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Advances in Education, Teaching & Technology 2019  
(EduTeach2019)**

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## Abstract of the Keynote Speech

### The Challenges of the European Higher Education

Bruno Dallago

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*Universities are called to pursue economic value also in the European Union (EU), as evidenced in both European and national strategies. In line with this perspective, European higher education and research institutions (HERI) have to strengthen the value of their education and knowledge output while strengthening their economic basis. The former goal is in line with the greater competition among economies following globalization. The latter goal became important following the international crisis and the fiscal crisis of many European states. As a consequence of these goals, natural sciences and technologies became prominent also in European higher education and research, to the disadvantage of social sciences and humanities. At EU level, the guiding strategies have been the Lisbon Strategy and Europe 2020.*

*Along the above set of goals, shared around the world, higher education and research institutions in the European Union are called to serve a peculiar European set of goals: support European integration, with particular concern for a unified labor market. The necessary precondition for doing so is that national education systems become somehow integrated. Much of the EU action has been concentrated on moving governments and HERIs in this direction, by proposing strategies and goals and providing (part of) the necessary resource basis. National governments are called to implement the necessary reforms. The fundamental component in this case is the so-called Bologna Process that created the European Higher Education Area. The core of the Process is to ensure comparability in the standards and quality of higher-education qualifications among European countries.*

*The outcome of these processes has been mixed and much remains to do. The paper critically analyzes the evolution of the European higher education and research system within the frame of European integration and with a view to the goals pursued, the results achieved and the challenges ahead. The goal of the paper is to assess the compatibility of the different national educational and research systems and their move towards integration, with a look at the effect of different specializations and competitive strategies followed by European countries. These may create new fractures in the European HERI system. Particular attention is dedicated to the features and effectiveness of European programs and efforts implemented to these ends and to the new long-term strategy for HERI under discussion.*

**JEL classification:** A22, A23, O30, O52

**Keywords:** European Union, Higher education, Higher education institutions, Policies, Reforms, Research



## **Exploring Fractal Imagery to Promote Culturally Responsive Dialogue and Healing: An Indigenous Focus**

Dr. Jennifer (Jenny) L. Penland

*Associate Professor, Director of the School of Education, College of NEHS, Shepherd University, U.S.A.*

### **Abstract**

*Institutions of higher learning are facing increasing demands for providing alternative technology-based programs that would more closely service the needs of the ever-changing 21<sup>st</sup> century populations. In today's amalgam of cultural differences, education that is independent of biases is more than difficult to author. I propose using fractals that are never-ending patterns that change as you explore deeper into the fractal as another. Exploring the Mandelbrot fractal is computationally expensive as each pixel (dot on the screen) must iterate through thousands of calculations to determine its appearance in the viable part of the fractal, only now are computers able to do this reasonably fast. My study will explore ways for businesses and government sponsored organizations to build pedagogical fractal imagery content to foster more immersive learning, as well as, content that is as closely culturally unbiased, as possible.*

### **Introduction**

Exploring the fractal space is akin to a journey through an art wonderland. In recent years, the advance and spread of technology has been blamed for a multitude of problems, including social isolation, increased violence, short attention spans, and more. Now, educational counsellors and therapists are putting the technology of virtual reality therapy to use helping their clients overcome fear, anxiety, anger and cultural unacceptance.

In recent years, the advance and spread of technology has been blamed for a multitude of problems, including social isolation. Now, therapists such as Thomas (2019) are putting the technology of VR and fractal imagery/ art therapy to helping their clients overcome fear, anxiety, pain, phobias and PTSD.” According to the U.S. Department of Education (2017), today’s average student is no longer the 18-year-old whose parents drive them to the campus. Instead, the “new normal” student may be a 24-year-old returning veteran, a 40-year-old single mother, a part-time student juggling work and college, or the first-generation college student athlete. The faces we picture as our college hopefuls can’t be limited by race, age, income, zip code, disability, or any other factor.

For higher education to fulfil its promise as a great equalizer, we need continued innovation that can move us toward increased access, affordability and equity. This innovation will develop an ecosystem that will include a range of opportunities for a variety of high-quality educational experiences and credentials with marketplace value suited for the differing needs of students (Rio, 2017). Computer Science as a field of research continues to change and evolve at lightning speed. Artificial Intelligence (AI) is reaching a breaking point where its applicability is being realized. There is a growing expectation that AI will play a much larger role in how we teach our students, but no one really knows where it will lead us. Another paradigm changing technology coming to maturation is Virtual (VR) and Augmented Reality (AR) (Penland, Laviers, Bassham, & Nnochiri, 2018).

It is nearly impossible to explore any corner of social media and not discover elements of criticism about the Millennial Generation, often unfairly; coupled with very little consideration regarding what makes them exceptional. Critics of Millennials need to begin thinking about creating new pathways to communicate with and teach the newest generation of learners who will become tomorrow’s community leaders. It is essential that the schools of higher education begin to disrupt the Industrial Age model for learning and move forward with progressive strategies to meet the needs of the Millennial education consumer; the “Net” Generation. This new generation of learners has a different way of demonstrating mastery than the learners of the past. The 21st century learner responds to instructional opportunities at a

far more rapid speed than generations past and progressive educators have learned to make the most of the talents, skills and interests of today's learner in both real world and virtual educational settings.

To meet the needs of a rapidly changing and growing global economy, schools of education must pursue adoption of a global business perspective to be able to teach marketable 21st and 22nd century skills. Schools need to focus on shifting from the concept of a local economy to a global economy; a cultural disruption of traditional "Industrial Age" pedagogy for teaching and learning. They must respond to the radical changes introduced in the 21st century workplace to meet the needs of the complex world economy. The Net Generation learner is shifting from being a recipient of instruction to a learner focused on collaboration, interactive learning, and reflective research, practice and work (Tapscott, 2009).

According to the National Conference of State Legislatures (NCSL), there are at least five states that are requiring an online or virtual reality/virtual class as a high school graduation requirement (2017). Schools need to move from the one room schoolhouse way of thinking to successfully meet the needs of the Net Generation learner; from the teacher as a "sage on the stage" to a teacher who is "a guide on the side" (Tapscott, 2009). Institutions of higher learning need to think about individualized and collaborative methods for focused on line and technological virtual learning experiences based on the needs of the individual, in a reflective and supportive learning environment. Learning in virtual environments provides an opportunity for student-centered individualization of instruction; to provide opportunities to learn about tough and challenging situations in a safe and controlled environment (Penland, Laviers, Bassham & Nnochiri, 2018).

*Interactive Presence.* Virtual Reality experience can be one of two things, or a mix of both. In the most passive sense, VR can be a medium to watch a 3-D movie in which a person can be standing in the middle of the scene and focus on an emotion without user engagement. This is accomplished by placing a 360-degree camera in the middle of a scene and recording the video information. On the other end of the spectrum, there are simulated environments where the VR user can move around, explore and interact with the items in the scene.

*Culturally Unbiased Delivery.* When we talk about the dynamics of creating a culturally inclusive online classroom community, the typical focus is on the diversity of the students in the "brick and mortar" school building. All too often the culture and diversity of the adults are on the periphery. But to navigate the intersection of student and adult cultural diversity, we must first acknowledge and understand our adult beliefs and practices.

This thinking requires educators to be willing to explore and analyze our own history and its effects on our behavior. First, we must consider our historical and current living situations and conditions. When we examine our childhood, young adult and present-day lives, we examine how our experiences influence us today and how they might influence our work with children and families who have vastly different experiences. While culture refers to a collective worldview, schools as culturally inclusive communities must relate to individual students first in addressing the distinct needs of the students who make up those communities, including the on line virtual world.

Freire (2005) addressed a critical concern on the purpose of education-- to develop individual thinkers who can provide innovative solutions to our complex problems. When we see education only to impart socialization and indoctrination, we do a great disservice to the liberating aspects that education can provide. Instructors must start changing how they view their students-- they are complex beings with past experiences and thoughts that cannot be ignored (Bledsoe & Baskin, 2014). To teach to a diverse group of students, an instructor needs to make the learning complex and malleable which mirrors how the brain works.

Some characteristics of the individual learner:

- Relies on the teacher to carry some of the cognitive load temporarily
- Utilizes strategies and processes for tackling a new task
- Regularly attempts new tasks without scaffolds
- Has cognitive strategies for getting unstuck

- Has learned how to retrieve information from long-term memory

Neurosciences will continue to highlight the tangible nature of learning, but the model of one size-fits-all is not conducive to real education (Foundry, 2018). While virtual delivery is often more convenient, not being able to see the learners and gauge their level of understanding and engagement can be difficult as a facilitator (Hawkins & Phelps, 2013). We learn both inside and outside of the classroom; given the removal of face-to-face interaction within online education, how can an instructor bring the outside world into the classroom? Highlighted below are some suggestions that could enhance culturally responsive learning between the teacher and student.

- **Awareness:** The instructor should recognize cultural norms of individualism as well as collectivism. Online instructors should acknowledge the socio-political context around race and language.
- **Learning Partnerships:** Reimagine the student-teacher relationship as a partnership and attempt to balance giving students both care and push. Cultivate a positive mindset amongst your students along with a sense of self-efficacy.
- **Information Processing:** Stimulate higher order thinking, instructional designers can help you match higher order objectives with the assignments and assessments that you as the instructor are planning on giving. Scaffolding becomes a component that can assist in the creation of independent learners in your online class.
- **Community of Learners:** Just because the instructor does not view the students face-to-face, does not mean a community of learning cannot be established. In fact, allowing students to have a voice by incorporating collaborative assignments, or allowing the students to help create the semester syllabus are great examples of building a community. A quality learning environment is one where the professor and the students both feel empowered to create their learning path. Building rituals and routines within the online course can also solidify the creation of a learning community. Creating a culturally responsive online classroom does not mean catering to any one group, rather it involves being more purposeful with how and what you utilize to measure learning within the course. Instructional designers can assist in the creation of quality assessments as well as how to nurture a learning community (Hammond, 2014.)

Since the beginning of time, most new and emerging technology has nurtured an unhealthy attachment to acronyms and virtual reality is no different. What does it mean to be “immersed”? It is a term emerging into almost every industry, as organizations seek a spot in the modern consumer’s content-rich diet. There are increasing levels of immersion that technology can help us imitate, but true immersion is a relative concept (Foundry, 2018).

## **Methods & Materials**

I will turn my focus now to an educational platform called “PL’s Fractal Explorer” which allows the users to merge places they visit from photographs or digitalized art using techniques popularized by deep neural networks. This experience produces new art that represents a cultural and emotional journey of the person exploring the space (Penland & Laviers, 2019). This imagery experience should reflect the student’s individual creative and/or critical thinking endeavors spanning the scope of their baccalaureate studies which mirrors the mission of any university. While there are many sources of VR educational content available, the magnitude of work involved in taking our VR fractal imagery content even close to 100 percent for educators is staggering.

*My study will use qualitative methods to measure and analyze the potential relationship between student engagement and meaningful learning (Callaghan, Gardner, Horan & Scott, 2008). Virtual reality environments enable students to interact with avatar/ fractal representations of each other. The long-term hypothesis that will be investigated is that avatar/ fractal representations will help create a sense of*

*shared presence, engendering a sense of community and improving student engagement with online lessons (Callaghan, Gardner, Horan & Scott, 2008).*

*If my study is to be effective in evaluating meaningful and applicable learning, it must incorporate a long-term plan to evaluate students not just after the proposed learning event/ course but must reevaluate the learner in intervals for months or even years later. I would propose as part of my study, to introduce anomalies (unconscious or experimental variables) not specifically included in the online coursework but should be noticed by the student. I am currently in the developing stages with this pilot study and anticipate collecting findings in spring of 2020 from the two groups. One group will be selected from an undergraduate junior level cohort and the second will be from a small graduate cohort both from a higher ed institution in the northeast panhandle of West Virginia.*

Below are potential requirements needed to build quality VR content:

- Two-dimensional (2D) and three-dimensional (3D) graphics (this includes user interface elements and image textures) and models for illustrations.
- A very simple mechanism to animate the 2D and 3D resources. This would have to be setup in a very intuitive and easy to use graphic environment.
- An easy way to include group VR participation in VR demonstrations/lectures is through fractal imagery. Again, we can take advantage of AI to help the developer out, but we should also be able to make a very simple and straightforward.
- An easy way to add Text and Sounds to any of the VR demonstrations/lectures. We would expect this to be offered in the form of a toolbox with these options that is always shown to the content developer, but a pilot study and survey may find a better, more intuitive way of offering these features to the educator.
- A method for the teacher to be able to make the VR demonstrations/lectures available to the students.
- A way of recording students' interactions in the VR content. When learning modules are engaged by the learner, we need to be able to record and analyze the outcome to gauge progress and how well the student is learning the material.
- A set of tools to evaluate student performances for the VR lectures (VRL).

## **Research & Discussions**

### **Why Incorporate Fractals?**

**Fractals** are objects with irregular curves or shapes and are recognizable building blocks of nature. Trees, clouds, rivers, galaxies, lungs and neurons are fractals. The new discovery is not about improving inkblots for psychological assessments -- their use became controversial and mostly set aside in the last 20 years for the technologies emerging. It does, however, have implications for Taylor's efforts to design a fractal- based healing therapy (2017). "These optical illusions seen in art are important for understanding the human visual system," said Taylor (2017), who is director of the UO Materials Science Institute.

One learns important things from when our eyes get fooled. Whether such perceptions speak to mental health, reflect a person's level of creativity in education or simply draw from a person's past experiences for healing has been debatable. These immersive experiences help students refine and practice critical learning skills in a virtual reality environment without being so expensive. Hands-on experiences will always trump other forms of learning (Ffiske, 2019).

## **Conclusions**

Thinking about our own instructional delivery as higher education professors, lead us to wonder why most educators do not talk about the process by which we leverage understanding in one context to solve problems in other contexts. Why not be more explicit with teaching students about “the skills and experiences” required to transfer knowledge gained and heal cultural misunderstandings using fractal imagery?

Krathwohl’s taxonomy of the affective domain that we found easy to understand:

- Receiving – Willingness to pay attention to an idea
- Responding – Willingness to react to the idea in some way
- Valuing – Willingness to be perceived by others as valuing the idea to some extent
- Organizing – Incorporating the value of the idea meaningfully into an existing value system
- Characterizing – Acting consistently with the now-internalized value

If you buy into the idea that the affective domain is an integral part of learning, then think it would follow (such as a fractal image) that students would need to be able to share the collaborative work they do. For students to be willing to be perceived as “valuing the study” of a topic, it must be possible for them experience it. This provides a rationale for expanding social media via the broader community. “21<sup>st</sup> Century learning facilitates the emergence of new approaches to learning that draw upon a range of insights into the human brain, the functioning of human societies and learning as a community-wide effort” (The 21<sup>st</sup> Century Learning Initiative, 2011).

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## **Study Abroad Program and the Issues to Consider**

Tony Minotti

*Osaka Shoin Women's University: Department of English as an International Language, Japan*

### **Abstract**

*Any private institution of learning has to have appealing qualities to attract prospective students. Japan has a declining birthrate, and with each passing year, the number of eligible students entering the educational system decreases. Schools need to be creative in attracting prospective students: offering small class sizes and distinctive extra-curricular activities are two examples of how they entice students. One event that schools incorporate into their curricula to attract students is a study-abroad program. These programs can range from several weeks to a full calendar year. This paper examines the issues related to creating a study-abroad program from the perspective of a private women's university in Japan. First, it explores the concerns involved in finding an ideal location to hold the study-abroad program, including the students' safety and the differences in culture between Japan and the host country. Second, it addresses the creation of materials to help students who participate in the program. This aspect entails institutions coordinating their curriculum so that students in the study-abroad program have a solid foundation before leaving their home country. Finally, this paper analyzes the students' progress and their satisfaction with the program after returning to Japan.*

*Keywords: Study-abroad, method, issues*

### **Introduction**

The population of Japan is in decline. In 2018, the total population of Japan stood at 125.4 million people, a decrease of 0.2 million people from 2017 (Japan Macro Advisors, 2019). Estimates claim that Japan's population will steadily decline in the coming decades. Projections show that by 2060, the population of Japan will be in the neighborhood of only 90 million people if these current trends continue. The declining birthrate is affecting all aspects of society, especially education (Fukawa, 2008). The number of students entering the educational system keeps decreasing, making it challenging for private educational institutions to attract students. There were 3.5 million primary school students in Japan as of 2012, down from over 5.3 million in 1990 (Education Statistics, 2015). The graduating primary school students of 2012 are now entering the university system. With the number of students eligible to enter university dwindling, private universities need to consider creative ways to lure students to their schools. Some schools offer small class sizes and distinctive extra-curricular activities to entice students. Others attract students by incorporating a study-abroad program into the school's curriculum, which lasts from several weeks to a full calendar year. When considering starting a study-abroad program, several issues are essential to consider. The first is to find an ideal location to hold the program that ensures the students' safety and recognizes the cultural differences between the home country and the host country. The second is to create materials that help students who participate in the program. The schools in the program must coordinate their curriculum so that students in the study-abroad program have a solid foundation before leaving their home country. The final issue is to monitor students' progress and satisfaction with the program after they return to their home country.

### **Ideal location**

Finding a location that will best serve the needs of the students taking part in the program is paramount. Japan holds some conservative beliefs derived from laws restricting specific types of marriage according to women's role in society. Osaka Shoin Women's University has a 101-year history, and it

prides itself on upholding traditional Japanese values. As a result, an ideal study-abroad partner would be an institution or location that either holds similar beliefs or would not infringe on the views of the school and their student body.

### **Students' safety**

Japan is a very safe country in which to live. The crime rate as a whole is notably low: one of the most prevalent crimes is bicycle theft at a rate of one every 100,000 people ("Japan Crime Statistics," 2014). Serious crime, such as murder and rape, are at levels that many western societies would envy. This circumstance contrasts to that of the United States, which has 27.3 more rapes and a higher rate of murder per 100,000 people than Japan (nationmaster, 2019). Because of the higher crime rate in places such as America, a study-abroad program needs to add specific precautions to satisfy the parents who allow their children to take part in the program.

### **Cultural differences between Japan and the host country**

The more similar a culture is to your own, the more likely you are to feel comfortable in your new environment (Yang, Hongbo, and Xiang, 2018). Japanese society believes in allowing their citizens to drink alcohol, practice freedom of religion, and enjoy many rights and liberties. Finding a location that is similar not only culturally but also socially would help students feel comfortable more quickly in their new environment.

### **Fresno State University**

Osaka Shoin Women's University's requirements led it to choose Fresno State University in California, U.S.A. and Auckland University in Auckland, New Zealand to begin a study-abroad program for its Japanese students. The university selected Fresno State because it offers Japanese language courses. This advantage not only allows Osaka Shoin's students to learn English but also permits Fresno State students to learn Japanese. The agreement with Fresno State also enables American students to attend classes at Shoin in early June for approximately ten days a year. To satisfy safety concerns, the students that attend Fresno State live in the school dormitory on campus for the duration of their studies. This arrangement helped relieve some apprehensions the Japanese parents had regarding their image of America as unsafe.

### **Auckland University, New Zealand**

Auckland University does not have a Japanese language course at their institution. However, the city and nation as a whole have a large Japanese community to help exchange students feel more comfortable while they are away from home. Because of New Zealand's image as a safe country, Osaka Shoin students do not live in a dormitory. Instead, each student lives with a family in a homestay agreement between the university and a third party.

### **School system**

As soon as students are accepted into the English as an International Language department (E.I.L.) at Osaka Shoin Women's University, they do homework so that all first-year students start from the same level at the beginning of their university life. All school levels, from kindergarten to university, begin the school year on April 1<sup>st</sup> in Japan. The first semester runs until the end of July or early August, depending on the level of education and the school itself. Students receive several weeks to a month of vacation in the summer. On the first Monday in September, the second semester begins in primary, junior, and senior



high schools. Most universities start the second semester at the end of September or early October. The second semester for the lower-level institutions runs until the Emperor's birthday in the third week of December. Universities run until the end of January or early February. For the lower-level grades, the third semester begins the first week of January and runs until mid-to-late March. The students receive a week or two of vacation before starting the process again.

To make the transition to a new country more comfortable, students commence their study-abroad program in September to coincide with the beginning of the school year in America and New Zealand. Another benefit is that the student and her family can travel to their new school in August and familiarize themselves with their new surroundings before starting university.

This paper discusses only the thirty-six students that attended the Auckland University program.

### **Creation of materials**

Upon securing an agreement, the next step involved creating specific materials for the Japanese students in the program. After consulting with educators in the E.I.L. as well as teachers from Fresno State and Auckland University, the organizers decided to concentrate on 18 themes to teach the students before leaving Japan: My home; personal information; family; education; around town; locations; directions around town; daily routines; eating out: restaurants; eating out: fast food; last weekend; my plans; the geography of Japan; the history of Japan; Japanese holidays; numbers; health and safety, and shopping.

