Emilio Aguinaldo College-Cavite

Journal of Multidisciplinary Research

ISSN 2651 - 7779 Volume 2 No. 1 November 2018

Faculty Research Journal

Emilio Aguinaldo College-Cavite

FACULTY RESEARCH JOURNAL

EMILIO AGUINALDO EDUCATIONAL CORPORATION

BOARD OF DIRECTORS

DANILO L. DOLOR
Chairman of the Board
Director

JOSE PAULO E. CAMPOS, Ed.D
President, Emilio Aguinaldo College
Director

ATTY. PAULO E. CAMPOS, JR.
Treasurer/ Corporate Secretary
Director

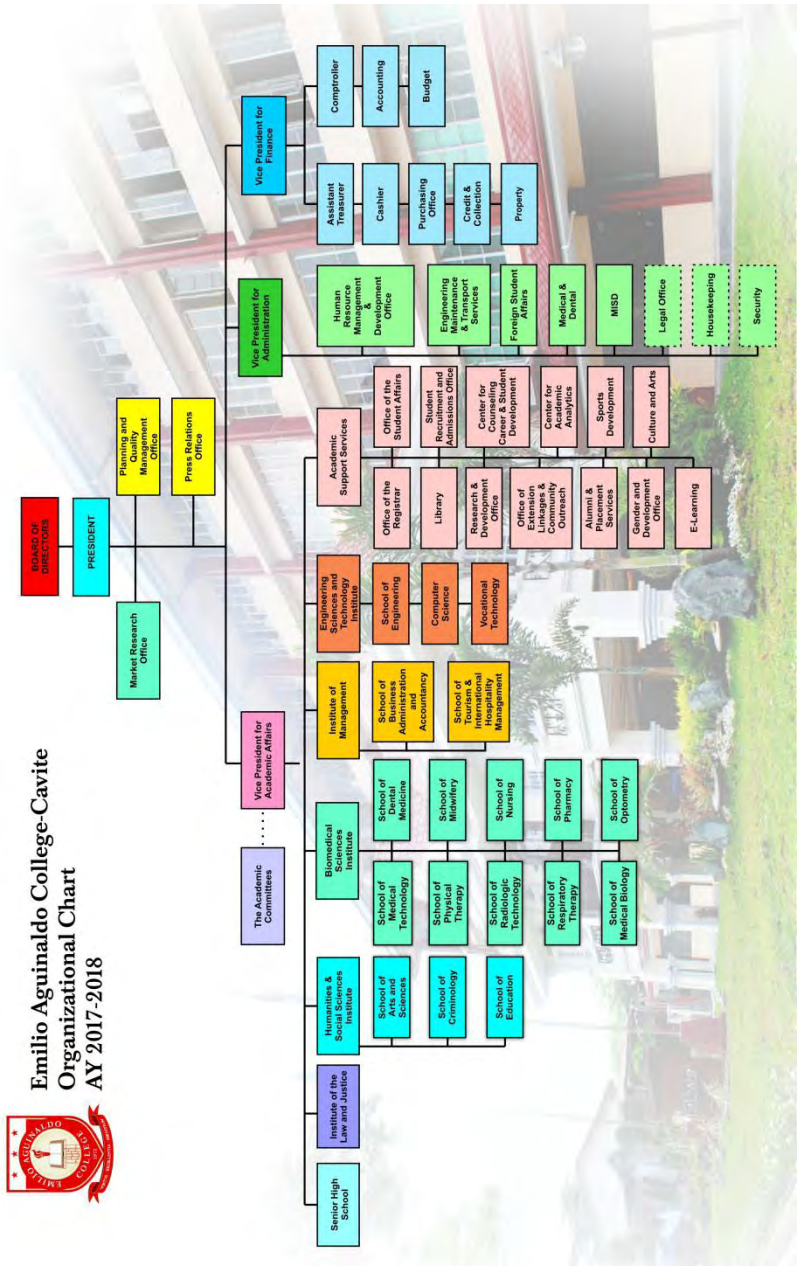
ENRIQUE E. CAMPOS, M.D.
Director

MA. SOLEDAD D.S. DE LEON
Director

LEANDRO M. DE LEON, M.D.
Director

ASUNCION L. ABAYA-MORIDO, M.D.
Director

EAC ORGANIZATIONAL CHART



Brief History of Emilio Aguinaldo College

The beginnings of Emilio Aguinaldo College - Cavite are attributed to Dr. Paulo C. Campos, then President of the University Physicians Services Incorporated (UPSI), which acquired the Marian College in Manila in 1973. Eventually, the school became Emilio Aguinaldo College.

With the various socio-economic developments and related circumstances during the Marcos regime, UPSI decided to open a new campus in Dasmariñas, Cavite, which is the hometown of Dr. Campos. This is to support the government's policy on the dispersal and decongestion of the student population in Metro Manila, particularly in institutions of higher learning. The policy also aimed to introduce regional development and democratization of opportunities in the rural areas (Campos, 2008).

Emilio Aguinaldo College in Bagong Bayan, Dasmariñas, Cavite was opened on March 17, 1978. Its opening coincided with the efforts of the then President, Ferdinand E Marcos and wife Imelda Marcos, who was the Minister of Human Settlements and Community Development, to remove the slum dwellers from the streets and under bridges of Manila and relocate them to Cavite. Dr. Campos proposed to the government through the Secretary of Education, Juan L. Manuel, to offer a tertiary school in Dasmariñas, Cavite patterned after the Emilio Aguinaldo College that had been approved in Manila (Campos, 2008).

Consequently, a campus comprising 29 hectares was established. In 1976 to 1978, UPSI developed over a dozen school facilities including school rooms, laboratories, a library, social hall, an administration building, dormitories, an Olympic oval, a landscaped campus, and a man-made lake. They also built a network of roads that covered the whole campus and dormitories (Campos, 2008). A commitment to improve the lives of the underprivileged sectors of the community motivated EAC-Cavite to offer courses in Dressmaking, High Speed Machine Operation and Ceramics. All programs were structured either for six months or two years of intensive study and training.

In the following year, owing to the permit granted by Minister Juan Manuel of the Ministry of Education and Culture, EAC-Cavite opened the College of Criminology, listing among its students the police forces in Cavite as well as the members of the Philippine Constabulary and the security guards of the establishments in the vicinity. In addition, the Graduate Program leading to the degree of Master of Arts in Teaching was offered to provide the school teachers with professional and academic advancement and opportunities. Envisioned, too, were the programs for Master of Science in Nursing and Master of Arts in Education.

On October 21, 1979, General Emilio Aguinaldo Medical School Foundation Inc. (GEAMSFI) was established in Dasmariñas, Cavite, thus giving birth to the Emilio Aguinaldo College- Cavite of Medicine with Dr. Lourdes E. Campos as Dean. In its first year of operations, the College had 150 students. The University Medical Center (UMC), which was built in 1980 and opened in 1983, served as the training center for the health science students of the College of Medicine and other health science courses.

In 1980, UPSI formed the Yaman Lahi Foundation, Inc. (YLFI) to manage and operate both Manila and Cavite campuses.

In 1986, when Dr. Paulo Campos was not in perfect health anymore, Brother Andrew Gonzales of the De La Salle University (DLSU) expressed the University's interest in acquiring the EAC College of Medicine and the University Medical Center (UMC). Since his UPSI colleagues were not ready to take over, Dr. Campos decided to transfer the ownership and responsibility to this worthy and credible institution.

It was in June 1987 when De La Salle University finally took over the management and the administration of two campuses from UPSI: the 29-hectare campus in Bagong Bayan, Dasmariñas and the 1.5 hectare Health Science Campus along Congressional Avenue. Included in the transfer were the two big buildings which had a length of 100 meters, 17-meter wide and seven levels of floor area with two elevators, including a basement, ground floor, and rooftop for water tanks and for viewing purposes. The 29-hectare property in Bagong Bayan had a dozen buildings that included classrooms, two administrative units, Olympic oval, network roads and a landscape that included a lake, teaching facilities, hospital equipment, a modest library and a historical museum. After that, the EAC Administration focused on the development of EAC-Manila.

EAC-Cavite reopened in 1996-1997 as a vocational technical school – Center for Technical Education and Skills Training (CTEST) - in a lot along Congressional Avenue (now Mangubat Avenue) which UPSI bought. In 1998, after the completion of five buildings, the voc-tech school became the EAC-Cavite campus and all academic courses were opened except medicine.

In 2001, under the leadership of Dr. Jose Paulo E. Campos, the first son of Dr. Jose Paulo E. Campos, the school administration strengthened the curricula of existing academic programs and opened new courses aligned with emerging trends. In 2003, the Commission on Higher Education (CHED) granted government recognition to AB Communication, Psychology, Business Administration, Accountancy, Computer Science, Secondary Education, and Hotel and Restaurant Management.

The other academic programs soon followed. In 2005, Elementary Education, Civil Engineering, Mechanical Engineering, and Diploma in Graduate Midwifery earned government recognition, followed by Nursing and Criminology in 2006; Customs Administration in 2007; and Computer Engineering and Electronics and Communication Engineering in 2010.

In 2008, the Technical Education and Skills Development Authority (TESDA)-registered vocational-technical courses, namely, Automotive Servicing, Computer Hardware Servicing, Consumer Electronics Servicing, Machining, and Programming were offered. In response to the emerging trends on health sciences, real estate and tourism, the administration opened Medical Technology, Physical Therapy and Radiologic Technology in 2011, Doctor of Dental Medicine and Real Estate Management in 2012, and Bachelor of Science in Midwifery and Tourism Management in 2015.

In its quest to achieve excellent standards in higher education, the institution participated in the accreditation by the Philippine Association of Colleges and UniversitiesCommission on Accreditation (PACUCOA), thus, receiving Level 1 Accredited Status in Nursing, Psychology, Criminology and Hotel and Restaurant Management programs in 2015 up to 2018. Likewise, Elementary Education, Secondary Education and Business Administration programs were granted Candidate Status until 2017.

Along with the commitment to innovate, the institution inaugurated the *Bulwagang Aguinaldo* in 2012, which was the replica of the Aguinaldo Shrine in Kawit, Cavite making it the ideal venue for the annual Philippine Independence Day Celebration held by the city government of Dasmariñas. The modernization of Buildings 3 and 4 which house the Life Science Institute, Engineering Science and Technology Institute, and School Library were completed in 2014. These developments sought to meet the needs of the growing student population.

In adhering to the call of the Department of Education (DepEd) headed by Secretary Bro. Armin Luistro to enhance the basic education program in the country, the institution earned the permit to implement the Senior High School programs in April 2015. This paved way for the restructuring of Building 5 for Senior High School and Building 6 which housed the new canteen and multi-purpose hall. The Senior High School started its operations and welcomed its pioneer batch in June 2016.

The institution strives to explore more avenues to serve its community and undertake worthwhile development programs towards its continuous transformation as a responsive and competent institution, as its Founders envisioned it to be.

Special acknowledgements are accorded to Dr. Lourdes E. Campos (co-Founder), Atty. Paulo E. Campos Jr. (Director, EAEC), Dr. Jose Paulo E. Campos (EAC President), Dr. Georgina B. Palmario (Vice President for Academic Affairs), Ms. Maria Teresa Santos (Chief Librarian) and Ms. Shelley Anne C. Martinez (Executive Assistant) for their contributions to this manuscript.

PHILOSOPHY

Emilio Aguinaldo College is a private, non-sectarian, co-educational institution of learning that fosters equal and fair opportunities for the holistic development of the persons concious of their national identity and their roles in the global community.

VISION

Emilio Aguinaldo College envisions itself as an internationally recognized autonomous academic institution rooted in its nationalist tradition that consistently pursues the advancement and welfare of humanity.

MISSION

Emilio Aguinaldo College provides an outcomes-based education with relevant curricula geared towards excellent research, active industry cooperation and sustainable community extension.

CORE VALUES

Virtue

Emilio Aguinaldo College integrates knowledge and understanding among Emilians equipping them with wisdom to choose to do only the right thing.

Excellence

Emilio Aguinaldo College inculcates among Emilians the habit of doing only the best in all undertakings.

Service

Emilio Aguinaldo College develops among Emilians a strong sense of duty and responsibility of helping others for the school, community, country and Mother Nature.

EDUCATIONAL OBJECTIVES

The objectives of Emilio Aguinaldo College are to:

- offer opportunities for quality and relevant education to all;
- cultivate the intellectual, spiritual, moral, social and physical aspects of a person;
- instill appreciation and pride for one's national identity; and
- produce graduates of global quality equipped with competencies in their field of expertise.

QUALITY POLICY

Emilio Aguinaldo College commits to the continuous improvement of quality standards with emphasis on instruction, research and community service to benefit its stakeholders.

QUALITY OBJECTIVES

The objectives of the Emilio Aguinaldo College are to:

- Adhere to all statutory and regulatory standards;
- Provide consistent quality service to the students, parents and other stakeholders; and
- Respond to periodic system review for continual improvement on quality standards.

