiana

Category: Developing Technology Talent Across the Lifespan

Gateway (or barrier, weed-out, killer, introductory) courses, which have remained largely untouched and understudied for decades, are simply characterized by being foundational, high-risk, high-enrollment, and linked to having a high degree of course severity (i.e., high percentage of students withdrawing or receiving a D, F, or incomplete grade). Negative outcomes from DFWI grades include students repeating courses, changing majors, or exiting college completely. A School of Engineering Technology (SoET) gateway experience was transformed from two unintegrated courses of record to a single course based on multiple problems with course design, curriculum, instructional methods, grading, assessments, integration, and documentation. Transformational elements included the refinement and expansion of learning outcomes, prioritization of instructional scaffolding, incorporation of stakeholder input, full integration of a learning management system, modernized teaching methods, and the creation of a significant amount of effective curriculum. This poster reports on the outcomes and analysis from the first cohort of students. Via student self-reported data, students perceived that the new time/work intensive gateway experience, which covered a large breadth of topics in little depth, prepared them for future academic success, but not equally across all domains. Students strongly supported the course structure, modality, and design that included a strong use of various technologies and contemporary assessment methods. Students also perceived that the course improved their competencies in the general areas of design, problem-solving, communication, and group/team work. The transformed gateway experience is contributing to the development of future ET talent and the shared curriculum will favorably impact curriculum talent development.

The Purdue Polytechnic High School Model

Senior VP & Professor Gary R Bertoline¹ and Executive Director Scott Bess²

¹Purdue University, West Lafayette, Indiana, USA.

²Purdue Polytechnic High School, Indianapolis, Indiana

Category: Developing Technology Talent Across the Lifespan

Founded by Purdue University and the City of Indianapolis in partnership with community, industry and academic leaders, Purdue Polytechnic High School (PPHS) prepares students to succeed in technical, STEM-related post-secondary programs and high-tech careers. The Purdue Polytechnic High Schools are public charter schools that aim to provide an alternative learning and education model for historically underserved students in urban communities.

Purdue Polytechnic High School inspires students to pursue their passion through the lens of science, technology, engineering, and mathematics (STEM); hands-on and project-based learning; industry partnerships; and a flexible, personalized learning environment. These projects challenge students to dive deep into research, determine commercial viability, gather data and brainstorm solutions, conduct trials, and build prototypes toward the best project outcome. Students use their hands and their minds, learning by doing, not just by listening.

Every student has a personalized learning coach (the PPHS word for “teacher”) and is assigned to an advisory group of 15 to 17 students with whom they start and end each day. Students work with their coaches and fellow students to set goals, review progress, discuss current events, and plan their learning activities to build their weekly schedules. Students have ownership of their learning schedule, seek mentoring and support when needed, and learn how to manage their workload and schedules.

These successful model schools extend the polytechnic principles to K-12 education, delivering better student learning outcomes.

Partnership for Resource Sharing, Education, and Coaching to Enhance Student Career Readiness (PaRSEC to Enhance SCR)

Engr. Prof. Amevi Acakpovi, Prof. Samuel Nii Odai, Mrs. Sylvia Beatrice Oppong-Mensah, and Ms. Fausta Kilian Ganaa Kodua
Accra Technical University, Accra, Greater Accra, Ghana

Category: Global Partnerships and Global Learning

Globally, standards for education are highly disparate from analogous institutions such as Polytechnic and Technical Universities. This leads to conflicts in certificate recognition and subsequently limits graduands in accessing international jobs; meanwhile the knowledge and skills required for a specific job are clearly made available by industry in skill gap databases of various countries. In this regard, only graduates from institutions with top names stand a good chance to grasp international jobs while others struggle to value themselves in their limited arena. Especially in STEM education, the bottom line for sufficient readiness to meet the dynamism in the industry relate to access to reliable and relevant curriculum; access to good tuition from reliable lecturers; access to equipment and tools required in the industry; availability of library resources; availability of computer simulators; and good ICT infrastructures. Even though some universities in the West meet these requirements, they are seldom provided in most universities in Africa.

Nowadays, this obvious gap in education and training can be mitigated by several technology interventions to bring education and certification gradually to a common level of acceptance and, therefore, promote graduate employability globally. In this paper, we propose three major technologies to be explored in addressing the gap in graduate readiness for jobs: resource sharing, education, and coaching. It is our firm belief that by putting together the three concepts of resource sharing, education, and coaching, our paper becomes a blueprint or framework for global integration towards ensuring parity in education and increasing graduate career readiness.

The Duality of Sunny Side Up Globalization Model and Managing the Balance between Spatial Identity and Global Socio-economic Networks.

Mr. Shadman Bashir

Utah Tech University, St. George, Utah

Category: Global Partnerships and Global Learning

The paper is an explanation of the dual status of globalization, starting after the Second World War, but gaining more visibility and clarity post 9/11 with limitations on global movements between developed and developing regions.

This creates two parallel globalization ecosystems with connections on the extreme ends of the social and economic spectrum especially within the developing world.

Academic institutions, especially those focused on STEM, must learn to adapt and evolve some aspects of their classical academic traditions and identity. The learning and strategy for survival will come from three primary and many secondary sources.

1. Contemporary Global conflicts, because these are the super catalysts for creating and disrupting regional social and economic ecosystems. (The challenge and reality of Global duality) The conflicts and any favorable strategic outcomes are a treasure trove of lessons on finding the right balance between the large centralized and the locally (Global localities) decentralized decision making.
2. Disruption of the post dotcom era and learning to create and accept the reality of disruption on micro and macro levels within academic institutions and business organizations when going Global, and if possible, applying the two-year model as a test. (Duality can be tackled in this case but, again, it depends on the decision making of the organization and flipping the program creation logic when planning for Global.)
3. Predictability and acceptance (preparation) of Mission Creep and Mission Drift as vital for any Global expansion strategy within the sunny side up model and using identified time and space markers.