Two sets of lessons focused on the above-mentioned themes. The first set appeared on an online self-study training program, and students had 15 weeks to complete all the materials online. The materials consisted of listening, reading, and grammar questions, followed by a short quiz after each assignment. If the student failed the end-of-unit quiz, they could retake it as many times as they liked. The educator in charge kept an online record of all activities and could monitor their progress at any time. Students had to complete at least 80 % of the materials and have a score of 75% or more on each unit test to be eligible to participate in the study-abroad program. Faculty members periodically received updates and supported the students whenever possible.

However, several issues with the online self-study program quickly surfaced. The first was large-scale cheating on the students' part. The administrator of the site noticed that a group of students would complete a unit simultaneously in record time. After speaking to the students in person, the administrator discovered that they were helping each other or copying the answers from friends via their telephones and phone applications. The second problem was that the online units were open throughout the 15 weeks of the semester. Therefore, students completed all the units within the first several weeks and then did nothing for the rest of the course. Or, they procrastinated until the final weeks and completed everything at the last minute.

### **In-class training programs**

To combat the rampant cheating and procrastination, the department added a pre-study-abroad course to its curriculum. The course contained the same themes as the online self-study program, but the materials were more challenging. Throughout the 15-week semester, the teacher selected a topic from those created for online training. The university servers maintained the materials for in-class instruction, including Word documents, audio files, and video files. The teacher then decided what materials to use and in what order to use them in their classroom. At the end of each lesson, students took a short quiz to evaluate their progress.

In contrast to the online program, the in-class students needed only to pass the course to be eligible for the study-abroad program. The other significant difference between the self-study work and the in-class work was the presence of a teacher to help the students in all areas when needed. By the end of the semester, students had completed ten hours of English lessons weekly with a foreign teacher, 30 minutes

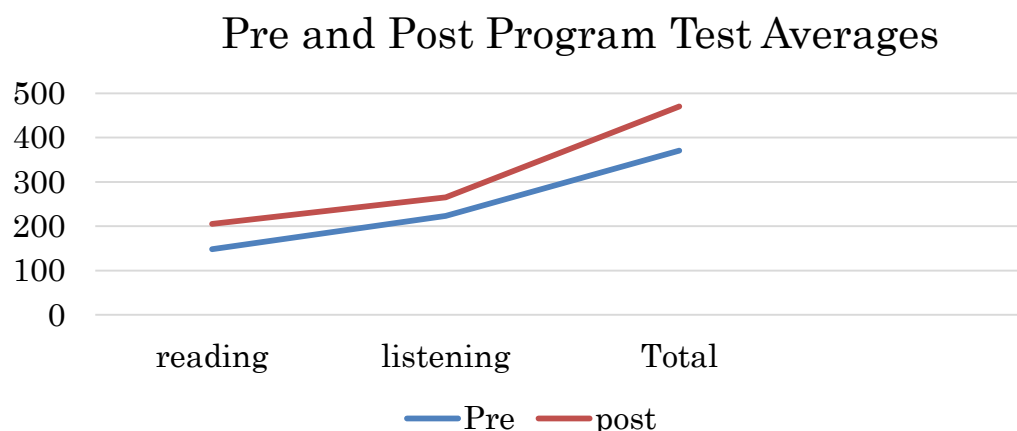
of Skype time with a foreigner in a different country, self-study online work, and an in-class study-abroad course. The final step was to give the students a pre-study-abroad test to evaluate their English ability before leaving Japan. The university chose to administer the Test of English for International Communication (TOEIC). The average overall score on the listening and reading sections was 380 points (scaled scores range from 10-990).

| How is TOEIC scores interpreted? |                   |
|----------------------------------|-------------------|
| 805-900                          | High advanced     |
| 655-800                          | Advanced          |
| 555-650                          | High intermediate |
| 405-550                          | Intermediate      |
| 305-400                          | High beginner     |
| 205-300                          | Beginner 2        |
| 10-200                           | Beginner 1        |

The university felt confident that the students had a firm foundation in English and that they had the tools to succeed in the study-abroad program.

### Students' progress

After spending four or five months in a foreign country to improve their English levels, it was time for the students to return to Japan. Once the students came home, they took a post-program test to evaluate their progress. The post-program test scores show an impressive average increase of 99 points in TOEIC, from a score of 371 to 470, raising the average student from a high-beginner level to an intermediate level.



In their final assessment interviews, most of the students said that they had fun and that the experience was beneficial to them. Despite their satisfaction with the program, however, a closer look at their scores and comments shows some disturbing trends.

The most glaring was that, of the thirty-six students who participated in the program, seven showed no improvement in their TOEIC scores. In their exit interviews, the Japanese students acknowledged that both Auckland and the university were small, enabling them to spend most of their days, evenings, and weekends together. There was little effort from the school or the homestay families to discourage them from speaking Japanese.

## **Conclusion**

In the face of a dwindling population, private universities in Japan need to find creative ways to entice students to their schools. Incorporating a study-abroad program into a school's curriculum boosts its attractiveness. When creating such a program, universities should highlight these factors: partnering with a location with a similar ideological outlook, creating a jointly-coordinated curriculum, student satisfaction with the experience, and visible improvement in English. Unfortunately, the exit interview results from the Auckland program have prompted the university to consider different locations and strategies to help the students advance their English while satisfying parental concerns.

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## **Agile in the Classroom – Can we revolutionize how we can learn?**

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### **Introduction**

February 13<sup>th</sup>, 2019 marks the 18<sup>th</sup> year anniversary of when the Agile Manifesto of Software Development was signed by 17 prominent Software Development experts at the Lodge in Snowbird Utah. With these 17 people coming together, it marks a journey that has changed how we do business globally.

Agile in education is very much in its infancy. There are a proverbial handful of schools and organizations that have implemented the Agile mindset through various methods or frameworks. Based on my research, all of these schools/organizations are showing success. A few examples include: Student engagement has increased; creativity has increased; collaboration has increased; teacher workload has decreased; behavior challenges has significantly dropped.

I would like to see these principles and values that the Agile Manifesto have, continue to expand into education so that we can better serve our ultimate customers: our students and give them the behaviors and tools to prepare them for the future.

Please bear with me! Some of the terminology in this article and my presentation is a direct reflection of me being an Agile Coach in the corporate environment. As I pursue to introduce Agile to schools, some of the terminology may in fact change to meet the needs of Agile in Education. For now, I would like to keep the terminology the same as it was founded to reduce confusion: especially mine!

### **What is wrong with the status quo?**

When we look at the current classroom format that many of us know from our days in the classroom, we see the teacher standing at the front of the room either writing notes on the board or lecturing in some way; the students are paying attention to the teacher while sitting in rows. I even remember scenes where either the trouble students were at the front of the room so the teacher can keep an eye on them, or they were relegated to the back of the class to minimize disruptions. Even in media, the stereotype continues to play out. Mrs. Krabapple and Miss Hoover from the Simpsons are examples.

The problem is that this classroom format was designed during the 2<sup>nd</sup> industrial revolution: the age of science and mass production. We had a sudden change in how children were looked at. Child Labour was banished. Education was made available to everyone. So to meet the challenge of what to do with these kids, classrooms were designed to maximize the amount of children that can be fit into a room and minimize the adult supervision required. This optimized learning to meet the needs of the students' future of working in predominantly a labour role in mass production. In this scenario, it seemed to work well to meet societal needs.

Fast forward more than 150 years, we still see the industrial revolution format of learning. The problem is however, society has changed a lot in those 150 plus years. Technologies has changed, industries have evolved, even the expectations on the workforce has changed. Mass production has largely been automated through the use of robotics and process simplifications. I bet, that many of you who are in fact reading this article cannot say that you are applying what you learned in school. Most of what we learn today is through career specific paths. The three R's, albeit are still applicable to what many of us do. In school we learned to learn

Many people that currently work in the education system can easily see that our current system is not meeting the needs of our students. According to 2018's Global Competitive Report, Canada rates: 13<sup>th</sup> overall of 30 industrialized nations; 11<sup>th</sup> in vocational training; 18<sup>th</sup> in digital skills; and 56<sup>th</sup> in student to teacher ratio!! In fact Canada has been consistently on the decline (Source Wikipedia):

| Year    | Ranking (Overall) |
|---------|-------------------|
| 2018-19 | 12                |
| 2017-18 | 14                |
| 2016-17 | 15                |
| 2015-16 | 13                |
| 2014-15 | 15                |
| 2013-14 | 14                |
| 2012-13 | 14                |
| 2011-12 | 12                |
| 2010-11 | 10                |
| 2009-10 | 9                 |
| 2008-09 | 10                |

### **What's this Agile thing?**

Since the 1980's, the vast majority of the software being created was following the Waterfall model. Creating software using waterfall was cumbersome and very resistant to meeting the needs of the customer. In 2001, 17 prominent software developers met in Snowbird, Utah and created the Agile Manifesto for Software Development. Within the Agile Manifesto, there are 4 Values and 12 Principles that provides the foundation of behaviors created a ripple effect throughout the World that grew to the point where almost three quarters of companies globally at various levels are adopting Agile methods as part of their operations (Source: Project Management Institute)

The term Agile represents an umbrella of many frameworks or methods of delivering software. Some of the most popular methods are: Scrum; Kanban; LeSS; SAFe; XP etc. These methods provide a framework to deliver software. Not only has this changed software, but we are noticing that behaviors and corporate cultures are changing too. Over the last few years however, the Agile industry has recognized that Agile has grown beyond delivering software. Car manufacturing; marketing; banking; human resources; insurance; business agility has all made strides to adopt the "Agile Mindset."

While these frameworks help to guide Agile software development, Agile is not about tools or processes. Agile is really about a cultural shift

### **Can Agile Revolutionize Education?**

At present, we are facing a different type of skillset that companies are looking for. According to LinkedIn, the top 5 soft skills that employers are looking for is:

- Creativity
- Persuasion
- Collaboration
- Adaptability
- Time Management

These skills can easily be addressed through Agile. Below not only addresses how Agile works in business, I have also touched on how a classroom team can address these in demand skills:

**Creativity** – Agile Teams are able to come up with the "HOW" work is done. In business Agile teams, the product owner is the representative of the business and will typically provide the "WHAT" the customer wants and will let the team figure out the how. In school, the teachers have to follow provincial curriculum guides. If the teacher acts as Product Owner for the class,

they will provide the “WHAT” also. The teams in the classroom can self-organize to come up with how to demonstrate learning.

**Persuasion** – Agile Teams are always negotiating the work they are taking on. A good example of this is with a Scrum team. Work is typically prioritized work from the product backlog by the Product Owner. During planning, the team will bring the work that they can complete within the Sprint. However, it is only the team that decides on the work. They use persuasion and negotiation with the Product Owner throughout the Sprint. In schools, the classroom teams would also be using persuasion when negotiating with the teacher/Product Owner.

**Collaboration** – Agile Teams work together with Business and IT hand-in-hand. In many enterprise level organizations, there is a distinct separation of roles and duties between business and IT. By having these “silos,” collaboration nowhere near as effective as what Agile teams can do when working together. Working together hand-in-hand allows for the people on the teams to sit together and work through challenges together and can in fact shorten responses to change.

**Adaptability** – Agile Teams can receive regular feedback from their customers and can effectively change rapidly. With teams working in short iterations and soliciting feedback on a regular basis, the team members can respond to changes in direction very rapidly. In fact, changes are encouraged, allowing for teams to adapt to a variety of influences which include market changes, technology innovation, and even the realization that what was originally scoped is not what is actually needed.

**Time Management** – Agile Teams work in short iterations allowing to inspect and adapt to changes. In working iterations, team members set short term goals on what can be completed at the end of the iteration. With those goals, the teams set themselves a target to aim for and work as best they can to reach those goals. The Agile Manifesto also encourages teams be able to work at a sustainable pace. Agile is not about being superheroes by working long hours to meet unreasonable expectations. The Agile Manifesto’s Principles actually states, “Agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely.”

## **Success Stories**

As stated in the introduction, Agile in education is very much in its’ infancy. However, there are many examples that prove that it is in fact working!

- **Blueprint** – Hope High School in Arizona – Scrum Alliance  
In 2003, Hope High School was founded to support “at risk” students in getting an education. These students have been kicked out of other programs and schools previously. In the 2014/2015 school year, the school decided to go on the Agile journey to facilitate achievement. The students at Hope High School are empowered to take control of their own learnings. In 2017, students and teachers were featured at the Scrum Alliance Global Scrum Gathering in San Diego.
- **eduScrum** – Willy Wijnands, Netherlands  
Willy Wijnands, a chemistry and physics teacher from Alphen aan de Rijn, Netherlands had a chat with his brother in law, who works in the Agile software development industry and was fascinated in hearing about teams in business using Scrum. This led him to start on a journey where he started to teach using Scrum and created the eduScrum organization. Willy is a contributing author to the book: *Agile and Lean Concepts for Teaching and Learning: Bringing Methodologies from Industry to the Classroom* ISBN: 9811327505

- **Teachers Who Scrum – Brett Thayer, Cherry Creek School District, AZ**  
Brett is now a teacher of AP World and AP European History Arvada West High School in Colorado. He founded the Teachers Who Scrum group on Facebook and is very active in helping other teachers learn more about Agile in the classroom. Brett has also presented at various sessions including this one: “Agile in the Classroom: How Agile Can Better Prepare Students for the Demands of the 21st Century Workplace” through the Scrum Alliance.
- **Agile in the Classroom – John Miller, Agile Classrooms CEO**  
John Miller is the Chief Empowerment Officer of Agile Classrooms, an organization that focuses on bringing Agile to education. John is one of the pioneers that saw how Agile can have an impact in education and in 2009 he started to work with teachers and helped introduce Agile in an elementary school. The results shocked them! “Students loved it, teachers were uplifted, and the school board was knocked off their feet.” John is also a Certified Enterprise Coach through the Scrum Alliance and has other coaching certifications.
- **Scrum in School – Michael Vizdos, Scrum Trainer**  
Michael Vizdos is another pioneer of bringing Agile to education. Michael is a Scrum trainer and Agile Coach that firmly believes in the benefits of Agile in School. He has worked with a number of schools throughout the United States. Michael also acted as facilitator in creating the Agile in Education Compass along with 12 other educators in 2016.
- **Agile Schools – Presented Learning Sprints to Alberta Teachers Association**  
In 2017, Dr. Simon Breakspear was invited to speak at an Alberta Teachers Association retreat to talk about Learning Sprints which is tied to the ATA Agile Schools Network. The Agile Schhols Network is a collaborative initiative that seeks to boost the quality and equity of Alberta’s Education system. (ATA News) In having this network, teachers are empowered to improve challenges they identify through 3 week “improvement sprints.”

These are just a few examples of where Agile has made an impact in education. There are others throughout the World. It would seem that Agile in Education is slowly gaining steam!

## **Case Study**

What I am proposing, is that we recognize the successes that we see throughout the world and look to apply our own successes here in Canada. Through my presentation, I would like to create a series of Case Studies where we can run Agile as an experiment to see how Agile can revolutionize Canadian Education. Scrum would be an avenue where we can start. I would like to encourage following the Scrum Guide

Here is what I propose (in very short order):

1. **Staff Training on Agile** - Once a school has indicated that there is interest in going Agile, initial staff training will be needed so that the whole school would be able to support any Agile initiatives that takes place.
2. **Identify Stream/Grade/Subject** – We would need to initially work with motivated teachers that would like to see the success take place. The subject and grade levels could vary.
3. **Teacher Product Owner** - An Agile Coach would work with the teacher(s) identified and help them to become “Product Owners” of their curriculum. The teacher would ideally be able to start to create a high-level overview of the required curriculum for the term, and identify some key areas of focus



4. Identify Students – Once the staff have been trained, we would need to create training for the students that are taking part. We would focus on team dynamics and the importance of the “Scrum Master” and “Team Member” roles for each team.
5. Set up Teams – My assumption of a typical classroom these days consists of about 30 students. This would allow for 4 Scrum teams per class. Ideally the teams should self-organize that are cross-functional or have the right people on the team to do the work. If this is a problem, the teacher could facilitate placement of students on the teams without assigning. The teams can determine their Sprint Cadence, depending on the amount of class time they have together in a given week. I would suggest ideally 1-week Sprints, but no more than 3 weeks. Definition of Done (DoD) will be created for each team.
6. Story Map Curriculum – Once teams are trained and have been established, the Teacher (Product Owner) will provide the term’s vision along with a high-level overview of what needs to be covered. Then in partnership with the teams, the class would create their own Story Map by decomposing the curriculum into small stories that can be delivered easily within a Sprint. Once the Story Map is created the Product Owner with the teams’ help will create a prioritized Backlog of work.
7. Sprints Begin – Each team would then look to plant their first Sprint. The Product Owner will be available to provide guidance on the learning outcomes. Team members can have the opportunity to have rotating Scrum Master roles to encourage leadership within their teams.
8. Sprint Routines – Daily Stand-ups will take place at regular times to allow for quick feedback and opportunity for students to ask for help. At a predefined time, the class would work with the Product Owner to do Backlog Refinement for stories in future Sprints. At the end of a Sprint, the teams will demonstrate their completed work to the Product Owner in a Sprint Review, and confirm that each story meets Acceptance Criteria and DoD. After the Sprint Review, each team will have a Retrospective to reflect and improve for future Sprints. Repeat.

Once in place and we start to practice the Value and Principles of the Agile Manifesto, the Sprint routines should become second nature for everyone directly involved. We can closely monitor the progress and adapt how the classes are working to better meet the needs of everyone involved. I feel confident in stating that the following measurable improvements should be visible:

- Achievement
- Common Core
- 21<sup>st</sup> Century Skills
- Life Long Learning
- Engagement
- Positive Relationships

## **Closing**

With us currently leaving the 3<sup>rd</sup> Industrial Revolution: The Digital Age, and about to embark on the 4<sup>th</sup> Industrial Revolution; we need to adapt our education system so that our children can be in a better position to meet the rapidly evolving needs in the 21<sup>st</sup> Century.

Agile can in fact help our children meet those needs. I’m sure that if we educators can adopt Agile into our daily lives, we not only empower our student into taking ownership of their learning, but we will find that our own satisfaction increases, knowing that our students will be in a better position for the future.

This journey on my part has been extremely rewarding. I hope that this can in fact turn education into something great!

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## **Social Media Use in Higher Education: A Case Study**

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### **Abstract**

*This study assesses the use of social media on a private learning environment in the UAE. The main question was: How far can we assure that social media has distinctive impact on the students' learning experience? A qualitative approach was employed using a semi-structured interview among sixty volunteer students. Results showed three categories of usage: Social media were used as a sphere of academic material exchange, academic discussions and information and news diffusion sphere. They are perceived by the sample as a great tool for learning process and a suitable path for a modern educational system. A limited number of respondents explained that there are still big challenges associated with the use of social media at the UAE universities sample, such as absence of academic language, privacy concerns and excessiveness in use. Finally, it was obvious from the sample attitude, that despite the challenges, the valuable addition of social media in academic context cannot be ignored.*

*Keywords: Social Media, Usage, Higher Education, UAE, impact, academic life*

### **Introduction**

Nowadays, social media interfere considerably with tertiary education which is considered as a huge communication platform and a modern space for academic interaction. The main question raised in this article relates to the pedagogical role and vocation that social media could play in enhancing learning experience in tertiary Education, particularly, stimulating critical thinking, supporting academic collaborations as well as group work, and facilitating the knowledge construction and diffusion.

### **Statement of the Problem**

Social media as modern ICT tools are frequently used, not only for communication and socialization purposes, but also in business, politics and education. Incorporation of social media in the educational system has increased these previous years. This study examines and assesses the use of social media and its impact on the teaching and learning experience from students' perspective, in a sample of private universities in the UAE: University Of Sharjah (UOS), American University in the Emirates (AUE) and Al Ghurair University (AGU).

### **Purpose of the Study**

This study investigates the level of exposure and the nature of social media uses as a pedagogical tool (the kinds of social media that are used the most by students for academic purposes and the presumed impact of that use on students' academic experience).

### **Research Questions**

The main question of the study was: How far can we assure that social media usage has a distinctive and positive impact on the students' learning experience in the UAE?

The following sub-questions were considered:

- How do students at UOS, AUE and AGU use social media?
- To what extent has social media supported students' learning experience?

This study draws from “**Uses and Gratifications’ Theory**” that was developed to understand mass media impact in the 1970’s, by Katz and his team. The theory states how the receivers use media to satisfy their needs and to get specific gratifications (Al Jenaibi, 2015, p. 57).

In this paper, a focus is put on the social media use by a UAE university registered students’ sample, to determine its nature and impact as a pedagogical tool enhancing the learning experience. This study will certainly determine whether social media sites satisfy the educational students’ needs and expectations.

