Creating Engaged Learning Environments for Operations and Supply Chain Management

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The 21st century has arrived, but most university courses and classrooms are still in the dark ages. Research indicates that student engagement and integrated technology are benchmarks for success in today's university. This study investigated creating engaged learning environments in a university setting. An inductive research methodology which develops theory rather than a deductive methodology which tests existing theories was used. Constant comparative analysis of the data lead to the emergence of six conceptual theories. The concepts/theories included: well-designed learning strategies, appropriate virtual and physical spaces, value-added technology, extensive support, as well as engaged facilitators and engaged learners. Specific themes that emerged for each theory were discussed.

DESCRIPTORS: engaged learning environment, engaged learners, technology, digital learning

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I. INTRODUCTION

The calendar confirms it, we are well into the 21st century -- the digital age, but university classrooms shout OLD SCHOOL. The blackboard is probably white, and there may be a faculty workstation, projector, and screen displaying PowerPoint presentations. But has teaching and learning really changed that much since the last century? According to Sharon Friesen, at the University of Calgary, "when it comes to the look and feel of the traditional classroom, the answer is no" (Rice, 2016). Most classrooms have student desks lined up in neat little rows. The desks face the professor in the front of the room as she lectures, writes on the board, or shows mind-numbing PowerPoints. In an age of Facebook, Amazon, Alexa, Twitter, online collaboration, and rapid technological change, the world of markers and whiteboards simply won't meet the demands of today let, alone tomorrow (Shelton, 2011).

The learners sit passively in uncomfortable desks and attempt to pay attention while staring at the back of someone's head. The students don't know what is expected of them for the course or for class sessions. A mid-term exam is given half way through the class and a final exam is given at the end of the class. Learners have no benchmarks to know if they are progressing successfully or failing until it is too late to make a change.

University students are bored and uninspired in many of today's classrooms (Brown, S., Armstrong, S. & Thompson, G., 1998). Proserpio and Gioia report a lack of compatibility between the learning styles of today's students and the teaching styles of their professors (2007). Former Deputy Secretary for Innovation and Improvement in the U.S. Department of Education, Jim Shelton, says: Too many of our students around the country use ***boring*** as the adjective of choice to describe their (learning) experiences. They have been

locked down by the concept of seat time and ***locked out*** of the technological revolution that has transformed nearly every sector of American Society, except for education (2011).

Today's university students want professors to use new teaching strategies (Merlino and Rhodes, 2010). Educators are constantly fighting the uphill battle of trying to keep their students engaged. However, numerous authors claim that teacher oriented lectures are commonly used in higher education for content delivery (Duron, Limbach, & Waugh, 2006; Pithers & Soden, 2000; Siddiqui, 2007; Van Amburgh, Devlin, Kirwin, & Qualters, 2007). The National Teaching and Learning Forum described how research on human attention and retention speaks against the value of long lectures. They reported that students focus most effectively in intervals of 10 to 18 minutes, and any time over that amount significantly decreases the information they retain. Therefore, it is nearly impossible for today's students to absorb content that is delivered in a two or three-hour lecture (Aspler, 2014).

The lecture method goes all the way back to Aristotle and Socrates, over 2400 years ago. Of course, they had to lecture because there were no books. Socrates used an ancient form of discourse, the Socratic Method. This method is reportedly founded on Socrates' belief that lecture was not an effective method of teaching all students (Coffey, 2008).

Salman Khan (2012) stated in the Education section of Time magazine: "if attention lasts 10 or 15 minutes while passively listening, it is questionable why valuable time in classrooms with teachers and peers should be devoted to lecture at all.

True integration of technology and increased student engagement are important indicators of success in the 21st century learning. Faculty are challenged with finding ways to engage students when using new course formats in addition to engaging students in the traditional classroom.

Traditional learning strategies are not successful for the emerging challenges of the technology age (Arhin & Cormier, 2007). Universities should provide students with a high-quality education and allow learners to discover new ways of getting information, transforming knowledge and constructing meaningful learning (Pascarella, Seifert and Blaich, 2010).

Educators need to come up with creative learning strategies which are suitable for today's learners. The digital revolution has the capability to promote effective learning and student engagement. The social process has expanded the educational landscape by encouraging students to exchange ideas, explore new knowledge, collaborate on ideas, and generate mutual understanding (Vygotsky, 1978; Chisanu, Sumalee, Issara & Charuni, 2012; Harris, Jones & Baba, 2013).

Studies show that well-designed learning environments play an important role in motivating students (Vygotsky, 1978; Cecez-Kecmanovic & Webb, 2000; Chiong & Jovanovic, 2012). However, it was reported that students are overwhelmed by the complexity and logistics required of collaboration and peer interaction, so teachers place less emphasis on these areas (Cecez-Kecmanovic & Webb, 2000; McLoughlin & Lee, 2010).

Student engagement is ever-present in discussions about higher education policy, in research literature, and even in the non-academic media. In her summary of findings from a large, three-year research project in the United Kingdom, Thomas found that student engagement is so prominent in the literature because it unequivocally connects with student success (2012).

While it has become increasingly clear that 'success' means helping all students to become more engaged learners in higher education, thus improving their academic outcomes and their progression opportunities after graduation. What is not increasingly clear is what we need to do to engage our learners.

What is the process? What are the tools? What are the techniques? Who must be involved? What is needed for a complete Engaged Learning Environment? This study investigated Creating Engaged Learning Environments for Operations and Supply Chain Management.