COILs at Lucerne University of Applied Sciences and Arts

Prof.-Dr. Stephen Wittkopf

Lucerne University of Applied Sciences and Arts, Horw, Lucerne, Switzerland

Category: Global Partnerships and Global Learning

The paper presents the journey of HSLU starting with COILs. It started with a survey among students in 2021, surfacing a strong demand for more international projects and lecturers in their classes and some drivers among the international office who proposed COILs (Collaborative Online International Learning) as a response, and eventually acquired external funding to set up and institutionalize COILs@HSLU. A hybrid kick-off workshop was held in Lucerne in November 2022 with COIL experts from U.K., U.S., and Chile being present and sharing best practices in community building, involvement, and support of lecturers and intercultural competency development and assessment. In addition, initial COIL offers from HSLU lecturers and other lecturers from more than 10 international institutions were presented and discussed for collaboration. In Fall Semester '22, the first COIL was held with civil engineering students from Napier University. Three more COILs with further international institutions are currently being planned for the spring semester. Some are very engineering discipline specific; some are interdisciplinary, and in the language or humanities domain. This paper also presents HSLU's learnings along the journey so far, specifically in dealing with the challenges of identifying the right lecturers and topics internally and finding suitable partners in international institutions, integrating COILs into different curricula, and finally, in developing the intercultural added value for all involved lectures and students alike.

International Artistic Exchanges through Dance Study Abroad: A Perpetuation of Positive Synergy

Jenny L. Mair, M.F.A.

Utah Tech University Dance Department, St. George, Utah, USA

Category: Global Partnerships and Global Learning

As a graduate student in Hawaii in 2014, I was heading to my dance technique class, and came across a poster advertising a three-week intensive study in Florence, Italy. “Ah,” I thought to myself, “this is my moment to increase my artistic international exposure and exchange through studying dance in Europe.” Dancing in Europe was something I had sought after since reading the book, *My Life*, by Isadora Duncan. Reading this book inspired me to one day teach, choreograph, and perform in Europe. Here was my first chance. I immediately sent in a dance video of myself and an application, receiving a scholarship to attend this intensive artistic dance study. Little did I know how this would transform my artistry, personal development, and life direction as an international dance artist and human.

My personal experience brings me to the present, teaching in the Utah Tech Dance Department, connecting student dancers to a global real-life interaction, living and studying dance in Florence, Italy, as a yearly study abroad program. This began in 2019, with eight students, 2022 with seven students and an assistant coach to the Blaze Dance Team, and prospectively nine students for 2023. This global learning I experienced with Liliana Candotti in Italy in 2014 continues today as a global partnership, transforming Utah Tech students’ lives both artistically and as human beings, through self-achievement, disciplinary focus, and creating opportunities to interact on an international platform for three weeks, perpetuating a positive synergy as they move forward after graduation.

Breaking the Mold & Finding the Unexpected in Global STEM Programming

Elizabeth Barajas and Misty Clugh
Purdue University, West Lafayette, Indiana, USA

Category: Global Partnerships and Global Learning

This presentation and subsequent discussion explore what it takes to break the mold of traditional study abroad programming. Presenters will detail a case study of an early-start global experience for STEM students that leverages global partnerships, includes the humanities, and ultimately serves the technology talent development lifespan, all the while being appealing to STEM students.

Since 2018, Purdue Polytechnic Institute has offered a Pre-Freshman global experience that is uniquely tailored to STEM students of all majors. To break the mold, participating students go abroad the summer before stepping foot on campus. This small group experience pushes students out of their comfort zones while simultaneously facilitating intentional intercultural learning. Quantitative results of intercultural assessments have shown consistent and significant growth in a short period of time. These gains challenge the traditional stereotype that longer is better for study abroad experiences and highlight the value in intercultural learning for STEM students.

While the presentation will share best practices for an early start model, it also explores unexpected outcomes centered on creating community at both local and global levels. This presentation will also intentionally create space for dialogue to address shared challenges to global mobility that are prevalent in STEM areas.

Exploring an Andragogical Learning Approach: Leveraging Social Media to Connect the Engineering Technology Classroom to the Global Industries

Dr. Noori Kim and Dr. Cho Hyun Park

Purdue University, West Lafayette, Indiana, USA

Category: Global Partnerships and Global Learning

Although the need for a well-prepared workforce has become increasingly critical, the gap between education and industry has long been a concern for students, educators, and employers. Considering the goal of post-secondary education is to prepare for a student's life and work as an adult, focusing solely on traditional pedagogical instruction may not fully meet students' needs and make them find it difficult to apply what they learned to real situations. Although universities as post-secondary education are within the boundary of formal education, students are adult learners who pursue their learning by their will. Thus, adding an andragogical perspective will be helpful to better meet learners' needs and prepare them as a well-prepared workforce that the industry wants, which is also aligned with the mission of the polytechnic. According to andragogy, adult learners are motivated by their learning when it is problem-centered and relevant and has an immediate impact on their job. In this regard, this presentation aims to showcase a learning approach connecting students with global subject matter experts, who have field expertise that cannot be covered by formal education, via social media. A simple 'experts recruiting to share their experience' social media posting with relevant hashtags triggered and invited professionals worldwide. Through interactive hybrid sessions, students had opportunities to meet those professionals and see real-world examples relevant to learning topics as well as their future jobs. This instructional approach based on andragogical principles drives students' autonomy and motivation in learning, and bridges the gap between education and industries.

Global Learning - An integrated Approach

Dr. Silke Aschmann

University of Applied Sciences Darmstadt, Darmstadt, Germany

Category: Global Partnerships and Global Learning

Startups are desirable and necessary in most economies; measures that can be used for joint education and training through collaborative partnerships with African universities, non-profit organizations, and companies.