### **Significance of the Study**

The study is aimed to be a quality addition, in terms of understanding of social media, its usage and how it is influencing students learning environment. The outcome of the study will help to strategize and reconstruct students’ attitude towards social media usage. It also provides researchers and academics with further evidences about the advantages of social media use in the academic field.

### **Literature Review**

In this Chapter, a focus will be put on the social media and students’ usage, particularly, researchers describing academic activities made by tertiary students.

Social media take many forms such as social networking sites, blogs, vlogs, instant messaging and virtual communities. For learning and teaching purposes, social media are used in a various contexts - language learning, writing development, after-class discussions, synchronous and asynchronous communication, community building and curricular tool. The use of social media in higher education is changing the nature of the relationship between learners and teachers (*Chugh, 2018, p1*).

Social networks are usually perceived either as on the very straightforward or the very philosophical emergent numbers of educationalists exploring and aspiring in this fields are beginning to consider the possible significance and likely implications of social media for education practice and provision, especially in terms of higher education. (*Owusu & Amank, 2016, p2*).

Selwyn (2012, p2) consider social media networking sites such as Web Chat, which is predominant in China, LinkedIn and Flipped E-classroom such as schoology, are now used by universities as alternative spaces in which students can cope with the university life style, through interacting online with peers and faculty. Social media provide a liberal environment for students to discuss, share their views and opinions easily and freely on issues that otherwise would not have been done in a normal traditional classroom.

Gurcan (2015, p 966) says that social media provides students with a new mechanism for a familiar exercise. It provides students with a direct medium by which they can publicly evaluate and comment on their campus environments, institutional policies, classes, professors, and administration and fellow students in real time. Social media zips through our campuses nearly unseen, dragging behind it the heavy weight of social injustices and complicated jurisprudence accumulated from decades of student speech. The researcher although notices that there is like hood of uses not being courteous and respectful of other such as that profanity, vulgarity, obscenity, or language that is harassing, derogatory, or otherwise inappropriate for the school environment sometimes circulates in these platforms.

Parusheva and Alexanrova (2018, p172) conducted a study on students’ adoption of economics, in Vann (Bulgaria). It was an empirical study on their attitude towards the social media. The result provided that the strong positive students’ interest in social platforms, especially on Facebook, where almost 100% of them have an account and use it on a daily basis. The detailed study on the use of the social media tools in the two platforms implemented in the UE. Varna (distance and digital learning platforms) revealed that the discussion forums, chats but no use for tools like wikis. The researchers concluded that the use of social media in Bulgaria University is still relatively low.

However, Researchers support that the use of social media tools in learning and education should no longer be considered as innovation but must be a daily practice. They made a forecast for increasing use of social media soon. Ractham and his team (2011, p 3) explored the possibility of using social network

technology to support a community of practice in a graduate level classroom setting, to enhance teaching. They utilized Facebook as learning resource for an MIS course for learners to share prior knowledge and experience. Result of 5 months study showed that Facebook provides an-easy-to- use and familiar technology for learners to leverage social networking to share and generate tacit knowledge amongst each other within the small group environment. Thus, they include that social media can be used effectively to foster a learning culture.

According to Griesemer, (2014, p9) the use of social media approaches enhanced the learning experience of undergraduate business students. Their Use allowed both the instructor and students to realize their roles, and behavior in the classroom had to change significantly. The researcher added that social media should be perceived as alternative ways to cover topics and even as means to introduce additional topics.

The literature review revealed the absence of studies about social media uses in the higher educational system in the UAE. Only some explored the general usage of social media in the country.

Researches about social media use in the UAE, was focused on how social media were integrated in the Emirati society. Al Jenaiby(2015, p57) noticed that the most popular types of social networks in the Emirates are generally the same as those used in other regions across the Middle East, North Africa and beyond. Social media are perceived as a vital source of information, vehicle of news, opinion sharing, cultural production and entertainment.

This study will focus on the nature, level and particularities of social media use, on a sample of students belonging to three universities implemented in the Emirates. It will be the first qualitative research conducted in this matter in the UAE level.

## **Methodology**

### *Research Design*

In the empirical part of this study, a qualitative approach was employed using a semi-structured interview applied on a sample of students registered in three (3) universities in the UAE: University of Sharjah (UOS), American University in the Emirates (AUE) and Al Ghurair University (AGU). The researchers are faculty members at these universities.

Researchers chose the qualitative approach over the quantitative because it seems that it is more appropriate to collect data in a natural setting rather than a contrived one. Moreover, a qualitative methodology provides more accurate answers and reactions during the face- to- face interviews, where body language can be easily detected and taken into consideration during the interpretation process. Supplementary questions could also be added to the interview guide when needed.

### *Population, sample and sampling procedure*

60 students from three universities implemented in the Emirates were targeted in this study (UOS, AUE and AGU). 20 students were extracted out randomly of each university included in the sample. The students were registered in undergraduate programs.

### *Data Collection procedure*

The whole Data collection period lasted two months during the summer semester 2018 for AGU (June and July 2018). Researchers then wanted to go more in-depth, and decided to enlarge the sample and introduced UOS and AUE as they moved from AGU to work at these universities. The aim was to obtain rigorous results as the 1<sup>st</sup> sample was limited to 20 interviews. Data collection period for UOS and AUE lasted one month (March 2019) during the spring semester 2019.

The availability of students for the in-depth interview was limited particularly at AGU due to summer time. Some interviews were rescheduled many times because of the students' non-availability. Interviews were conducted at the researchers' offices as a natural space for academic chatting. They took 30 to 45 minutes each; some of them were videotaped for easier transmission of information and captures

of interviewees' body language; some were recorded as per the volunteers' convenience, particularly females.

## Results and Discussions

This section includes the data collection and analysis of sixty (60) interviews conducted for this paper. The sample includes students registered in eleven (11) fields, (five (5) to six (6) fields of studies were included from each university according to its offered programs), as mentioned below in the table1.

*Table1. Information about sample composition*

| UOS      |           |           |                  | AGU      |           |           |                  | AUE      |           |           |                  |
|----------|-----------|-----------|------------------|----------|-----------|-----------|------------------|----------|-----------|-----------|------------------|
| No       | Gender    |           | Field of studies | No       | Gender    |           | Field of Studies | No       | Gender    |           | Field of Studies |
|          | M         | F         |                  |          | M         | F         |                  |          | M         | F         |                  |
| 1        |           | 1         | PR               | 1        | 1         |           | PR               | 1        | 1         |           | PR               |
| 2        |           | 1         | PR               | 2        | 1         |           | PR               | 2        | 1         |           | PR               |
| 3        |           | 1         | PR               | 3        |           | 1         | PR               | 3        |           | 1         | PR               |
| 4        |           | 1         | PR               | 4        |           | 1         | PR               | 4        |           | 1         | PR               |
| 5        |           | 1         | R & TV           | 5        | 1         |           | Int. Design      | 5        | 1         |           | R & TV           |
| 6        |           | 1         | R & TV           | 6        | 1         |           | Int. Design      | 6        | 1         |           | R & TV           |
| 7        |           | 1         | R & TV           | 7        |           | 1         | Int. Design      | 7        |           | 1         | R & TV           |
| 8        |           | 1         | R & TV           | 8        |           | 1         | Int. Design      | 8        |           | 1         | R & TV           |
| 9        | 1         |           | Law              | 9        | 1         |           | Architecture     | 9        | 1         |           | E- Commerce      |
| 10       | 1         |           | Law              | 10       | 1         |           | Architecture     | 10       | 1         |           | E- Commerce      |
| 11       |           | 1         | Law              | 11       |           | 1         | Architecture     | 11       |           | 1         | E- Commerce      |
| 12       |           | 1         | Law              | 12       |           | 1         | Architecture     | 12       |           | 1         | E- Commerce      |
| 13       | 1         |           | Charia           | 13       | 1         |           | Comp. Sc.        | 13       | 1         |           | Accounting       |
| 14       | 1         |           | Charia           | 14       | 1         |           | Comp. Sc.        | 14       | 1         |           | Accounting       |
| 15       |           | 1         | Charia           | 15       |           | 1         | Comp. Sc.        | 15       |           | 1         | Accounting.      |
| 16       |           | 1         | Charia           | 16       |           | 1         | Comp. Sc.        | 16       |           | 1         | Accounting       |
| 17       | 1         |           | Business. Ad.    | 17       | 1         |           | Business. Ad.    | 17       | 1         |           | Business. Man.   |
| 18       | 1         |           | Business. Ad.    | 18       | 1         |           | Business. Ad.    | 18       | 1         |           | Business. Man.   |
| 19       |           | 1         | Business. Ad.    | 19       |           | 1         | Business. Ad.    | 19       |           | 1         | Business. Man.   |
| 20       |           | 1         | Business. Ad.    | 20       |           | 1         | Business. Ad.    | 20       |           | 1         | Business. Man.   |
| <b>T</b> | <b>10</b> | <b>10</b> | <b>5</b>         | <b>T</b> | <b>10</b> | <b>10</b> | <b>5</b>         | <b>T</b> | <b>10</b> | <b>10</b> | <b>6</b>         |

### **Social media use**

In this part of study, the main focus was on the exposure level and nature of social media uses. For this purpose, four (4) questions were designed to help collecting accurate information about students' sample:

- Do you use social media?
- Which social media are you familiar with? And which one do you use the most?
- What kind of use?
- Do you use social media for academic purpose? And how?

The table below shows the collected data:

*Table2. Students social media uses*

| <b><i>Social Network</i></b> | <b><i>Nb</i></b> | <b><i>%</i></b> |
|------------------------------|------------------|-----------------|
| <i>Facebook</i>              | <i>60</i>        | <i>100</i>      |
| <i>Instagram</i>             | <i>60</i>        | <i>100</i>      |
| <i>Snap Chat</i>             | <i>60</i>        | <i>100</i>      |
| <i>Twitter</i>               | <i>18</i>        | <i>30</i>       |
| <i>What's app</i>            | <i>48</i>        | <i>80</i>       |
| <i>YouTube</i>               | <i>12</i>        | <i>20</i>       |

As mentioned in the table n° 2, all participants claimed using social media like Facebook, Instagram and Snap chat. What's app is frequently used (80%), but Twitter and YouTube usage is very limited (30% and 20%).

In order to be more structured, details related to the uses claimed during the interviews, are gathered in the table no 3.

*Table3. Nature of students' social media uses:*

| <b><i>Nature of Social Media uses</i></b>                            | <b><i>Nb</i></b> | <b><i>%</i></b> |
|----------------------------------------------------------------------|------------------|-----------------|
| <i>Post and read announcements and comments</i>                      | <i>60</i>        | <i>100</i>      |
| <i>Download photos, videos, texts, exercises, handouts, ...etc.</i>  | <i>60</i>        | <i>100</i>      |
| <i>Upload and posting photos, videos of academic nature</i>          | <i>54</i>        | <i>90</i>       |
| <i>Watch snaps of fellows</i>                                        | <i>48</i>        | <i>80</i>       |
| <i>chat with classmates</i>                                          | <i>60</i>        | <i>100</i>      |
| <i>Share photos, videos and profile posts of fellows and friends</i> | <i>60</i>        | <i>100</i>      |
| <i>Watch You Tube videos about lessons</i>                           | <i>12</i>        | <i>20</i>       |
| <i>Find inspiration and support for projects topics</i>              | <i>36</i>        | <i>60</i>       |
| <i>Follow the news and updates</i>                                   | <i>54</i>        | <i>90</i>       |
| <i>Send and receive private messages</i>                             | <i>60</i>        | <i>100</i>      |

According to the table above, participants claimed many kinds of uses. Categorization is therefore essential. Three categories were set based on the data collected from respondents:

- Social media as a sphere of academic material exchange,

- Social media as a sphere of academic discussions,
- Social media as a sphere of information and news diffusion.

*a. Social media as a sphere of academic material exchange*

All participants claimed their need and habit of using social media for exchanging material such as handouts, exercises, pictures, graphics, videos, E-books links, etc. This kind of use supports their learning experience. **Participant7** from AGU (*Female, Interior Design*), confirmed that social media sites help her in lessons and enhance the course comprehension by exchanging many models of supported interior design pictures of small cutters and outline schemes projects.

Besides, social media seemed to be an excellent medium of IT courses that links exchange via what's app and Facebook personal and classes' pages. **Participant15** from AGU (*Female, Computer Sciences program*) claimed using often Facebook to gather links from her classmates about computer sciences lessons, particularly exercises and problems with solutions.

YouTube also serves as an educational platform for a small number of participants where they look for online videotaped lessons to deepen their knowledge about the program and to understand their courses further. **Participant10** from AUE (*Male, E- Commerce program*) explained: "I watch video lessons on YouTube mostly because it gives me explanation of some complicated equations and helps me to consolidate the information given by the instructor".

*b. Social media as a sphere of academic discussions*

Social media seemed to be the perfect platform of group work and projects preparation; a sphere for public discussions and chat. **Participants 1 and 2** from AGU (*Males, Bachelor of Arts in Public Relations program*) explained that in their program, they have a course entitled "social media", in which, they must create five (5) social media accounts to be used in online brain storming sessions, in order to consolidate their online PR campaigns about humanitarian causes like road safety, alcohol and smoking damages. For them, social media became a rich source of interaction with people and a suitable space for public awareness.

**Participant 19** from UOS (*Female, Business Administration program*) also confirmed: "We divide our group work: Each group member is committed to implement a part separately, but she has to refer to the team and discuss the small details with the rest through the class Facebook page".

**Participant4** from AGU (*Female, Public Relations program*) added in the same context: "Our instructors in PR program usually ask us to create a particular what's app group for each course in the beginning of the semester and enter the names and contact numbers of all registered students. Thanks to these groups, we can discuss many issues related to the course content outside the classroom. Instructors interact with us at any moment. They are accessible 24/7. It is helpful for me especially during the revision week before the final exams period".

**Participant3** from AGU (*Female, Public Relations program*) claimed: "We discuss some content posted through Instagram. We can spend hours discussing about a press photo taken by a professional Journalist; its quality, the message that the journalist wanted to convey though it and whether it respects human rights and Journalism ethics or not".

**Participant2** from AUE (*Male, Public Relations Program*) assured that "a collaborative and enthusiastic atmosphere was built thanks to the Blog created by their instructor to practice the writing skills in the Arabic PR Section program".

*c. Social media as a sphere of information and news diffusion*

According to respondents, many instructors are using social media for their announcements to consolidate Blackboard and LMS system, thanks to the ease and simplicity of students' access to social media.



**Participant 19** from AUE (Female, Business Management program) explained that the instructors are using social media to reschedule course sessions, venues tests and exam dates. Chapters to be taught are mostly posted through what's app course' groups. Some meetings are scheduled based on a social media group discussion and then announced publicly to all the concerned students.

**Participant 5** from UOS (Female, Radio & TV program) confirmed: *"Our instructor reminds us through what's app course group, about the deadline of assignments' upload in the blackboard. Besides, she keeps informing us when the grades are uploaded in the system, when the room is changed for a course session or exam; she even informs us about the biggest common mistakes that students committed during exams, so we avoid repeating them in the future"*.

**Participant 11** from AUE (Female, E- Commerce Program) claimed that she follows people *"who have well maintained reputation in Marketing as they are experts and tweet interesting articles to my major. As well as i follow universities, companies and influencers when they post things related to my field"*.

**Participant 9** from UOS (Male, Law Program) uses social media *"to follow the news particularly via Instagram like UAE\_Barq page for local news, and University Of Sharjah page for announcements"*.

### **Social media as a pedagogical tool in higher education**

To determine the extent to which the sample is persuaded that social media can enhance learning and teaching experience, four (4) questions were fixed to help participants explain how social networks helped them in their academic life:

- Do you believe that social media can enhance your learning experience?
- To what extend has social media helped you in your learning experience?
- Do you have challenges associated with the use of social media?
- Rate Social Media "good" or "bad" for learning experience in higher education and tell why!

The majority of participants answered "Yes", to the first question. Thus, social media are perceived by the sample as a great tool for the learning process and a suitable path for modern educational system.

Many respondents confirmed that Facebook, Instagram and what's app helped them in their learning experience. Social media made for them easy to concentrate on their studies and made them up to date and well informed about their academic life. **Participant 1** from AGU (Male, Public Relations program) explained: *"In one week, I collected 100 proposals to reduce speed while driving and to avoid road crimes, and I presented them to the concerned authorities. It was a wonderful opportunity for me to discover the power of S.M. sites and especially how to invest them in PR campaigns. I got an A in the course and, rewarded in my work place too, because they adopted many ideas of what was proposed during my online campaign"*.

**Participant 13** from AUE (Male, Accounting program) added that he is using social media, mainly YouTube to watch videos related to some Math's or IT online courses, and it was of great help.

**Participant 7** from UOS (Female, R& TV Program) noted that students could learn from each other's experiences through social media: *"We can be motivated by others' experiences and stories or even by their success in a certain area. S. M. can show me alternative ways to learn things in a more practical way"*.

**Participant 1** from AUE (Male, Public relations Program) was convinced about the efficiency of social media usage for learning new things: *"Using S.M. can enhance my knowledge to view the world from different aspects and to get to know different people who have other ways of perceiving things. I think that from this kind of interaction with others, i certainly will get to learn many lessons in public relations and public opinions fields"*.

Although, there was semi- consensus about the quality addition of social networks in the learning experience on tertiary education, a limited number said that there are big challenges associated with their uses.

**Participant 16** from UOS (*Female, Charia program*) spoke about many challenges including technological and privacy concerns, and absence of academic language usage.

**Participant 18** from UOS (*Male, Business Administration*) added the lack of awareness of the functionality offered by social media environment. “*Many students miss-use these platforms and consider them as mainly distractive means of communication*”, he explained.

**Participant 11** from AUE (*Female, E-Commerce Program*) was convinced that most of the information posted on social media is fake, or half-truth. Students need to pay attention while seeking information related to their academic experience.

**Participant 2** from AGU (*Male, Public Relations Program*) supported the same option by confirming that “*the worst sides of social media are the addiction of use and gathering non official news that could be rumors ruining careers and destroying lives*”.

Social media were rated “good” by all the respondents with regards to their role in the learning process. Questioned students are pushing learning beyond the borders of the classroom through social media. They explained their excitement to use social networks in academic issues by the easiness in communication and interaction, access to information and flexibility in learning anytime and anywhere. For the sample, social media represents a new exciting educational environment that helped them cut with the traditional, stereotypical, boring old system of teaching and learning.

## **Conclusions**

This study tends to assess the level of exposure and nature of social media uses as a pedagogical tool by students’ sample extracted from three universities in UAE. Based to the collected Data from the respondents, results showed three categories of uses: Social media are used as a sphere of academic material exchange, academic discussions, and information and news diffusion.

A number of researchers have confirmed the positive impact of the social media in the academic context. According to Chugh, the use of social media has demonstrated increased teacher-student and student-student interaction. The study has indicated that the use of social media in higher education has enhanced learning, increased participation and engagement, improved content dissemination and improved pedagogy and information sharing. (Chugh, 2018, p1).

The nature of social media as a useful servant but also a dangerous master and a two edge sword has been revealed in the findings of Kolan’s study that, despite the benefits that students can harness from social media networks such as sharing of information, building relationship, partaking in a group discussions from near and far among others, there is to some extent addiction and distraction of attention caused by the use of social media which could have serious consequences on the academic life of students. (Kolan & Dzandza, 2018, p10).

Social media are perceived by the sample as a great tool for the learning process and a suitable path for a modern educational system. A limited number of participants explained that there are still big challenges associated with the use of social media, such as absence of academic language usage, privacy concerns, lack of credibility on information published through social networks and excessiveness in use. Despite the challenges participants mentioned above, social media represents for the sample a new exciting educational environment that helped them cut with the boring traditional old system of teaching and learning.

To conclude, social media will certainly transform the history of technology as a learning platform far from the classroom’s walls. To accelerate the transformation process with more efficiency and rigor, academicians are invited to elaborate a well-structured awareness campaigns in their classrooms, for best social media practices in academic context: a well-balanced and judicious use guided by wisdom along with rationale thinking must take place as a Model of the “Academic Use” for social networking sites. Faculties are also required to come up with new adequate learning strategies that fit with all social media platforms, facilitating their fusion as a pedagogical tool.