II. RESEARCH DESIGN

While thousands of articles have been published, and the topics were varied, the understanding and clarity of the big picture about the engaged learner and the creation of an engaged learning environment is minimal if not non-existent. Much of the literature is anecdotal and focuses on faculty experiences or program challenges of design and implementation (McGee, P Reis, A., 2012).

Because of this initial lack of clarity and cohesion about engaged learning and creating the engaged learning environment, an inductive research methodology, grounded theory, was selected as most appropriate. Grounded theory ***develops*** theories that are ***grounded*** in the data rather than merely ***testing*** theories that the researcher has written. Grounded Theory follows a set of rigorous research procedures leading to the emergence of conceptual categories (Glaser, 2010). The purpose of grounded theory is to develop theory about the phenomena of interest. This is not abstract theorizing. Theory needs to be grounded or rooted in observation – thus the term grounded theory.

According to Engward (2013) "Grounded theory provides a methodology to develop an understanding of social phenomena that is not pre-formed or pre-theoretically developed with existing theories and paradigms." As an exploratory method, grounded theory is particularly well suited for investigating social processes that have attracted little prior research attention, where the previous research is lacking in breadth and/or depth, or where a new point of view on familiar topics appears promising (Milliken, P. 2010).

The stages of Grounded Theory are Preparation, Data Collection, Constant Comparative Analysis, Memoing, Conceptual Sorting, Theoretical Outlining, and Writing. Fig. 1 shows the process of Grounded Theory in graphic format. The arrows and curved arrows indicate that data collection, constant comparative analysis, memoing, conceptual sorting, and theoretical outlining overlap and are ongoing until theories emerge, and data saturation is reached (no new data is discovered). Details about grounded theory methodology in general and the specific processes used for this study follow.

2.1. Preparation

Unlike other methodologies, grounded theory has no predetermined research problem statements. The purpose of grounded theory research is to uncover the emergent theories from the data that is collected during the research process. A general research area or phenomena is determined at the beginning of the grounded theory process. *Creating Engaged Learning Environments for Operations and Supply Chain Management* was determined to be the general research topic.

2.2. Data Collection

Grounded Theory encourages data collection from both primary and secondary sources. Interviews, questionnaires, surveys, participant observations, focus groups, case studies, documents, records, publications, social networking, and information from a digital learning institute constituted the first round of data collection. Initial analysis determined where to go and what to look for next. Analysis and data collection continually inform one another.

FIGURE 1. STAGES OF GROUNDED THEORY METHODOLOGY.
Adapted from Simmons, O., 2010, The Grounded Theory Review (2010) vol.9, #2

2.3. Constant Comparative Analysis

Constant comparative analysis required relating data to ideas, then ideas to other ideas and codes. Finally, how these codes relate is determined. During the comparative analysis stage, the following questions are kept in mind. What does the data study? What category does a particular incident indicate? What is happening in the data? Relevance and fit are the two criteria for coding. Everything must have relevance and fit to be coded.

2.4. Memoing

Memos are used for the theorizing write-up of ideas about codes and their relationships. Data collection, constant comparative analysis, conceptual sorting, theoretical outlining, and memoing overlap and are ongoing until data saturation is achieved, that is when no new data is discovered.

2.5. Conceptual Sorting and Theoretical Outlining

The relationships between concepts were shown when conceptual sorting of memos became an outline of the emergent theory. This outline of emergent theory showed the relationships between concepts. After conceptual sorting, theoretical outlining identified the emerging patterns.

2.6. Writing

The completed conceptual sorting and theoretical outlining constituted the first draft of Creating Engaged Learning Environments for Operations and Supply Chain Management. The research was then refined and polished into a final paper.

2.7. Independent Review

A person with experience in grounded theory methodology reviewed all the research papers and notes. The review helped insure that the series of systematic, exact methods of Grounded Theory research were executed. This

review also confirmed that the process was completed accurately.

III. FINDINGS

During Constant Comparative Analysis, data were reviewed and coded, producing over 340 codes. Selective coding uncovered topics that captured the emergent theories in the data. Emergence necessitates that the researcher remains open to what is discovered empirically in the data "without first having them filtered through and squared with pre-existing hypotheses and biases" (Glaser, 1978)

3.1. Emergent Theories

The data, after constant comparative analysis, indicated that creating engaged learning environments for Operations and Supply Chain Management had six emergent concepts/theories.

The emergent concepts/theories were: 3.1.1. well-designed learning **Strategies**, 3.1.2. appropriate virtual and physical **Space**, 3.1.3. value-added **Technology**, 3.1.4. extensive **Support**, 3.1.5. engaged **Facilitators** and 3.1.6. engaged **Learners**. Fig. 2 displays the six theories.

3.2. Themes

The conceptual sorting of memos into an outline of the emergent theories showed distinct themes within each theory. Peter Holme's (2017) word stemmer, which prepares chunks of text for quantitative text analysis, was used. This tool cleans the text, stems the words using an algorithm, and lets you specify stop words. Each emergent theory along with its themes follow.