Partnering with a university in sub-Saharan Africa through a joint online learning program allows students to gain both interdisciplinary and international experience. Students from the partnering universities are attending classes at their home universities; lecturers share responsibilities and take over parts in both countries. The courses focus on the founding of a startup in the African country. The business idea is not limited to a specific business field, but can e.g. focus on environmental projects, social projects, urban development, circular economy, food production, or logistics.

In class, students learn how businesses work; gain an understanding of project planning and project management; and focus on entrepreneurship, financial planning, funding opportunities, and presentation skills.

In the subsequent joint project phase, students apply theoretical knowledge. Divided into teams, they develop a business case for a startup in an African country. The business is to provide both employment and income. The cases are then presented to practitioners from both countries to get practical feedback, undergo a reality check.

Classes can just take place online or have the teamwork part onsite in either of the participating countries. If possible, partner companies should be involved to act as coaches and provide feedback on the final presentations. The benefits for the companies are direct contact with the next graduates and the opportunity to report on their involvement in corporate volunteering.

Advancing Global Englishes through Digital Media in Professional Writing

Dr. Florence Elizabeth Bacabac
Utah Tech University, St. George, Utah

Category: Global Partnerships and Global Learning

Advancing Global Englishes through digital tools in professional writing contexts also promotes language variation and cross-cultural awareness. Through guided exercises that examine features of different linguistic levels and rhetorical intent, student writers acquire language competency using online sources. In this presentation, I will share teaching strategies that cover the need for understanding (1) linguistic variations and (2) cultural variations through digital media in professional writing courses. This two-pronged approach to teaching writing develops analytical skills for intercultural variations and global language learning across multiple writing contexts.

How Do You Transform Teaching?: Collaborative Learning Design as a Change Agent

Marc D. Lundstrom and Huck M. Stewart
Utah Tech University, St. George, Utah, USA

Category: Global Partnerships and Global Learning

As polytechnic universities, we are always looking for ways to transform our teaching practices to include more active and applied learning opportunities. In our experience, transformational change in teaching practice can happen in an individual by engaging in a one-on-one, collaborative process of learning design. So... in an environment with limited resources where one-on-one collaboration isn't always feasible, is it possible to achieve this transformation on a larger scale? In this presentation, we'll share details about our attempt to do just that through the creation of a cohort-based approach to collaborative learning design in which 60+ faculty designed or redesigned 80+ online courses in a relatively short time frame. We'll also share feedback and experiences from participants that suggest a larger-scale transformation of teaching perspectives occurred as a result.

Cross-Cultural Student Experience in Architectural Design

Assistant Professor Luciana Debs¹, Bruna Bitencourt Costa², and Professor Bryan Hubbard¹

¹Purdue University, West Lafayette, Indiana, USA. ²Senai Cimatec, Salvador, Bahai, Brazil

Category: Global Partnerships and Global Learning

As part of a course in the Design and Construction Integration (DCI) degree program at Purdue University a student virtual exchange was developed with Senai Cimatec in Salvador, Brazil. Students from Purdue were paired with construction students from Brazil to foster cross-cultural collaboration and innovation in building design. The student teams worked on a building project for the Wabash Avenue Neighborhood, a mixed-use development that aimed to revitalize the community and promote sustainability located in Lafayette, Indiana.

Through the virtual exchange, students from both countries collaborated through weekly group video conferencing and individual emails between the partners to share ideas on design concepts. The project required the students to work together to discuss possible types of buildings for the development and design ideas for specific buildings. The exchange not only provided students a different perspective on their design concepts but also broadened their understanding of issues related to gentrification of neighborhoods.

The DCI curriculum is focused on developing construction professionals to be able to manage the design and preconstruction phase of a project. While one of the goals of the exchange was to have the architectural students support the design, another underlying goal was to observe how the DCI students interacted with the architectural students. Often architects and constructors have an adversarial relationship because of the different perspectives for the project. Details on implementation and observations from the exchange are provided for this cross-cultural student experience.

Trust in the Writings of the Dalai Lama

Lecturer William Ledbetter

Purdue University, West Lafayette, Indiana, USA

Category: Integrating Humanities, Arts, and Social Sciences

This research investigates the idea that there is a correlation between words used in a peace artifact and their sentiment. It also expands on previous work by the same author by searching for emotional valence terms (Ledbetter & Springer, 2020). The NRC sentiment dictionary category of Trust defines several terms that have a high frequency in the Dalai Lama's writings. Besides being positive, words identified as trusted by the NRC dictionary may be good candidates for helpful speech based on their high occurrence in the texts by the Dalai Lama. The terms *peace*, *truth*, *found*, *true*, and *wisdom* all may imply a supportive text based on this research. These keywords may also point to a common language of peace.

This study was conducted as part of the doctoral program at Purdue Polytechnic University. The submission is meant to allow criticism and further direction to the authors as they prepare a dissertation on the same topic. It will also demonstrate possible curriculum exercises to attendees using computer science and the humanities to engage both disciplines. Some attendees may be interested in the computational operations described in the study. The researcher welcomes the opportunity to share the process of detecting peace with sentiment analysis and learn from the Global Polytechnic Education Alliance about how the technique may improve STEM instruction.

From Puppeteers to Philosopher Kings: Utilizing Chatbots in Teaching, and how Their Presence Makes Us Rethink our Pedagogical Foundations

Dr. John Wolfe

Utah Tech, St. George, Utah

Category: Integrating Humanities, Arts, and Social Sciences

In *The Republic*, Plato famously establishes the allegory of the cave. A depiction of education, teachers often use this image to focus on the journey from the darkness of ignorance to vibrant reality. We see ourselves as aiding students in a similar learning journey. We facilitate students from a stage of dark ignorance to a bright future. In a world of computer screens, instead of cave walls, there is a rising concern that programs like ChatGPT are drawing students back into the shadows. It could be argued that these programs allow students to be satisfied with the ‘illusion’ of education, providing only artifacts of work.