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## **College Sports Club Participation, Companionship, and Regular Exercise Behavior: A Self-Determination Theory Perspectives**

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### **Abstract**

*The purpose of this study was to examine the differences in sports club participation with companionship in self-regulated motivation and regular exercise behavior for college students. 508 responses retrieved and 443 were valid. All subjects were college students from three different regions, north, middle and south of Taiwan. Behavioral Regulation in Exercise Questionnaire for measuring self-regulated motivation, and two questions used to estimate regular exercise frequency by 5-point scale and intensity by 3-point scale. The personal data collected by several open questions. Reliability analysis, factor analysis, t-test, ANOVA, and hierarchical regression used to analyze the data. The results of the study indicated that four exercise participation types, sports club participation with company needs, non-sports club participation with company needs, sports club participation with no company needs, non-sports club participation with no company needs, have significant differences on self-regulated motivation and regular exercise behavior, in addition, five self-regulated motivation among 4 exercise participation types also have different predictive effects on regular exercise behavior. In conclusion, with self-determination theory perspective, based upon the existing evidence to provide a future approach to exercise motivation research to address unresolved issues in the field of exercise, and to make suggestions to promote the development of SDT and further studies.*

**Keywords:** *exercise club participation, companionship, motivation, self-determination theory, regular exercise*

### **Introduction**

Insufficient physical activity has been identified as the leading risk factor for global mortality, breast and colon cancers, diabetes and ischemic heart disease burden (WHO, 2017). Therefore, the data shows 35.7% of male and female at age 18 to 24 who are doing regular exercise, with a third of young people being inactive in Taiwan (Minister of Education Sport Department, Taiwan, 2018). Colleges and universities where are young people at age 18-14 being educated are potentially crucial settings in which to implement interventions to help to promote exercise behavior throughout the life span. A large percentage of adolescents do not achieve moderate physical activity per week which are recommended by WHO, and continue to fail to achieve this amount of physical activity into adulthood (Gordon-Larsen, Nelson, & Popkin, 2004). Regular physical exercise and health lifestyles should be valued and improved constantly by late adolescences.

As children move towards adolescence, they spend increasing time with peers enhancing the potential for the norms and behaviors of peers to influence exercise or physical activity (PA) (Duncan, Duncan, Strycker, & Chaumeton, N. R., 2007). The peer relationships and friendships that are developed through physical activities, exercise, or sport offer important opportunities for companionship, support, and recreation. Findings from development psychology suggest that peers would have most influence on adolescent physical activity (Weinberg & Gould, 2018). Considering a potential role that peers and/or friends' influences may have on adolescents' PA. Borgers et al. (2016) have found that participation frequency and time spent on sports is higher among members of sports clubs in certain types of sports, in contrast to the frequency of engagement of non-organized sports participants. One aspect of his study will estimate that whether or not college sports club participants involve in more regular exercise behaviors than non-organized sport participants. Another aspect of this study, peer's companionship is important to

consider in relation to exercise whether or not adolescence engage in more exercise with the needs of peer company than alone during exercise.

Self-determination theory (SDT) (Deci & Ryan, 1985; 2000) is the motivational theory that is currently developing the most research in this field and has been widely used in recent years to develop intervention strategies aimed at increasing student participation in PA (Fenton, Duda, & Barrett, 2016), sport and exercise (Hagger & Chatzisarantis, 2008). This theoretical perspective argues that behavior can be broadly categorized as intrinsically motivated, extrinsically motivated, or amotivated and has shown the important role of different types of motivation in inducing a number of different cognitive, behavioral, and affective outcomes (Deci & Ryan, 2000). *Intrinsic motivation* is the prototypical form of autonomous motivation and reflects engaging in a behavior in the absence of external contingency and for the inherent pleasure and satisfaction derived from the activity. The extrinsic motivation is the driving force of external influence, relatively, usually by more control, less autonomy. However, extrinsic motivation is the prototypical form of controlled motivation and based on the degree of continuing internalization or integration can be divided into four different motivational regulations, From the least to the maximum degree of self-regulated internalization, respectively, external regulation, introjected regulation, identified regulation, and integrated regulation. At the far left of the self-determination continuum is amotivation, the state of lacking the intention to act (Ryan & Deci, 2000). In this study, self-regulated motivation is the main issue of research and amotivation is excluded. Usually, higher self-determination or Autonomous forms of motivation have been shown to be significantly related to higher health behavior engagement while controlled forms are related to desistence and avoidance. This is because autonomous reasons for acting do not depend on external contingencies or cues and are self-regulated rather than other-regulated. intrinsic motivation has been found to be the strongest predictor of persistent exercise (Deci & Ryan, 2000; Chatzisarantis et al., 2003). Standage, Duda, and Ntoumanis, N. (2003) also indicated that self-determined motivation can predict the PA intentions of leisure time. The results showed the more self-determined, the more behavioral adaptation. Researchers have found that the intrinsic motivation was able to predict the degree of effort and the persistence of PA after school, external regulation and amotivation can predict the boredom of physical education. (Hagger, et al., 2007).

This study focuses on the differences among four exercise participation types which are sports club participation with peer company needs (type 1), non-sports club with peer company needs (type 2), sports club participation with no peer company needs (type 3), and non- sports club with no peer company needs (type 4) on the five different self-regulated motivation, and regular exercise behavior. Moreover, this study also focuses on the predictive effects of self-regulated motivations in four exercise participation types on regular exercise behavior. The researcher assumes that sports club participation and peer companionship play a vital role in determining university students' exercise self-regulated motivation and regular exercise behavior. Based on research literatures, we set two hypotheses for this study. First, there would be significant differences among four exercise participation types on self-regulated motivation and regular exercise behavior. Second, there would be different predictive effects of self-regulated motivations in four exercise participation types on regular exercise behavior for university students.

## **Method and Materials**

### ***Participants***

Pilot data was obtained from 167 undergraduate students in National Yunlin University of Science and Technology. Formal study data was collected from 508 undergraduate students in three different universities of Taiwan. The total collected data was comprised 443 valid samples by 198 boys and 245 girls.

## **Measures**

### ***Behavioral Regulation in Exercise Questionnaire (BREQ-3):***

To measure exercise motivation, we used the Behavioral Regulation in Exercise Questionnaire (BREQ-3) of Wilson, Rodgers, Loitz, and Scime (2006). Based on the present study need, we revised original 24 items into 40 items in Chinese version that were rated on a 5-point Likert-type scale ranging from 1 (totally disagree) to 5 (very strongly agree). 10 items containing amotivation factor were excluded through item-analysis process. The result of exploratory factor analysis showed 5 factors including 5 items of external regulation, 6 items of introjected regulation, 4 items of identified regulation, 5 items of integrated regulation, and 5 items of intrinsic motivation, with total 25 items remained. The total explanation of variance was 70.69% and the analysis of internal consistency was satisfactory with Cronbach's alpha of .86~.90 for five-dimension regulations. In the analysis data, Skew ranged from -.94 ~ .35, and kurtosis ranged from -1.75~ .95.

### ***Regular exercise behavior :***

Self-reported regular exercise frequency per week and average intensity each time were combined to measure regular exercise behavior. There was an item to filtered students who did not have regular exercise behaviors. Those subjects skipped other regular exercise related questions. Four levels of self-reported regular exercise frequency per week which were "Once exercise a week, twice a week", "three times a week scored 3", and "above three times a week" were scored 1, 2, 3, 4. On the other hand, the intensity of physical activity depends on students' previous exercise experience and their relative level of fitness. Based on WHO definition of physical activity intensity, three levels of self-reported exercise intensity were scored 1, 2, and 3. We manipulated the score of exercise frequency and intensity to be the independent variable of regular exercise behavior.

### ***Statistical analysis***

Before analysis, missing values were imputed using the multiple imputation features of the IBM SPSS version 23 software. Item analysis and exploratory factor analysis were used to reduce items and to conduct dimensions of the revised BREQ-3 Chinese version. One-way ANOVA and Scheffé post hoc was used to examine the first hypothesis. Furthermore, hierarchical regression analysis was computed to examine the second hypothesis.

## **Results and Discussion**

### **1. The Peterson Correlation between the Variables**

The independent variable of external, introjected, identified, integrated regulation, and intrinsic motivation (mean=2.86~4.06, SD=.70~.89) strongly related to the dependent variable of regular exercise behavior (mean=5.10 SD=3.21) (correlation coefficient =.23~.63,  $p<.01$ ).

### **2. Dependent samples one-way ANOVA**

With regular exercise behavior (exercise frequency\*exercise intensity) as the dependent variable, revealed significant differences within 4 types of sport club participation. ( $F=3.66\sim19.91$ ,  $P<.01$ ). Means, standard deviations and F-ratios for the univariate analysis of variances are presented in Table 1. As shown, the Scheffé post hoc follow-up method indicated that type 2 scored significantly lower than other groups in introjected, identified regulation, only lower than type 4 in external regulation and lower than group in group 1, lower than type 1 and 3 in integrated regulation and regular exercise behavior. type 4 scored lower than type 1 and 3 in integrated regulation and regular exercise behavior, and only lower than type 1 in intrinsic motivation.

### **3. Hierarchical Regression Analysis**

Two regression models were formulated in each group and independent variable of self-regulated motivation. The first model included gender as a control variable. In the second model, each self-regulated motivation was used to predict regular exercise behavior (see Table 2, model 1: gender only has listed in the external regulation). Hierarchical regression analysis has shown that only in type 2 external regulation can positively predict regular exercise behavior ( $\beta = .29$ ,  $R^2 = .20$ ,  $\Delta R^2 = .19$ ,  $F = 16.94$ ,  $df = 165$ ,  $p < .01$ ), only in type 3 intrinsic motivation cannot positively predict regular exercise behavior, and in all groups introjected, identified, and integrated regulation can positively predict regular exercise behavior. Gender in these analyses was a significant predictor of regular exercise behavior.

### **Discussion**

A major concern for university students is to promote their regular exercise behavior. Participation frequency and time spent on sport increase when participants engage with club-organized sport. Club-organized participants spent more days a week and time for leisure-time sport than non-club-organized sport (Borgers, et al., 2016). This study has conducted similar results which sports club participants with or without peer company needs have more exercise behavior a week than non-sports club participants with or without peer company needs. In adolescence, peers represent increasingly important role models and sources of social support for physical activity and for efficacy beliefs regarding activity (Duncan, et al., 2007). The result also revealed that non-sports club with company needs scored significantly lower external, introjected, identified, integrated regulation, intrinsic motivation and regular exercise behavior. Non-sports club with company needs participants could be lack of social support and exercise role models in their school environments, both controlled motivation and autonomous motivation gradually decrease for doing regular exercise. It is important to explore more insight in participation behavior of potential participants to develop targeted regular exercise strategies for university students. On the other hand, external regulation only in type 2 can positively predict regular behavior and intrinsic motivation only in type 3 cannot positively predict regular behavior. Higher external regulation only in type 2 activates higher initiated. And students of type 3 could be initiated higher intrinsic motivation. The relationship of autonomous motivation (as integrated regulation and intrinsic motivation) and physical activity has been found to be partially mediated by self-regulation techniques, particularly self-monitoring. Self-regulatory techniques and self-monitoring interventions may benefit from fostering autonomous motivation by, for instance, addressing adolescents' using autonomy-supportive language, supporting positive interaction and relatedness with their peers (Hagger et al., 2007).

### **Conclusion**

The current study implied that the climate of trust and personal agency could be generated by peers support or in sport organizations and groups. self-regulatory techniques interventions between the relationship of self-regulated motivations and regular exercise behavior may be a further research issue for advance understandings.

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Table 1. one-way ANOVA Analysis of 4 types of sport participation on different self-regulated motivation and regular exercise behavior (N=443, \* $p < .01$ )

| Variables groups | external regulation |      | introjected regulation |      | identified regulation |      | integrated regulation |      | intrinsic motivation |      | exercise behavior |      |
|------------------|---------------------|------|------------------------|------|-----------------------|------|-----------------------|------|----------------------|------|-------------------|------|
| (N)              | M                   | SD   | M                      | SD   | M                     | SD   | M                     | SD   | M                    | SD   | M                 | SD   |
| Goup1 (140)      | 3.84                | 0.73 | 3.00                   | 0.97 | 3.97                  | 0.67 | 3.69                  | 0.70 | 4.32                 | 0.65 | 6.33              | 3.21 |
| Goup2 (168)      | 3.72                | 0.69 | 2.64                   | 0.80 | 3.67                  | 0.68 | 3.19                  | 0.70 | 3.88                 | 0.76 | 4.01              | 2.65 |
| Goup3 (27)       | 4.05                | 0.60 | 3.35                   | 1.07 | 4.13                  | 0.72 | 3.78                  | 0.83 | 4.22                 | 0.74 | 7.19              | 3.41 |
| Goup4 (108)      | 3.96                | 0.69 | 2.91                   | 0.76 | 3.98                  | 0.69 | 3.34                  | 0.64 | 3.98                 | 0.68 | 4.70              | 3.22 |
| F                | 3.66*               |      | 7.86*                  |      | 7.75*                 |      | 15.94*                |      | 11.12*               |      | 19.91*            |      |
| post hoc         | 4 > 2               |      | 1 > 2, 3 > 2           |      | 1 > 2, 3 > 2          |      | 1 > 2, 1 > 4          |      | 1 > 2, 1 > 4         |      | 1 > 2, 1 > 4      |      |
|                  |                     |      | 4 > 2                  |      | 4 > 2                 |      | 3 > 2, 3 > 4          |      |                      |      | 3 > 2, 3 > 4      |      |

Table 2. Hierarchical Regression Analysis: the predictive effects of five self-regulated motivations in 4 types of sport participation on regular exercise behavior (N=443, \* $p < .01$ )

| Independent variable   | (type 1) sports club participation with company needs |                                 |              | (type 2) non-sports club participation with company needs |                                 |              | (type 3) sports club participation with no company needs |                                 |            | (type 4) non-sports club participation with no company needs |                                 |              |
|------------------------|-------------------------------------------------------|---------------------------------|--------------|-----------------------------------------------------------|---------------------------------|--------------|----------------------------------------------------------|---------------------------------|------------|--------------------------------------------------------------|---------------------------------|--------------|
|                        | $\beta$                                               | R <sup>2</sup> ( $\Delta R^2$ ) | F (df)       | $\beta$                                                   | R <sup>2</sup> ( $\Delta R^2$ ) | F (df)       | $\beta$                                                  | R <sup>2</sup> ( $\Delta R^2$ ) | F (df)     | $\beta$                                                      | R <sup>2</sup> ( $\Delta R^2$ ) | F (df)       |
| Model 1                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .27*                                                  | .07 (.07)                       | 10.69* (138) | .34*                                                      | .12 (.11)                       | 21.83* (166) | .26*                                                     | .07 (.03)                       | 1.85 (25)  | .15                                                          | .02 (.01)                       | 2.60 (106)   |
| Model 2                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .29*                                                  |                                 |              | .32*                                                      |                                 |              | .30*                                                     |                                 |            | .15                                                          |                                 |              |
| External regulation    | .17                                                   | .10 (.09)                       | 4.31 (137)   | .29*                                                      | .20 (.19)                       | 16.94* (165) | .15                                                      | .09 (.02)                       | 0.59 (24)  | .23*                                                         | .08 (.06)                       | 5.87 (105)   |
| Model 2                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .21*                                                  |                                 |              | .31*                                                      |                                 |              | .21*                                                     |                                 |            | .17                                                          |                                 |              |
| Introjected regulation | .27*                                                  | .14 (.13)                       | 11.17* (137) | .26*                                                      | .18 (.17)                       | 13.68* (165) | .48*                                                     | .29 (.23)                       | 7.62* (24) | .27*                                                         | .10 (.08)                       | 8.47* (105)  |
| Model 2                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .25*                                                  |                                 |              | .32*                                                      |                                 |              | .38*                                                     |                                 |            | .15                                                          |                                 |              |
| identified regulation  | .26*                                                  | .14 (.13)                       | 10.96* (137) | .38*                                                      | .26 (.25)                       | 32.71* (165) | .44*                                                     | .25 (.19)                       | 5.89* (24) | .38*                                                         | .17 (.15)                       | 18.15* (105) |
| Model 2                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .19                                                   |                                 |              | .28*                                                      |                                 |              | .34                                                      |                                 |            | .15                                                          |                                 |              |
| integrated regulation  | .43*                                                  | .25 (.24)                       | 33.57* (137) | .37*                                                      | .25 (.24)                       | 30.13* (165) | .42                                                      | .24 (.18)                       | 5.47* (24) | .32*                                                         | .12 (.11)                       | 12.37* (105) |
| Model 2                |                                                       |                                 |              |                                                           |                                 |              |                                                          |                                 |            |                                                              |                                 |              |
| gender                 | .23*                                                  |                                 |              | .28*                                                      |                                 |              | .27*                                                     |                                 |            | .16                                                          |                                 |              |
| intrinsic motivation   | .32*                                                  | .17 (.16)                       | 16.83* (137) | .36*                                                      | .24 (.23)                       | 26.95* (165) | .14                                                      | .09 (.01)                       | .53 (24)   | .32*                                                         | .12 (.11)                       | 11.84* (105) |

## **Globalization of learning through pedagogic technologies for hospitalized learners in Nigeria**

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### **Abstract**

*Globalization has become an overarching ideology for anybody that wants to play the large field of human endeavour, including that of education. The study was carried out to determine the perspectives of teachers on “Globalization of learning through pedagogic technologies for hospitalized learners in Nigeria”. Four research questions guided the study. The design of the study was descriptive survey. The population comprised 548 secondary school teachers in Awka South Local Government Area of Anambra State, Nigeria. Using accidental sampling, 86 teachers who had taught hospitalized students at least three months preceding the study were selected as respondents. A questionnaire tagged “Use of Pedagogic Technologies for the Learning of Hospitalized Learners Questionnaire” was used in collecting data, having two parts and four clusters according to the research questions. Findings indicated that teachers in rural and urban schools unanimously alluded to the need for pedagogic technologies in learning for hospitalized learners, irrespective of how far away such learners are. It was also found that cost of data, poor connectivity, affordability of compliant devices and inadequate training constrain the use of pedagogic technologies for globalizing learning for the benefit of hospitalized students. Recommendations included that government at the central and lower levels should endeavour to provide the necessary technological and infrastructural backing to enable distance learning occur in web-based mode, among others.*

*Keywords: Globalization, pedagogic technologies, hospitalized learners*

### **Introduction**

Globalization symbolizes man’s era of universality and multi-nationality: an era of ergonomic considerations in production, efficiency, and ease of transactions among nations. The term is etymologically rooted in the English language, and involves international networking based on a socioeconomic system cum structure that is vast in nature, such that those sovereign states subscribe to it (Cuterela, 2012). Reich (1998) noted that the meaning of globalization was derived across climes based on how each nation viewed it and how they structured their participation in it. However, a plausible conceptualization of globalization comes from that of Mir, Hassan and Qadri (2014), which holds that globalization encompasses economic, technological, social, political and cultural aspects.

According to Misra (2014), globalization entails economic and societal integration through flows of goods, ideas, technologies, information, services, finance and individuals across international borders. Implicit in this is that globalization brings the world under a single umbrella for its own betterment, making the world a global village. As Lee and Vivarelli (2006) would have it, globalization has re-conceptualized distance, due to the fact that information and communications technology (ICT) has made distance quite reduced with the interconnectivity revolution of the 1980s through the 1990s. However, there are criticisms of globalization based on its impact on sovereignty (Ganaie & Mohiuddin, 2016; Moeh & Abdullah, 2016), and its negative impact on the poor (Aisbett, 2007). Inasmuch as the initial intent of globalization had been social, economic, cultural, and political integration; globalization has crept into education, since without education, the knowledge and understanding of the ideals of globalization cannot be acquired. Education can be a veritable tool for the transfers of ideas through technologies to occur.

### **Globalization and Education**

According to Misra (2012), globalization demands systemic changes in education. One of the most crucial adjustments to make in teaching and learning is that of making the classroom mobile enough to be

uninhibited by distance and borders just as globalization has done for trade, economies and transfer of technologies. This should be accompanied by concomitances such as curricular and teaching practice adjustments.

Reynolds and Vinterek (2013) asserted that teachers have to respond to ongoing changes in students' access to global learning environments, which is possible through the instrumentality of information technology. That is, apart from making school curricula to be more culturally universal and globally responsive, the apparatus for sustaining seamless learning should also be in place. Learning, as behaviourists see it, is a relatively permanent change in the potential behaviour of an individual as a result of experience, while as the cognitive tradition sees it, it is the process of gaining new insight or changing old ones (Ebenebe & Unachukwu, 1995). For the behaviourists, learning requires observable behavioural alterations to justify the inference that learning has occurred in an individual. In the cognitive view, some conceptualization must be there for learning to occur.

To make learning more global in outlook, distance learning has been proffered severally in research as a panacea to the problem of classroom exclusion that affects students physically separated from their learning environments (Atwell, 2016; Traxler, 2018). Traxler opined that digital technologies and artificial intelligence are avenues through which distance learning can be delivered to students in need of connectedness to their classmates. Therefore, using pedagogic technologies that can sustain students' interest in learning, despite their absence from school is crucial to the success of the process of using distance learning for this purpose. Pedagogic technologies are defined in the context of this study as the technological apparatuses responsible for the delivery of teaching onsite and remotely to a learner or group of learners.