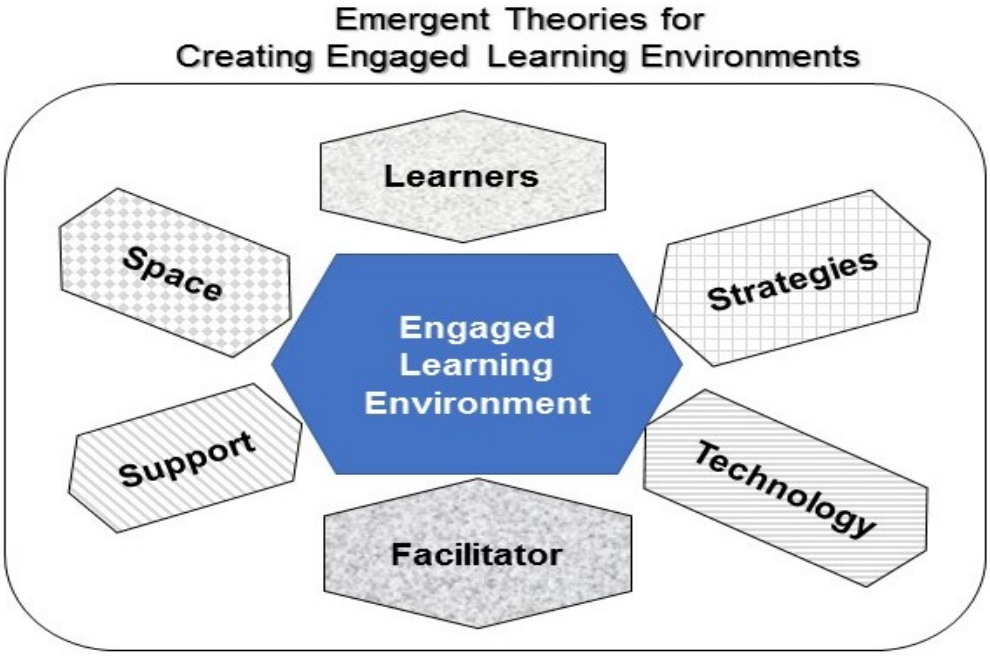

FIGURE 2. THEORIES REQUIRED FOR CREATING ENGAGED LEARNING.

3.2.1. Themes for Strategies

Well-designed learning strategies for engaged learning was one of the emergent theories. The distinct and necessary themes for Learning Strategies were Course Design, Goals and Objectives, Traditional/ Hybrid/Online/ Flipped, Tools and Techniques, Syllabus, and Assessment.

Course design represents the entire roadmap for the course. The Engaged Environment requires that the course be planned, mapped, and published when the first class meets. The research suggests that you start at the end—where do you want the learners to be when the class is over? Then define the strategies to get the learners to that point.

What are the **goals and objectives** of the course? In the past goals and objectives were used by teachers to know what to teach. However, in engaged learning the students should see all the goals and objectives at the beginning of the course. The goals and objectives must be measurable. In addition, each class session should have specific objectives that are explained to the students at the beginning of class, and some type of activity at the end of class to see if the objectives were met.

A valuable tool is the Bloom's Verb Wheel which shows the six levels of learning on the inside of the wheel, appropriate verbs for each level on the middle of the wheel, and activities that will reinforce the level and verb you have chosen (teachonline.asu, 2012). In addition, Arizona State University has an app for writing performance-based objectives. It has a series of pull-down menus that guide you through the process starting with what you want the students to do, overview, verbs and example objectives Bloom's also has a Digital Taxonomy. For example, in the applying section the verbs are implementing, carrying out, using, and executing. The digital verbs are running, loading, playing, operating, hacking, uploading, sharing, and editing (teachonline.asu, 2012).

Publishing the objectives shares with the learner what they must accomplish. Learning should not be a guessing game. The days of "that is for me to know and you to find out" should be over. Tell the learners – everything about the course and tell them at the beginning of every class session. At the end of each class session, assess whether the learners met the objectives with a short exercise.

Blended/Traditional/Online/Flipped. Will the course be run as a traditional course? Or will it be run as a blended/hybrid format, online format, or flipped format.

Traditional format is face-to-face for the entire time allotted for the class. Normally the teacher lectures and the students listen. This has been and still is the most commonly used format.

The flipped class has become quite popular. *High profile articles in The New York Times (Fitzpatrick, 2012); The Chronicle of Higher Education (Berrett, 2012* have added to the popularity of the flipped classroom. Flipping the classroom means that students are introduced to new material before the class meets, typically by reading the book, viewing videos, and reading powerpoint slides. Class sessions are saved for integrating information through completing problems, discussion, or other active learning methods.

The term flipped class comes from the fact that traditional formats present the information in class and the students perform the integration of knowledge outside of class. So, FLIP the class and just the opposite happens. Holik (2016) found that the flipped classroom reflected higher levels of student engagement, as well as attentiveness, and preparedness than the traditional classroom. Fig. 3 highlights a Flipped-Out Success Story from a Fluid Mechanics class at Cal Poly Pomona.

Fluid Mechanics had a high rate D, F, and W(withdraw). Between Fall 2007 and

Winter 2016, the average D/F/W rate was 37.2 %. Several faculty with the help of the Faculty Development Center, and a grant from Student Success funds Flipped the class in Fall of 2016. The average D/F/W rate dropped to an amazing 13.1% after the class Flipped.

Blended/hybrid format. Generally, this means the class meets face-to-face part of the time and online part of the time. The Online Learning Consortium defines blended learning as a course where 30% to 70% is delivered online, (blended.online.ucf.edu).