This discussion has two goals. First, I propose that the presence of chatbots is a watershed moment for humanities education, and polytechnic education as a whole. Sophisticated text generation makes us rethink our learning outcomes, our assessment of students, and our communication methods. But, this evaluation isn’t a negative. I argue that the presence of ChatGPT and similar programs shows us how our use of certain assessment tools is insufficient for determining student knowledge and overall student success. To use the image of the cave, we might not be the liberators we think we are, but are instead more akin to the puppeteers creating shadows for the cave victims.

Second, I will discuss how ‘chatbots’ can possibly be utilized in our classes to better achieve learning outcomes in the humanities. I will provide sample assignments that incorporate chatbot programs into courses.

Teaming and Productive Conflict Engagement With First-Year Cybersecurity Students

William Ledbetter and Dr. Paul Thomas

Purdue Polytechnic Institute, West Lafayette, Indiana, USA

Category: Integrating Humanities, Arts, and Social Sciences

Through the Center for Intercultural Learning, Mentorship, Assessment, and Research (CILMAR) at Purdue, the researchers conducted a teaming and productive conflict training workshop with first-year cybersecurity students at Purdue Polytechnic Institute. This work showcases the qualitative responses from the nearly 200 students as they completed their group work over the semester. It also highlights integrating training on team building and productive conflict in STEM settings.

One lab section, consisting of five groups, was not given this direct training, serving as a control group. They were provided with the same material and encouraged to review it; however, they did not participate in a formal workshop seminar. Six sections, consisting of the other thirty groups, were provided with training on “Understanding their perception,” including pacing, direct and indirect communication, conflict styles, and intent versus impact in email. At the end of milestones, students reflected and answered questions about the team’s performance.

The presentation will offer an opportunity to share techniques, and compare and contrast the value of the workshop intervention based on how the students felt about their group and how they performed as a team in the course. Natural Language Processing was employed to measure the emotional valence of responses from the different groups, and close reading for themes and trends in the evaluations. The hypothesis is that the groups with the intervention will outperform the control group.

Brain Night: A Service Learning Project with Cross-Disciplinary Collaboration

Dr. Spencer Bell

Utah Tech University, St. George, Utah

Category: Integrating Humanities, Arts, and Social Sciences

Service learning has been identified as a high-impact practice for undergraduates. Published examples of service learning in the context of undergraduate neuroscience education include activities which catalyze cross-disciplinary collaboration, such as hosting health fairs, leading campus campaigns against underage drinking, and analyzing data on adolescent drug use. My Spring 2022 Behavioral Neuroscience course included a service learning project that entailed hosting a community outreach event for middle-school-age children in collaboration with the STEM Outreach center at Utah Tech University. The open-house event, publicized as Brain Night, included interactive booths with hands-on, instructive activities related to neuroscience. Each booth was hosted by my students who had worked in small groups throughout the semester to design and create it. An IRB-approved, anonymous survey conducted after the event indicated that most of my students agreed that it helped them to increase their understanding of course material (54.3%) and that it was a valuable use of time (56.5%). Students commented on which aspects of the project they considered most valuable, which included “interacting with the community,” “learning how to explain things simply,” “learning to work as a team,” and “real life application.” Student suggestions for improvement included increasing publicity to boost attendance and adjusting the layout of the booths in the event space. Brain Night was successfully hosted again in Fall 2022 with significantly increased attendance.

Integrating the Humanities with STEAM: Digital Humanities, Industrial Design, and Digital Fabrication

Professor Jennifer D. Astwood and Professor Mitch P. Ogden
University of Wisconsin-Stout, Menomonie, Wisconsin, USA

Category: Integrating Humanities, Arts, and Social Sciences

FabLabs have become generative, collaborative spaces that have brought together diverse disciplines and facilitated connections where they have been difficult before. But they have generally been the domain of STEM and STEAM disciplines with little opportunity to engage the humanities beyond visual arts. The field of digital humanities has innovated approaches of humanities fabrication (Sayers et al., 2015) that insert humanistic inquiry into these maker spaces. The Wisconsin History Maker Kit project is an example of a deep collaboration between humanities (history and cultural studies) and STEAM (industrial design).

This presentation makes the case for humanities fabrication as a digital humanities endeavor that achieves a deep integration of humanities with the STEAM disciplines. This deep dive into humanities integrated with industrial design strengthens the outcome to create and redesign Russell Oakes' Spaghetti Spinner, a satirical mechanical gadget reminiscent of Rube Goldberg's cartoons of the same era. An industrial design student will share insights on their design process—from building on prior prototypes to design detailing a new generation of the redesign of the Spaghetti Spinner. Both faculty members and the student researcher will discuss the affordances and limitations when designing an object for cultural and historical learning. This productive interdisciplinary experience will highlight the challenges and the serendipitous intersection of working to develop a redesign. And the presentation further makes the case for the cross-disciplinary collaborative opportunities at the intersection of design, digital humanities, and maker spaces.

A Degree Integrating Science and Technology with Foundational and Applied Humanities

Colette Faidley¹ and Dr. Brian F. Martensen²

¹MinnPoly, St. Paul, Minnesota, USA. ²MinnPoly, Mankato, Minnesota, USA

Category: Integrating Humanities, Arts, and Social Sciences

MinnPoly of Minnesota State University has designed a new Bachelor of Science in Integrated Science and Technology (ISAT), which serves as a flexible, customizable, multidisciplinary degree.