TABLE OF CONTENTS

Baiting, isolation and characterization of lytic bacteriophage from a sewage using hospitalacquired methicillin resistant *Staphylococcus aureus* (HA-MRSA) Host Cells

Supachai A. Basit, Patrick Jumar S. Buenaflor
and Charmaine Peralta

School of Medical Technology, Emilio Aguinaldo College Cavite

Abstract

Hospital Acquired-Methicillin Resistant Staphylococcus aureus (HA-MRSA) are resistant to many antimicrobial agents. The extreme preponderance of such bacteria necessitates the need to look for alternative therapy such as the use of lytic bacteriophages. Lytic bacteriophages are viruses that can disrupt bacterial host cells. This study intends to isolate and characterize lytic bacteriophage by baiting with an HA-MRSA host cells. The HA-MRSA is collected from a tertiary hospital and is phenotypically screened using the Cefoxitin Disc Diffusion Assay. The bacteriophage is also collected from a local sewage. It is morphologically characterized by a transmission electron microscope and the phage concentration is determined through plaque forming assay. The isolated bacteriophage is named Aguinaldo-6 and phenotypically classified as Myoviridae based on its tail length morphology. Aguinaldo-6 has a concentration of >6,500 pfu/ml and has a lytic life cycle enabling the disruption of HA-MRSA host cells. Our findings affirmed the potential use of bacteriophages to address problems in managing HA-MRSA infections.

Keywords: plaque forming assay, Aguinaldo-6, Myoviridae

INTRODUCTION

Methicillin Resistant *Staphylococcus aureus* (MRSA) exhibits resistance to a large variety of antimicrobials (Harada et al, 2018). It causes different types of hard-to-manage- diseases such as skin infections, endocarditis and food poisoning (Han et al, 2013). These multidrug resistant organisms may be inadvertently acquired either from livestocks or from hospital or community settings. Thus, MRSA may be categorized as hospital acquired (HA-MRSA) and community acquired (CA- MRSA), depending on the origin of infections (Harada et al, 2018). Over the last 30 years, MRSA has emerged as a significant cause of nosocomial infections and its main feature is its resistance to multiple broad spectrum antimicrobial agents making it difficult to treat (Rahimi et al, 2016). In the Philippines, the overall cumulative rate of MRSA from different sentinel sites is at 57% (DOH-ARSP, 2017).

The difficulty of controlling the preponderance MRSA is one of the challenges that the healthcare system is facing nowadays (Abe et al, 2012). Vancomycin is considered as one of the possible treatments for MRSA cases but it has been considered traditionally as nephrotoxic and ototoxic drugs (Hermsen et al, 2010). Nephrotoxicity may also be apparent if vancomycin is combined with other drugs such as the tandem of piperacillin-tazobactam (Balci et al, 2018). Most of the clinicians are limited when it comes to prescribing vancomycin due to the need to balance safety and therapeutic efficacy in treating MRSA infections (Su et al, 2018).

There is a need for a paradigm shift in the management of MRSA infections. One of the alternatives in managing increasing bacterial drug resistance and hard-to-eradicate opportunistic infections is the use of bacteriophage (Abedon, 2018). These viruses are useful in controlling multidrug resistant bacteria (Kutateladze et al, 2016). Lytic bacteriophages are viruses that could lyse or disrupt bacterial cells in one of the stages of their life cycle. These viruses have been clinically used as antibacterial agents for nearly 100 years (Abedon, 2018). Bacteriophages are reported to control cases of MRSA (Hathaway et al, 2017). They are also being utilized to control the MRSA epidemics in CA-MRSA cases (Mohammed et al, 2012).). Bacteriophages are also equally effective in treating animal infections (Sunagar et al, 2010; Han et al, 2013; Takemura-Uchiyama et al, 2014; Fan et al, 2016 and Osada et al, 2017) and human infections (Zhou et al, 2017). Thus, using bacteriophages as potential new therapeutics to replace or supplement antibiotics is not a remote possibility (Kutateladze and Adamis, 2010). This paper aims to isolate and

characterize bacteriophages from a local creek through baiting with HA- MRSA host cells.

MATERIALS AND METHODS

Research Design

This study utilized descriptive research design. The morphologic characterization is described using electron microscopy. The in vitro predation capacity is assessed through plaque forming assay.

Screening of HA-MRSA Host Cells

Clinical isolate of *Staphylococcus aureus* is collected from a tertiary hospital in Dasmariñas, Cavite. The isolate has a zone of inhibition diameter <21 mm in Cefoxitin Disc Diffusion Assay and is phenotypically confirmed as MRSA (CLSI, 2017).

Figure 1. The Cefoxitin disc zone of inhibition in MRSA host cells is <21mm.

Isolation of Bacteriophages

Two 400 ml samples were collected from sewage in Dasmariñas, Cavite. The samples were placed in screw-capped sterile containers that were stored in an ice-box container during transportation. The samples were brought to the laboratory and were filtered using 0.1 mm Whatman filter paper to remove unwanted gross debris. This was followed by centrifugation at 3,877.2 g for one hour.

Pure culture isolates of the MRSA were used as host cells for bacteriophage isolation. Baiting of bacteriophage was made by using a one ml of a five-hour old culture of the clinical isolates in Tryptic Soy Broth (TSB). The inoculum was added to five 90-ml TSB flasks that were placed in a shaker incubator for 24 hours at room temperature. Double filtration system was utilized using both the 0.45 µm and 0.22 µm Acrodisc syringe filters. The filtration was continuously performed until 10-ml filtrates were obtained. The said filtrates were used for the isolation of the bacteriophage (De la Cruz-Papa et al, 2014).

Transmission Electron Microscopy

Morphologic characterizations of isolated bacteriophages were described using transmission electron microscope (TEM). The sample was prepared by supplementing the pure bacteriophage suspension with 500uL TSB containing colonies of host cells. The suspension was incubated at 37^{o}C overnight. This procedure was done for three days or until the sample has lost its turbidity. After days of supplementing the bacteriophages with host cells, the sample was sent to Research Institute for Tropical Medicine (RITM) in Alabang, Muntinlupa City, Philippines.

In TEM, the formvar coated grid was picked with forceps and these were pushed and until the grid was firmly held. The same forceps were also laid down on the lid of the Petri dish with its tips extending over the edge with the grid held coated-side up. A Pasteur pipet was used to add one drop of concentrated bacteriophage suspension to the gridwidth. The suspension was removed after 3-5 minutes by touching the ragged torn edge of filter paper to the edge of the forceps jaws until the grid surface is nearly dry. A drop of sodium phosphotungstate solution was added to the grid. After one minute, the grid was quickly and completely dried. The sample side of the grid was immediately touched to a clean piece of filter paper at the bottom of Petri dish. A fresh piece of filter was slid down between the forceps to remove the dried grid onto the forceps and placed on dry filter in the Petri dish. The grid is dried for 15 minutes in the covered Petri dish and was examined with a TEM model JEM 120.

Plaque Forming Assay Using Soft-Agar Overlay Method

The method described by Clokie and Kropinsky (2009) was utilized for the isolation, purification and determination of phage titer. The filtrates were serially diluted from 10^{-5} to 10^{-9} in Tryptic Soy Broth (TSB). Zero point five milliliter (0.5 ml) of diluted filtrates from each dilution i.e. 10^{-5} to 10^{-9} and 1 ml of a new batch of the host cells were mixed and added on 3 ml of soft agar. These were thoroughly mixed before adding on the surface of pre-plated Tryptic Soy Agar (TSA). These plates were allowed to solidify, and then inverted and incubated at room temperature for 18-24 hours. Plaque formations were checked and counted. However, only plates with 30-300 plaques formation were counted. Otherwise, the accepted formula using the Sibata colony counter was utilized. Four representative squares were counted and this was multiplied to a factor of 65 to get the plaque count. The plaque forming unit was calculated dividing the number of plaques to the product of used volume and dilution factor. The quotient is then multiplied to 100.

RESULTS AND DISCUSSION

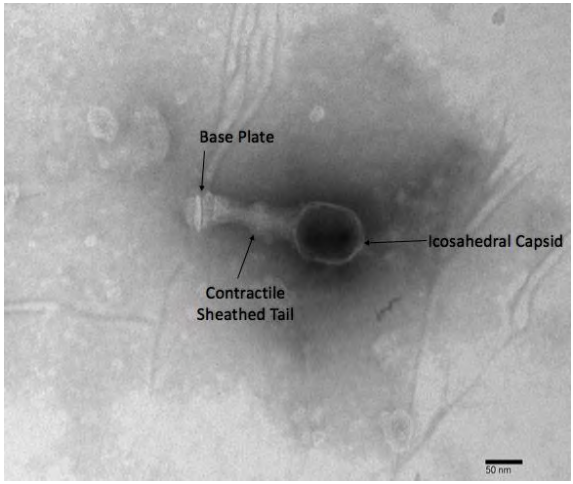


Figure 2. The isolated MRSA Bacteriophage from Family Myoviridae (535,000x)

Features	Characteristics
Name of Phage	Aguinaldo-6
Order	Caudovirales
Family	Myoviridae
Capsid	Icosahedral
Capsid Size (LxW)	99x58 nm
Tail	Contractile, sheathed
Tail Length	155 nm
Tail Fibers	Present, Long
Total Size	254 nm
Life Cycle	Lytic
Phage Concentration	>6,500 p.f.u./ml

Our isolated bacteriophage belongs to Order Caudovirales, Family Myoviridae. This is named Aguinaldo-6 as this is the 6th bacteriophage isolated in our laboratory. The capsid is icosahedral with a size of 99x58 nm. The tail length is 155 nm and is covered by a contractile sheath. The tail fiber is also present and terminated with a base plate. The tail fiber of our isolated bacteriophage can recognize and bind to specific receptors or the peptidoglycan of the MRSA host cells. It is because of the phenomenon known as adsorption. Adsorption determines the high specificity of receptor recognition that link phages to specific host strains (Villaroel, 2018). The sheath of this bacteriophage will then have conformational changes to release the nucleic acid from the capsid and eventually injects the genetic materials to the MRSA host cells through its hollow tail. Our findings are also consistent with the findings of Zschach et al (2018) who affirmed the susceptibility of MRSA to bacteriophages such as Myoviridae. Myoviridae has been known to control S. aureus infections such as bovine mastitis (Han et al, 2013) and other livestocks (Jung et al, 2017).

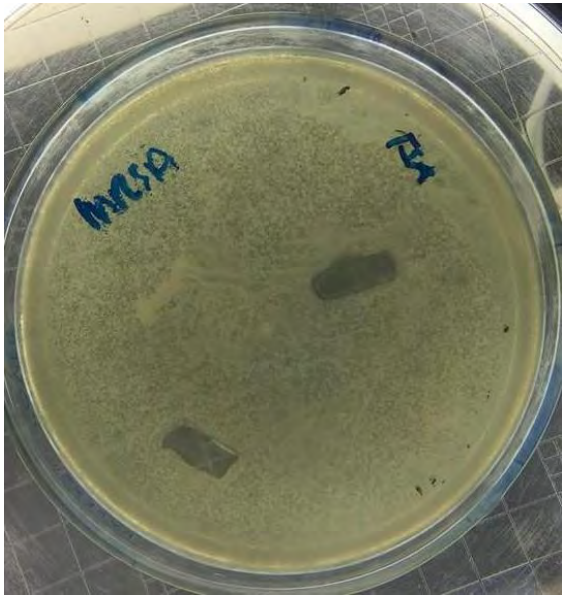


Figure 3 Plaques formed on lawn of HA-MRSA host cells

Aguinaldo-6 has a lytic life cycle as it has clear zone in the periphery of the plaques. Clear plaques on the edge of the zone indicates that the isolated phages are lytic while turbid edges mean that the phages are lysogenic (Maloy, 2006). The plaques as shown in Figure 3 are numerous (>6,500 pfu/ml), pinpoint and has evenly spread on the lawn of bacterial cells. These findings are indicative of the fact that the isolated bacteriophages can lyse bacterial cell. This phenomenon would enable the bacteriophages to control MRSA. This is in congruent with many literature findings that bacteriophages may be used controlling MRSA in community outbreaks (Otter et al, 2010 and Gasch et al, 2012), in livestock (Han et al, 2013) and in experimental animal (Takemura-Uchitama et al, 2014).

Over the years, the genotypic characterization of HA-MRSA has been changing its antibiogram and this inadvertently leads to difficulty in managing the infection (Harada et al, 2018). Utilizing HA MRSA host cells could pave way in addressing such problems. Based on our findings, our isolated lytic bacteriophages can potentially be used in controlling the spread of nosocomia infections related to HA-MRSA. Our study also affirms several reports from literature that bacteriophages could control HA-MRSA. In fact, Alfadhel et al (2011) utilized lyophilized inserts for nasal administration to control the risk HA-MRSA infections. Also, bacteriophages are potentially useful in

reducing or even in eradicating HA-MRSA nasal colonization (Mann, 2008). Isolation of HA-MRSA of nosocomial origin could also pave way for improvement of its diagnosis by means of phage typing after its holistic genotypic characterization (Wildemauwe, 2010 et al).

CONCLUSION

Bacteriophages from Myoviridae family is isolated from a local sewage by baiting with HA-MRSA host cells. The isolated phage has a long and sheathed contractile tail with base plate terminal. These viruses are capable of lysing multidrug resistant host cells such as the HA- MRSA. Thus, our bacteriophages could potentially be used in addressing the preponderance of HA-MRSA.

Based on the conclusion of our study, we recommend confirming the genotype of the HA-MRSA by probing the presence of mecA gene. In addition, future researchers may also embark to animal modeling and eventual clinical trials of the bacteriophage.

REFERENCES

Abe Y, K Shigemura, H Yoshida, M Fujisawa and S Arakawa (2012). Risk factors for anti-MRSA drug resistance. International Journal of Antimicrobial Agents. 40(5): 423-426

Abedon ST (2018). Use of phage therapy for treat long-standing, persistent, or chronic bacterial infections. Advanced Drug Delivery Reviews. 1-22.