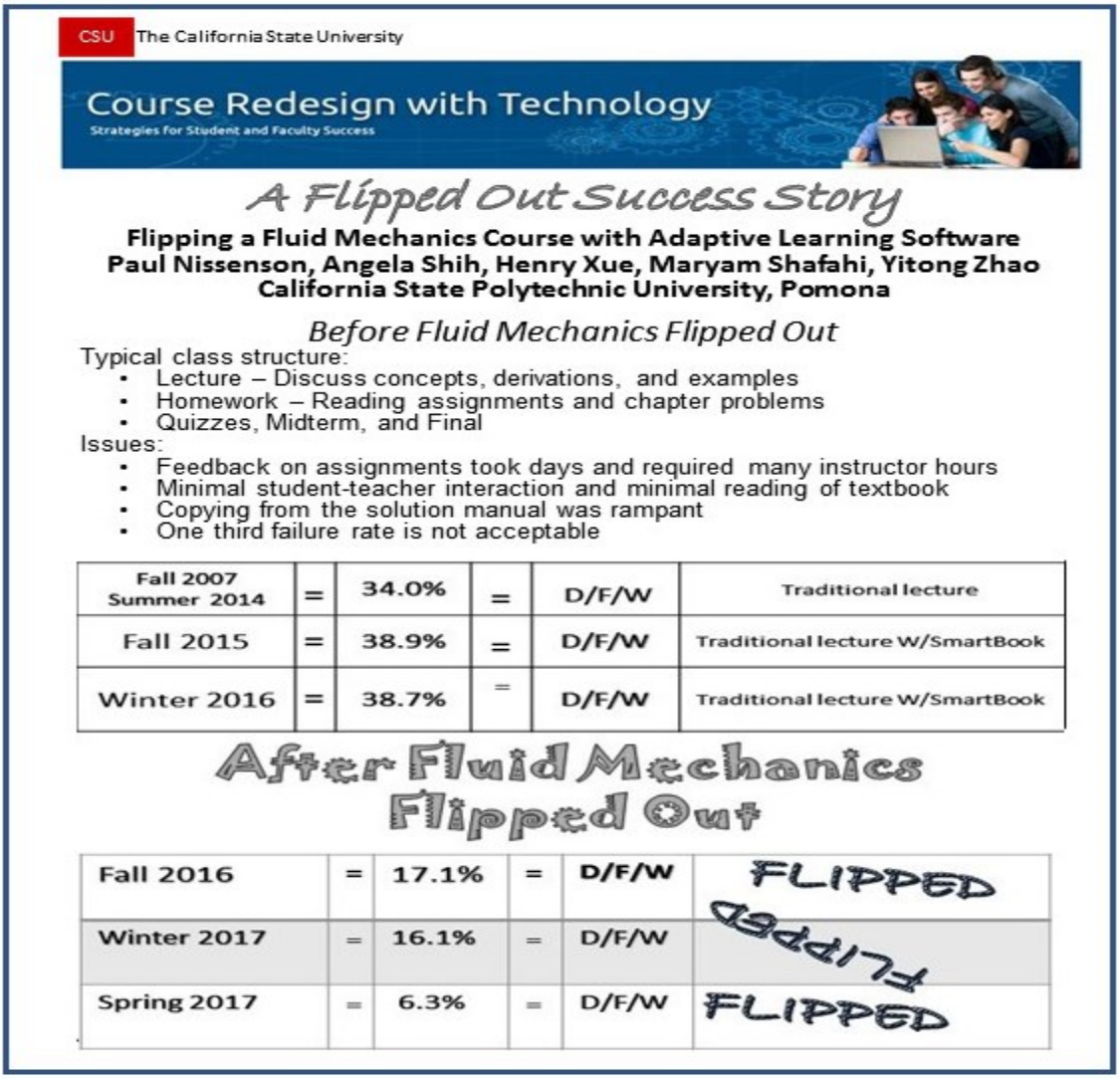

FIGURE 3. A FLIPPED OUT SUCCESS STORY.
Permission granted by Paul Nissenson

FIGURE 4. TOOLS AND TECHNIQUES.

Online format classes do not meet face to face unless it is via an internet meeting method. All of the instructional activities are delivered online. Many universities have entire programs that can be completed online. MOOCs (Massive Open Online Courses) are an example of online learning. There might be 20,000 students from all over the world in one MOOC.

Tools and Techniques. The data and constant comparison analysis resulted in numerous codes for tools and techniques for engaged learning. While numerous tools and techniques exist, the most relevant tools and techniques for Operations and Supply Chain are: Relevant Learning, Active Learning, Critical Thinking, Collaborative Learning, Digital Learning Systems, Workplace Learning, Project-Based Learning, Simulations, Virtual Reality, and Augmented Reality.

According to the Glossary of Education Reform (2013) **Relevant Learning** refers to learning experiences that are either directly applicable to the personal aspirations, interest, or cultural experiences of students {personal relevance} or experiences that are connected in some way to real-world issues, problems, and contexts {life relevance}. One common prerequisite for engaging learners is "relevancy." Today's learners want their learning to apply to real-life scenarios whenever possible as opposed to being theoretical and text-based. Working with authentic problems or community issues engages students and builds a sense of purpose to the learning experience (Claxton, 2007; Dunleavy & Milton 2009; Willms, Friesen, & Milton, 2009). "The work students undertake also needs to be relevant, meaningful, and authentic – in other words, it needs to be worthy of their time and attention" (Willms, Friesen, & Milton, 2009).