The upper division portion of the degree is comprised of courses that must populate two technical areas (one of which must have a STEM focus) and two humanities areas (one applied and one theoretical). Additionally, students enroll each semester in a professionalism seminar and engage in a senior capstone experience in which they are tasked to articulate and integrate their learning across the four areas of learning. This approach allows students to choose classes from across the curriculum that align with their interests and goals as well as industry needs.

The degree offers options for students interested in STEM, but for which traditional pathways have not aligned, including interdisciplinary spaces, particularly those in which STEM overlaps with policy, business, and communications. Additionally, pre-populated tracks and thematic collections of tracks address the industry need for emerging interdisciplinary fields, including Industry 4.0, for which the university does not have an existing curriculum, and allow for single project-based learning teams to serve students earning different degrees.

In this talk, we will discuss the design of the degree in educating broadly trained technical graduates founded in humanities and professional skills; the student market, including those with a broad STEM background, prior work experience, transfer students, underrepresented students, and/or those with diverse interests; industry need; and the ways in which the degree meets the socio-technical needs of society.

Discovering Transdisciplinary Ways of Knowing: An Epistemic Approach to Integrating STEM into Art and Design Education

Chris Jensen

Pratt Institute, Brooklyn, New York, USA

Category: Integrating Humanities, Arts, and Social Sciences

Our most pressing social challenges cannot be overcome by the work of a single discipline; in order to meet the challenges of our time, our students need to learn how to work in transdisciplinary environments. Currently, very few educational models create paradigms that allow students to integrate STEM with other disciplines. I report on a faculty learning community (FLC) at Pratt Institute focused on formulating and assessing a transdisciplinary epistemic framework designed to empower art and design students to better integrate STEM into their creative work.

Better Addressing Extinction Risk and Biodiversity Loss: Integrating Humanities, Arts, Health, and Social Sciences with STEM

Jeffrey V. Yule

Utah Tech University, St. George, Utah

Category: Integrating Humanities, Arts, and Social Sciences

In *Imagining Extinction*, literature scholar Ursula Heise asserts that, “biodiversity, endangered species, and extinction are primarily cultural issues, questions of what we value and what stories we tell, and only secondarily issues of science” (Heise, 2016, p. 5). Whether or not we agree with that position, Heise having advanced it in the first place suggests an awareness that STEM fields cannot provide all the perspective necessary to address existing, ongoing threats to global biodiversity. Conservation biology—which, despite the phrasing of its name, extends to fields beyond the sciences—has already given us an informed perspective on and ample details about what humans need to do to preserve biodiversity, ecosystem services, and evolutionary potential. Because the strategies and tools needed to address these concerns extend well beyond biology and because so many issues require similarly interdisciplinary solutions, we can reasonably tell students that one goal of a university education should be not just that graduates leave school with brains and skill sets with “six-pack abs” but also the ability to work and collaborate across disciplinary boundaries to ask and answer questions and solve problems.

I Wish I Knew That": Understanding and Bridging the Gap Between Public Health, STEM, and the Cooperative Extensions National Framework for Health Equity and Well-being

Brione Lockett

Tennessee State University, Nashville, Tennessee, USA

Category: Integrating Humanities, Arts, and Social Sciences

In his essay "The Creative Process," writer and activist James Baldwin notes, "It goes without saying . . . that if we understand ourselves better we would damage ourselves less" (Baldwin, 1985, p. 317). This quotation reflects Baldwin's viewpoint that, often, individuals knowing and learning about themselves and what impacts them (e.g., education, employment, social environments, policy) and their quality of life is compromised by the action of seeking to know others instead. This paper meets at the intersection of Baldwin's profound words and the ways health equity and wellness conversations complement rather than compete with STEM fields. The National Framework for Health Equity and Well-being offers a tool to systematically address the programmatic area of health and wellness at the individual, community, policy, and environmental levels. STEM education allows learners to become innovators, collaborators, and problem solvers, leading to various opportunities to fill critical roles (e.g., STEM, public health, education) in fields worldwide. STEM education, in conversation and collaboration with public health programs and equity initiatives, can create positive relationships with communities, introduce a broader range of questions and comparisons involving social determinants, and increase cross-sectional efforts to minimize poor health and quality of life outcomes.

The Real World: Incorporating Experiential Practices into Art and Technology Curriculum at the New Cal Poly

Dr. Michelle L. Cartier, Dr. Berit Potter, and Dr. James F. Woglom
Cal Poly Humboldt, Arcata, California, USA

Category: Integrating Humanities, Arts, and Social Sciences

Three instructors at a northern California state university outline their experiential and technologically-engaged teaching practices and how those curricular and pedagogical models resonate with Humboldt State University's recent move to become a polytechnic institution. One will discuss the development of immersive reality technologies (VR and AR platforms) being added to the film course curriculum to innovate new ways of storytelling, as well as creating a category in their "Film Festival" course for VR experiences, which since 1969 continues to be one of the longest running student-led film festivals in the world. Another will discuss supporting students in museum and exhibition internships at regional and national institutions such as the Morris Graves Museum of Art, an online archive called "Humboldt in the Time of Covid," and Ziibiwing Center for Anishinabe Culture and Lifeways. The third will describe a service learning-based arts education pathway program through which students engage in designing and implementing units of instruction in K-12 and community educational spaces (ranging from a public elementary school to a maximum security prison) in preparation for pursuit of careers in teaching art.

The discussants will conclude with a collaborative consideration of how their respective projects reflect the recent polytechnic implementation on campus, and how those courses point toward an expansion of the conception of the role of the arts in a polytechnic context, through hands-on community engagement.