Alfadhel A, U Puapermpoonsiri, SJ Ford, FJ McInnes and CF van der Walle (2011). Lyophilized inserts for nasal administration harboring bacteriophages selective for Staphylococcus aureus: In vitro evaluaton. International Journal of Pharmaceutics. 416(1) 280-287.

Belci C, O Uzun, M Arici, S Hayran, D Yuce and S Unal (2018). Nephrotoicity of piperacillin-tazobactam combined with vancomycin: Should it be a concern? International Journal of Antimicrobial Agents. 52(2): 180-184.

Clinical Laboratory and Standard Institute (2017). Performance Standards for Antimicrobial Susceptibility Testing; 25th Informational Supplement. CLSI

Document M100-S27, Clinical and Laboratory Standards Institute, Wayne, PA.

[DOH] Department of Health. Antimicrobial Resistance Surveillance Program of the Philippines (2017).

De La Cruz-Papa DMA, CMG Candare, GLS Cometa, DEG Gudez, AMIT Guevarra, MBTG Relova and RDS Papa (2014). Aeromonas hydrophila bacteriophage UP87: An alternative to antibiotic treatment for motile Aeromonas septicemia in Nile tilapia (Orechromis niloticus). Philippine Agricultural Scientist. 97(1):96-101

Fan, J, Z Zeng, K Mai, Y Yang, J Feng, Y Bai, B Sun, Q Xie, Y Tong and J Ma (2016). Preliminary treatment of bovine mastitis caused by Staphylococcus aureus, with trx-SA1, recombinant endolysin of S. aureus bacteriophage IME-SA1. Veterinary Microbiology. 191:65-71.

Gasch, O., A Hornero, MA Dominguez, C Suarez, S Gomez, M Camoez, J Lineres, J Ariza and M Pujol. MRSA clone related to the early pandemic phage type 80/81 causing an outbreak among residents of three occupational centres in Barcelona, Spain (2012). Clinical Microbiology Infection. 18:662-667.

Han JE, Kim JH, Hwang SY, CH Choresca, SP Shin, JW Jun, JY Chai, YH Park and SC Park (2013). Research in Veterinary Science. 95: 758-763.

Hermsen D, M Hanson, J Sankaranarayanan, JA Stoner, MC Florescu and ME Rupp (2010). Clinical outcomes and nephrotoxicity associated with vancomycin trough concentrations during treatment of deep-seated infections. Journal of bExpert Opinion on Drug Safety. 1:9-15.

Hathaway H, J Ajuebor, L Stephens, A Coffey, U Potter, JM Sutton, A Toby and A Jenkins (2017). Thermally triggered release of the bacteriophage endolysin CHAPk and the bacteriocin lysostaphin for the control of MRSA. Journal of Controlled Release. 245:108-115.

Harada D, H Nakaminami, E Miyajima, T Sugiyama, N Sasai, Y Kitamura, T Tamura, T Kawakubo and N Noguchi (2018). Change in genotype of MRSA affects the

antibiogram of HA-MRSA. Journal of Infection Chemotherapy. 24:563-569.

Jung P, MMH Abdelbary, B Kraushaar, A Fetsch, J Geisel, M Herrmann, W Witte, C Cuny and M Bischoff (2017). Impact of bacteriophage Saint3 carriage on the immune evasion capacity and hemolytic potential of Staphylococcus aureus CC398. Veterinary Microbiolgy. 200:46-51.

Kropinski AM, AM Mazzocco, TE Waddell, E Lingohr and RP Johnson (2009). Enumeration of Bacteriophages by Double Agar Overlay. Bacteriophages: Methods and Protocols. USA: Human Press.

Kutateladze M and R Adamia (2010). Bacteriophages as potential new therapeutics to replace or supplement antibiotics. Trends in Biotechnology. 28(12):591-595.

Kutateladze M, L Leshkasheli, D Bolkvadze, L Askilashvili and N Balarjishvili (2016). Bacteriophages against multidrug resistant bacterial infections. International Journal of Infectious Disease. 4-163.

Mann NH (2008). The potential of phages to prevent MRSA infections. Research in Microbiology. 159(5): 400-405.

Mohamed DH, S Saberesheikh, AM Kearns and NA Saunders (2012). Putative link between Staphylococcus aureus bacteriophage serotype and community association. International Journal of Medical Microbiology. 302(3):135-144.

Osada K, I Takeuchi, K Miyanaga and Y Tanji (2017). Coevolution between Staphylococcus aureus isolated from mastitic milk and its lytic bacteriophage SA012 in batch co-culture with serial transfer. Biochemical Engineering Journal. 16-23.

Otter JA, AM Kearns, GL French and MJ Ellington (2010). Clinical Microbiology Infection. 16:68-73

Rahimi F, M Katouli and S Karimi (2016). Biofilm production among MRSA strains isolated from catheterized patients with urinary tract infection. Microbial Pathogenesis. 98:69-76.

Su YC, PC Lin and CC Wu (2018). Risk pf nephrotoxicity among patients who received vancomycin. Journal of Infectious Disease. 50(2): 152-155.

Sunagar R, SA Patil and RK Chandrakanth (2010). Bacteriophage therapy for Staphylococcus aureus bacteremia in streptozotocin-induced diabetic mice. Research in Microbiology. 161(10):854-860.

Takemura-Uchiyama I, J Uchiyama, M Osanai, N Morimoto, T Asagiri, T Ujihara, M Daibata, T Sugiura and S Matsuzaki (2014). Experimental phage therapy against lethal lung-derived septicemia caused Staphylococcus aureus in mice. Microbes and Infection. 16:512-517.

Villarroel, J., Nielsen, M., Larsen, M. V., & Kilstrup, M. (2018). Isolation and characterization of bacteriophages with therapeutic potential. Technical University of Denmark (DTU).

Wildemauwe C, DD Brouwer, C Godard, P Buyssens, J Dewit, R Joseph and R Vanhood (2010). The use of spa and phage typing for characterization of a MRSA population in Belgian hospital: Comparison between 2002 and 2007. Pathologie Biologie. 58(1): 70-72.

Yan Z, H Zhang, H Bao, X Wang and R Wang (2017). The lytic activity of recombinant phage lysin LysKAmidase against Staphylococcus aureus strains associated with bovine and human infections in the Jiangsu province of China. Research in Veterinary Science. 111:113-119.

Zhou, Y, H Zhang, H Bao, X Wang and R Wang (2017). The lytic activity of recombinant phage lysine LysK delta amidase against staphylococcal strains associated with bovine and human infections in the Jiangsu province of China. Research in Veterinary Science. 111:113-119.

Zschach H, MV Larsen, H Hasman, H Westh, M Nielsen, R Miedzybrodki, E Jonczyk- Matysiak, B Weber-Dabrowska and A Gorski (2018). Use of regression model to study host determinants of phage susceptibility in MRSA. Antibiotics. 7(1) 1-16.

Sensing salivary glucose using nano-particles

Laarni E. Gloriani, Pamela Rose F. Bremner
and Larra Lei Parugrug

School of Medical Technology, Emilio Aguinaldo College-Cavite

legloriani@yahoo.com

Abstract

This study aimed to determine the potential of measuring salivary glucose by utilizing silver nanoparticles (AgNPs). The gold standard for diagnosing and monitoring diabetes involves checking the glucose levels using blood. However, the use of saliva for diagnostic purpose is also explored in the study. Patients were randomly selected in one of the barangays in Maragondon, Cavite where blood glucose concentration was measured using a glucose oxidase strip method Those whose glucose levels exceeded 120 mg/dL, were requested to collect their saliva samples.Salivary glucose determination was achieved by coupling of silver nanoparticles (AgNPs) and glucose oxidase reagent to measure the concentration of glucose levels by increasing its absorption onto the AgNPs and stabilizing the glucose concentration, thereby, resulting to a corresponding spectrophotometric absorbance reading of glucose in saliva with stable glucose values. The application of nanosilver particles in this study, sustained the salivary glucose level especially with 0.01 molar concentration of silver. Since silver nanosizes obtained in this study vary from 26.9 nm to 64.7 nm, this demontrates that the more nanoparticles obtained the higher the surface area that will react with the substrate. Results of the blood glucose level and saliva showed a significant difference (p=.027). However, post hoc Tukey"s revealed that there is no significant difference between glucose level of blood and saliva treated with AgNPs (p=.264). When comparing the glucose level of saliva and saliva treated with AgNPs, there is a clear evidence of difference (p= .027) significant difference (p=.027) and post hoc indicated a significant difference (p=.021). Therefore, nanoparticle conjugated with the sample dramatically increased its sensitivity in detecting glucose in saliva.

Keywords: diabetes, enzymatic, glucose oxidase, nanoparticles

INTRODUCTION

Emerging technologies employ techniques to study glucose concentration in small volumes with minimal protocols that require destructive sampling procedures but focus on the development of rapid, minimally invasive biosensors that do not depend on addition of external reagents. Application of nanoparticles in bio-sensing due to its small size improves electrochemical, enzymatic biosensor performance by increasing electron transfer rates by shortening enzyme-to-electrode distances.

The gold standard for diagnosing and monitoring diabetes involves checking the glucose levels using blood. Colorimetric determinations involved simple classic method and involved ultraviolet/visible (UV/Vis) spectrometry or concentrations of a sample could be possibly detected with the naked eye without complicated instruments. The non-enzymatic method for colorimetric identification of glucose based on classic silver mirrorreaction could be modified with the application of silver nanoparticles (AgNPs).

However, the use of saliva for diagnostic purposes is increasing its recognition due to its many potential advantages. It provides an attractive alternative to more invasive, time consuming, complicated glucose monitoring tests as individuals can collect saliva in a non-invasive manner with modest training including patients. Because of the ease, safety, and low cost of saliva collection, diagnosis with warrant considerations is a promising trend in diagnostic procedures (Naik VV et al, 2011). Since glucose could easily diffuse through semi-permeable membrane levels of serum glucose are increased and can easily reach the salivary secretion by ultra filtration, the impaired permeability that was present in diabetic patients occurred as a result of changes in the basement membrane and was an additional reason for the increase in salivary glucose (Ivanovski et al, 2003). Hence, there is an immediate need for an effective minimal or non-invasive diabetes monitoring procedure. Thus saliva has been tapped into reflecting and monitoring the blood glucose concentration in the patients with diabetes mellitus.

The use of biochemical sensing technology, which has attracted more attention due to its high selectivity, repeatability, accuracy and strong biocompatibility, is needed. Nano-sensors for glucose detection rely mainly on nanomaterials to maintain the standard enzymatic electrochemical detection of glucose. Glucose oxidase (GOx) and glucose dehydrogenase (GDH) are the most commonly used enzymes in glucose biosensors, which change redox state during the biochemical reaction (Prashant, 2014). This biochemical detection of glucose use nanomaterials providing advantages due to high surface area that

enhances electron transfer from enzyme to electrode and its ability to include additional catalytic steps.

The challenge in the use of this nanotechnology is testing saliva with that small amount which is too small for detection and this requires nanoparticles to increase its sensitivity. The biochemical sensing in this study utilized fabricated glucose oxidase enzyme (GOx) selectively sensitive to glucose which could measure the possible range of glucose in the human body. This study aimed primarily to use silver nanoparticles as chemical sensing material to measure salivary glucose with reliability and accuracy and to test its clinical practicability.

Salivary glucose determination was achieved by the coupling of silver nanoparticles and the glucose oxidase reagent to measure the concentration of glucose levels by increasing its absorption onto the AgNPs and stabilizing the glucose concentration resulting to visual readout.

METHODOLOGY

This study was carried out from the March 2018 to June 2018. The number of patients included in the study were randomly selected based on the number of glucose testing done in a Maragondon, Cavite community based health service. Study was conducted with the approval of the Ethics Committee of the Faculty of Biomedical Science in Emilio Aguinaldo College-Cavite approved the study.

The purpose, procedures and risks were thoroughly explained and a written informed consent was obtained from each of the participants. Upon consent, the collection of the specimen immediately followed and all patient information was treated with strict confidentiality.

A. Preparation of AgNP

Silver nanoparticles (AgNPs) were prepared by synthesizing silver from silver nitrate. The procedure followed the works of S. Iravanietal (2014) with modification. Silver nitrate solution was prepared by adding 3.4 grams of silver nitrate into 20 mL distilled water. The polyvinyl alcohol (PVA) solution was prepared by dissolving (PVA) 2.76g in 70 ml deionized water. Glucose was prepared by dissolving 0.8g n 4 mL de-ionized water and heated to 60-70oC while stirring vigoruously. Sodium hydroxide solution (0.1N NaOH) was added into the solution drop by drop. When all the silver nitrate was added, the solution was mixed and stirred for 30 minutes more. Yellow color appearance indicated the formation of AgNPs. Nitrates were removed from the obtained sample by

centrifugation and washing using deionized water for three times. Then it was stored in amber vialat 2 to 8°C. The presence of polyvinyl alcohol (PVA) produced silver colloidal particles possessing a negative charged ion creating a repulsive force working along particles and preventing it from agglomerating.

Transmission electron microscope (TEM) was used to determine the image and size of silver in 3D. Photomicrograph of silver as examined under TEM (RITM-EM Lab) Figure 1 shows the size obtained ranging from 26.9 to 64.7 nanometer (nm). The figure below clearly showed the nano size particles of silver in varying sizes <100 nm.