Active Learning is generally defined as any instructional method that engages students in the learning process. According to the Center for Research on Learning and Teaching, active learning is where students engage in activities,

such as reading, writing, discussion, or problem solving that promote analysis, synthesis, and evaluation of class content. The activities range from simple -- reflection, think-pair-share--to complex activities--interactive lectures, experiential learning (2012*)*.

Paul and Elder (2008) explain that **Critical Thinking** is a mode of thinking - about any subject, content, or problem - in which the thinker improves the quality of his or her thinking by taking charge of the structures in thinking and imposing intellectual standards upon those structures.

Collaborative Learning is based on the view that knowledge is a social construct. Collaborative activities are based on four principles. (1) the learner is the primary focus of instruction, (2) interaction /doing are of primary importance, (3) group work is an important code of learning, and (4) structured approaches to developing solutions to real-world problems should be incorporated into learning.

Digital Learning Systems are not 20th century materials. SmartBook (McGraw Hill) is a digital version of the textbook, but unlike a typical ebook, it actively tailors the content to a learners individual needs. SmartBook can be accessed online through your laptop (McGraw Hill). MindTap (Cengage) is a personalized program of digital products and services that engages students with interactivity while also offering learners and facilitators choice in content, platform, learning tools, and devices -- including smartphones and tablets. At the 2011 TED Conference, Cengage says MindTap is the first in a new category they are calling Personal Learning Experiences (PLEs). Every activity in the business courses in MindTap put the students in the position of a manager. Students are asked to address a scenario, and then are told how an experienced manager would handle the situation.

The publishers of Digital Learning Systems have research that concludes the systems; help students get better grades, save time, study smarter, accessible on the go, and provide results in real-time. Both the learner and the facilitator can track student progress throughout the term instead of waiting for the midterm when it is almost too late to make any changes.

Workplace Learning, broadly speaking, can be defined as the acquisition of knowledge or skills by formal or informal means that occurs in the **workplace**. According to Collin et al **learning** in the **workplace** is perceived as an ever-present practice that occurs through customary work systems, (2011) Internships that are closely monitored to assure learning are good examples of workplace learning. The learner and the manager must have measurable objectives. A facilitator should be in close contact with the learner and manager to assure that learning occurs. Having a student perform a job for a company without measurable goals and objectives as well as supervision by a manager and a faculty member is NOT really workplace learning.

Project-Based Learning is a dynamic classroom approach in which learners actively explore real-world problems and challenges to acquire deeper knowledge (https://www.edutopia.org/project-based-learning). Project-based learning (PBL) is used to combine academic knowledge with real-world applications. As the learners are developing the work, they are receiving support from their instructors, peers, and professionals in the field (often with a range of interdisciplinary backgrounds). Project-based learning engages the student with any or all the following: brainstorming the specifications, assigning work roles, documenting their work, creating prototypes, monitoring their work, defining end users for their services, analyzing what is being learned, peer evaluation and self- critiquing, analyzing the quality, and presenting the project (Ikonen, Piironen, Saurén, & Lankinen, 2008). Fig. 5 showcases a Project-Based Learning Example.

Project-Based Learning Example
Technology and Operations Management
California State Polytechnic University, Pomona

During 2016 and 2017, teams of Cal Poly Pomona students in the Technology and Operations Management department, with Boeing Corporation sponsorship, and mentorship by Dr. Hassan Halati and Dr. Rita Kumar, engaged in a data analytics project to examine five million lines of data, spanning a five-year period. The goal of the project is to identify spending trends over time, quantify patterns, and develop future spending predictions. The team utilized Tableau software to analyze the data (Sarah Rierson, TOM Graduate).

www.cpp.edu/~honorscollege/documents/convocation/BUS/TOM_Rierson,Sarah.pdf

FIGURE 5. PROJECT-BASED LEARNING EXAMPLE.

Simulations create an environment where learners can apply theory and practice skills in real-world issues related to their discipline. A powerful tool for learning, simulations allow facilitators to integrate multiple teaching objectives in a single process. Simulations motivate students, provide opportunities for active participation, promote deep learning, develop communication skills, and link knowledge and theory to application (Hertel and Millis, 2002).

Simulations have been successful in the classroom for decades. John P. Hertel reported in 1948 that simulations were valuable to the learners as well as the facilitators. Research since that time continues to report the value of simulations for motivation, engaged learning, active participation, and integrating previously learned theory (Griffin and Williams 1964, Keys and Wolfe 1990, Hertel and Millis 2002). Faculty and learners alike reported the positive learning experiences they have had with properly executed simulations.

Many faculty report that they literally have to "kick the students out of the classroom at the end of class." There are simulations for entire courses as well as for specific functions within Operations and Supply Chain Management. A representative sample of simulations are listed in Fig. 6.

The following resources provide comprehensive information about simulations for Management:

The **Hall Marketing** site provides information about a comprehensive range of Computer Business Simulations and Experiential Exercises for Management Development and Business Training and information about why and how to use them to enhance learning and management

performance(http://www.simulations.co.uk/index.html).

Range of Simulations currently describes some three dozen computer simulations and experiential exercises available for management development and are adding several each year (http://www.simulations.co.uk/RANGEFLY.HTM).