Due to geographical inconsistencies that could mar the process of making education more multi-cultural in purpose, certain pedagogic technologies need to be in place to ensure the smoothness of the teaching-learning process. These pedagogic technologies include computer-aided, audiovisual and sundry devices that enhance classroom digitization. Shi, Xie and Xu (n.d.), in this light, advocated for the development of smart classrooms whereby the teacher can simultaneously teach students who are present in class or attending remotely through wireless technology. The smart classroom is thus a borderless learning environment that encourages inclusivity by accommodating those who can and those who cannot be physically present during the lesson period. Barriers to the success of this, Shi, Xie and Xu continued, include lack of adequate technological infrastructure to cope with large-scale access, and lack of adequate technologies to accommodate users of different network platforms in one learning session. Another encumbrance is teachers' inability to utilize pedagogic technologies to reach a wide audience of learners (Okenjom et al, 2016), which could be due to inadequate training in the use of such resources for instruction and assessment.

The importance of pedagogic technologies in instruction and assessment is underscored by the need to pass on knowledge across borders, as well as to carry out assessments of students' performance in a way that it accommodates those for whom it is uncomfortable. In this study, the focus is on hospitalized learners who face the threat of missing classes as well as tests/examinations due to prolonged absence from the learning environment. For such students, there is need to provide a level playing field in order for them not to be excluded from knowledge acquisition and its accruing assessments, no matter what part of the globe in which they are or the situations they find themselves in.

### **Use of Pedagogic Technologies in Learning for Hospitalized Learners**

The Australian Research Alliance on Children and Youth (ARACY, 2015) identified illnesses capable of hospitalizing students and causing non-negligible school absence among students. These include cancer, digestive disorders, asthma, cystic fibrosis, epilepsy, among others. In the Nigerian case, the culprit is often malaria. According to the ARACY, as their illnesses differ, the educational support needs of these students equally differ. Some might require light interventions, while others might require serious interventions. Illness has been known to prevent many a student from participating in active learning. However, in the era of the global village, as the world has become, hospitalized learners have been availed the opportunity for active learning through technologies that enhance pedagogy. This is to

prevent that feeling of detachment from peers and from the school physical environment, which can lead to anxiety and depression for the sick student (Wilkie & Jones, 2007).

According to Wilkie and Jones (2007), strategies have been developed through technological advancement to help learners with chronic illnesses maintain contact with their respective schools while hospitalized or recuperating. Videoconferencing, web-based interaction, telephone conversations, podcasts, webcasts and chat room discussions are among the avenues that can be used to reach chronically ill and hospitalized students. Prior to that, hospitalized learners were availed curricular content through “hospital schools” whereby the teaching was done by proxies using the provided curriculum (Carstens, 2004). Therefore, with the ease of access that pedagogic technologies bring, hospitalized learners can be made to feel they are not missing anything while being treated or while in recuperation. With good internet access, it implies that even if the student is from Nigeria but hospitalized in India, such a student can link up with peers and enjoy learning as if present in the real classroom via pedagogic technologies.

The possibilities of remote learning for students in long-term hospitalization abound in Nigeria, with the introduction of mobile telephony in 2001. Access to telephones has increased tremendously, with every citizen either owning a mobile phone or knowing someone who does. In Awka South Local Government Area in Anambra State, Nigeria, telephone access among secondary school students is high. However, the greater number of these phones are observably not equipped with android and sundry operating systems that allow for videoconferencing and chats through media platforms such as Skype, WhatsApp, Instagram and Facebook. Only students from middle class or wealthy homes have personal ownership of such devices or at least access to them. Another problem is connectivity, whereby in the same local government area, network service can be on one device but not on another. It does cause bother as to how hospitalized students in the area can avail themselves of the opportunity for uninterrupted learning, with access and astronomical connectivity costs threatening such an opportunity.

### **Statement of the Problem**

Quite a number of public secondary school students in Awka South Local Government Area of Anambra State, Nigeria either fall sick during examinations or are hospitalized during the term with a wide range of illnesses, especially malaria and typhoid fever. Some that can afford it personally or through humanitarian interventions, travel outside Nigeria for medical attention and spend long periods outside the walls of their schools, disconnected from learning. Sadly, they have been observed by the researcher to miss examinations and precious lessons, thereby lagging behind in knowledge and competencies. For those hospitalized in the same town as the school, teacher benevolence and empathy appears to determine the student’s access to taught content. Some hospitals bring sick students to the examination hall in extreme cases, but this is often discouraged and sometimes impracticable. It therefore suggests that such students lose out in the unbalanced equation of hospitalization versus school attendance/classroom participation.

International studies have indicated that it is possible to educate hospitalized students but contextual inconsistencies appear to mar the possibility of such opportunities in Awka South Local Government Area, Anambra State, Nigeria. This is because one can hardly find any public secondary school with interactive writing boards, multimedia resources, wireless internet access, input and output devices to make this lofty ideal fruitful within the area. Hospitals appear not to fare better either. Specifically, teachers are often found struggling to grapple with the ever-changing landscape of ICT because they are not digital natives as their students are. When students possess the devices that can provide videoconferencing, the teachers (who might possess similar devices) are often not ICT savvy enough to dissipate information to these students remotely. Learning has gone global and robots are serving as avatars for sick students in class, transmitting images to the hospital in developed countries. It appears that sick students in Awka South Local Government Area, Anambra State who are admitted in hospitals will not be able to partake in learning activities. The problem of this study is therefore to seek the opinions of teachers on globalizing learning for hospitalized students from the area, specifically those teachers whose students have been or are hospitalized as at the time of this study.

### **Purpose of the Study**

The main purpose of this study was to determine how learning could be globalized for hospitalized secondary school students in Awka South Local Government Area, Anambra State, Nigeria. Specifically, the study set out to determine:

1. Teachers' perceptions on the possibility of globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State.
2. Teachers' perceptions on their competencies for globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State.
3. Teachers' perceptions on the constraints to the globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State.
4. Teachers' perceptions on the solutions to the constraints to the globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State.

### **Research Questions**

The following research questions guided the study:

1. What are teachers' perceptions on the possibility of globalization of learning using pedagogic technologies for hospitalized learners in rural and urban settlements in Awka South Local Government Area, Anambra State?
2. What are teachers' perceptions on their competencies for globalization of learning using pedagogic technologies for hospitalized learners in rural and urban settlements in Awka South Local Government Area, Anambra State?
3. What are teachers' perceptions on the constraints to the globalization of learning using pedagogic technologies for hospitalized learners in rural and urban settlements in Awka South Local Government Area, Anambra State?
4. What are teachers' perceptions on the solutions to the constraints to the globalization of learning using pedagogic technologies for hospitalized learners in rural and urban settlements in Awka South Local Government Area, Anambra State?

### **Method**

The descriptive survey research design was adopted to achieve the purpose of the study, which was carried out in Awka South Local Government Area, Anambra State, Nigeria. Four research questions guided the study. The population of the study comprised 548 teachers in the area. The study sample, accidentally selected, included 86 teachers who taught at least a student hospitalized from the three months preceding this study until the time of the study. Of this figure, 23 taught in rural schools, while 63 taught in urban secondary schools. A 20-item questionnaire tagged "Use of Pedagogic Technologies for the Learning of Hospitalized Learners Questionnaire" was used in collecting data. It had two parts, A and B. Part A sought the personal data of the respondents, while Part B consisted of four clusters: B1, B2, B3 and B4 with respect to the research questions. The instrument was rated on a four-point Likert type scale of strongly agree (SA), agree (A), disagree (D) and strongly disagree (D).

The instrument was validated by two experts in educational measurement and evaluation, and an expert from educational psychology. Cronbach Alpha reliability statistic was used in determining the internal consistency of the questionnaire. This exercise yielded 74.48, 82.20, 76.62 and 74.38 as coefficients of internal consistency for clusters B1, B2, B3 and B4. The research questions were answered using the statistical mean and standard deviation. The criterion was that a mean perception score of 2.50

and above indicated agreement or positive response, while a score of 2.49 and below indicated disagreement or negative response. This was done relative to the real limits of numbers. The analysis was carried out using SPSS version 23.

### Results

Research Question 1: What are teachers' mean perception scores on the possibility of globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State?

**Table 1: Teachers' mean perception scores on the possibility of globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements**

| S/N                  | Variables                                                                                                                            | Teachers' perception scores |             |        |                   |             |               |
|----------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------|--------|-------------------|-------------|---------------|
|                      |                                                                                                                                      | Urban Sec. School           |             |        | Rural Sec. School |             |               |
|                      |                                                                                                                                      | Means                       | SD          | Remark | Means             | SD          | Remark        |
| 1                    | Education should be imparted with a global outlook in this era of globalization                                                      | 3.00                        | 0.87        | Agreed | 3.02              | 0.86        | Agreed        |
| 2                    | Using technology, hospitalized students can learn together in an online class with peers                                             | 3.34                        | 0.77        | Agreed | 3.22              | 0.82        | Agreed        |
| 3                    | With technology, hospitalized students can join their peers in other countries based on a unified curriculum, e.g., English Language | 3.25                        | 0.64        | Agreed | 3.28              | 0.80        | Agreed        |
| 4                    | It is possible for hospitalized learners to write credible examinations online along with their peers in school                      | 3.36                        | 0.72        | Agreed | 3.30              | 0.76        | Agreed        |
| 5                    | Hospitalized learners can partake in practicals using videoconferencing on a real-time basis                                         | 2.88                        | 0.96        | Agreed | 2.75              | 0.97        | Agreed        |
| <b>Mean of Means</b> |                                                                                                                                      | <b>3.17</b>                 | <b>0.79</b> |        | <b>3.11</b>       | <b>0.84</b> | <b>Agreed</b> |

Data from Table 1 indicates that there was agreement to all the items in the cluster, with means ranging from 2.75 to 3.36. With cluster means of 3.17 and 3.11 respectively, there is general agreement among urban and rural schoolteachers that pedagogic technologies can be used in globalizing learning for hospitalized learners.

Research Question 2: What are teachers' mean perception scores on their competencies for globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State?

**Table 2: Teachers' mean perception scores on their competencies for globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements**

| S/N | Variables                                            | Teachers' perception scores |      |        |                   |      |           |
|-----|------------------------------------------------------|-----------------------------|------|--------|-------------------|------|-----------|
|     |                                                      | Urban Sec. School           |      |        | Rural Sec. School |      |           |
|     |                                                      | Means                       | SD   | Remark | Means             | SD   | Remark    |
| 6   | I can teach classes using videoconferencing tools to | 2.85                        | 0.91 | Agreed | 2.11              | 0.86 | Disagreed |

|                      |                                                                                                                        |             |             |                  |             |             |                       |
|----------------------|------------------------------------------------------------------------------------------------------------------------|-------------|-------------|------------------|-------------|-------------|-----------------------|
| 7                    | hospitalized students<br>I can coordinate instruction<br>using chat rooms or chat groups<br>with hospitalized students | 2.31        | 0.72        | Disagreed        | 1.14        | 0.61        | Strongly<br>Disagreed |
| 8                    | I can personalize learning by<br>online conversation with my<br>hospitalized student                                   | 2.64        | 0.96        | Agreed           | 1.27        | 0.44        | Strongly<br>Disagreed |
| 9                    | I am familiar with a host of<br>devices that enhance web-based<br>learning                                             | 2.13        | 0.85        | Disagreed        | 1.94        | 0.49        | Disagreed             |
| 10                   | Devices that are used for online<br>learning are too complex for me                                                    | 1.91        | 0.50        | Disagreed        | 1.19        | 0.53        | Strongly<br>Disagreed |
| <b>Mean of Means</b> |                                                                                                                        | <b>2.34</b> | <b>0.73</b> | <b>Disagreed</b> | <b>1.53</b> | <b>0.59</b> | <b>Disagreed</b>      |

Data from Table 2 shows that with cluster means of 2.34 and 1.53 respectively, both urban and rural secondary school teachers disagree that they are competent in the use of pedagogic technologies in globalizing learning for hospitalized students.

Research Question 3: What are teachers' mean perception scores on the constraints to the globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State?

**Table 3: Teachers' mean perception scores on the constraints to globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements**

| S/N                  | Variables                                                             | Teachers' perception scores |             |                    |                   |             |                    |
|----------------------|-----------------------------------------------------------------------|-----------------------------|-------------|--------------------|-------------------|-------------|--------------------|
|                      |                                                                       | Urban Sec. School           |             |                    | Rural Sec. School |             |                    |
|                      |                                                                       | Means                       | SD          | Remark             | Means             | SD          | Remark             |
| 11                   | Poor network connectivity will<br>make the process unsuccessful       | 3.90                        | 0.79        | Strongly<br>Agreed | 2.76              | 0.81        | Agreed             |
| 12                   | The cost of purchasing airtime<br>and internet data is prohibitive    | 3.77                        | 0.60        | Strongly<br>Agreed | 3.84              | 0.94        | Strongly<br>Agreed |
| 13                   | Some people cannot afford<br>android devices for<br>videoconferencing | 3.86                        | 0.74        | Strongly<br>Agreed | 3.95              | 0.78        | Strongly<br>Agreed |
| 14                   | Slow adaptation to pedagogic<br>technologies will mar the process     | 2.78                        | 0.56        | Agreed             | 3.08              | 0.70        | Agreed             |
| 15                   | Teachers are not well trained in<br>pedagogic technologies            | 2.62                        | 0.67        | Agreed             | 2.92              | 0.87        | Agreed             |
| <b>Mean of Means</b> |                                                                       | <b>3.39</b>                 | <b>0.67</b> | <b>Agreed</b>      | <b>3.31</b>       | <b>0.82</b> | <b>Agreed</b>      |

From Table 3, items 11-15 indicate unanimous agreement by respondents that poor network connectivity, cost of data, affordability of android devices, slow adaptation to technologies and lack of training are perceived constraints to the use of pedagogic technologies in globalizing learning for hospitalized learners.

Research Question 4: What are teachers' mean perception scores on the solutions to the constraints to the globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements in Awka South Local Government Area, Anambra State?

**Table 4: Teachers' mean perception scores on the solutions to the constraints to the globalization of learning using pedagogic technologies for hospitalized students in rural and urban settlements**

| S/N                  | Variables                                                                                                                         | Teachers' perception scores |             |                 |                   |             |                 |
|----------------------|-----------------------------------------------------------------------------------------------------------------------------------|-----------------------------|-------------|-----------------|-------------------|-------------|-----------------|
|                      |                                                                                                                                   | Urban Sec. School           |             |                 | Rural Sec. School |             |                 |
|                      |                                                                                                                                   | Means                       | SD          | Remark          | Means             | SD          | Remark          |
| 16                   | Network providers should boost their reception in towns and villages outside state capitals                                       | 2.96                        | 0.68        | Agreed          | 3.64              | 0.78        | Strongly Agreed |
| 17                   | Schools should be provided with constant internet connection for them to stay connected to hospitalized students                  | 3.05                        | 0.80        | Agreed          | 3.17              | 0.83        | Agreed          |
| 18                   | Hospitals should be provided with constant internet connection for them to stay connected to the schools of hospitalized students | 3.79                        | 0.89        | Strongly Agreed | 3.73              | 0.62        | Strongly Agreed |
| 19                   | Teachers and students should generally be trained on online learning                                                              | 2.84                        | 0.94        | Agreed          | 2.96              | 0.91        | Agreed          |
| 20                   | Classrooms should be kitted to be web-based learning compliant                                                                    | 3.91                        | 0.71        | Strongly Agreed | 3.82              | 0.70        | Strongly Agreed |
| <b>Mean of Means</b> |                                                                                                                                   | <b>3.31</b>                 | <b>0.80</b> | <b>Agreed</b>   | <b>3.45</b>       | <b>0.77</b> | <b>Agreed</b>   |

From Table 4, it can be seen that both rural and urban teachers opine that internet connection be provided in hospitals and schools, network providers should boost their network services and classrooms be kitted to be compliant to web-based learning. This is based on the item and cluster means, which are above the criterion mean.

### Discussion of Results

Findings of the study revealed that in answer to the first research question, the mean perception score of secondary school teachers in urban settlements is 3.17, while those in rural settlements scored 3.11. This means that both rural and urban teachers perceive that globalization of learning is possible for hospitalized learners using pedagogic technologies. This finding is in tandem with the assertions by Wilkie and Jones (2007) that technology can help hospitalized students reach the peers and teachers from whom they were separated. One socio-cultural reality in this regard is that social media awareness and usage is on the increase in Awka South Local Government Area because the most basic of mobile phones now have installed in them the Facebook application.

With respect to the second research question, with means of 2.34 and 1.53, teachers in urban and rural settlements overwhelmingly alluded to their incompetence in the use of pedagogic technologies in delivering learning on a global scale for the benefits of their students hospitalized in remote sites. Okenjom et al (2016) hinted this by commenting that Nigerian teachers were poorly trained in the use of technologies for teaching. A socio-cultural reality in this regard is that the cost of training is somewhat



prohibitive in the Nigerian polity, thereby making schools shy away from training their teachers in ICT usage.

Findings in respect of Research Question 3 shows that teachers with means of 3.39 (urban) and 3.31 (rural) agreed that cost of data, poor connectivity, affordability of compliant devices and inadequate training constrain the use of pedagogic technologies for globalizing instruction for the benefit of hospitalized students. In relation to this, Mishra and Tyagi (2017) wrote that students' perceived learning is related to the seriousness of school authorities about the process, students' interest, programme organization and the pedagogic effect. Students' interest actually comes first in most nations' policies on education, but schools are often found putting themselves first before the learner.

With respect to the fourth research question, teachers responded that constant internet connection be provided to schools and hospitals for the benefit of hospitalized learners. Across school locations, teachers also agreed that there is need for teachers and students to be trained in the use of online/web-based resources for learning. This is in line with the position of Carstens (2004) that pedagogic technologies bring ease of access to teaching and learning.

### **Conclusion**

Findings of the study have led to the conclusion that teachers perceive pedagogic technologies to be usable in fostering learning on a global scale for learners who are hospitalized. It was also concluded that teachers do not perceive themselves to be competent in deploying pedagogic technologies, and that there are several constraints to the use of these pedagogic technologies in globalizing learning for hospitalized learners. Finally, the study concluded that internet connectivity, training of users and beneficiaries and infrastructure provision would enhance the use of pedagogic technologies to reach hospitalized learners anywhere they are in the world. All of these were irrespective of geographical differences (urban-rural dichotomy) between the study participants.

### **Implications for the Use of Pedagogic Technologies for Hospitalized Learners**

Many universities and even secondary schools now have units for international collaboration and linkages, with professors from two or more continents moderating learning through the use of pedagogic technologies. Classrooms can be brought closer to hospitals and learning can become more dynamic and continuous, availing the hospitalized student the positivity needed to grapple with his or her condition. Globalization of learning through pedagogic technologies is a reality. Schools in Awka South Local Government Area, Anambra State, Nigeria have to re-engineer their instructional activities to remotely engender collaborative and cooperative learning. Peer tutoring can be moderated through pedagogic technologies. When education is globalized for hospitalized learners, curriculum implementation will be afforded the inclusivity it deserves. Sickness will no longer be a death sentence or an inadvertent endowment of illiteracy on victims. Hospitalized learners can therefore gain from the positives of pedagogic technologies in their hospital classrooms.

### **Recommendations**

Based on the findings of this study, the following recommendations were made:

1. Government at the central and lower levels should endeavour to provide the necessary pedagogic technologies to enable distance learning occur in web-based mode. This will enable hospitalized learners to partake in learning without interruption.
2. Teachers should not wait for appropriate authorities to retool them for the task of using pedagogic technologies to enhance onsite and remote learning because it is knowledge that will last a lifetime with them for their own ultimate benefit.
3. Hospitals should be provided with environments that promote learning, instead of reminding hospitalized learners of imminent dangers they face due to their health statuses.
4. Where governmental input is not tenable or slow to achieve, international groups or bodies should come to the aid of hospitalized learners to make the hospital a school for them, as well as a playground with their peers using pedagogic technologies.

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## **Exploration College Students' Motivation for Joining Judo Clubs —Taking National Yunlin University of Science and Technology in Taiwan as an Example**

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### **Abstract**

*Judo is a physically demanding sport. Motivation plays an important role in athletes' persistence in practicing judo, particularly when they encounter hardships. In this study, 21 participants who were judo players in the last 10 years (each with at least 2 years' training experience) were recruited. Based on the Self-determination Theory, the factors that influence whether judo players persist in the sport were explored. In addition, the four-stage textual and decoding analyses were both carried out on the basis of the Constructivist Grounded Theory. This study puts forward the "Framework of the Motivations for the Participation in Judo Clubs on Campus", revealing the important factors that motivate judo athletes to persist in practicing the sport and the relationship between motivation regulation. This contribution can guide teachers, coaches, and athletes.*

*Keywords: Judo, Grounded theory, Motivation*

### **1. Background/Objectives and Goals**

Chin-Chu Huang (1985) pointed out to coaches and instructors that it is of great significance to find out what motivates college students to join a certain sports club, for an understanding of their motivation facilitates the construction of sporting environments for students to do the sport. According to the National Database of Student Athlete, 250 judo players participated in judo competitions of general groups (from non-sports departments, and judo clubs) in 2015 while 181 entered for judo competitions in 2017. The decrease reveals that the sport could be physically demanding for contemporary college students who are growing up with 3C products (computer, communication, and consumer electronics). Doing judo involves attacks and defenses between two judo players, and that requires not only good explosiveness, muscle strength, agility, softness, speed, and endurance, but also a complete set of competitive skills (Chen & Hung, 2006). Therefore, college judo players need to spend much time training before they are qualified to enter for judo competitions. Also, only those with great tolerance and perseverance can achieve accomplishments. Why are some students willing to invest much time and energy doing judo, a physically demanding sport? Why do some students start doing judo and persist in practice, while others give up? Why are the motivations of students who have been practicing judo for several years changed? What type of self-determination do different levels of motivation produced by college students who have been practicing judo for years belong to? These questions are to be further studied.