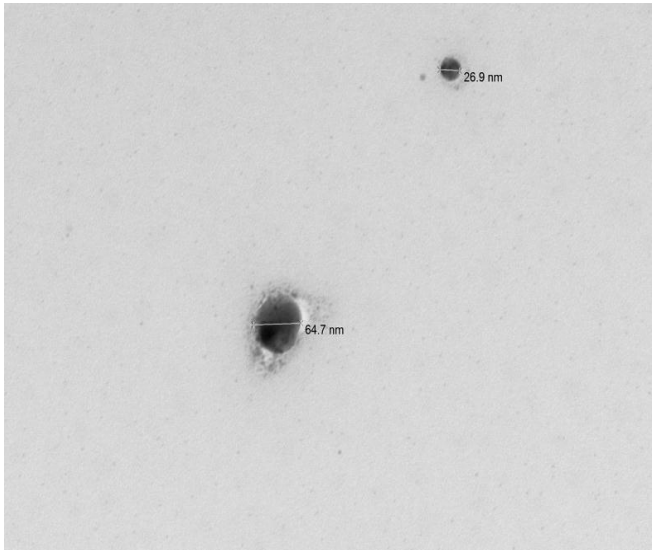


Figure 1. Photomicrograph of silver nanoparticles
(TEM 10000x magnification)

Varying sizes of silver nanoparticles obtained was used to facilitate the efficient detection transfer between the immobilized biomolecules and electron substrate (Ali, 2014).

B. Conjugation of Glucose reagent with AgNPs

Extracted silver nanoparticle was incorporated into a glucose oxidase reagent by Teco Diagnostics using the following concentrations: 1 µL/mL, 2 µL/mL and 3 µL/mL or equivalent to 5, 10 and 20 ppm which is the most commonly used concentration of commercial silver

nanoparticles. The procedure follows the works of Wang et.al.,(2011) with modifications.

Suspended silver nanoparticles were added to glucose reagent containing glucose oxidase using the three different concentrations prior to assay. The reaction was allowed to proceed for 30 minutes to one hour with shaking at the speed of 200 rpm and stored in amber bottle. The concentration was allowed to stand and kept at 4 to 6°C. The said dilution was used for salivary glucose determination.

C. Sample Collection

Blood samples from randomly selected patients who have purposely sought community health service specifically glucose testing was done in Maragondon, Cavite. An on-site glucose monitoring device with a glucose oxidase principle reagent strip was used to determine blood glucose levels. All results were collated and fifteen (15) patients whose glucose levels were greater (>) than 120 mg/dL were further requested for collection of saliva samples.

Patients were requested to sit in a comfortable position with head tilted slightly forward and to avoid swallowing and oral movements during collection. The pooled saliva in the floor of the mouth was spitted every 60 seconds or when they experienced an urge to swallow the fluid accumulated.Salivary samples were transported in a cooler box to EAC-Cavite laboratory for centrifugation at 3000 rpm for 10 minutes at room temperature (23.8°C), then the salivary supernatant was separated and aliquoted in 2 parts.

D. Salivary Glucose Testing (Untreated and Treated with AgNPs)

Five (5) uL of the first aliquot of saliva was treated with 500 uL of glucose oxidase reagent by TECO Diagnostics. The mixture is then incubated for 10 minutes and read at 520 nm. Absorbance reading was recorded and computed against standard multiplied by 100 as factor. The same techniques were performed all throughout the first aliquoted saliva samples. For each batch of measurements, standard glucose solutions were prepared following the manufacturer„s protocol to provide a calibration curve. Absorbance reading was then converted into glucose concentrations using the calibration curve. The results reflect the glucose concentrations of saliva untreated with AgNPs.

The mixture is then incubated for 10 minutes and read at 520 nm. Absorbance readingwas recorded and computed against standard multiplied by 100 as factor. Thesame techniques were performed all throughout the 2ndaliquotsaliva samples. Absorbance reading was then

converted into glucose concentrations using the calibration curve. Glucose concentrations of the untreated and treated with AgNPs were collated and subjected to statistical analysis using ANOVA.

RESULTS AND DISCUSSION

Blood samples and saliva from 15 diabetic patients were assayed based on blood chemistry protocol using glucose oxidase method parallel to the limit in the variations in results. Based on the analysis, the following data were obtained:

Table 1

Glucose level of saliva treated with silver nanoparticles

ANOVA

	mean	df	F	p value
Blood	248.46	2	3.936	0.027
Saliva	169.4	42		
Saliva with AgNPs	309.11	44		

At .05 level of significance

ANOVA result as shown in Table 1 demonstrates the mean glucose level of saliva treated with silver nanoparticles using glucose oxidase principle. As can be gleaned from the table; the mean value of blood glucose level of diabetic patients is 248.46 mg/dL; the while, saliva of a diabetic patient has a mean value of 169.30 mg/dL. More so, the glucose level of saliva treated with silver nanoparticles has a mean value of 309.11 mg/dL, a value higher that glucose in blood and in saliva alone or without AgNPs.

Thus, test for saliva required highly sensitive spectrophotometry to determine the glucose concentrations. The application of nano-silver particles in this study, sustained the salivary glucose level by applying 0.01 molar concentrations of silver nanoparticles. Since the silver nano size obtained in this study varied from 26.9 nm to 64.7 nm, this means that the more nanoparticles obtained the higher the surface area that will react with the substrate, if the size obtained were slightly bigger than 25 nm, higher than this optimum size would lead to reduction in surface area.

The difference in blood glucose level and saliva showed a significant difference (p=.027). However, post hoc Tukey"s revealed that

there is no significant difference between glucose level of blood and saliva with AgNPs (p=.264). When comparing the glucose level of saliva and saliva treated with AgNPs, it clearly showed that there is significant difference (p=.027), and the post hoc indicated a significant difference (p=.021).

The difference in the glucose level of saliva treated with silver nanoparticles may be attributed to the unique spatial and charge properties of nano-materials associated with high surface-to-volume ratio that promote superior optical and catalytical properties (Luo et al, 2006; Eustis et al 2006). Similarly, according to the study of Taguchi et al, 2014, the rate of electron transfer being inversely proportional to the distance between the enzyme, nanoparticles are more capable of reducing enzyme-to-electrode distances than bulk-size material. More so, according to the study of Madan and Wasewar (2017) the dosage of free nanoparticles, which differ from most of the sensing applications, may affect the concentration and exposure which may be expected to be much less.

The result can be further explained based on the study of Ali and Raid (2014) since silver act as the best conductor among the metals. It exhibitS high catalytic activity for H2O2 production and that silver nanoparticles could provide a suitable micro-environment to retain biological activity for biomolecule immobilization. Silver facilitateS more efficient detection transfer between the immobilized biomolecules and the electron substrate.

The correlation of blood glucose and salivary glucose w/ Ag NPs resulted to the linear equationy = 1.239x+99.216. This indicates that for every increase of glucose in blood there is an average increase of glucose in saliva treated with AgNPs. Thus, AgNPs increases the sensitivity of the glucose oxidase to the glucose substrate present in the saliva.

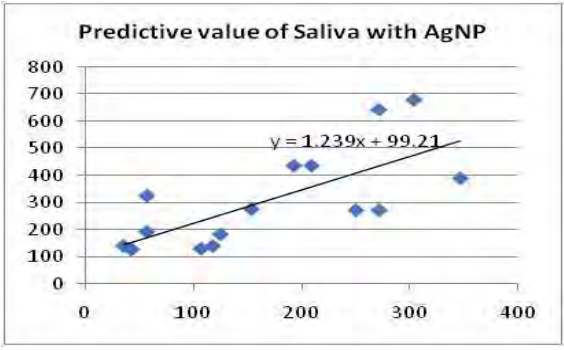


Figure2. Fitted line graph

This nanoparticle was conjugated with the sample to dramatically increase its sensitivity in detecting glucose in saliva. Classic method was modified with the use of enzyme glucose oxidase coupled with SNPs where glucose reduced the silver ion (Ag+) from Ag(NH3)2OH to metallic silver to generate the Ag-glucose oxidase structure as the product of the reaction (Tangsong et al, 2011). At the same time, the end product could be distinguished by the change in color as observed by the naked eye. Thus, silver nanoparticle can be regarded as sensitive detector of analyte as aid for detection or monitoring in diagnostic techniques.

REFERENCES

Ali H and Raid SJ. 2014. Synthesis of Silver nanoparticles. ARPN Journal of Engineering and Applied Sciences.Vol 3 Number 4.

IvanovskiK, Naumovski V, Kostadinova M, Pesevska S, Drijanska K, Filipce V. Mealey B. 2003. Diabetes mellitus. In. Burket"s oral medicine. Diagnosis and treatment, 10th ed, Greenberg MS, Gilck M eds, BC Decker, Hamilton. 2003: 563– 577

Luo X, Morrin A, Killard AJ, Smyth MR. 2006. Application of nanoparticles in electrochemical sensors and biosensors. Electroanalysis.;18(4):319-326.42.

MadanSapana and Wasewar Kailas. 2017. Optimization for Benzene acetic acid removal from aqueous solution using CaO2nanoparticles based on Taguchi method. Journal of Applied Research and Technology Vol 14, Issue 4. 332-339.

Naik VV, Satpathy Y, Pilli GS, Mishra MN. 2011. Comparison and correlation of glucose levels in serum and saliva of patients with diabetes mellitus. Indian J Pub Health Res Dev.;2(1):103-105.

PrashanthMakaram, Dawn Owens and Juan Aceros. 2014. Diagnostics, 4, 27-46; doi:10.3390/diagnostics 4020027

Tangsong Li, Kui Zhu, She He, Xi Xia, Shaoqui Liu, Zhuo Wang, Xingyu Jiang. 2011. Sensitive detection of glucose based on gold nanoparticles assisted silver mirror reaction. Analyst 2011 136.2893.

Wang and Lee 2015. Recent developments in blood glucose sensors

Microbial screening of antibiotic residues in chicken tissue samples from selected markets of Dasmariñas City, Cavite

Elena O. Mercado

School of Arts and Sciences, Emilio Aguinaldo College Cavite

elleomercado@gmail.com

Abstract

Antibiotic residue in meat calls for a serious concern due to its potential hazards on consumer health. This study employed the quantitative descriptive research design to screen and investigate,using microbial technique, the presence of Fluoroquinolone and Aminoglycoside residues in chicken meat samples from Dasmariñas public market and Kadiwa public market in Dasmariñas City, Cavite. The findings revealed that 67.50% of all collected chicken tissue samples contained Fluoroquinolone residues; while, 42.50% of the same tissue samples were detected to contain the Aminoglycoside residues. As a whole, 55% of the entire tissue samples from two sampling sites were observed to contain antibiotic residues. Statistical analysis indicates that there is a significant difference in the detected level of Fluoroquinolones and Aminoglycosides in chicken tissue samples which is accounted for by the higher number of samples from Dasmariñas public market that tested positive for the presence of Fluoroquinolones. The results further pointed out that Fluroquinolones are one of the most frequently used antibiotics in poultry farms which provided poultry meat in two public markets of Dasmariñas City. The kidney and wing samples in both markets exhibited the mostly contaminated samples; while thigh and breast tissue samples were observed to have low detection of antibiotic residues. Statistical analyses, however, did not establish a significant difference in the detected Fluoroquinolones in all tested biological matrices and similar finding was observed in Aminoglycosides. Conclusively, the results of this study have initially shown that the recommended withdrawal period for poultry antibiotics and proper dosing or antibiotics administration with veterinary prescription have been violated.

Keywords: Microbial screening, antibiotic residues, antibiotic resistance, fluoroquinolones, aminoglycosides, withdrawal period

INTRODUCTION

The presence of antibiotic residues in food for human consumption is a global food safety issue. To protect the health of consumers, maximum residue limits (MRLs) of pharmacologically active substances in foodstuffs of animal origin have been established by the Commission Regulation (EU) No. 37/2010(European Commission, 2010). Residues, as defined by the European Union and the Center for Veterinary Medicine, an agency under the Food and Drug Administration (FDA/CVM) in the USA, are pharmacologically active substances whether active principles, recipients or degradation products and their metabolites which remain in foodstuffs obtained from animals. The maximum level of concentration of certain drug allowed in animal tissues ensures that residual drugs will have no detrimental effects to human health if ingested. However, studies conducted by Benmohand and Benouaddah (2008) and Tassist et al. (2012) showed that majority of antibiotic identified by High Performance Liquid Chromatography (HPLC) clearly exceed the maximum residue limits (MRL), which confirms the health risk associated with the consumption of this type of product. Sinirtas et al (2009) has established that antibiotics used as veterinary drugs in cattle often are present at dangerous levels in the animal origin food, That creates toxicological problems or resistance phenomena. Hakem et al (2013) confirms the noncompliance and misuse of the withdrawal period between the administration of antibiotic in animal and its slaughter.

Antibiotics are commonly used in veterinary medicine, and subsequently drug residues may persist in foods derived from animals, which may pose adverse health effects for the consumer (Chandaet al., 2014; Riviere and Papich, 2013). In 2012, Babapour and Fartashmehrome notably disclosed how some drugs are quickly excreted from the animal while others are not readily metabolized or excreted and so, their residues will persist in the animal tissues and hence enter the human food chain which poses health concerns. The European Food Safety Authority (2007) has recently issued a conviction on the effect of residues in meat and emphasized that epidemiological data provided evidence or an association between some forms of residues-dependent cancers and meat consumption.