Virtual Reality is an artificial environment created with software and presented to the user in such a way that the user accepts it as a real environment. On a computer, virtual reality is primarily experienced through two of the five senses: sight and sound. The simplest form of virtual reality is a 3-D image that can be explored interactively at a personal computer. More sophisticated efforts involve wrap-around display screens, actual rooms augmented with wearable computers, and haptics devices that let you feel the display images. Numerous smart phones such as the Samsung Galaxy 7 can display virtual reality by adding Samsung Gear VR. This makes virtual reality very affordable and easy to use in the classroom.

Using virtual reality, students can experience events that would be impossible in person. Imagine taking your students on a tour of a car manufacturing plant in Japan, and having them actually participate in the building of the vehicle.

Another example of virtual reality, DHL reports, is a company called Yihaodian in China. They are getting ready to open up a series of virtual supermarkets that will be located in "blank" public spaces (e.g., train or subway stations, parks, and college campuses).

While the naked eye will see empty floors and walls, people using virtual reality devices will see a complete supermarket, with shelves filled with digital representations of real-world products. To buy products, the user just scans each product with their mobile device, adding it to their online shopping cart. After completing their VR shopping tour, the user receives delivery of the products to their home.

Augmented Reality an on-demand learning technique where the learning environment adapts to the needs and inputs from the learners. As defined in an industry report on AR by DHL, Augmented Reality refers to the layering of computer simulation models over the physical layout of current surroundings. This could be any kind of virtual content or object, including text, video, graphics, sound, GPS data, haptic feedback, and even smell. AR in Supply Chain and Operations Management improves the efficiency of today's processes (Glockner, et al, 2014).

Perhaps the most commonly experienced form of AR today is the widely used yellow stripe displayed in pro and college football games to indicate the first down mark. That yellow stripe is of course not really on the field (Max, 2016)**.**

Augmented Reality in Logistics Changing the way we see logistics a DHL perspective (2014) is a comprehensive report powered by DHL Trend Research in cooperation with z punkt The Foresight Company. The report discusses Understanding Augmented Reality, Best Practice and AR Reality in Logistics. Figure 7 highlights some of the applications discussed by DHL.

Augmented Reality in the Classroom. Augmented Reality is an example of a technology that can make learning more transformational and engaging. What seemed like fantasy is now a part of our reality.

Many practical examples for Augmented Reality are being used in classrooms around the world. As the ability to overlay digital content and information onto the real world--using triggers like images and locations--opens a new world of learning opportunities. What started out as something that was simply “cool” has become a way to engage learners like never before. Augmented Reality is a way to bring a new dimension to learning. By unlocking the everyday world, one

can dig deeper and engage learners in a new and interesting way (Brown, 2015). Fig. 8 displays Augmented Reality applications for Logistics.

While there are literally hundreds of applications available for K-12 classes, only a few exist for Operations and Supply Chain Management at the university level. That is the bad news, the good news is: the opportunity for developing applications for the university classroom is abundant. Applicable applications for Operations and Supply Chain Management classes are described below.

Operations and Supply Chain Management Simulations

Beer Game -- The most well-known game, was developed at MIT in the 1960s to demonstrate the bullwhip effect in an inefficient supply chain. Another turn-based game was recently developed by the Harvard Business School. This interactive online simulation game allows students to manage However, students still gain limited experience in dealing with a 24/7 global supply chain environment.
http://www.systemdynamics.org/Beer.htm "The Beer Game" System Dynamics Society

SCM Globe – SCM Simulation. A very engaging simulation tool for students to learn the basics surrounding supply chain management. Provides a "real world" simulated environment. www.scmglobe.com
Supply Chain Game. The objective is to maximize cash position at the end of the game. Designed for use in **supply chain** electives or core courses that emphasize **supply chain management**. Includes: forecasting. inventory and production control, and supply network design *responsive.net/supply.html.*

Global SCM Simulation. *Harvard Business.* https://cb.hbsp.harvard.edu/cbmp/product/6107-HTM-ENG

Xtreme Supply Chain Management | Marketplace® Business Games. This business simulation focuses on supply chain risk management in an emerging technology market.*www.marketplace-simulation.com/en/xtreme-supply-chain-management*

Supply Chain Simulation - FlexSim Simulation Software. Supply chain simulation is the computer-based modeling of a real supply system. Simulation enables an organization to analyze and experiment with its existing supply chain process in a virtual setting, reducing the time and cost requirements associated with physical testing. Through the model, the individual events that make up the entire system are represented, and uncertainties such as machine breakdowns that might occur in the system are incorporated *https://www.flexsim.com/supply-chain-simulation/*

LINKS Supply Chain Management Simulations-Five separate simulations
www.links-simulations.com/indexEMS.php?variant=SC

Distributor Game Corsi et al. focuses on the distribution process in a global real-time supply chain. Different from other turn based simulation games, this game replicates a real-world experience on a 24/7 basis. https://www.jstor.org/stable/20713644

Supply Chain Game developed by Responsive Technologies is completely web-based and played in real time. It is also commercially available and uses the complexities of a global supply chain in a mobile phone company (Harvard Business School, 004). responsive.net/supply.html

FIGURE 6. SIMULATIONS FOR OPERATIONS AND SUPPLY CHAIN MANAGEMENT.

The Rise of the Augmented Reality Supply Chain is Here and It's Going to be Effective

Supply Chain Technology// Adam Robinson// 02.10.2016

What separates science fiction from reality? Is it the application and use of new technologies that have yet to be discovered, or does science fiction simply blur the lines between idealism and reality? Often, the precursors to science fiction begin within the needs of society and commerce. Along the digital supply chain, we now see the rise of the augmented reality supply chain.