From Artificial Intelligence to Death Meditations: Developing Independent Studies that Bridge the Gap Between the Humanities and STEM

Dr. John Wolfe

Utah Tech University, St. George, Utah, USA

Category: Integrating Humanities, Arts, and Social Sciences

Transdisciplinary thinking is required to address everything from social injustice to climate change. To help facilitate this type of thinking, we need to think of ways to promote interdisciplinary research projects. Nuanced independent study projects provide students with the space to explore complicated issues across discipline lines. Additionally, mentoring such efforts gives instructors the opportunity to integrate other disciplines into their own research. I discuss the independent study methods in Utah Tech University's Humanities and Philosophy program, highlight successful interdisciplinary projects, and explore means to improve our process.

Utah Tech Creative Studios

Professor Nate Snow

Utah Tech University, St. George, Utah

Category: Integrating Humanities, Arts, and Social Sciences

One of the goals of any polytechnic institution is the synthesis of various branches of technology, bringing together disparate disciplines and generating new ideas through their cooperation. That is precisely the goal of Utah Tech Creative Studios, a new academic center at Utah Tech University. Utah Tech Creative Studios (or UTCS) is a collaboration between digital film, animation, and social media, which seeks to provide students with real-world, hands-on experience working with clients and each other to produce innovative creative work. In this presentation, two of the center's founding members, Alex Chamberlain and Nathan Snow, share the impetus behind the Creative Studios and their unique approach to how creative programs in higher education and private industry can benefit from each other. During the course of the presentation, they share insight into how they have structured their academic programs to fit within a Creative Studios model, integrating curriculum requirements and rigor while students complete projects for industry. They will also discuss how UTCS set up an equitable pay structure with its student creative teams, and the challenges they faced in building a start-to-finish interdisciplinary creative studio with student involvement that still delivered professional-level products to its clients.

From Hand-Wringing to Imagining: “Being Human UT” podcast

Randy Jasmine and Jim Haendiges
Utah Tech University, St. George, Utah

Category: Integrating Humanities, Arts, and Social Sciences

The embrace of a polytechnic mission at Utah Tech University led English professors, Dr. Randy Jasmine and Dr. Jim Haendiges, to process this new polytechnic focus by recording podcast conversations on the subject. Since the publication of their first episode of the “Being Human UT” podcast in February 2022, Jasmine and Haendiges addressed the changing state of humanities locally and nationally. In their presentation, “From Hand Wringing to Imagining: the ‘Being Human UT’ podcast,” Jasmine and Haendiges discuss the early philosophical and logistical challenges they faced in creating the podcast; then, they discuss the impact and vision moving forward of the podcast. Ultimately, Jasmine and Haendiges show through the “Being Human UT” podcast that conversation can help demystify change in an academic landscape.

Having a Blast Bypassing Disciplinary Silos: Integrating Humanities, Arts, and Social Sciences with STEM

Dr. Jeffrey V. Yule¹, Dr. John Wolfe¹, Chris Jensen², Dr. Brione Lockett³, McGarren Flack¹, Beth Axelgard¹, and Jeremy Bakelar¹

¹Utah Tech University, St. George, Utah, USA. ²Pratt Institute, New York, New York, USA. ³Tennessee State, Nashville, Tennessee, USA

Category: Integrating Humanities, Arts, and Social Sciences

Panelists collaborate across departmental boundaries to benefit students, bypassing the barriers that unavoidably result from disciplinary siloing. Join and contribute to an ongoing dialogue with an interdisciplinary honors program coordinator; a protein structural biologist for whom artistic and graphical representations are central to communicating protein function; a painter-paramedic who teaches anatomy and brings his students to the cadaver lab as part of that process; a biologist who teaches at a renowned art and design school; a health equity and wellness professor whose teaching and outreach focus on necessary but often overlooked contexts and insights from multiple disciplines; a philosopher who teaches the university's bioethics class for a biology department; and a humanities-science dual specialist whose teaching and research straddle multiple fields and departments.

An Employee Empowered Marketing Proposal for a Polytechnic Mission Transition.

April A. Ficklin

Utah Tech University, St. George, Utah

Category: Marketing and Financing

In the midst of the current economic outlook with potential budget cuts looming, employee burnout is a major concern. Given that Utah Tech University is also in the middle of a polytechnic mission transition, the Service-Profit Chain proposes a way to communicate a polytechnic mission to current and potential students by providing a polytechnic experience to the employee. In an effort to increase employee identity to the polytechnic mission, increase employee job satisfaction, and reduce employee turnover, the following steps were implemented among the Academic Support Staff (front-line employees).

First, supporting networks identify the hierarchical structure to seek training and advice for questions that arise in unique circumstances. This fosters collaboration to streamline complicated processes across academic units. Scheduled training meetings include onboard training, bi-annual training for the group in its entirety, and monthly training meetings for leadership allowing for quick dissemination of updated methods. A website for important training materials and frequently asked questions archives instructions specific to the needs of this group for convenient access and input.

Second, a customer service model based on the mission and culture of the university provides context on how a Utah Tech employee responds to customer needs in a complex service environment. The service model includes a motto, three core beliefs, and steps in a customer service process. In addition, the website highlights stories of how employees have implemented the model to perpetuate the ideals and further refine the polytechnic experience.

Re-examining Post-pandemic International Student Recruitment Strategy

Director, Office of International Education Scott Pierson¹ and CEO Vinay Chaudhry²

¹University of Wisconsin-Stout, Menomonie, Wisconsin, USA.

²Worldwide EduConnect, Toronto, Ontario, Canada

Category: Marketing and Financing

Pandemic-related disruptions in international student mobility have resulted in changes to student psyche and technology usage; however, selecting an institution requires human interaction. This presentation highlights these changes in relation to North American HEIs and provides data-driven strategies to approach international student recruitment.