Antibacterial drugs and hormonal growth promoters are the main Veterinary Medicinal Products (VMPs) that potentially contaminate foods of animal origin (Takele et al., 2015) rendering veterinary drug or VMPs residue as one of many global issues concerning food contamination (Rokka et al., 2005). Antimicrobials are administered to animals by injections (intravenously, intramuscularly, or subcutaneously), orally in feed or water, topically on the skin and by intramammary and intrauterine infusions (Mitchell et al., 2002).

Human health can be affected either through residues of drugs in food of animal origin, which may cause direct side effects such as immediate toxicity (Beyene & Tesaga, 2014), or indirectly, through selection of antibiotic resistance determinants that may spread human pathogen (Samanidou & Nisyriou, 2008; Chang et al., 2014; Landers et al., 2012). Drug low-level contamination generally may not generate a violation problem on public health. However, extensive use of drugs may increase the risk of an adverse effect of residues on the customer including the occurrence of antibiotic resistance (Beyene & Tesaga, 2014) and hypersensitivity reaction (Samanidou & Nisyriou, 2008). High doses of antibiotic residues results in immediate toxicity. Streptomycin in pregnant women damaged cranial nerve and cause congenital deafness. Sulfonamides and Neomycin damaged the kidney and hearing (Baldrias, 2015).

Regular consumption of food animals previously exposed to antibiotics can worsen the antibiotic resistance load of bacteria particularly of poultry origin. Antibiotic resistance is rising to dangerously high levels in all parts of the world. New resistance mechanisms are emerging and spreading globally, threatening our ability to treat common infectious diseases (World Health Organization, 2015). With its alarmingly escalating pattern, antibiotic resistance has currently become one of the greatest challenges to global public health.

Although development of antibiotic resistance is a natural phenomenon, its development and spread is being accelerated by misuse in healthcare and overuse in animal husbandry and agriculture. The use of antibiotic in livestock production has been associated with the development of human antibiotic resistance (Chang et al., 2014; Landers et al., 2012). Antibiotic resistance is thus putting the achievements of modern medicine at risk. As antibiotics offer decreased efficacy, an increasing list of infections such as pneumonia, tuberculosis, septicaemia, and gonorrhoea are getting harder, and at times impossible to treat. Chemotherapy,surgeries, and organ transplantations become much more dangerous without effective antibiotics for prevention and treatment of infections.

The limited information on the magnitude of veterinary drug residue worldwide, however, has rendered the issue a more conflicting twist.The irresponsible use of antibiotics, leads to the selection of pathogens that are difficult to eradicate (Algburi et al., 2017); when antibiotics can be bought for human or animal use without a prescription, the emergence and spread of resistance is made worse.Without urgent action, the scenario can lead to a dreadful post-antibiotic era, in which common infections and minor injuries can once again kill. Prudent antimicrobial use and comprehensive infection prevention and control

strategies targeting all healthcare sectors are the cornerstones of effective interventions aiming to prevent selection and transmission of bacteria resistant to antimicrobial agents (CDC, 2015).

On the local setting, a research team from the University of the Philippines conducted a study that aimed at detecting antibiotic residues from freshly dressed chicken employing the Four Plate Test (FPT). Baldrias et al (2008) observed that on the frequency of detection of suspect type of antimicrobials in chickens as inferred by the FPT, penicillin type ranked highest in occurrence for chickens of both backyard and commercial producers, followed by aminoglycosides. The least frequent type of antibiotic detected for both producers was the macrolides.

The study also identified the nine reasons behind the acquisition of antibiotic residues namely, antibiotics administration without veterinary prescription, improper dosing, non-observance of withdrawal period, emergency slaughter of treated animals sold from one farmer to another without strict requirement of certification of treatment, intensification of livestock production, common practice of long-term preventive use of subtherapeutic concentrations of drugs, lack of satisfactory data concerning the efficacy and safety of drugs, lack of funding and/or interest to gather needed data as evaluation is a long and tedious process, and little interest in developing and applying for licensing of livestock and poultry drugs.

The Philippine Generics Law of 1988 stipulates that certain antibiotics for humans should not be used on food animals. Chloramphenicol was banned in food animals, but 75% of *Campylobacter jejuni* isolates showed resistance to chloramphenicol (Baldrias et al, 2008) which revealed an illegal dispensation of antibiotics and could be inferred as a deliberate violation of law. One of the critical findings of the study pointed out the significant relationship between detected level of antibiotic residue and resistance profile of bacteria. As such, the least frequent detected residue was macrolidesand antibiotic resistance profile was markedly low to Erythromycin, a macrolide. Rationally, no treated animal or its products must be consumed unless the entire drug administered has been eliminated from its system. This is called zero tolerance or the concept of total absence of residual amounts.

Microbiological Screening Technique

The use of *E. coli* in microbial screening detects the presence of Fluoroquinolones while *Bacillus subtilis* is used for the detection of Aminoglycosides. The meat samples are considered positive, if they form

the inhibition zone equal or superiorto 2 mm in width on plates seeded with *Bacillus subtilis* BGA, *Bacillus cereus* and *Escherichia coli* (Gondová et., al 2014).

The choice of analytical technique for residue testing must be based on thorough evaluation of the reliability and accuracy, benefits, and disadvantages of the available tests. Myllyniemi (2004) rationalized that microbiological methods have an important role in residue analytics because while inexpensive and simple to perform, they can detect a broad spectrum of antimicrobial substances.

Microbiological assay, particularly agar diffusion assay, usually proceeds with a preliminary extraction in order to isolate the drugs of interest from the biological matrix. The main objective of sample treatment by certain solvents is removal of macromolecules and other matrix constituents that may either adversely affect the system or interfere with the detection, and enrichment of the analytes in order to achieve the required low limits of detection. Standard microbiological tests, nonetheless, has its limitation in indicating only the presence of an inhibiting agent. Analytical assays are required in the confirmatory procedure such as identification and quantitation of antibiotic residues. However, analytical assays like HPLC, ELISA, LC, GC, and MS, are quite costly and time-consuming if there is no prior knowledge of the nature of the residue. A feasible screening test to characterize the residue could generate considerable savings of time and resources. Agar diffusion tests are by far the most widely used microbiological methods in antimicrobial residue analytics.

Quantitative Confirmatory Methods

Confirmatory procedures for the quantitative detection of veterinary drug residues include HPLC, gas chromatography (GC), thin layer chromatography (TLC) and mass spectrometry (MS) (McCracken et al., 2000). Compounds must be separated from another and the food matrix. The low solubility of some antimicrobials in organic solvents has made it difficult to develop procedures to extract and concentrate their residues from biological matrices. Chemical or analytical methods are generally considered too specific but equally too expensive to be applied as an initial screening. Liquid chromatography–tandem mass spectrometry methods have the ability to simultaneously detect multiple classes of antibiotics but have remained exorbitantly charged in the Philippines.

Although limited to one-time sample collection, this paper reflects the existing condition of chicken meat sold at two public markets of Dasmariñas City, Cavite which may reveal a potential evidence for

certain health hazards of specific pharmacological classes of drugs. Most antibiotic residues used in veterinary industry occur in food at such low levels that they rarely pose an immediate health hazard to consumers; nonetheless the importance of food safety through the reduction of residues in food supply cannot be undermined. Food safety has remained a major concern for every society.Discussion on the biochemical pathways of residue accumulation and the pharmacokinetics were not a major scope of this study. The actual risks from the consumption of contaminants in chicken meat were not addressed either.

This study conducted a microbial screening that detected and identified the antibiotic residues in chicken tissue samples obtained from Kadiwa public market and Dasmariñas public market in Dasmariñas City, Cavite. Specifically, this study addressed the following objectives:(1) to screen aminoglycoside and fluoroquinolone residues in chicken tissue samples obtained from Kadiwa public market and Dasmariñas public market; (2) to identify the chicken tissue samples (breast, wing, thigh, kidney) that mostly contain the fluoroquinolone and aminoglycoside antibiotic residues; (3) to determine the significant difference of detected fluoroquinolone and aminoglycoside antibiotic residues among chicken tissue samples.

A number of local studies tackle mostly the resistant pathogenic bacteria in humans; while, there has been a paucity of information about food animals" pathogens and the accompanying pathogenicity, much less the investigations on antibiotic residues in food animals. Antibiotic residues in chicken tissues that are beyond the threshold of maximum residual limit reflects the pattern of misuse and overuse of antibiotics in poultry.The results of this study will be of significant value to the following:

Local health government agencies. This paper will contribute to the baseline data of the recent condition of antibiotics application in farm animals. While this study is confined to two public markets of Dasmariñas City, nonetheless, results can express the current and realistic conditions concerning withdrawal periods and antibiotics dispensation for farm and food-producing animals in local poultry farms. Local health officials can address this most pressing health issues by re-implementing policies, for strict compliance, on the regulatory dispensation of antibiotics supply for poultry.

Poultry owners and farmers. Being the frontliners in poultry industry, poultry raisers and farmers have the huge accountability and responsibility in addressing the alarming problem of antimicrobial resistance. This study will help them evaluate their poultry management practices concerning antibiotics administration, withdrawal periods, and

other risk factors that can contribute to the development of resistant genes in poultry pathogens.

Researchers. This study will serve as local reference materials which future researchers can peruse for related or more intensive studies with respect to the profile of antibiotic residues particularly fluoroquinolone and aminoglycoside in the tissues of chicken.

Consumers. A local study like this will be of help in reaching out the huge number of less informed consumers. Most certainly, misinformation is ascribable to ignorance or indifference towards the issue. Effective information dissemination must be provided to consumers for them to grasp the truth of increasing antibiotic resistance and detrimental effects of antibiotic residues in regularly consumed products from farm animals. Meat contaminated with antibiotic residues can even cause allergic reaction, toxin accumulation if not immediate toxicity and cooking offers no amount of effective measure to remove residues in animal products.

METHODOLOGY

Collection of Samples

Test samples were obtained from 5 breast muscles, 5 wings, 5 thighs, and 5 kidneys. Forty samples (20 samples from each market) were purchased from Kadiwa Public Market and Dasmariñas Public Market. Purchased samples were wrapped in polyethylene bags packed in a cool box with ice and kept in freezer until microbiological screening was conducted in the laboratory. The samples were frozen and thawed thrice to promote cell lysis thereby liberating antibiotics in the process. Quantitation of residual level is not a function of this performed microbiological test and this study was limited to one-time sample collection from the two sampling sites.

Extraction of Analytes

Three grams of manually tenderized tissue samples were mixed with 5mL distilled water in a 50 ml tube. The mixture was vortexed for 5 minutes and centrifuged at 4000 rpm for 15 minutes at 15°C.The supernatant was then heated in water bath for 10 minutes at 54^{O}C to inactivate the complement system and other natural antimicrobial systems and to destroy bacteria that may significantly affect the findings. Four millilitres (mL) of clear supernatant were transferred into a dry test tube. One mL of n-hexane was added and mixed for 30 seconds and the

mixture was centrifuged for 4000 rpm at 15°C in 15-minute duration. The upper layer was removed and the lower layer aliquot was stored at -18°C for the detection of fluoroquinolone and aminoglycoside residues. Ten microliter (µl) of analytes were applied to each sterile blank paper disc and three discs were placed on each agar plate inoculated with either *E. coli* or *B. subtilis*.

Microbial Screening Technique

Microbial screening of antibiotic residues using *E. coli* (ATCC 25922) and *B. subtilis* (ATCC 6051) inoculated on Mueller-Hinton Agar with pH 7.2 were able to detect Fluoroquinolone and Aminoglycoside residues respectively. This study adapted and conducted a revised microbial technique of Mund et., al (2017) and Shahbazi et., al (2015). The presence of antibiotic residues in the sample was indicated by the formation of 2mm diameter or more zone of inhibition from the edge of the paper disc. The absence of antibiotic residues was indicated by the produced zone of inhibition of less than 2mm or the absence of inhibition zone around the paper discs previously soaked in analytes extracted from chicken tissue samples. In conclusion, the microbiological detection and preliminary group level identification methods showed a good reliability and applicability to routine large scale sample throughput. Identification even to group or class level of antibiotics can significantly reduce the time needed for residue confirmation and quantitation (Myllyniemi, 2004).

RESULTS AND DISCUSSION

The obtained results have revealed that 27 out of 40 (27%) samples from two sampling sites were positive for the contamination of Fluoroquinolones. On the other hand, 17 out of 40 (42.50%) tissue samples were found to contain Aminoglycoside residue.

Table 1

Number and percentage of the chicken tissue samples positive for residues of Fluoroquinolones and Aminoglycosides

	Number and Percentage of Positive Samples		Total and Percentage of Positive Samples
	Quinolones	Aminoglycosides	
40	27 (67.50%)	17 (42.50%)	44 (55%)

Table 1 shows a moderately high contamination of antibiotic residues in collected and screened samples from two sampling sites. As such, 50% of samples were positive for Quinolone residues while 42.50% were positive for Aminoglycoside residues. A similar result was reported by Ramatla et., al (2017) and Hamdi (2008) that more than 50% of poultry meat samples were positive to antibiotic residues. Hakem et., al (2013) reported anidenticalpattern of results such as detection of lower contamination in chicken tissuesby Aminoglycosides compared to Fluoroquinolones.However, Tassist et al. (2012) recorded a lower positive case of 29%. Ramatla et al (2017) detected high level of both Fluoroquinolone and Aminoglycoside residues in poultry samples and conveyed that the high residue level in some of the meat samples calls for concern. Long-term exposure to doses of antibiotic residue in the body could lead to acute or chronic toxicity to the organs and the entire body. Their presence may also cause allergic reactions or produce drug-tolerant bacteria in humans after long exposure. Continuous doses of ciprofloxacin residues to humans is also known to cause toxicity, impede cytochrome (CYP1A2) mediated metabolism, and can result in increased concentration of drug in systemic circulation due to reduced renal clearance Khan et., al 2015).