The Internet of things has radicalized how machines interact with people and one another. Sensor-driven technologies and advanced analytics hold promise in restoring the balance between workload and production. The supply chain stands on the cusp of innovation and augmented reality (AR) is becoming more applicable to today's supply chain needs.

Unlike science fiction, augmented reality is a very real factor in today's world. "Futurists" like Robert Scoble and Shel Israel, and Brett King are currently writing books on the matter, *Beyond Mobile: Life after Smartphones* and Augmented – Life in the Smart Line, respectively.
http://cerasis.com/2016/02/10/augmented-reality-supply-chain/

FIGURE 7. AUGMENTED REALITY.

Augment is a mobile app that lets you and your customers visualize your 3D models in Augmented Reality, integrated in real time in their actual size and environment. Augment provides free education subscriptions to students, teachers, and schools (play/google.com/apps).

Wikitude voted "Best Augmented Reality browser" in 2009, 2010, 2011 and 2012. Wikitude is your "third eye" and allows you to see things you wouldn't normally see. (wikitude.com).

Aurasma is an augmented reality app brings tagged images, objects and physical locations to life with interactive digital content, such as video, animations and 3D scenes. (aurasma.com).

ARDL is a revolutionary concept that makes virtual, 3D objects appear in the real world. These 3D objects are attached to real objects by using a viewing device (augmentedreality2014).

Syllabus. The syllabus outlines the policies of the course and answers the students' questions about the course. Backward planning is an effective method for creating an engaged syllabus. To use backward planning, start with the desired course outcomes (goals) and then move **backwards** to the teaching techniques, texts, and course assignments which will best enable students to achieve those goals. Start with what you want them to be able to DO with what they know, rather than starting with what you want them to KNOW (Obrien, Millis,

Cohen, 2008). The syllabus should include all the expected topics (course materials, due dates, etc). In addition, an engaged learning syllabus sets the tone for the course, explains the course goals, and defines what student success looks like.

AR (Augmented Reality) Applications for Logistics
Adopted from DHL Trend Research Report

Picking Process. Recently, DHL conducted a successful test with AR. They utilized smart glasses in their warehouses focusing on the picking process. Their systems offered real-time barcode scanning, indoor navigation, seamless integration of data with their Warehouse Management System, and object recognition. With these features, workers can:

- Choose the best route from the navigation system
- View a digital picking lists via a smart glass
- Quickly point out the item using the barcode scanning capabilities
- Update stocks in real-time through scanning

Warehouse Planning. Through AR, one can visualize any planned arrangements in full scale, allowing for the placement of interactive digital representations of proposed modifications for the present warehouse setting. Planners can use AR to: Check if the measurements of the proposed modification will match through mixed-reality simulation, and model new workflows and adjust appropriately.

Transportation. In the last decade, the adoption of advanced information technologies by logistics providers has improved the reliability, efficiency, and security of freight transportation. AR has the potential to further advance cargo transportation in areas like:

- ***Freight Loading***. AR can be a great replacement for printed cargo lists and load instructions. The loader would receive a loader plan and instruction of the sequence of pallets and where to place them directly on their AR device.
- ***International Trade.*** AR can be used to scan printed parcel labels and trade terms. This will help facilitate trade documentation and international freight handling.
- ***Completeness Checks.*** With a wearable AR device on hand, users can perform more effective pick-ups, by assessing the number or volume of pallets or parcels and comparing them to predefined values. This can also be used to check if a delivery is ready for pick-up.

Dynamic Traffic Support. Traffic congestion is the biggest problem in today's transportation. Replacing navigation systems with AR thus provides real-time traffic analysis and alternative routes. This will help optimize routing in real-time, improve transportation safety, and reduce drive distraction.

Glockner, H., Jannek, K., Mahn,J., Theis, B. ***Augmented Reality in Logistics***. 2014. DHL Customer Solutions and Innovation. csi_augmented_reality_report_290414.pdf

FIGURE 8. AUGMENTED REALITY APPLICATIONS FOR LOGISTICS.

Sets the Tone for the Course. Syllabus should give insight into why the course is relevant, why you have structured the course the way you have and what your role/responsibility in the course will be. "A syllabus is, at its heart, a learning resource, a motivational introduction and guide to a great learning experience, not a legal document…" (COB eLearning Office: syllabus)

Explains the Course Goals: The syllabus should acknowledge ALL course goals, including the mastery of content and skills. Acknowledge any "hidden curriculum" items you may be trying to teach, like the ability to work under pressure.

Defines Student Success: What does student success look like in this course? The syllabus should list what is required in the course, when it is due, how it can be accomplished successfully, but also why it is required. If class participation is required, what exactly does that look like or sound like?

Many universities are encouraging the use of Universal Design for Learning. As the name implies UDL provides a consistent framework for learning.

Assessment. If one has completed the upfront work of deciding what you want your learners to do, written measurable objectives using Bloom's Verb Wheel, and use a Smartbook or Digital Learning Assistant, assessment should not be the cumbersome task it was in the past.

Cengage's MindTap uses Video Quizzes, Chapter Quizzes, What would you do Exercises, guided cases and group assignments. All of which put the learner in the role of a manager. Write Experience use artificial intelligence to help the students write essays. The grading for all the quizzes and exercises is done by the program and recorded either in MindTap or your LMS.