Learning Objectives

1. Explaining how the pandemic has changed international student mobility and impacted U.S.' competitiveness in the student recruitment sector
2. Comparing different international recruitment models with a SWOT analysis
3. An in-depth analysis of the in-country representation model via a case study involving the University of Wisconsin-Stout (UW-Stout) and other institutions
4. Understanding financials and maximizing ROI through in-country representation model

Content Takeaways

Handouts include public and proprietary data demonstrating the impact of our recommended strategy. Learn from the Senior International Officer at a U.S. mid-size public HEI and a company with over a decade of experience implementing similar strategies in Canada, and understand how cost-effective, in-country (on-the-ground) representation enhances a student-centric approach, leading to significant yield and higher ROI.

Putting Waste in its Place: Student-guided Solutions to Sustainable Resource Management at Utah Tech University

Dr. Christina Pondell

Utah Tech University, St. George, Utah

Category: Sustainability

For many of us, the last time we think about our waste is when we throw it in the trash bin. But what happens to that waste after it leaves our space? Environmental science students at Utah Tech were asked to confront this question by conducting a waste audit of their weekly waste production and tracking their waste to local landfill facilities. Using data from their weekly waste audit, students estimated that they produced up to 600 kg of waste per person each year. More than 80% of their waste was recyclable (i.e., 32% was metal, 25% was plastic, and 23% was paper), yet the recycling programs on campus are not often used by students, faculty, or staff. The Utah Tech campus currently generates four times more waste than recycling. Students identified a few solutions to improve waste and recycling management on campus including 1) increasing awareness and education of the recycling opportunities on campus, 2) increasing the distribution and labeling of recycling bins around campus, 3) composting to reduce food waste, and 4) better decisions regarding material use on campus (for example, reusable water bottles to replace single use plastic bottles). This presentation will consider four different case studies in university waste management programs related to each of the students' proposed waste solutions and explore the viability of such programs for the Utah Tech campus.

Quantitative Methods in Business Administration: Financial Performance of ESG-strategies

Prof. Dr. Michaela M. Kiermeier

University of Applied Sciences Darmstadt, Darmstadt, Germany

Category: Sustainability

The structure of Business Administration study programs at department of economics and business administration (fbw) at University of Applied Sciences Darmstadt (h_da) allow for modules that combine teaching of theoretical capital market theories and the application of quantitative methods. This includes retrieving economic and firm specific data from Refinitiv, identifying the best ARIMA model for forecasting, choosing adequate estimation techniques and to evaluate their specific results. In an advanced class on digital finance (Advanced Digital Finance), students research the current state of research with regards to financial performance of firms implementing ESG strategies. Literature suggests that an improved financial performance of firms implementing ESG strategies only manifests itself in the long term. With Machine Learning methods (Wavelet analysis), this insight is investigated further. This approach allows analysts to discriminate between various time periods. This practical approach serves as an example to teach ML methods and to incentivize students from non-technical departments (high percentage of female students) to engage in research. Students who take the opportunity and participate in the Master Class “Advanced Digital Finance” have the opportunity to get involved in research topics on Fintech. In that class, a critical question is if distributed ledger technology and solutions from Fintech can help to achieve UN sustainable development goals. Involved students are engaged to participate through seminars and projects. Ideally, students are encouraged to consider PhDs in the fields of sustainable finance at the respective research center at h_da.

Fly Net Zero by 2050: Does the Airline Industry Forget the Trips from Home to Airports?

Dr. Yi Gao and Mr. Sen Wang
Purdue University, West Lafayette, Indiana, USA

Category: Sustainability

At the 77th IATA Annual General Meeting in Boston, USA, on 4 October 2021, a resolution was passed by IATA member airlines, committing them to achieving net-zero carbon emissions from their operations by 2050. While the entire aviation industry is working towards this ambiguous goal through adopting sustainable aviation fuel (SAF), developing new technology, constructing efficient infrastructure, and implementing carbon offset and capture projects, a crucial question starts to emerge and is still left unanswered: Does this commitment consider aviation-induced ground trips from home to airports? In this study, we use Florida as a case study, and new datasets that have recently become available, to calculate induced trips taken by passengers when accessing commercial aviation. In particular, we differentiate essential trips connecting passengers from residences to the nearest commercial airports from those trips to distant airports motivated by lower airfares or more attractive flight schedules. By doing so, we expect to estimate the total carbon emissions generated by ground trips induced by air transportation and, more importantly, the otherwise avoidable emissions caused by cross-airport catchment area trips. This study is significant in that it attempts to complete the puzzle of carbon emissions generated or induced by commercial aviation from a holistic perspective, which will help the aviation industry achieve true net zero.

Rethink Rotor

Professor Marcin Orawiec¹ and Saskia Schmidt²

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²University of Applied Science Darmstadt, Darmstadt, Germany

Category: Sustainability

Rethink*Rotor is a project investigating methods of reusing wind turbine rotor elements already on the market as a “second life application” in the construction sector. However, the rotor blades of the wind turbines will have to be replaced after 20 years. Already now, about 7,500 of the parts are disposed of every year in Germany...

But what happens to the discarded, in some cases over 80 m long, custom-made parts made of epoxy resin-bonded fibre-reinforced plastics (FRP) after they have been used in the wind farm for about 20 years?

Because of the high-performance material cocktail, which is made almost exclusively of duromers, the rotor blades can only be partially recycled by means of costly, environmentally harmful processes. Some of them are therefore shredded after dismantling and the metal residues they contain are separated. The remaining waste is used thermally as a fuel and sand substitute in the cement industry or burnt in small quantities in conventional waste incineration plants. This form of thermal recycling is not residue-free, neither CO₂-neutral, nor sustainable, because recycling is accompanied by a loss of quality of the non-degradable materials, which still end up in the waste.

The project is reusing rotor elements in the construction sector to enable large turbine components to remain in the anthroposphere, thanks to the aesthetic potential and material properties such as durability, corrosion resistance, low weight and high rigidity.

A way out of the recycling dilemma - new applications; circular, “profitable” in the construction sector.