Quinolones or Fluoroquinolones (Ciprofloxacin, Enrofloxacin, Oxolinic acid, Flumequine, Nalidixic acid, Sarafloxacin, Danofloxacin, Orbifloxacin, Gatofloxacin, Marbofloxacin and Grepafloxacin) have been widely used in animal production and veterinary medicine for the treatment and prevention of diseases (Er et., al, 2013) and also in human beings (Pyun et., al, 2009). Ciprofloxacin and enrofloxacin are usually prescribed for the treatment and prevention of infectious diseases in farm animals (Chafer et., al, 2010). Ciprofloxacin is effective against microorganisms which are resistant to other antimicrobial agents, such as macrolides, β-lactams, aminoglycosides, and tetracyclines. Administering these antibiotics to farm or food animals will accelerate the likelihood of increasing antibiotic resistance. It has been reported that, because of the presence of Quinolone residues in human food obtained from animal sources, effectiveness of Quinolones in human treatment has decreased (Donkor et al., 2011).

The findings of this study indicated that administration of antibiotics in poultry industry has the capacity to produce residues in edible tissues. Beyene (2016) conclusively revealed that the most probable reason for drug residues in meat products arises from human mismanagement, as seen in improper use of antimicrobials and unprescribed drug applications, to name a few. The most obvious reason for unacceptable level of residues is the failure to practice the withdrawal period, overdosing, and the use of long-acting drugs. Hence, it is imperative to respect the withdrawal periods of antibiotics to reduce the

level of their residues in meat samples to a minimum. This can be reinforced through regulatory standard and monitoring like regular sampling and analysis by appropriate government agencies.

Table 2 shows the zones of inhibition formed by analytes extracted from chicken tissue samples from the two public markets of Dasmariñas City. For Dasmariñas public market, the mean value of analytes extracted from chicken kidneys and wings formed the highest inhibition zone, followed by breast tissues. The least zone of inhibition zone on agar plates inoculated with *E. coli* was formed by analytes obtained from chicken thigh tissues. For Kadiwa public market, the kidney tissue samples were observed to produce the highest mean value of zone of inhibition formed and followed by wings. The least zone of inhibition was formed by analytes extracted from thigh tissues of chicken.

Table 2

Zone of inhibition formed on agar plates by analytes extracted from chicken tissue samples

Chicken Tissue	Average Zone of Inhibition (mm)			
	Dasmariñas Public Market		Kadiwa Public Market	
	E. coli	*B. subtilis*	*E. coli*	*B. subtilis*
B1	2	0	1	0
B2	2	0.5	2	0
B3	2	1	0	0
B4	1.5	2	1.5	0
B5	1.5	2	2	0
Mean	1.8	1.1	1.3	0
K1	2	2	2	0.5
K2	2	0.5	2	2
K3	2	2	2	0
K4	2	2	2	2
K5	2	2	2	2
Mean	2	1.7	2	1.3

Table 2 *(continued)*

Chicken Tissue	Average Zone of Inhibition (mm)			
	Dasmariñas Public Market		Kadiwa Public Market	
	E. coli	*B. subtilis*	*E. coli*	*B. subtilis*
T1	1.5	0	0	0
T2	2	2	0	0
T3	1.5	0.5	2	2
T4	1.5	0	0.5	0
T5	2	1.5	2	1.5
Mean	1.7	0.8	0.9	0.7
W1	2	2	2	2
W2	2	1.5	1.5	2
W3	2	2	2	1.5
W4	2	2	2	2
W5	2	1	1	1.5
Mean	2	1.7	1.7	1.8

The results have revealed that kidney and wing tissue samples, obtained from both Kadiwa and Dasmariñas public markets, mostly contained the Fluoroquinolone residues. Other studies reported higher Fluoroquinolones detection in kidney and liver because these are the sites of accumulation of Ciprofloxacin residues. Naeem et al. (2006) found antibiotic residues in liver and kidney samples, which corroborate the findings of this research work.

Table 2 further shows that the lowest concentrations were found in breast and then thigh muscles. Under the normal physiological conditions, following administration of a drug to an animal, most drugs are metabolized in order to facilitate elimination, and to a large extent detoxification as well. In general, most of the parent product and its metabolites are excreted in urine and a lesser extent via feces (Boothe & Reevers, 2012).

The study conducted in 2011 by InternationalCooperation on Harmonization of Technical Requirements for registration of veterinary medicinal products confirmed that these substances may also be found in milk and eggs, and in the meat. Subcutaneous and intramuscular

administrations increase the potential for residues at the injection sites (Berends et al., 2001) which can explain the case of chicken wings being contaminated with Fluoroquinolones as injection sites are located in the wings of chicken. Unfortunately, consumers cannot protect themselves as residues often tolerate very high cooking temperature. Thus, cooking is not an effective control measure to remove residues in animal products (Baldrias, 2015).

Table 3

Significant difference between the detected antibiotic residues in all chicken tissue samples from Kadiwa and Dasmarinas public markets

Antibiotic residue	p-value	Interpretation
Fluoroquinolones	0.035	Significant
Aminoglycosides	0.249	Not significant

The statistical analysis through paired T test indicates that there is a significant difference (p = 0.035) between all samples detected with fluoroquinolones in Kadiwa and Dasmariñas public markets. For chicken breast and thigh tissues, Dasmariñas public market showed positive detection of fluoroquinolones while those of Kadiwa public market displayed the absence of detected fluoroquinolones. Conversely, kidney and wing tissue samples from both markets manifested the presence of fluoroquinolone residues. As for aminoglycoside residues, there is no significant difference in the detection of aminoglycosides. As such, both sampling sites failed to establish the presence of aminoglycosides in all chicken tissue samples based on the criterion that the zone of inhibition must measure 2 mm for inner diameter from the edge of paper disc previously soaked in extracted analytes.

Table 4

Significant difference in the detected flouroquinolone residues in all tissue samples

Chicken Tissue Sample	Mean	Standard Deviation	p-value	Significance
Breast-Kidney	-0.45	0.35355	0.323	not significant
Breast-Thigh	0.25	0.21213	0.344	not significant
Breast-Wing	-0.3	0.14142	0.205	not significant
Kidney-Thigh	0.7	0.56569	0.33	not significant
Kidney-Wing	0.15	0.21213	0.5	not significant
Thigh-Wing	-0.55	0.35355	0.272	not significant

The statistical findings shown in Table 4 reveal that there was no significant difference in the detected fluoroquinolone residues in all chicken tissue samples collected from two sampling sites. Kidney and wing tissues, however, were detected to be mostly contaminated by fluroquinolones (p=.500) compared to all other tissues.

Table 5

Significant difference in the detected aminoglycoside residues in all tissue samples

Chicken Tissue Sample	Mean	Standard Deviation	p-value	Significance
Breast-Kidney	-0.95	0.49497	0.225	not significant
Breast-Thigh	-0.2	0.70711	0.758	not significant
Breast-Wing	-1.2	0.84853	0.295	not significant
Kidney-Thigh	0.75	0.21213	0.126	not significant
Kidney-Wing	-0.25	0.35355	0.5	not significant
Thigh-Wing	-1	0.14142	0.063	not significant

Table 5 shows that there was no significant difference in the detected Aminoglycosides in the tested biological matrices from chicken. Although the least p value (.063) is observed between thigh and wing due to the higher detection of Aminoglycosides in wing than thigh tissue samples, but statistical analysis did not establish a significant difference between the two tissues.

CONCLUSION

The findings of this study have revealed that 67.50% of all collected chicken tissue samples contained Fluoroquinolone residues while 42.50% of the same tissue samples were detected to contain the Aminoglycoside residues. As a whole 55% of the entire tissue samples from two sampling sites were observed to contain the two classes of antibiotic residues. Statistical analysis indicates that there is a significant difference in the detected level of Fluoroquinolones and Aminoglycosides in chicken tissue samples which is accounted for by the higher number of samples from Dasmariñas public market that tested positive for the presence of Fluoroquinolones compared to Aminoglycosides. Weighted mean computations showed that the chicken kidney and wing samples from both markets were the mostly contaminated sampleswhile thigh and breast tissues were observed to have low detection of both antibiotic residues. However, paired t-test revealed no significant difference in the detected fluoroquinolone residues in all tested samples.

The results further pointed out that Fluoroquinolones were the most frequently used antibiotics in poultry farms that provided poultry meatsin thetwo public markets of Dasmariñas City. Screening of poultry meat through microbial assay, specifically disk diffusion technique, showed detectable levels of antibiotic residues which may indicate the widespread misuse of antibiotic in poultry farms and the unsatisfactory level of awareness of poultry farmers regarding the recommended withdrawal periods of drugs for health and safety measures.

With the increased awareness of the safety and quality it becomes imperative to maintain the safety standards of the food for human consumption. The active involvement of livestock producers, veterinarians, toxicologists, pharmacologists, and microbiologists in food safety risk assessment and risk management is imperative. Appropriate withdrawal periods should be strictly followed and enforced to make the meat rendered safe for human consumption.

RECOMMENDATIONS

After having considered the findings of this study, the following are cited as recommendations:

To employ the use of analytical assays or methods like HPLC to ensure high level of accuracy and credibility of findings and to quantify the detected residues which can be compared to the allowed maximum residual limit(MRL) as defined by European standards.

Future endeavor has to conduct collection of samples during wet and dry seasons to compare residual level detection which may indicate the possibility of differing amount of antibiotics administered to poultry due to seasonal change.

An increased number of tissue samples may influence the findings and this can be explored to establish credible results. Liver samples are to be considered also due to the function that liver plays in the excretion and detoxification process.

Sample or analytes extraction has to consider the utilization of other solvents that can maximize the extraction of analytes or antibiotic residues from biological matrix or tissues.

Rapid and reliable screening methods must be regularly conducted to monitor MRL levels of antibiotics in food animals. More stringent regulations and strategies are necessary if the government is concerned at protecting the public health.

REFERENCES

Aarestrup, F.M., Wegener, H.C., &Collignon, P. (2008). Resistance in bacteria of the food chain: Epidemiology and control strategie s. *Expert Review of Anti-Infective Therapy*. 6:733– 750.

Algburi, A., Comito, N., Kashtanov, D., Dicks, L., &Chikindas, M.L. (2017). Control of biofilm formation: antibiotics and beyond. *Appl Environ Microbiol*. 83:e02508-16.

Babapour, L.A. and Fartashmehr, J. (2012). Overview of antibiotic residues in beef and mutton in Ardebil North West of Iran. World Applied Science Journal, 19(10): 1417-1422.

Baldrias, L., Gatchalian-Yee, M., &Raymundo, A. (2008). Detection of Antibiotic Residues in Dressed Chicken from Commercial from Commercial and Backyard Producers Using Four Plate Test. *Philipp. J. Vet. Med*. 44: 39-48.

Baldrias, L. (2015). Antibiotic Residues in Meat and Meat Products, Implications on Human Health. *National Academy of Science and Technology, Philippines*.

Benmohand C., Benouaddah A. (2008). «Contribution à la recherche des

résidusd"antibiotiquesdans le muscle de bréchet du poulet de chair». Communication au 6émes journées desSciences Vétérinaires. ENV. 19 – 20.

Berends, B.R., A. van den Bogaard, F. van Knapen and Snijders, (2001). Human health hazards associated with the administration of antimicrobials to slaughter animals. Part I. An assessment of the risks of residues of tetracycline"s in pork. Vet. Quart. 23: 2-10.

Beyene, T.&Tesega, B. (2014). *Rational veterinary drug use: Its significance in public health. J Vet Med Anim Health* 6: 302-308.

Beyene, T. (2016). Veterinary Drug Residues in Food-animal Products: Its Risk Factors and Potential Effects on Public Health. J VeterinarSciTechnol 7:285.

Boothe, D.M.,&Reevers, P.T. (2012). Pharmacology introduction In: Aiello SE, Moses MA, Steigerwald MA (Eds) *The Merck Veterinary Manual. Merck Publishing Group.*

Centers for Disease Control and Prevention. (2013). Antibiotic Resistance Threats in the United States.

Chanda R., Fincham R., Venter P. (2014). Review of the Regulation of Veterinary Drugs and Residues in South Africa. Crit. Rev. Food Sci. Nutr. 54:488–494.

Cháfer-Pericás C., Maquieira A., Puchades R. (2010). Fast screening methods to detect antibiotic residues in food samples. TrAC Trends Anal. Chem. 29:1038–1049.

Chang, Q., Wang, W., Regev-Yochay, G., Lipsitch, M., &Hanage, W. (2014). Antibiotics in agriculture and the risk to human health: how worried should we be? Evolutionary Applications. 8(3):240-247.

Commission staff working document on the implementation of national residue monitoring plans in the member states in 2009. (2010). European Commission (EC) Council Directive.
Donkor, E., M. J. Newman, S. C. K. Tay, N. T. K. D.

Dayie, E. Bannerman, and M. Olu-Taiwo. (2011). Investigation into the risk of exposure to antibiotic residues contaminating meat and egg in Ghana. Food Contr. 22:869–873.

Er, B., Onurdağ, F.K., Demirhan,B., Özgacar S.Ö., Öktem, A.B., Abbasoğlu, U. (2013). Screening of quinolone antibiotic residues in chicken meat and beef sold in the markets of Ankara, Turkey. Poult Sci. 92(8):2212-5.