Rubrics that are shared with the learners before the assignment allow the student to be a part of the assessment process. Granted, all of this takes up front time, but it more than pays for itself later in the course, not to mention the next term.

No longer do students have to guess how they are performing in a class. They are aware of the grading procedures and expectations before they start. In addition, the feedback is almost instantaneous. Facilitators now have time to help the learners apply their knowledge instead of grading, grading, grading.

3.1.2. Technology

Technology that adds value was one of the theories that emerged from the data. Research reports that engaged learning is not guaranteed by incorporating digital learning technologies. However, today's educators still lack the understanding of the appropriate technologies and techniques that best support students' needs and engage the learners (Laurillard, et al, 2011; Stohlmann, Moore & Roehrig, 2012; Downey, Mohler, Morris & Sanchez, 2012).

At a minimum, the engaged learning environment includes computers, smart books or digital learning systems, mobile devices (that means cell phones in the classroom), learning management systems, class response systems and social media. The Center for Teaching and Learning at the University of Washington includes**:** Online collaboration tools, such as those in *Google Apps*, **Presentation software** (such as *PowerPoint*), **Tablets** can be linked to computers, projectors and the cloud so that students and instructors can communicate through text, drawings and diagrams. Course management tools such as *Canvas* allow instructors to organize all the resources students need for learners, Lecture-capture tools, such as *Panopto*, allow instructors to record lectures directly from their computer, without elaborate or additional classroom equipment.

3.1.3. Space — Virtual or Physical

Appropriate Space, whether virtual space or physical space was one of the emerging theories. The themes that emerged from Space were: presentations space, break-out space, discussion areas, team/group areas, collaborative areas, cloud storage, wifi access, appropriate software and hardware. It would be next to impossible or at least difficult to try the engaged learning strategies in a traditional classroom. A truly engaged classroom environment would be set to fail with using traditional space.

3.1.4. Support

Support was one of the emerging theories**.** Support for the engaged facilitator and the engaged student is critical, especially when the facilitator and learners are using new strategies.

Institutions, learners, and facilitators do not just "become" engaged. The Engaged Learning Fairy does not wave a magic wand and poof you have engaged learning. True engagement is a process that requires support from colleagues, departments, universities, faculty development, LMS technicians, campus technicians, publisher technicians, and financial assistance and time is needed for training. In addition, money for necessary materials, software, hardware and other items is essential. Fig. 9 details the themes for Support in Engaged Learning Environments.

Ideally, engagement will become a part of the institutions strategic plan. This plan should then cascade down to colleges, departments, faculty, information technology, and facilities. Each entities' strategic plan should include engagement.

FIGURE 9. THEMES FOR SUPPORT IN ENGAGED ENVIRONMENTS.

3.1.5. Facilitators

Engaged **Facilitators** are an integral part in Creating an Engaged Learning Environment, just as they have been an integral part in every classroom. The themes that were revealed about facilitators in an engaged learning environment include the ability to change, show a great deal of enthusiasm, are student-centered, are willing to give up the traditional methods of teaching and use engaged learning strategies, and are willing to learn new methods. The engaged learning environment requires the "teacher" to become a "facilitator." The facilitator is not expected to just transfer knowledge to the learner, but find ways for the student to become engaged in their learning. Facilitators for engaged learning should be enthusiastic, willing to learn, are technology savvy, are willing to change and give up the old ways, and use engaged learning strategies.

3.1.6. Learners

Engaged learners must play an active role in the Engaged Learning Environment. The engaged learners think, listen, question, seek help, participate collaborate, communicate, challenge ideas, exert their best effort, are technology savvy, are higher order thinkers, use Metacognitive strategies, are enthusiastic about learning, are responsible for their learning and show a sustained behavioral involvement in their classes.

IV. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary.

A grounded theory methodology was used to discover emerging theories and themes concerning creating engaged learning environments for operations and supply chain management**.** The emergent theories indicated that engaged learning environments for Operations and Supply Chain Management included six theories. They were Strategies, Technology, Support, Space, Facilitator, and Learners.

The literature revealed that while there are thousands of articles and the topics included are numerous, the understanding and clarity of the big picture about the engaged learner and the creation of an engaged learning environment is minimal. Much of the literature is anecdotal and focuses on faculty, individual classes, or program challenges of design and implementation.

Conclusions.

Conclusions from ***Creating Engaged Learning Environments for Operations and Supply Chain Management*** include:

- engaged learning environments must be defined in a more comprehensive manner than the literature reveals
- all the emergent theories—Strategies, Technology, Support, Space, Facilitators, and Learners— must be considered when planning engaged learning,
- engaged learning environments should be part of the strategic plan for the university, college, departments, and courses,
- comprehensive research which is based on hard data not just anecdotal evidence is needed in the area of engaged learning environments.
- The entire university should become involved in the process of creating engaged learning environments

Recommendations.

The recommendations for Creating Engaged Learning Environments for

Operations and Supply Chain Management include:

- the emergent theories (Strategies, Technology, Support, Space, Facilitators, and Learners) from this study, which are grounded in data, should be researched using quantitative and qualitative methodologies,
- the themes that were drawn from the emergent theories should be researched using quantitative and qualitative methodologies,
- as faculty try new engaged learning methods, they should document their experiences and share with others
- students should be continually included in the process of creating engaged learning environments.

Our educational system has needed updating for decades. Comprehensive engaged learning environments could be the beginning…

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