Fighting Planned Obsolescence: Using and Creating Open Resources in the Technical Writing Classroom to Amplify Active Learning and Reduce E-waste

Dr. Joy McMurrin and Dr. Lacy Hope
Utah Tech University, St. George, Utah

Category: Sustainability

People often mistakenly believe that technical writers' primary aim is to improve products, processes, and profits; however, technical writers know that we are actually in the service of people. This presentation will discuss how two technical writing courses at Utah Tech University are using and creating open resources to contribute to e-waste solutions supported by the sustainability-focused organization iFixit. The collaborative iFixit projects encourage active, applied, and authentic learning, and they give students from diverse academic backgrounds opportunities to apply humanities-driven solutions to technology-driven problems. This presentation will include examples of student work that demonstrate how Utah Tech's partnership with iFixit is engaging our emerging professionals in meaningful service learning. The students' SEO and open-source repair guides contribute to the right-to-repair campaign that we hope takes over the tech world. Although technical communicators rely heavily on technology to do our work, planned obsolescence and electronic waste is a global threat that disproportionately threatens already vulnerable populations. Therefore, this presentation will also touch on the ethics of writing technologies in our effort to encourage more sustainable e-practices.

Bringing University Education into the Juvenile Justice System through Technology and Partnerships

Nathan G. Caplin

Utah Tech University, St. George, Utah

Category: Sustainability

To address the problem of educational inequities for youth in the corrections system, Utah Tech University (UT) and Utah's Juvenile Justice and Youth Services (JJYS) created and implemented an education solution—the Higher Education for Incarcerated Youth (the HEIY program)—which spans the state juvenile justice system from detention centers to long-term secure care relying on unique technology from Zoom meetings in youth facilities to modified LMS to justice-tech laptops to a dedicated server for the HEIY program. The mission of the HEIY program is to serve incarcerated youth by facilitating college certificates and degrees in partnership with Utah's Juvenile Justice and Youth Services (JJYS).

Peer-reviewed surveys of carceral higher education lead the authors' colleagues to conclude that HEIY is perhaps the first public program to ever extend to all qualified incarcerated youth a fully-funded university education up to a bachelor's degree [NC1] (Nuzman, 2021; Read & O'Cummings, 2011), although the Youth Law Center has noted the difficulty in monitoring carceral higher education programs for youth (Dudley, 2022). The HEIY program covers tuition, textbooks, fees, scholarships, and other education costs for enrolled students (Caplin & Simmons, 2021; *Utah HB 279 Higher Education for Incarcerated Youth: Hearings before the Senate Education Committee, State Senate*, 2021). The average HEIY student earns approximately 9.7 credits during incarceration, with an average Grade Point Average (GPA) of 2.99 (Clark & Caplin, 2022), and the average length of incarceration for these incarcerated youth is less than 1 year (Dudley, 2022).



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References

- Baldwin, J. (1985). The Creative Process. In *The price of the ticket: Collected nonfiction 1948-1985* (p. 137). St. Martin's/Marek.
- Caplin, N., & Simmons, K. (2021). *Legislative fact sheet: Higher education for incarcerated youth* [Unpublished fact sheet]. Dixie State University.
- Clark, A., & Caplin, N. (2022). *HEIY student stats* [Unpublished data set].
- Dudley, D. (2022, December 9). Utah offers “free college for all” to juveniles behind bars. *Youth Today*. <https://youthtoday.org/2022/12/utah-higher-education-for-incarcerated-youth-offers-free-college-for-all-to-juveniles-behind-bars/?fbclid=IwAR32mfLNuH6e0i5KxjQwnsucqxt59ZomF7fgdPMesWKMxwv6QnWNBsXS6oE>
- Finley, A. (2021). *How college contributes to workforce success: Employer views on what matters most*. Association of American Colleges and Universities. <https://dgmg81phhvh63.cloudfront.net/content/user-photos/Research/PDFs/AACUEmployerReport2021.pdf>
- Heise, U. K. (2016). *Imagining extinction: The cultural meanings of endangered species*. University of Chicago Press. <https://doi.org/10.7208/chicago/9780226358338.001.0001>
- Heskett, J. L., Jones, T. O., Loveman, G. W., Sasser, W. E., & Schlesinger, L. A. (2008). Putting the Service-Profit Chain to work. *Harvard Business Review*. <https://hbr.org/2008/07/putting-the-service-profit-chain-to-work>
- Ledbetter, W., & Springer, J. (2020). Peace Speech Identification Using ABBYY Fine Reader and HathiTrust. *2020 IEEE International Conference on Big Data (Big Data)*, 5739–5743. <https://doi.org/10.1109/bigdata50022.2020.9377870>
- Nuzman, A. (2021, March 24). DSU's Higher Education for Incarcerated Youth program signed into law. *Dixie Sun News*. <https://dixiesunnews.com/news/articles/2021/03/25/dsus-higher-education-for-incarcerated-youth-program-signed-into-law/>
- Read, N. W., & O'Cummings, M. (2011). *Factsheet: Juvenile Justice Education* [Fact sheet]. National Evaluation and Technical Assistance Center for the Education of Children and Youth Who Are Neglected, Delinquent, or At Risk (NDTAC). <https://eric.ed.gov/?id=ED577085>
- Sayers, J., Elliott, D., Kraus, K., Nowviskie, B., & Turkel, W. J. (2015). Between Bits and Atoms. In S. Schreibman (Ed.), *A New Companion to Digital Humanities* (Vol. 1, pp. 1–21). Wiley. <https://doi.org/10.1002/9781118680605.ch1>
- Utah HB 279 Higher Education for Incarcerated Youth: Hearings before the Senate Education Committee, State Senate, (2021). <https://le.utah.gov/av/committeeArchive.jsp?timelineID=182148>