Human beings have instincts for exploring the unknown and achieving self-actualization, which are both because of motivations. Motivation, a very important factor that influences college students' participation and performance in sports, is an internal process that causes individuals to participate in an activity, continue engaging in this activity and move toward established goals (Kleinginna & Kleinginna, 1981). Furthermore, motivations also play a key role in decision of individuals to participate in a sport, how long they will play this sport, and whether they quit it and why. Self-motivation is a kind of dynamic psychological need and individuals display unique behaviors based on different levels of psychological needs (Chiang, 2011). In addition, motivations are greatly influenced by external environmental factors, so motivations can be changed, enhanced or weakened (Yen, Gao, Hsiu, Chen, Zeng, Wang & Chen, 2010). The theory about the generation and influence of motivations mainly derives from the "Self-determination theory". Therefore, different types of motivations should be explored based on the extent of

self-determination in the study on whether the motivation for students participating in judo clubs at college persists or not (either a strong or weak motivation).

Vallerand (1997) divided the intrinsic motivation into three hierarchies in his previous research, namely “intrinsic motivation to know”, “intrinsic motivation toward accomplishments,” and “intrinsic motivation to experience stimulation”. All of these types refer to the situations in which individuals are involved in a particular sport because of his interest and for fun. Deci and Ryan (1991) divided extrinsic motivation into controlling motivation and autonomous motivation based on the level of self-determination involved. They also proposed four basic types of extrinsic motivation for learning and participation, namely integrated regulation, identified regulation, introjected regulation, and external regulation. These four types of regulation involve different levels of self-determination and they are all produced because of external benefits so they bear no relevance with fun from participating in the sport itself (Ryan and Deci, 2002). In addition, amotivation proposed by Deci and Ryan (1985) refers to the individual who has no intrinsic or extrinsic motivation and no expectation or purpose for a particular sport. For someone with amotivation, he feels that he is incapable of this sport, unable to exercise control over it, and he will stop doing this sport when he encounters obstacles. The study on the role of internal and external motivation levels in sports motivation by Vallerand (2007), Lu and Zhuang (2008) pointed out that motivation can lead to consequences, and intrinsic motivation, extrinsic motivation, and amotivation produce different consequences. The closer one’s motivation is to amotivation, the more negative the resulting consequences will be. Moreover, the motivation at the holistic level refers to one’s general disposition to internal motivation, extrinsic motivation. and amotivation when he interacts with the environment, which is similar to personality.

This study aims to explore the motivation of judo players for persisting in sports training with the self-determination theory. It collected the data about why students at the National Yunlin University of Science and Technology (hereinafter referred to as YunTech) decide to do judo and analyzed the implications of their motivation for participating in the judo club, distinguishing the types of motivation based on the level of autonomy or controlling, and determine whether the different types of motivation exert varied influence on their training persistence. The research results could be used by college sports clubs in recruiting future players and by teachers, coaches and club instructors in regulating college students’ motivation.

## **2. Methods**

This study uses the five important steps of the qualitative research method proposed by Denzin and Lincoln (1994). First, the researcher has 10 years of experience as a member of the national judo team and 29 years of experience as a coach for university judo teams. Therefore, the researcher has a considerable awareness and reliability regarding the technical and psychological aspects of judo players and overall judo administrative policies. Second, the researcher teaches in colleges and universities. Through years of research experience, he has found out that motivation plays an important role in whether students persist in sports training. Third, this study, based on a literature review (Kleinginna & Kleinginna, 1981; Chiang, 2011) to develop research questions, and chose 21 judo players who participated in judo clubs at YunTech between 2007 and 2017 with purposive sampling. Each participant was informed that the whole interview would be recorded and they were asked to sign a research consent form before the interview. After the interview, the interviewees were codified before they were studied to keep them completely anonymous when the data was collected. It was a one-on-one interview and there were a total of 21 sessions. In addition, there were six focus group interviews (three on-campus students and four graduates for a group interview). The interviews mainly centered on individual motivation to participate in judo training and whether interviewees upheld an inherent interest and goals to motivate themselves to actively engage in judo training. Fourth, the author of this study is the coach of the involved judo players who observed them during training three times a week, and two hours each time. Moreover, the data was also collected based on judo players’ training logs and post-training experience. Fifth, this study is carried out based on the grounded theory. A large number of data was inspected, classified, compared and contrasted,

and summarized. Furthermore, the textual analysis, open coding, axial coding, and selective coding were performed, respectively.

In the first step of data collection, individual differences were considered to challenge a single theory to reveal characteristics and objectivity. In the second step, the focus-group interview method was used to obtain data that were generated by the interaction between the interviewer and the interviewee and between the interviewees. In the supportive atmosphere of the group, the interviewee would express a wide range of opinions. The use of focus-group interviews helped make the process of information collection inductive and naturalistic, and the interviewees expressed a diversified range of viewpoints (Krueger, 1998). After the interview, the recording files were compiled into verbatim manuscripts with the aid of computers for later analysis. This study excerpted the verbatim manuscript of the interview for the first participant of the second group, as shown in Table 1. Two sports psychology scholars were invited for content analysis and cross-validation. Doctoral students with judo specialty were also invited to participate in focus-group interviews. In this aspect, this study has considerable reliability and validity.

Table 1. Verbatim Manuscript

| <b>Code: 2-2-11</b> | <b>Participant: 2E</b>                                                                                                                                                                                                                                                                                                                                                                                            | <b>Time of interview: 10:20 on Oct. 3 of 2018</b> |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|
|                     | T: The first question is what motivated you to take part in the judo team? There could be multiple reasons.                                                                                                                                                                                                                                                                                                       |                                                   |
|                     | E: I watched a judo competition when I was a senior high school student. At that time, I thought I could do judo to make myself healthier and improve physical fitness as well as acquiring a defensive skill. I encountered judo by chance when I was a college student. I had learned similar skills. There were some new skills that I could learn, so I continued doing judo which has become a hobby for me. |                                                   |
|                     | T: You continued doing judo for what purpose?                                                                                                                                                                                                                                                                                                                                                                     |                                                   |
|                     | E: To improve physical fitness.                                                                                                                                                                                                                                                                                                                                                                                   |                                                   |
|                     | T: Did you achieve that goal?                                                                                                                                                                                                                                                                                                                                                                                     |                                                   |
|                     | E: Yes, yes, I think I did.                                                                                                                                                                                                                                                                                                                                                                                       |                                                   |
|                     | T: For instance?                                                                                                                                                                                                                                                                                                                                                                                                  |                                                   |

Induction, which is the first step under the grounded theory, should be taken with an open mind. The basic principles involve framework, category, subcategory, attribute, and dimension (Goldkuhl & Cronholm, 2010). Therefore, the study used open coding during the process of data systematization with the research objectives as the core although the data were compiled based on the concept, paragraph, and keyword. Also, a category was set for the data that demonstrated a similar or the same characteristic. Furthermore, all the set categories were discussed with other two scholars, and the verbatim manuscripts were used for confirmation. In this way, the open coding was gradually done and a total of 53 open codes were obtained, as shown in Table 2. (List 1-8 only)

Table 2. Selective, Axial and Open Coding

| Selective coding | Description                                                                                                                                                                   | Axial coding         | Open coding                                                                                                          |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------------|
| 1. Amotivation   | One feels that he would not achieve his anticipated results, or has no expectation for rewards from participating in judo. He has no motivation because of his own negligence | 1. Because of others | 1. Classmates gathered together shouting to ask me to take part in judo.                                             |
|                  |                                                                                                                                                                               |                      | 2. My friend in the same department asked me to take part and I felt the sport was special, so I participated in it. |
|                  |                                                                                                                                                                               | 2. Having            | 3. Sometimes I did not know what to do.                                                                              |

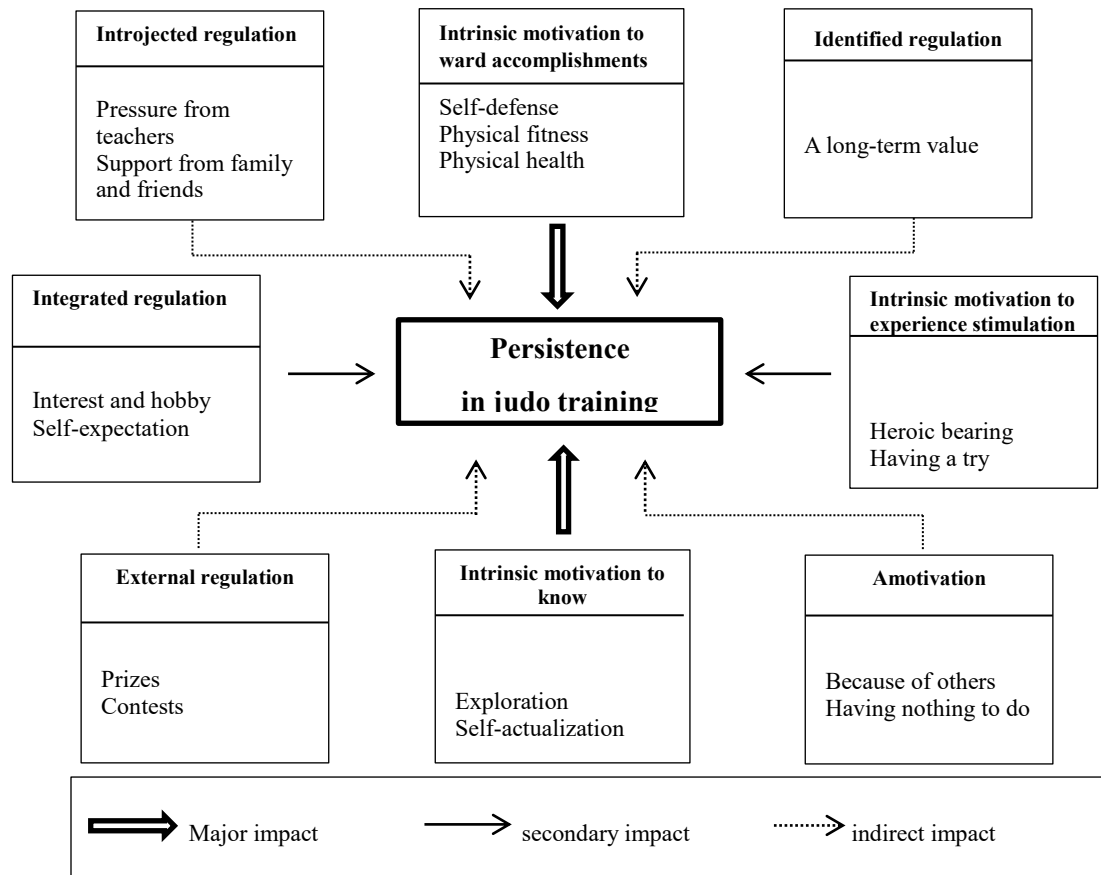
|                        |                                                                     |               |                                                                                       |
|------------------------|---------------------------------------------------------------------|---------------|---------------------------------------------------------------------------------------|
|                        | and he is very likely to doubt himself when encountering hardships. | nothing to do | 4. I felt bored in the evening, so I took part to kill time.                          |
| 2. External regulation | One takes part in judo to avoid punishments                         | 3. Prizes     | 5. I wanted to get a black belt.                                                      |
|                        |                                                                     |               | 6. I reckoned I was more likely to get a prize if I learned judo because of my build. |
|                        |                                                                     | 4. Contests   | 7. Judo competitions gave me high tension.                                            |
|                        |                                                                     |               | 8. I wanted to participate in martial sports.                                         |

The 53 open codes were classified; the open codes with the same property and of the same dimension were aggregated under the same axial code. For example, the third and fourth open codes (3. Sometimes I did not know what to do; 4. I felt bored in the evening, so I took part in the judo club to kill time) were both conceptualized, and a theme of “having nothing to do” was set. The themes were all fixed in line with the research purpose. In this way, a total of 18 axial codes were obtained. As the induction of the axial codes is completed, it means that the thematic concepts of the research phenomenon were obtained. After that, selective codes were created to establish core categories (Chang & Chen, 2013). During the process of categorizing axial codes, the two scholars were invited to determine whether there were omissions. Moreover, hypotheses and questions were raised for each category and three researchers looked for proof for the categorization in the verbatim manuscripts, training logs, and players’ experience in judo competitions in order to verify the relationship between the categories. In the end, eight categories were obtained.

### **3. Results and Discussion**

Goldkuhl and Cronholm (2010) pointed out that the unique characteristic of the grounded theory is that a new theory obtained from the research results should not only be based on empirical data but also on existing theories. Based on the self-determination theory, this research is carried out based on the theoretical analysis of the literature; the eight categories, which range from the lowest to the highest level of autonomy, were generalized through an in-depth content analysis and fusion of the same or similar content. In addition, only the opinions that the three experts had simultaneously agreed on were sorted out and the meaning of the category was discussed until all the three experts agreed on it. The data obtained from the 21 respondents were clustered into three types. There was no baseline data before the intervention, so the researchers chose to use “indirect impact”, “secondary impact” and “major impact” to describe these three types of impact (Alberto & Troutman, 1995). Regarding the context in which a motivational factor involved little or some enthusiasm to participate in judo, “indirect impact” was used to describe the relationships between the motivation and persistence in judo training. Regarding the context in which a motivational factor involved more enthusiasm, “secondary impact” was used. As for the context in which a motivational factor involved full and active participation, “major impact” was used. Therefore, after the discussion, the meaning of the motivations that enable judo players to persist in judo training has been listed above. Furthermore, three different types of impact paths of training persistence were mapped based on the motivations that have different levels of autonomy or control, as shown in Table 3.

Table 3. Framework of the Motivations for the Participation in Judo Clubs on Campus



Pelletier, Fortier, Vallerand, and Brière (2001) pointed out that athletes are able to persist in practicing judo for a long time because they have an autonomous motivation. The more autonomous their motivation is, the longer they will persist in doing the sport. If they have high intrinsic motivation, their motivation will drive them to participate in the training spontaneously. Furthermore, this high intrinsic motivation will constantly drive them to achieve their goals (Tsaor, 2001; Chien & Tsail, 2009). Overall, the factors of the sports environment, like awards, competition, rewards, scholarships, and feedback from instructors, will affect the level of autonomy of students or players, which in turn affects the changes in intrinsic motivation, extrinsic motivation, and amotivation (Lu & Zhuang, 2008). The study of Chou (2006) has revealed that external rewards or incentives do not necessarily impede the intrinsic motivation. When individuals lack intrinsic motivation, moderate application of extrinsic motivation can stimulate interest and promote motivation in them. Moreover, the term “motivation” encompasses multiple properties, states, and change courses (Lee, 2003). In this aspect, the reasons for participating in judo, the state of thinking during the practice of judo, and the inner psychological process of training behaviors and emotions are constantly evolving. The research by Chen (2012) explored whether the extrinsic motivation for inducing continuous participation is internalized into intrinsic motivation by using a questionnaire.

#### **4. Conclusions**

The aforesaid exploration, contrast, and discussion on theories reveal that (1) motivation has three types of influence, namely major impact, secondary impact, and indirect impact. To explain in detail the motivation of YunTech students to participate in judo training, these three impacts should all be taken into account. (2) Internal motivation, external motivation and amotivation influence whether students persist in judo training. Among them, intrinsic motivation toward accomplishments and intrinsic motivation to know have the greatest impact followed by intrinsic motivation to experience stimulation and introjected regulation. Identified regulation, introjected regulation, external regulation, and amotivation exert a minimum influence on their persistence in doing judo.

The students who insist on practicing judo are mainly influenced by their intrinsic motivation (a high level of autonomy). In this aspect, various sports clubs are advised to provide satisfaction and support that meet psychological needs of their players and create a pleasant and health-promoting atmosphere when facing students who do not have sufficient confidence for sports and exercise habits. It is recommended that on-campus judo clubs should advocate doing judo for self-defense, physical fitness, and health when recruiting club members. In addition, it is advised to equip students with the advantage and value of the sport, make students experience and explore the pleasure of autonomous learning. In this way, students may regard judo as part of their college life and persist in doing judo out of their own will to improve their sense of self-determination and participate in judo competitions to achieve self-actualization. Furthermore, coaches and teachers are recommended to constantly change the motivational factors, cater to the interest of college students, and flexibly apply the factors that exert major, secondary, and indirect effects on determining whether college students persist in doing sports. In this way, instructors can enable university students to participate and persist in doing various sports. A majority of studies on sports motivation both at home and abroad involve the development and application of motivation scales. In this aspect, it is hoped that more qualitative research methods can be used to construct motivation concepts in the future to boost interest in quantitative and qualitative research on sports motivation.



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## **SuCraft: promoting dialogue in elementary schools about cities and citizenship with the crafting of physical and virtual mockups**

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### **Abstract**

*This project aims to propose, implement and test a pedagogical strategy to promote dialogue in elementary schools about cities and the rights, duties and responsibilities of citizens. Initially applied in public and private schools in São Paulo – Brazil, the strategy under development has an inclusive and global scope for having low-tech stages such as the construction of urban equipment models with scrap materials and promoting steps of hi-tech complexity as 3d scanning and level game design, using open software and hardware. Students and teachers are protagonists in the construction of physical and virtual models in a dialogic and reflective conception about what is the ideal, the real and the possible city. In addition to this empowerment about cities and citizenship, they participate and learn with the technological process of crafting urban equipment mockups, 3D scanning and game design, in the construction of the virtual city. Each group can create its ideal city and interact with other virtual cities through a sharing, discussion and interaction cloud platform to be developed and made available. The project was named SuCraft to join the words "sucata" (scrap in Portuguese) and "craft" (with the meaning of making and building) as reference to building games such as Minecraft. This paper presents the results of the firsts implementations and pretests of the project.*

*Keywords: Elementary School, Citizenship, Crafting, Mockup*

### **Introduction**

It becomes increasingly necessary that the critical view of cities as a portrait of social problems and inconsistencies is translated into propositional and inclusive projects. To think about the city is necessarily to consider the rights, duties and responsibilities of citizens so they can be participant and protagonist in the construction, monitoring and rearrangement of social, economic, political and cultural relations that occur in the collective space. For this to happen more efficiently, UNESCO (United Nations Educational, Scientific and Cultural Organization) is promoting since 2013 the Forum on Global Citizenship Education. The Global Citizenship Education is the effort that “aims to be transformative, building the knowledge, skills, values and attitudes that learners need to be able to contribute to a more inclusive, just and peaceful world” (UNESCO, 2015).

This concept of Global Citizenship Education by UNESCO (2015) is based in three cores described as:

1. Cognitive: To acquire knowledge, understanding and critical thinking about global, regional, national and local issues and the interconnectedness and interdependency of different countries and populations.
2. Socio-emotional: To have a sense of belonging to a common humanity, sharing values and responsibilities, empathy, solidarity and respect for differences and diversity.
3. Behavioural: To act effectively and responsibly at local, national and global levels for a more peaceful and sustainable world.

For this, education must be considered from the perspective that it is not possible to teach things mechanically only, but rather work the theory and the practice together, in which the actions provoked and developed are accompanied by conceptual reflections, discussions and ethical provocations (Carolei & Gamez, 2017). Thus, considering education that promotes reflection and maturity on citizenship should consider the conjunction of pedagogical strategies that with theoretical discussion and propositional actions.

In this context of theory-practice based education, it is important to emphasize the role of technology as a means to a formation process, especially in relation to the new generations of learners (Yanaze,

2012). Digital information and communication technologies are embedded transversally in various areas of human activity, including formal, non-formal and informal education. Thus, resources, activities and interventions that take advantage of the technological possibilities to maximize the educational objectives (medium) and even turn into learning outcomes (end) must be considered. According to Yanaze (2012), the concept of "techno-pedagogy" refers to all human-computer interactions that generate information and, therefore, knowledge and change.