European Centre for Disease Prevention and Control. (2015). Antimicrobial resistance surveillancein Europe 2014. Annual report of the European Antimicrobial Resistance Surveillance Network (EARS-Net). European Centre for Disease Prevention and Control, Stockholm, Sweden.

European Centre for Disease Prevention and Control. (2016). Summary of the latest data on antibiotic resistance in the European Union. European Centre for Disease Prevention and Control, Stockholm, Sweden.

European Food Safety Authority. (2007). Opinion of the scientific panel on contaminants in the food chain on a request from the Chemical Acta, 473: 3-26.

Hakem, A.,Titouche, K.,Houali, B., Malki, O., Chenouf, et., al. (2013). Screening of antibiotics residues in poultry meat by microbiological methods. Bulletin UASVM, Veterinary Medicine, 70(1).

Health Canada. (2013). Maximum residue limits for veterinary drugs.

Hollis, A., & Z. Ahmed. (2013). Preserving antibiotics, rationally. The New England Journal of Medicine 369:2474–2476.

International Cooperation on Harmonization of Technical Requirements for registration of veterinary medicinal products. (2011). Studies to evaluate the metabolism and residue kinetics of veterinary drugs in food-producing animals: metabolism study to determine the quantity and identify the nature of residues.

Khan, G.J., Khan, R.A., Majeed, I., Siddiqui, F.A., Khan, S. (2015). Ciprofloxacin: The frequent use in poultry and its consequences on human health. The Professional Medical Journal. 22(1), 1–5.

Landers TF, Cohen B, Wittum TE, Larson EL. (2012). A review of antibiotic use in food animals: perspective, policy, and potential. Public Health Rep 127:4-22.

Lau CH-F, van Engelen K, Gordon S, Renaud J, Topp E. (2017). Novel

antibiotic resistance determinants from agricultural soil exposed to antibiotics widely used in human medicine and animal farming. Appl Environ Microbiol 83:e00989-17.

Marshall, B. & Levy, S. (2011). Food Animals and Antimicrobials: Impacts on Human Health. Clin Microbiol. 24(4):718-733.

Mitchell, J.L., M.W. Mcewen, S.A. Mcnab and A.J. Yee. (2002). Antimicrobial drug residues in milk and meat: Causes, concerns, prevalence, regulations, tests and test performance, J.F. Protection, 61: 742-756.

Myllyniemi, A. (2004). Development of microbiological methods for the detection and identificationof antimicrobial residues in meat National Veterinary and Food Research Institute (EELA) Helsinki, Finland.

Naeem M., Khan K., Rafiq S. (2006). Determination of residues of quinolones in poultry products by high pressure liquid chromatography. J. Appl. Sci. 6:373–379.

Pyun C.W., Abd El-Aty A.M., Hashim M.M.M., Shim J.H., Lee S.K., Choi K.D., Park K.H., Shin H.C., Lee C. (2008).Monitoringof streptomycin and dihydrostreptomycin residual levels in porcine meat press juice and muscle via solid-phase fluorescence immunoassay and confirmatory analysis by liquid chromatography after post-column derivatization. Biomed. Chromatogr. 22:254–259.

Ramatla, T., Ngoma, L., Adetunji, M., Mwanza, M. (2017). Evaluation of antibiotic residues in rawmeat using different analytical methods. Antibiotics (Basel). 6 (4): 34.

Riviere J.E., Papich M.G. (2013). Veterinary Pharmacology and Therapeutics. John Wiley & Sons; Hoboken, NJ, USA.

Rokka, M., Eerola, S., Perttilä, U., Rossow, L., Venäläinen E, et al. (2005). The residue levels of narasin in eggs of laying hens fed with unmedicated and medicated feed. Mol Nutr Food Res 49: 38-42.

Samanidou, V., &Nisyriou, S. (2008). Multi-residue methods for confirmatory determination of antibiotics in milk. J Sep Sci 31: 2068-2090.

Shanbazi Y., Ahmadi F., Karami, N. (2015). Screening, determination

and confirmation of tetracycline residues in chicken tissues using four-plate test, ELISA and HPLC-UV methods: comparison between correlation results. Food and Agricultural Immunology 26(6):821-834.

Shin, S.W., Shin, M,K,, Jung, M., Belaynehe, K.M., Yoo, H.S. (2015). Prevalence of antimicrobial resistance and transfer of tetracycline resistance genes in *Escherichia coli* isolates from beef cattle. Appl Environ Microbiol. 81:5560–5566.

Sinirtaş, M., Akalin, H., &Gedikoğlu, S. (2009). Investigation of colistin sensitivity via three different methods in *Acinetobacter baumannii* isolates with multiple antibiotic resistance. International Journal of Infectious Diseases. 13(5):217-220.

Takele, B., Abdulkaf, K., Tariku, J., Fanos, T., Dinka, A., et al. (2015). Assessment on chemicals and drugs residue in dairy and poultry products in Bishoftu and Modjo, Central Ethiopia. J Nutri Food Sci.S13:003.

Tassist A., Ami D., Tadjine N, Hezil N., and Guétarni D. (2012). «Screening of antibioticresidues in Chicken meat by microbiological methods (Premi® Test and four plat method associatedwith STAR method). Quantification with High performance liquid Chromatography (HPLC) ». Communication affichée. Second edition of the international congress: "Microbial Biotechnology for Development" (MICROBIOD 2.

Vancutsem, P. M., Bapish, J. G. and Schwark, W. S. (1990). The fluoroquinolone antimicrobials: structure, antimicrobial activity, pharmacokinetics, clinical use in domestic animals and toxicity. Cornell Vet. 80, 173-186.

Wegener, H.C. (2012). Antibiotic resistance - linking human and animal health. National Academy of Sciences. World Health Organization.(2015). Worldwide country situation analysis: response to antimicrobial resistance.

World Health Organization, Geneva, Switzerland. World Health Organization- Advisory Group on Integrated Surveillance of Antimicrobial Resistance. (2011). Critically important antimicrobials for human medicine - 3rd revision. WHO Advisory Group on IntegratedSurveillanceof Antimicrobial Resistance, World Health Organization, Geneva, Switzerland.

Development of students" metacognitive skills

Ma. Victoria C. Balbio, Frederick A. Andal

School of Education, Emilio Aguinaldo College Cavite

vcbalbio@yahoo.com

Abstract

Metacognition plays a vital role in the teaching-learning process. Students" metacognitive skills can be taught by immersing students with metacognitive activities. The aim of this study is to investigate the developmental change of the students" metacognitive skills using the learning journals. The study was a one group pre-test - post-test design utilizing the Metacognitive Awareness Inventory (MAI) developed by Schraw and Dennison in 1994 and the researcher-made learning journal (LJ) used to analyze the developmental change in the students" metacognitive skills. Paired t-test was employed to assess the students" metacognitive skills at the beginning and at the end of the study. Results indicated a positive developmental change in the students" metacognitive skills during the experimentation. Significant difference ($p<0.05$) was observed between the pre-test and post-test scores of the students" Metacognitive Awareness Inventory (MAI) as the students scored significantly higher in the post-test as compared to the pre-test. Further, the students were able to identify the strategies and even name sources that they can apply in their learning process. Learning journal was found as an effective tool to enhance students" metacognitive skills. These findings suggest that students must be taught of metacognition and be given metacognitive trainings such as learning journals to enhance metacognitive skills.

***Keywords*:** Learning Journals, Metacognition, Reflection

INTRODUCTION

For more than 40 years, metacognition has been an area of interest to educational researchers (Ellis, Denton & Bond, (2013). However, there are only couple of studies that summarize the specific instructional practices for improving students" metacognitive thinking (Ellis et.al., 2013). Moreover, there is a lack of evidence showing how specific practices are implemented to affect student achievement (Ellis et. al, 2013).

Metacognition is awareness and understanding of one"s own thinking processes. It plays an important role in learning. Many studies show that enhanced academic performance resulted from students" knowledge of metacognitive strategies (Millis, 2016; Chatzipanteli et al., 2015; Balbio, 2013; Zare & Mohammadi, 2011). If students know how to reflect on how they learn, they become better learners.

Several theorists (Brown, 1987; Garner & Alexander, 1989; Flavell, 1987) believed that knowledge in metacognition appears early and continues to develop at least throughout adolescence (as cited in Schraw & Moshman, 1995).

Based on previous studies of metacognition, the researchers predicted that students" metacognitive abilities will show developmental changes during this period of life.

Development of Metacognitive Skills

Early researches on development of metacognition showed that metacognitive skills appears to improve with age (Schneider, 2008; Kuhn & Dean, 2004; Schneider & Lockl, 2002; Schraw & Moshman, 1995).

Schraw and Moshman (1995) presented their metacognitive development process. They suggested that the first to appear in children is cognitive knowledge. At the age of 6, they can reflect on the accuracy of their cognition. And by age 8 to 10 years, they can already consolidate these skills; followed by the dramatic improvements in monitoring and regulation at the age of 10 to 14 in the form of planning. In this stage, they acquired the ability to regulate cognition. Slower to develop are monitoring and evaluation of cognition which sometimes remain not fully develop in many adults. The last to appear is the construction of metacognitive theories. These allow the integration of cognitive knowledge and cognitive regulation.

In the Developmental Framework of Metacognition introduced by Kuhn and Dean (2004), the first stage is realists. It refers to the preschool children who equate believing with knowing. Next is absolutism. Children at the age of 4 learn that some beliefs can be wrong. Multiplism followed when adolescent recognizes that even experts can disagree on certain topics. Adulthood is evaluative epistemology. Here, they learned that there can be better or worse opinions to the extent that they are supported with reason and evidence. Kuhn and Dean (2004) as cited in Lai (2011) argued that it is in the progression to the fourth stage that requires some instructional effort.

Weil et.al., (2008) conducted a study in the development of metacognitive ability in adolescence. Results indicated that metacognitive ability improves with age over the course of adolescence which is similar to the findings of Stel and Veenman (2014). They pointed out that at the age of around 15 years; it appears to be relevant point in time during the developmental trajectory of metacognitive skills.

However, Sperling, Howard, Miller and Murphy (2002) developed a self-report instrument for measuring general metacognitive knowledge regulation. The researchers found that there was a slight tendency for younger students to earn higher metacognition scores than the older students. They speculated that it is possible that metacognition is domain-general among younger students, but gradually becomes more domain-specific for older students.

Teachability of Metacognitive Skills

Several researchers offer evidence that metacognition is teachable (Dignath et al., 2008; Kramarski & Mevarech, 2003; Schraw, 1998).

Dignath et al. studied how primary school students learn self-regulated learning strategies and provided a list with the most effective training characteristics at the end of their research. It means that they successfully taught metacognitive skills to their subjects.

Kramarski and Mevarech (2003) proved that metacognitive skills are teachable when their study showed that students exposed to metacognitive training scored higher in metacognitive questionnaire than those who are not.

Teachers can conduct activities in the classroom to promote metacognition. Millis (2016) used activities leading to students to consider their knowledge levels, their learning processes and their ability

to monitor and adjust attempts at problem-solving. She emphasized that metacognition skills can be taught by immersing students with metacognitive activities.

Schraw (2001) argued that metacognitive knowledge is multidimensional, domain-general in nature, and teachable. He presented four instructional strategies and these include promoting general awareness, improving self-knowledge and regulatory skills, and promoting learning environments that are conducive to the construction and use of metacognition.

Learning Journal as Metacognition Strategy

Several researches are conducted to determine the effectiveness of learning journal in developing students" metacognitive behavior (Knox, 2017; Henter & Indreica, 2014; Swanson, 2014). Learning journal is similar to learning log, diaries or reflective journal where students reflect upon their learning, identify their strengths and weaknesses, and comment on how they will deal with their difficulties. According to Mitchell (2015), with greater awareness of how students acquire knowledge, they learn to regulate their behavior to optimize learning and they begin to see how their strength and weaknesses affect how they perform.

Henter and Indreica (2014) recommended reflective journal writing as a tool to develop students" metacognitive skills. Olson and Johnson (2012) suggested that writing journals should become a weekly routine in order to meet its purpose, along with a descriptive feedback offered each time by the teacher.

This study was conducted to examine the development of students" metacognitive skills through the use of learning journals. It compared the metacognitive skills of the students at the start of the study, determined the developmental change between the students" metacognitive skills at the beginning and at the end of the study, and showed the developmental change of students" metacognitive skills.

METHODOLOGY

The study was conducted during the semester School Year 2017 – 2018. respondents are the second, third and fourth year college students in School of Education of Emilio Aguinaldo College – Cavite.

The metacognition strategy used in this study is reflection through the learning journal .The metacognitive skills of the students was measured using the Metacognitive Awareness Inventory (MAI) originally developed by Dr. Schraw and Dr. Dennison in 1994. MAI is a 52-item questionnaire answerable by true or false and covered the knowledge about cognition and regulation of cognition. The researchers were given the approval by Dr. Sperling- Dennison to use the MAI for this study.

The learning journal encourages students to reflect on what they learn and how they learn. It was designed by the researcher and was used in her previous study. It is composed of 6 questions to encourage students" metacognition. The instrument was validated by the following experts: Dean and Associate Dean of the College of Engineering, Architecture and Technology of the De La Salle University-Dasmariñas, the Cluster Head of Mathematics Department of the De La Salle Health Sciences Institute, and the Coordinator of the Mathematics Learning Area of Our Lady of Pilar Montessori Center.