To support this continuous process of research, product development - in this case, a pedagogical strategy for citizenship education - and improvement, it was considered appropriate the implementation of design science research (DSR) as the research method. This is because DSR is characterized as an approach that legitimates the development of artifacts as a means to produce scientific knowledge from the epistemological and philosophical point of view (Pimentel, 2017). Thus, the DSR is configured as a scientific method highly adherent to propositive projects that are based on processes of continuous improvement.

There is an opportunity and need to consider pedagogical strategies that promote the purposeful reflection on cities and citizenship, encouraging the protagonism and participation of students and teachers of elementary education in the formulation of projects for the city. In order to develop such pedagogical strategies allied to an investigative process, the design science research presents itself as an adherent research method that privileges the development of an artifact in a continuous process of research and improvement.

For this, the SuCraft research project aims to propose, implement and test a pedagogical strategy to promote dialogue in elementary schools about cities and the rights, duties and responsibilities of citizens. The pedagogical strategy of SuCraft is in development and has an inclusive and global scope for having low-tech stages such as the construction of urban equipment models with scrap materials and promoting steps of hi-tech complexity as 3d scanning and level game design, using open software and hardware using the maker culture in education (Halverson & Sheridan, 2014). The project was named SuCraft to join the words "sucata" (scrap in Portuguese) and "craft" (with the meaning of making and building) as reference to building games such as Minecraft.

Thus, the main objective of the SuCraft project is to support the development of a citizenship education strategy in the context of elementary education that promotes a reflexive and purposeful discussion about cities and citizenship through playful activities.

For this, the specific objectives are:

- To develop the protocol of research in design science research for the development of SuCraft as pedagogical strategy of education for citizenship;
- Apply SuCraft in school context for assessment, validation, and improvement.

## **Method and Materials**

SuCraft's methodological basis of development is the design of science research as the intention is to produce a pedagogical strategy as an artefact for citizenship education that supports purposeful research. SuCraft is composed of a variety of activities and interventions that seek to promote dialogue within a school context (the first hypothesis is to segment students from the context of elementary education), encouraging students to reflect on cities and the role of citizens and solutions in a dialogical way. The initial proposal of SuCraft considers the following activities, as systematized in Figure 1:

1. Discussion: directed debate among the students about the their concepts and understandings of city and citizenship;
2. Planning: students are encouraged to design the ideal city of the class, considering the main urban equipment needed and its functionalities
3. Physical materialization: Collective assembly of models of urban equipment using scrap.
4. Digital materialization: Scrap models are scanned or/and modeled in three-dimensional assets to compose an interactive virtual model, in digital game language;

5. Sharing: The virtual cities of each class are sent on a sharing platform to be accessible by other schools, classes and students, and to promote comparative and analytical discussion of city solutions.



FIGURE 1. Initial proposal of SuCraft's activity

This proposal is the starting point for the construction of SuCraft as a pedagogical strategy and probably will change with the application of science research design (DSR) as a method that continuously improves the artifact. This paper presents the results of the firsts implementations and pretests of the project.

### Results and Discussion

The pretest was applied with 5 children aged 8 to 11 years, on March 16, 2019. Following the order of proposed activities, in Activity 1 the children answered the following reflective questions with their respective research objectives:

| Question                                                 | Research objectives                                                                                                 |
|----------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
| Which cities have you visited?                           | Understand the children's experience and identify their aspirations about cities                                    |
| Which cities do you know and would you like to visit?    |                                                                                                                     |
| Which cities do you know and would not like to visit?    |                                                                                                                     |
| In a sentence, what is a city?                           | Explore children's understanding of cities                                                                          |
| What does a city need to have to function?               | What are the urban facilities that children consider essential                                                      |
| What does your city have that is good for its operation? | What are the urban facilities that children consider essential                                                      |
| What's missing in your city to work properly?            | How do children see the shortcomings of their city?                                                                 |
| How should the city work to improve your life?           | Investigate and conduct the child to reflect on their relationship with the city and its citizens' responsibilities |
| What should you do to help the city to be better?        |                                                                                                                     |
| What you should not do to help the city to be better?    |                                                                                                                     |

TABLE 1. Reflective questions and research objectives for initial conversation in SuCraft pretest

The responses were written in sticky notes (Figure 2) and then assembled in panels per question (Figure 3).



FIGURE 2 – Children responding to reflective questions



FIGURE 3 – Compilation of children's responses

Then, in Activity 2 (Planning) and Activity 3 Physical materialization), with scrap materials (Figure 4) the children planned and made (Figure 5) urban equipment models (Figure 6) according to the priorities previously discussed about what an ideal city needs to have.



FIGURE 4 – Scrap material



FIGURE 5 – Using the scrap material to make urban equipment models



FIGURE 6 – Urban equipment models of Sucraft in pretest

The children chose the fictional name Lugia for their city – reference to a Pokémon (cartoon/game) character. And they decided to make the following urban equipment models: a house model, an apartment model, a tree model, city hall, fire station, police station, hospital, school and university.

Then, to the Activity 4 of digital materialization, the photogrammetry and three-dimensional scanning processes were first attempted. Both processes proved to be very slow resulting in virtual models with various mesh and texture information gaps and with a lot of polygons, which is very inefficient for the graphic processing of a game level design platform. The solution adopted was to model the mesh using the open source software Blender and work with the composition of the scrap model photos to create the texture based on the children's production (Figure 7).

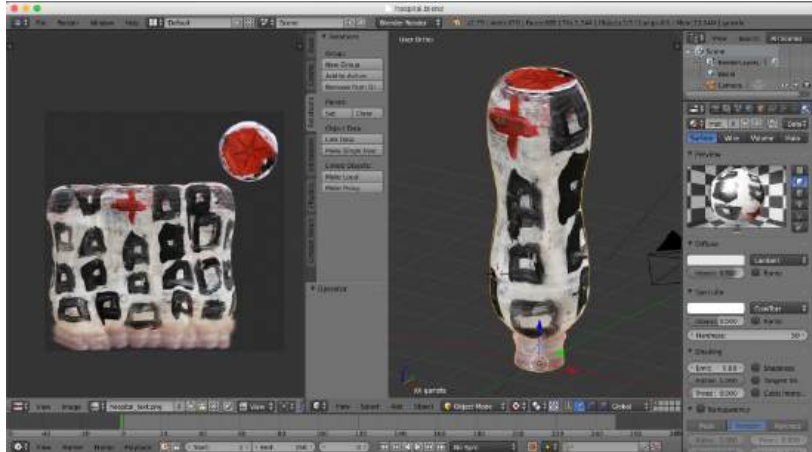


FIGURE 7 – Digital modelling and texturing process of the hospital scrap model in Blender

The Activity 5 of building and sharing the virtual city based on the children's scrap model was done in the Unity game engine, Personal version (free). It was possible to compile a version for the web to be accessed by any browser (Figure 8, hosted in the link: <http://www.leyanaze.com/lugia/>) and another to be used with Cardboard VR system (Figures 9 and 10, more details in: <https://vr.google.com/cardboard/>).



FIGURE 8 – Web version of Lugia, the city builds in Sucraft's pretest





FIGURE 9 – VR version (Cardboard) of Lugia, the city builds in SuCraft's pretest



FIGURE 10 – One of the participating children riding the VR version of Lugia

As expected in the design science research process, many lessons have been learned and SuCraft's developing pedagogical strategy needs to be redesigned primarily in the points presented in the Conclusions topic. But in general, the results of this pretest demonstrate the possibility of validating the hypothesis that a playful pedagogical strategy can support the citizenship education at the level of an initial reflection on the city and citizenship. Promoting the creativity of children through the maker culture can encourage the protagonism and initiation in the process of participation in propositions and solutions for the city.

### **Conclusions**

SuCraft is a research project that aims to develop a pedagogical strategy for citizenship education. As a strategy, various activities and resources will be continuously applied and tested in order to offer diverse possibilities for different contexts. The premise of using the maker culture with scrap materials and the logic of construction games such as Minecraft reinforces the creativity and protagonism of

children, promoting their interest and engagement in the theme, in this case, reflection on cities and citizenship.

In this pretest it was possible to identify a motivated and engaged participation of the observed children. However, some issues have been noticed and should be considered in future applications, such as:

- There was anxiety of all of the children in being able to see the digital result, since the adopted technological strategy resulted in a couple of weeks to develop and to share the virtual version of the city without their direct involvement;
- It is necessary to consider a greater participation of children in the technological process for the construction of the virtual version of the city;
- It is necessary to implement structured tools of observation and evaluation to collect data during the application of SuCraft to investigate if the reflection on the city and citizenship has in fact improved between the participants.

For this, the development of a platform in which children will not have to worry about three-dimensional modeling from the scrap models but will focus on the design of the textures to be applied in pre-determined models, is under study. Thus, in this new platform, the children will be able to focus on creating the textures of the urban equipment and the construction of the virtual city, getting closer to the concept of construction games. In this way it will be easier, including establishing the shared visualization of the various virtual cities among the various children, classrooms and schools.

This pretest phase of SuCraft's project was essential to test the proof of concept and learn lessons for its improvement. It is concluded that it is possible to create a pedagogical strategy that supports education for citizenship through activities and technologies that promote creative authorship and, therefore, the children's engagement in thinking about city and citizenship.



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**Title: Transformational Improvement in Learner's Mathematical Skills by Integrating a Mixture of Technologies.**

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**Abstract**

*Many Mathematics teachers encounter issues such as students' inability to: solve problems, relate mathematical concepts, fully recall the previous lesson or even justify concepts or procedures. These challenges have affected both teacher and students' confidence in Mathematics Education. Could a technologically diverse programme be developed to meet the needs of students who are weak at Mathematical skills such as: reasoning, problem solving and critical thinking and simultaneously learn mathematics in an integrated conceptual way? This research provides a solution to these issues. The research was designed by creating guided conceptual activities in everyday context which students should be able to identify with readily. The activities were designed to stimulate critical thinking, encourage collaboration, enhance long term memory and develop creativity. Each activity has a collection of skill guides integrated such as: Problem Solving and Conclusion Guide. Video recordings of either blank or completed activity sheets or just passive teaching sessions were made. Students were placed in groups and given varied combinations of activities and video or video only. Students who were exposed to a combination of activity sheets, blank recordings of activity sheets and subsequently videos of classes going through the topics scored 30 - 50% better than all other groups. These are general results which indicate that there is indeed a way to develop various Mathematical skills in students and improve their grades.*

*Keywords: Mathematical concepts; conceptual activities; problem solving; Mathematics Education.*

**Introduction:**

Efforts to design conceptual activities that: allows students to gain long learn knowledge and understanding through; guided discovery were yet to be developed. These conceptual activities will be required to foster the development of critical thinking, reasoning and problem solving skills, present Mathematical concepts as being related and further promote creativity through Project Based Learning (PBL). Many schools that seek to develop these skills in their students, normally do so without a clear structure. Many teachers would give the students a question, ask them what they understand; the student may or may not be able to answer, nevertheless teachers expect the students to be able to naturally follow through and answer the question. These teachers are not mindful of the fact that some of the students do not have a mental road map for getting to the answer and as such will have to help them create the mental road map for critical thinking etc. Many teachers still believe that problem solving means doing worded questions and not the ability to answer unfamiliar questions correctly. The ability for students to relate one concept to the other is an essential skill for Mathematics Education. Many of our students are unable to start Mathematical problems on their own and as such, once they are faced with an unfamiliar task, frequently cry out to say that they do not understand. This is clearly because of the lack problem solving skills. It is a known fact that many teachers shy away from allowing students to undergo constructive struggle; in the name of completing the curriculum in time. Additionally, sometimes because the teachers themselves lack conceptual understanding of Mathematics which is essential to an instructors' ability to guide a student in the way required for them to develop the skills. According to; Elizabeth L. Bjork and Robert Bjork, (2009) (5) "learning requires an active process of interpretation and desirable difficulties in order to learn for the long term." Many learners are unable to think critically. Critical Thinking Skills are effective means of enhancing students' understanding of Mathematical concepts because the skills help in interpreting, analyzing, evaluating, and presenting data in a logical and sequential manner (Asuai Nelson Chukwuyenum, 2013) (2). Critical Thinking may also involve logical reasoning an ability to separate facts from opinion and to examine information critically with evidence before accepting or rejecting ideas and questions in relation to the issue at hand. In other words, it makes individuals think, question issues,

challenge ideas, generate solutions to problems and make intelligent decisions when faced with challenges (Semil, 2006)(1). Reasoning is another challenge that students face on a daily basis. Once students cannot think critically they will not be able to reason, lack of ability to reason means that they will not be able to solve problems and lack of ability to solve problems will result in their inability to relate concepts. In the Caribbean, only a mean (average) of 21% of all students score 50% or more on the Paper 2 during the May/June sittings of the Caribbean Secondary Examination Certificate; CSEC Mathematics Examination for the period 2004 to 2017 (see Appendix A1). At no point in recorded history, did more than 30% of any cohort of students scored 50% or more on the Paper 2 of the Examination. It is Paper 2, the structured paper and not paper 1, which is multiple choice that really examine students' Mathematical skills. These results clearly indicate that something is fundamentally wrong with how the students are being taught mathematics. This study provides a combination of heavily researched methods and technology in a strategic design to solve these problems.

### **Objectives:**

The objectives of this study are to: Determine if students' strength in English Language affects their Mathematics performance, determine which of four ways is the best for developing Mathematical skills in students who are poor or average performers in English Language and provide an effective way to learn Mathematics which uses a mixture of technology and methods to develop students' Mathematical skills, conceptual knowledge and understanding simultaneously. To do this, comparisons were made between the uses of four different teaching methods in promoting the development of the various Mathematical skills. The results were recorded in tables and graphs and analysed in order to meet the objectives of the study.

### **Hypothesis:**

Null hypothesis: There is no significant difference between the methods used in the control group and any of the combinations of methods and technologies used in this study. Alternative Hypothesis: Based on the design of the conceptual activities and the combined technologies, there should be a significant difference in performance of students with reference to skill development and content understanding and retention.

### **Methodology:**

**Research design:** To achieve the objectives, students were given pre and post-tests. In order for a student to qualify to participate in this study, the student must have a baseline score of 70% for conceptual knowledge in Algebra: simplification; excluding factorization, equation writing from patterns and solving equations in two steps for one unknown value. Students were classified into three classes. Class one (1) was comprised of students who were considered as focused, with good or very good command of English Language. These students scored 60 to 100% in a general English Language Examination. Class two (2) comprised of students who were considered as focused, with poor or average command of English Language; these students scored 10 to 50% in a general English Language Examination. The control class was a mixture of students of the types in classes one and two. This class was called class three (3). Students of each class were further separated into four groups; a control group and three experimental groups called group 1, 2 and 3. This yielded a total of 12 classes of students; four from each of the three distinct classes. Each group including the control, had a total of thirty (30) students; of which ten (10) were assigned from each of the three classes of students. The content was divided into eighteen (18) general objectives and four (4) units as outlined in appendix A. The students were given a standardized unannounced assessment one (1) week after the end of the particular objective, unit and course; the post-test. Each assessment was designed to measure three general skill areas; conceptual knowledge, mathematical comprehension and mathematical reasoning; to include solving problems. Participants were asked to: refrain from additional Mathematics support classes, only use learning material directly provided by their teacher and review their previous class for only 1 hour, after

class, on the day of the class. All groups were required to spend only fifteen (15) minutes at the beginning of a new class, reviewing a previous lesson. All review sessions were done in a similar way during the period of this study. Where a student was absent from school, both the student and the teacher is responsible for organizing lesson makeup time. Unpaired t-test was used to determine the degree of significance between classes in groups. The investigation was repeated once to validate the initial results.

**Participants:** A total of 120 High School students participated in this study. Of this number 62 were females and 58 males between the ages 15 to 17.

**Procedure:** Simple random sampling was used to assign each student of the specific class to one of the four groups. Students of each class in the control groups, were the first to be studied. These students were taught Mathematics conceptually in a general passive way; i.e. the teacher is the source of information, dominates the class; presented strands as being unrelated, teaching by giving examples and following with general blocked practice; questions requiring the same strategy to derive the answer. Additionally, students were given lesson summary, critical thinking questions to answer. Subsequently, each lesson was repeated once, within a stipulated period as outlined in Appendix A. Following which, the students were given written assessments, in the order of: end of objectives, unit and post-test. Their marks were recorded as outlined in table 1 overleaf. Students of each class in the first experimental group #1, were the second to be studied these students were given interconnected, conceptual written activities which presented Mathematics, using straight forward language in a completely student-centered approach. The instructions were such that the student appeared to be having a conversation with the writer, who was guiding them in understanding mathematical concepts. The subject was presented using concrete methods followed by abstract, and all concepts were presented as being related. Once students completed a major objective, they were then navigated by the writer to undertake minor projects, thereby employing **project-based learning**, which is known to solidify understanding while developing **creativity** and **application skills**. At the end, students were given a major project. This integrated all concepts presented in previous activities (see appendix C for sample). Active learning formed the foundation of the conceptual activity sheets. Concepts were linked to real life situations. **Cooperative, Collaborative and Project Based Learning** were emphasized significantly. Student's problem solving skills were addressed by having students use a problem solving guide provided to come up with answers to abstract questions. Student's critical thinking skills were addressed by having students use a three (3) step approach, critical thinking guide to make decisions about what to do in each activity. Student's reasoning skills were addressed by having students use a conclusion, justification, explanation guide and by interrelating concepts. Student's long term knowledge retention skills were addressed by adequately spacing concepts in the activities in an interrelated way, having students do peer teaching, employing verbal repetition and doing interleaved practices. Student's Mathematical comprehension skills were addressed through the learning of Mathematics in an interrelated conceptual way and by using an application guide (See appendix B and C) for sample. Each activity was interconnected to previous activity while meeting the specific objectives. During each activity, the teacher's role was reduced to being a director to the various guides and to pose directional questions if the students were unable to complete an aspect of the activity. Once the student completed an activity, including lesson summary, critical thinking questions within the stipulated time as outlined in appendix A, the students were asked to repeat the activity following which, a video recorded lecture covering the said objectives was shown to the students. At the end of each group of objectives, interleaved practice questions were done by the students; each question required a different strategy to get to the answer. The students were assessed in the order of end of: objectives test, unit test and course test; post-test and their marks recorded as outlined in the table 2 overleaf. Students of each class in the second experimental group #2, were the third group to be studied. These students were given interconnected conceptual activity sheets similar to experimental group 1 (See appendix C for sample). The only difference between group 2 and group 1 was that group 2 had video recording with the teacher completing the activity sheets and not a general extended lecture as in group 1. This groups results were recorded in table 3 overleaf. Students of each class in the third experimental group #3, were the fourth

group to be studied. Video recordings of lectures were administered to the students. During the viewing of each video, the teacher's role was to pose questions in a particular way for the students themselves to answer. Once the student has completed a video covering specific objectives, including lesson summary, critical thinking questions within the stipulated time as outlined in appendix A, the students were asked to repeat watching the video. At the end of each group of objectives, blocked practice questions were done by the students. The students were tested and their marks recorded for each objective band. At the end of each unit, students were again tested and their marks recorded as outlined in the table in table 4 tested, eaf. During all practice sessions for each group, the teacher had a general class discussion, once students practice time elapsed. This was done to clarify each question's solution and elaborate on Mathematical concepts. At the end of the 40 hours stipulated for each group to complete learning of content and skills, a general written test was administered without notice. The test assessed: critical thinking skills, problem solving skills, reasoning skills, content knowledge and Mathematics comprehension. Fifty (50) percent of the reasoning questions were unfamiliar problems. Students were required to write their detail thought process in deriving their answers to questions. A comparison of each data set was done using t-test to derive a conclusion.

## Presentation of Data

| Control Group     | Mean pre-test score | Mean post-test score | Mean end of objective test score | Mean end of unit test score | Mean knowledge post-test score /30% | Mean comprehension post-test score /40% | Mean reasoning post-test score /30% |
|-------------------|---------------------|----------------------|----------------------------------|-----------------------------|-------------------------------------|-----------------------------------------|-------------------------------------|
| Class #1          | 15%                 | 59.8%                | 64.2%                            | 65.4%                       | 20.94%                              | 24.92%                                  | 13.94%                              |
| Class #2          | 5%                  | 29%                  | 35%                              | 30%                         | 13%                                 | 11%                                     | 5%                                  |
| Class #3; control | 5%                  | 43.3%                | 51%                              | 55.6%                       | 18%                                 | 13.3%                                   | 12%                                 |

**Table 1**

Table 1 above shows the mean (average) test results expressed in percentage for the control group of students for this study.

| Experimental Group #1 | Mean pre-test score | Mean post-test score | Mean end of objective test score | Mean end of unit test score | Mean knowledge post-test score /30% | Mean comprehension post-test score /40% | Mean reasoning post-test score /30% |
|-----------------------|---------------------|----------------------|----------------------------------|-----------------------------|-------------------------------------|-----------------------------------------|-------------------------------------|
| Class #1              | 15%                 | 86%                  | 78%                              | 89.4%                       | 28.55%                              | 31.8%                                   | 25.65%                              |
| Class #2              | 0%                  | 54%                  | 45.4%                            | 66%                         | 16.2%                               | 25.2%                                   | 12.6%                               |
| Class #3; control     | 15%                 | 69%                  | 53%                              | 64.3%                       | 22.4%                               | 27%                                     | 19.6%                               |

**Table 2**

Table 2 above shows the mean (average) test results expressed in percentage for experimental group #1 in this study.

| Experimental Group #2 | Mean pre-test score | Mean post-test score | Mean end of objective test score | Mean end of unit test score | Mean knowledge post-test score /30% | Mean comprehension post-test score /40% | Mean reasoning post-test score /30% |
|-----------------------|---------------------|----------------------|----------------------------------|-----------------------------|-------------------------------------|-----------------------------------------|-------------------------------------|
| Class #1              | 15%                 | 61%                  | 57%                              | 65%                         | 14.65%                              | 26.06%                                  | 20.94%                              |
| Class #2              | 5%                  | 55%                  | 40%                              | 50%                         | 21.6%                               | 22%                                     | 11.4%                               |
| Class #3; control     | 0%                  | 59%                  | 55%                              | 59%                         | 18.8%                               | 24%                                     | 16.2%                               |

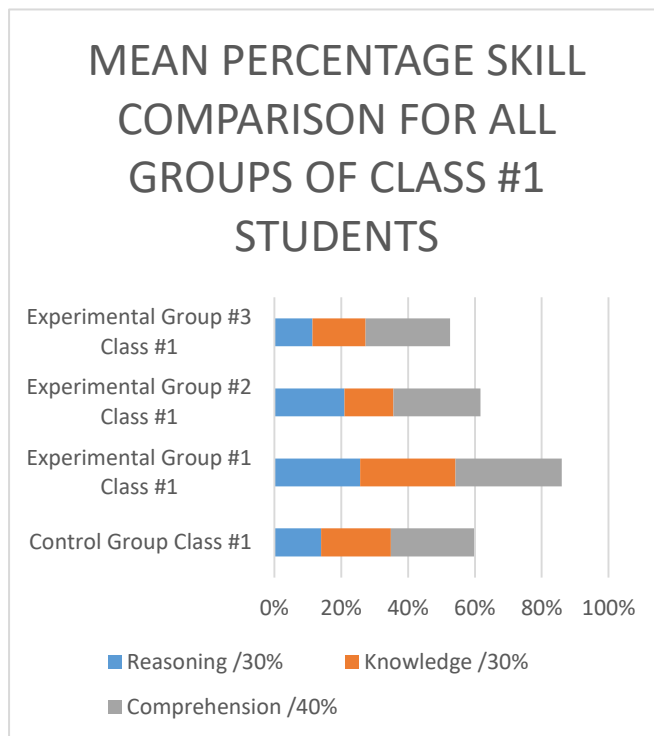
**Table 3**

Table 3 above shows the mean (average) test results expressed in percentage for experimental group #2 in this study.

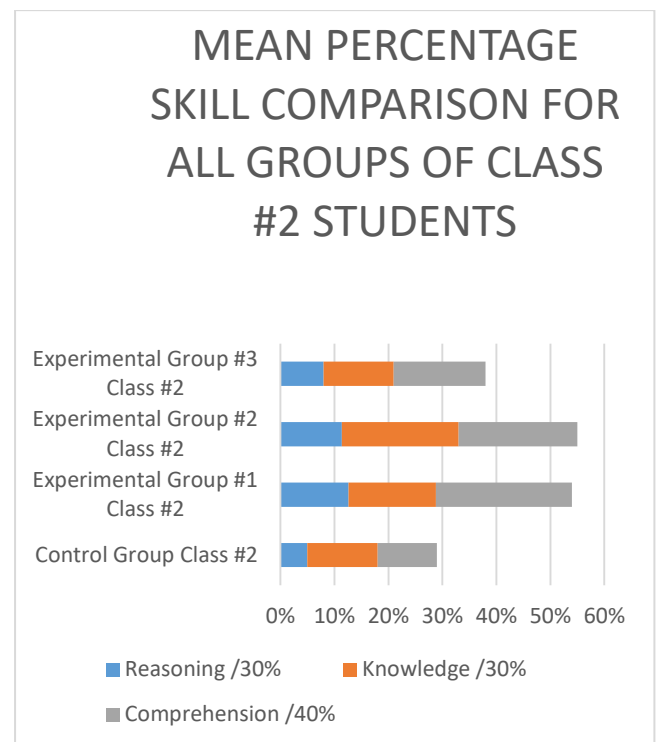
| Experimental Group #3 | Mean pre-test score | Mean post-test score | Mean end of objective test score | Mean end of unit test score | Mean knowledge post-test score /30% | Mean comprehension post-test score /40% | Mean reasoning post-test score /30% |
|-----------------------|---------------------|----------------------|----------------------------------|-----------------------------|-------------------------------------|-----------------------------------------|-------------------------------------|
| Class #1              | 15%                 | 52.6%                | 53.7%                            | 58.4%                       | 15.83%                              | 25.31%                                  | 11.44%                              |
| Class #2              | 4%                  | 38%                  | 44.2%                            | 48%                         | 13%                                 | 17%                                     | 8%                                  |
| Class #3; control     | 5.5%                | 49%                  | 57%                              | 57%                         | 16.6%                               | 18.2%                                   | 14.2%                               |

**Table 4**

Table 4 above shows the mean (average) test results expressed in percentage for experimental group #3 in this study.



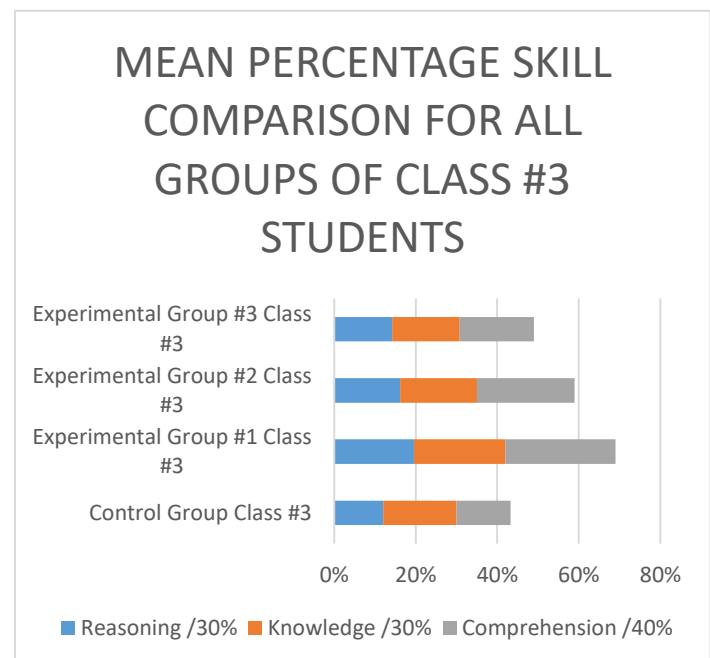
**Figure 1**



**Figure 2**

| Item      | Control Group Class #1 Mean(SD) | Experimental Group #1 Class 1 Mean (SD) | P          |
|-----------|---------------------------------|-----------------------------------------|------------|
| Post-test | 59.8% (10.135)                  | 86% (8.882)                             | P < 0.0001 |
|           | Control Group Class #2          | Experimental Group #1 Class 2           |            |
| Post-test | 29% (11.662)                    | 54% (9.556)                             | P < 0.0001 |
|           | Control Group Class #3          | Experimental Group #1 Class 3           |            |
| Post-test | 43.3% (14.16)                   | 69% (17.22)                             | P = 0.0018 |

**Table 5**



**Figure 3**

Table 5 above shows mean standard deviation and significance level for post-test differences between control group and experimental group 1.

### **Qualitative Observation**

The results of this study indicated that students who learnt primarily from conceptually guided activity sheets combined with lecture videos produced statistically significantly better quality written: outlines of their thought process in critically analysing problems, justification and conclusions for their answers to the unfamiliar questions in the final assessment. The quality of the responses for those students who belong to class #1, of experimental group #1 were significantly better than those belonging to class #1, of all other groups. Those students belonging to class #1, of experimental group #2, produced significantly better quality written responses to problems in comparison to students of the same class in the control group. There was no significant difference between the qualities of the responses for students of the same class in experimental group #3. The results compared similar to those described above for the other two classes of the various groups; namely class #2 and class #3.

### **Analysis of Data**

The data in tables 1 to 4 under presentation of data, indicates that Class #1 students' performance was statistically more significant than all other classes in this study, in both the post and pre-test. For the control group, class #1 students score on the post-test was between 16.5 - 30.8% better than all other classes. For experimental group #1, class #1 students performed 17 - 32% better than all other classes in this group. For experimental group #2, class #1 students performed 2 - 6% better than all other classes in this group. For experimental group #3, class #1 students' performed 2.6 - 14.6% better than all other classes in this group. The 'P' value for all classes in experimental group #1 and the control group, indicates that the difference in the results of experimental group #1 and the control group, ranged from being very statistically significant ( $P = 0.0018$ ) to extremely statistically significant ( $P < 0.0001$ ). The data also indicates that students of class #1, in experimental group #1, performed 25.36 - 46.3% better when assessed for conceptual knowledge, 14.35 - 17.2% better when assessed for Mathematical comprehension and 15.7 - 50.37% better when assessed for reasoning in comparison to all other groups. Class #2 students in experimental group #2, performed better when assessed for conceptual knowledge than all other groups for this class. However, students of the same class in experimental group #1, performed 8 - 35.5% better when assessed for Mathematical understanding and 4 - 25.34% better when assessed for reasoning in comparison to all other groups. Class #3 students, of experimental group #1, performed 12 - 19.33% better when assessed for conceptual knowledge, 7.5 - 34.25% better when assessed for Mathematical comprehension and 11.33 - 25.33% better when assessed for reasoning, in comparison to all other groups. The difference between the highest mean percentage post-test score of any one group; the experimental group #1 and the lowest mean percentage post-test score of the other groups; the control group is 57%. The difference between the highest mean percentage post-test score; the experimental group #1 and the next highest mean post test score of a different group; experimental group #2, is 25%. This gives a mean percentage difference score range of 25 - 57%. Though not included, all other experimental groups *P-value*, for the post-test shows no significant difference when compared to the control group. However, the results indicated that students of experimental group #1 and #2 performed statistically significantly better than all other groups at reasoning and problem solving tasks.

### **Discussion of Findings and Conclusion:**

The data indicates that the strength of students English Language skills significantly affects a student's skill development in Mathematics. This was evident in class #1 students performing better than all other classes in all groups in this study. There was clear indication that the general passive teacher centred, teaching method is not the most effective method for building Mathematical skill and conceptual knowledge, because it does not in most cases, automatically require any form of desirable struggle which is essential to accessing and building the neural pathways for skill development. One could argue that the use of this method only yield students who can successfully reason, critically think and solve problems; when they follow up with intentional practices for better understanding. For students who are not self-driven or required to do independent work, this method is not the best for teaching and learning Mathematics. The data also revealed that methods used in experimental group #1 was the most effective

to teach students who have poor or average command of English Language, because it supports the development of Language comprehension skills during the problem solving process, therefore helping to reinforce their confidence and command of the Language. The most effective methods by far based on the findings, were the methods used in experimental group #1. These methods proved to be ideal because they required the student to undergo desirable struggles in order to build the neural pathways and by extension the particular skills. Having undergone significant struggle to learn content by guided discovery with the use of the skill development guides, the students were able to become significantly more proficient at the various Mathematical skills. The video seemed to have served as solid reinforcement of previously discovered concepts which helped to boost the students' performance on the post-test. Students of experimental groups #1 and #2 performed better at reasoning and problem solving tasks, because they had continuous mandatory training in the development of these skills in comparison to all other groups in this study. One can conclude based on the findings, that combination of methods used in experimental group #1, is an effective way to learn Mathematics which uses a mixture of technologies and methods to develop students' Mathematical skills, conceptual knowledge and understanding simultaneously. Based on the *P*-values obtained for comparison between the control group and experimental group #1, the null hypothesis is rejected.

**Recommendations:**

Teachers should begin to integrate skill learning and development guides in their lessons and allow students to undergo desirable struggles. Integrated guided conceptual activity sheets should become a mandatory part of Mathematics Teaching and Learning; for this will allow students to learn and develop their critical thinking and problem solving skills.

**Acknowledgement:**

My heartfelt appreciation goes out to the Tacky High students who participated in the math trials, which have helped me in undertaking this study. To the Mathematics department and other teachers who spent the time engaging me in constructive discussions. These discussions were enlightening. I must also express special thanks and acknowledge Tyrone Brown, Secondary, Math Coach, Region 2, whose invaluable contribution has greatly enriched the designing of activity sheets. Thank you for the time spent knocking 'proverbial horns' with me to ensure that the students get the very best.



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## Appendices:

### Appendix A1:

[https://www.caribexams.org/m\\_pass\\_rates](https://www.caribexams.org/m_pass_rates)

<https://cxc-store.com/csec-mathematics-syllabus-specimen-paper-mark-scheme-and-subject-reports-ebook.html>

## Appendix A

### Appendix A

#### UNIT 1

|                                         |             |
|-----------------------------------------|-------------|
| THE CARTESIAN PLANE                     | 100 minutes |
| INTRO TO REACTIONS AND GEOMETRIC SHAPES | 80 minutes  |
| NATURE OF LINES                         | 100 minutes |
| RELATIONS BETWEEN LINES                 | 120 minutes |
| RELATIONSHIP BETWEEN STRAIGHT LINES     | 120 minutes |
| CURVES AND TRANSFORMATION               | 200 minutes |
| SKETCHING CURVES                        | 120 minutes |

#### UNIT 2

|                                                     |             |
|-----------------------------------------------------|-------------|
| PROPERTIES OF LINES AND ANGLES                      | 200 minutes |
| RELATION BETWEEN RIGHT ANGLE TRIANGLE AND ITS SIDES | 440 minutes |
| ANGLE OF ELEVATION AND DEPRESSION                   | 20 minutes  |
| RELATION BETWEEN NON RIGHT TRIANGLE SIDE AND ANGLE  | 80 minutes  |
| COSINE RULE                                         | 80 minutes  |

#### UNIT 3

|                                             |             |
|---------------------------------------------|-------------|
| QUADRILATERALS AND PROPERTIES               | 180 minutes |
| CIRCLES                                     | 220 minutes |
| RELATION BETWEEN CIRCUMFERENCE AND DIAMETRE | 80 minutes  |
| SOLIDS                                      | 120 minutes |

#### UNIT 4

|                                 |             |
|---------------------------------|-------------|
| ABSTRACT ALGEBRA                | 300 minutes |
| INVERSE AND COMPOSITE FUNCTIONS | 70 minutes  |

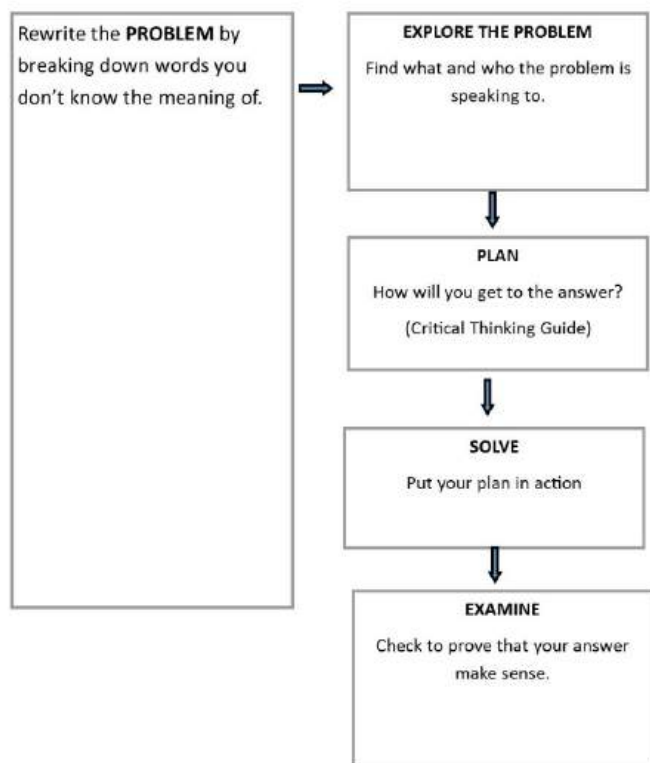
## Appendix B:

### CONCLUSION GUIDE

Look for similarities in results.

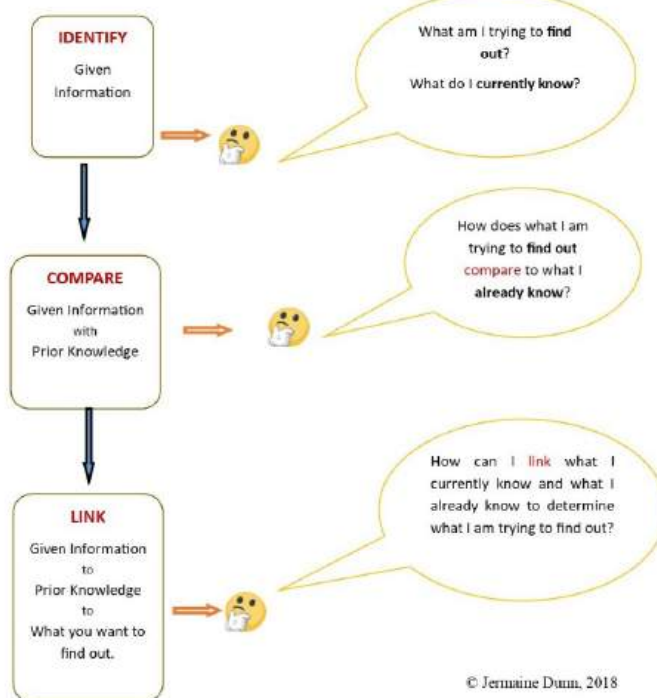
Make a general statement about the similarities identified.

### Problem Solving Guide



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### Critical Thinking Guide



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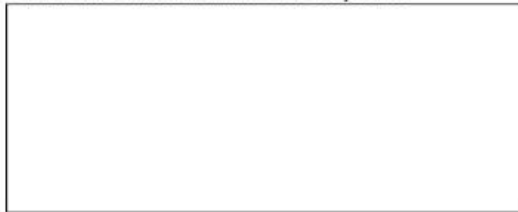
## Appendix C: Sample Conceptual Activity sheet

### Activity #4.2 RELATIONSHIP BETWEEN STRAIGHT LINES

1. Write down the function that describes the relations in item 3.1.1.7, 3.2.8 and 4.1.7 above. \_\_\_\_\_

2. Copy the description of these lines below. Do this quickly! \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

3. Now that you have the descriptions of the lines and the function that describes them. Look at which element in the description matches the terms in the algebraic representation (function). Just write your functions below and label what matches. Work in Groups of three.



4. What pattern are you seeing emerging in activity 4.2.3 above? \_\_\_\_\_

5. Please STOP for a minute and think about this, then take two minutes and discuss with your partners.

**NOTE:** This is called the **EQUATION OF A STRAIGHT LINE**. ALL lines have this general equation. The y-intercept will be called 'c'.

6. Tell me, what is always changing in the functions above as time goes by to form the straight line? You may look at item 4.1.7 above to help you see this. \_\_\_\_\_

7. Johnathan lives at the point (1, 5) and needs to get to the grocery store. His GPS told him to get to the points (2, 8) and (3, 11) from his house.

8. Graph Johnathan's path on the "DB" and on the Cartesian plane below (figure 6). Assume each square measures 1 cm X 1 cm and Johnathan's movement is in centimetres (cm)

### CRITICAL THINKING QUESTIONS

1. Is it possible for the slope of a line to be zero? Justify [Analysis]. You may use the justification guide to help you. \_\_\_\_\_

2. Do all lines have the same y-intercept? Explain why or why not. You may use the explanation guide to help you. [Analysis] \_\_\_\_\_

3. Can a line not intercept the y-axis? Justify [Analysis] \_\_\_\_\_

4. Is it possible for a line to have an x-distance where  $y = 0$ ? Justify your answer. \_\_\_\_\_

5. Do all points on the same line yield the same y-intercept? \_\_\_\_\_

### PBL- MINOR PROJECT [ANALYZING AND CREATING]

1. In groups of 5 you are going to design a road network that has five lines. All lines must connect and at least one must be a diagonal. You are to use a scale of 1 cm to one 1 cm on the x and y axis for your graph of the network.

2. Label each line A-E

3. Determine the equation of each line (road)

4. Each member of the group should find the equation of one line

5. Members should all discuss the equations to validate them.

6. I need you to Identify the different ways each line may relate to each other (parallel, perpendicular, intersecting) **This should take you 10 minutes maximum to complete**