Data Analysis

The researcher administered the questionnaire to the second year students enrolled in Educ Tech 1 class, third year enrolled in assessment of student learning 1 class, and fourth year enrolled in Differential Equation class

The researchers utilized the learning journals of the students to analyze the developmental change of students" metacognitive skills.

Research Procedure

The researcher used the Educational Technology 1 class for the second year, Assessment of Student Learning 1 class for the third year and Differential Equations class for the fourth-year students.

The actual experiment started on October 4, 2017. Orientation was conducted to the students followed by the administration of the pretest of Metacognitive Awareness Inventory (MAI). The Learning Journals were given at the end of each lesson as an assignment to be submitted the following meeting. This is to give students the time to reflect on the lesson discussed. The researcher collected, read and the returned the learning journals to the students the following meeting. Moreover, the researcher wrote comments on the students" learning journals to inform them that the learning journals were read and to motivate them to accomplish the next learning journal honestly. Digital

copies of the learning Journals were made to be used for the analysis of the students" metacognitive skills development.

The experiment ended on May 6, 2018. Posttest of the MAI was administered to the three classes.

RESULTS AND DISCUSSION

Students Metacognitive Skills at the Start of the Study

The researcher categorized the level of metacognitive skills of the students using percentiles as shown in Table 1.

Table 1

Students Metacognitive Skills Level

Percentile	Mean Value	Description
P100	41.61 – 52.00	Very High
P80	31.21 – 41.60	High
P60	20.81 – 31.20	Average
P40	10.41 – 20.80	Low
P20	0.01 – 10.40	Very Low

The computed mean of the students at the start of the study is 39.630 which denote high level of metacognitive skills.

The 52 questions in the Metacognitive Awareness Inventory were divided into two major parts: the knowledge about cognition and the regulation of cognition. The knowledge about cognition comprised of questions regarding students" knowledge about themselves, and the learning strategies and conditions when these strategies were most useful. On the other hand the regulation of cognition dealt with the students" way of planning, using of strategies, monitoring and correcting comprehension errors, and evaluating their learning.

Table 2

Analysis of Students' Pretest in Metacognitive Awareness Inventory

	No. of Questions	Mean	%
Knowledge about Cognition	(17)		
Declarative Knowledge	8	5.429	68
Procedural Knowledge	4	2.929	73
Conditional Knowledge	5	4.143	83
Regulation of Cognition	(35)		
Planning	7	5.457	78
Information Management Strategies	10	7.500	75
Comprehension Monitoring	7	5.257	75
Debugging Strategies	5	4.529	91
Evaluation	6	4.243	71

As shown in Table 2, the students high (P80) and average (P60) in declarative and procedural knowledge. In this aspect of metacognition, the results show that students know what learning strategy to use, how to use it, when and why is there a need to use it.

The regulation of cognition showed that students" debugging strategies are high (P80), while information management strategies and evaluation is at average level (P60). It suggests that before the study, students already had skills in organizing and processing information, assessing and analyzing the effectiveness of strategy used, and correcting performance errors.

Declarative knowledge and evaluation obtained the lowest mean in the knowledge about cognition and regulation of cognition,respectively. This validates earlier findings of Schraw and Moshman (1995) which stated that slower to develop are monitoring and evaluation of cognition which sometimes remain not fully developed in many adults.

Developmental Change of Students"Metacognitive Skills

The developmental change of the students" metacognitive skills at the beginning and at the end of the experimentation is based on the results of the pretest and posttest of the Metacognitive Awareness Inventory (MAI).

Table 3

T-test on the difference between the Pretest and Posttest of the Metacognitive Awareness Inventory

	N	Mean	SD	Mean Diff	t - test t	df	Sig. (2-tailed)
Pretest	70	39.629	6.787	-3.985	-7.169	69	0.000
Posttest	70	43.614	5.616				

The computed p-value was .000 ($p < .05$) indicating that there is a significant difference between the pretest and posttest scores of the students. The negative sign associated with the t-ratio implies that the metacognitive scores were higher on the posttest. The result also shows a higher mean in the posttest ($\mu_{posttest} = 43.614$) compared to the pretest mean ($\mu_{pretest} = 39.629$).

The result supported the earlier studies of Weil et al. (2013) and Stel and Veenman (2014) which states that metacognitive ability improves with age over the course of adolescence and appears to be a relevant period for development.

The Learning Journal used in the study consists of six questions to help students reflect and monitor their learning process.


EMILIO AGUINALDO COLLEGE
SCHOOL OF EDUCATION

LEARNING JOURNAL

Name :
Course :
Date :

Topic :

The lesson today is ☐ easy ☐ average ☐ difficult

What are my chief strengths during lesson?

How will they help me in understanding the lesson?

What part of the lesson confuse me?

What did I do to clarify confusion?

What I learned in this lesson that I may be able to use in future?

Figure 1. The Learning Journal used by the students in the study.

As shown in Figure 1, the first question allowed the students to evaluate the day"s lesson using the easy, average, or difficult scale. Identifying students" strengths and weaknesses (questions number 2 and 4 respectively) and how these affects their learning (questions number 3 and 5) are comprehension questions which allowed students to think what they know and do not know have learned and are still confused with after the day"s lesson. Moreover, the fifth question is a strategy question which the researcher used in answering the third research objective. It deals with how the students handle confusion on the topic after class discussion. Through this question, students have identified their learning techniques and name resources to be used to clarify confusion.

Table 4

Summary of the Students' Responses in their Strategies in Handling Confusion

Students" Responses	L. J. # 1 *Oct. 9 – 13 Jan. 27 & Feb.3*		L. J. # 2 *Oct. 18 – 23 Feb. 17 & 24*		L. J. # 3 *Nov. 6 – 11 Mar. 3 & 10*		L. J. # 4 *Nov. 13 – 18 Mar.17 & 24*		L. J. # 5 *Nov 20 – 25 Apr. 7 - 14*		L. J. # 6 *Nov 27 – Dec. 1 Apr. 21 & 28*	
	f	%	f	%	f	%	f	%	f	%	f	%
Search the internet / research on line	14	17.5	23	25.84	20	23.26	34	29.31	32	25.6	32	21.77
Ask for more examples and/or ask for further explanation	2	2.5	1	1.12	4	4.65	4	3.45	4	3.2	3	2.04
Ask the teacher	10	12.5	19	21.35	21	24.42	36	31.03	34	27.2	41	27.89
Ask the reporter or presenter, classmates, friends	9	11.25	9	10.11	6	6.98	9	7.76	7	5.6	7	4.76
Ask parents, siblings or relatives	0	0	1	1.12	0	0	4	3.45	4	3.2	4	2.72
Read, browse or review notes or pictured slides	16	20.0	16	17.98	21	24.42	20	17.24	22	17.6	32	21.77
Read books or visit library	0	0	1	1.12	6	6.98	5	4.31	15	12.0	12	8.16
Advance reading of the topic	0	0	1	1.12	1	1.16	1	0.86	3	2.4	4	2.72
No confusion / Not Applicable	7	8.75	9	10.11	1	1.16	1	0.86	4	3.2	12	8.16
No answer	13	16.25	5	5.62	5	5.81	2	1.72	0	0	0	0
No learning journal or did not submit	9	11.25	4	4.49	1	1.16	0	0	0	0	0	0
TOTAL	80	100	89	99.98	86	100	116	99.99	125	100	135	99.99

Table 4 shows the summary of students" responses. Last question in the learning journal is a forward-looking and significant question. The students will value the acquired learning if they realize its importance.

Six learning journals were used by each student in the duration of the experimentation period in both classes. The researcher tallied their responses in question number 5 as to what strategies they used when they have confusion in the lesson discussed. Asking the teacher when they are confused is the most frequent answer of the students with a total of 161 which is 25% of the total responses. Second is searching the internet or online lessons with a total of 155 responses, (24%). The third is reading, browsing or reviewing notes or pictured slides with 127 responses (20%).

Remarkable changes were observed in the “no answer” and “no learning journal or did not submit” from L. J. #1 to L. J. #6. The “13-5-5-2-0-0 frequency of no answer and 9-4-1-0-0-0 frequency od “no learning journal or did not submit” show that students improved in terms of accomplishing their learning journals. The frequency of responses in the students" identified strategies in overcoming their confusion regarding the lesson discussed is evidently increased which implies that as students undergo the experimentation they realized and identified gradually the strategies they can apply to clarify their confusion. One example is the 10-19-21-36-34-41 frequency of asking their teacher when confused is evidently increased. The results of the students" responses in the strategies they used were consistent with the earlier findings regarding the comparison of students" pretest and posttest in MAI which showed that the posttest score of the students were higher than their pretest scores of 3.985 (see Table 3).

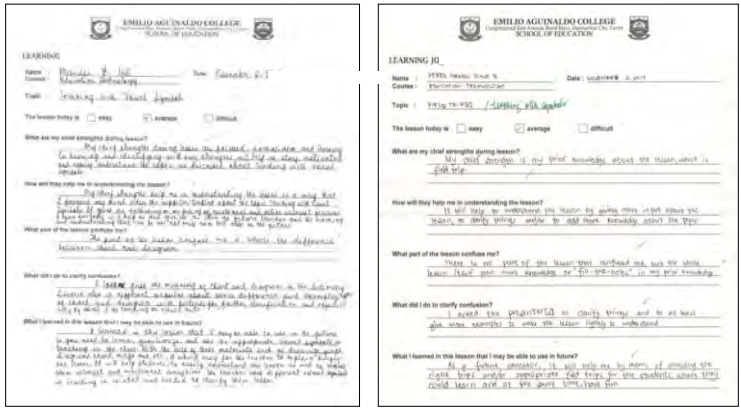


Figure 2. Samples of Students" Learning Journal

The improvement in the students‟ metacognitive skills were evident in the way they accomplished their learning journals (see Figure 2) and in Table 4 which showed a clearer view of the development of students‟ metacognitive skills. Earlier studies supported these findings that metacognitive skills are teachable if students are exposed to metacognitive trainings (Dignath et al., 2008; Kramarski & Mevarech, 2003; Schraw, 1998).

The researcher took a further step in analyzing the gathered data. Using one-way ANOVA, the researcher aimed to find out if there is a significant difference in the metacognitive skills of the students at the end of the study when grouped according to age, gender and course.

Table 5

Students' metacognitive skills at the end of the study

	AGE					GENDER					COURSE				
	Sum of Squares	df	Mean Square	F	p	Sum of Squares	Df	Mean Square	F	p	Sum of Squares	df	Mean Square	F	p
Between groups	60.073	3	20.024	0.624	0.602	0.111	1	0.111	0.003	0.953	49.465	4	12.366	0.378	0.824
Within groups	2116.51	66	32.068			2176.47	68	32.007			2127.12	65	32.725		
Total	2176.59	69				2176.59	69				2176.59	69			

It was found that there was no statistically significant difference in the metacognitive skills of the students when grouped according to age [F(3, 66) = 0.624, p = 0.602], gender [F(1, 68) = 0.003, p = 0.953] and course [F(4, 65) = 0.378, p = 0.824] at the p < .05 level. These suggest that in this stage of late adolescence to early adulthood, the level of metacognitive skills is the same regardless of age, gender and course.

CONCLUSION

Based on the gathered data, the researchers concluded that in this stage of late adolescence to early adulthood in which age ranges from 18 to 39, the students‟ metacognitive skills are high. A positive developmental change in the students‟ metacognitive skills was observed during this period of life. Students were able to evaluate their learning status by reflecting on the questions in their learning journals. They were able to identify strategies and even name sources that they can apply in their learning process.

REFERENCES

Balbio, V. C. (2013). *Guided Note Taking: Effects on Student Problem-Solving Ability and Metacognitive Skills in Algebra* (Master"s thesis). University of the Philippines, Diliman, Quezon City.

Brown, A. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In Weinert, F., and Kluwe, R. (Eds.), *Metacognition, Motivation, and Understanding.* Erlbaum, Hillsdale, NJ, psp. 65-116.

Chatzipanteli, A., Digelidis, N., Karatzoglidis, C., & Dean, R. (2015). Promoting Students" Metacognitive Behavior in Physical Education Through TGFU. *American Journal of Educational Research,* 1(2), 28-36). Retrieved from https://www.researchgate.net/publication/279447813.

Dignath, C., Buettner, G., & Langfeldt, H. (2008). How Can Primary School Students Learn Self-Regulated Learning Strategies Most Effectively? A Meta-Analysis on Self-Regulation Training Programmes. *Educational Research,* 3(2), 101-129. Retrieved from https://eric.ed.gov/?id=EJ813065.

Ellis, A.K., Denton, D.W., & Bond, J.B. (2013). *An analysis of research on metacognitive teaching strategies.* Procedia - Social and Behavioral Sciences 116 (2014) 4015 -4024

Flavell, J.H. (1987). Speculations about the nature and development of metacognition. In Weinert, F., and Kluwe, R. (Eds.). Metacognition, Motivation, and Understanding. Erlabaum, Hillsdale, NJ, pp. 21-29

Garner, R., & Alexander, P.A. (1989). Metacognition: Answered and unanswered questions. Educational Psychology, 24, 143-158.

Henter, R., & Indreica, E.S. (2014). Reflective Journal Writing as a Metacognitive Tool. Retrieved from www.afahc.ro/ro/afases/2014/socio/henter_indreica.pdf

Knox, H. (2017). Using Writing Strategies in Math to Increase Metacognitive Skills for the Gifted Learner. *Gifted Child Today,* 40(1), 43 – 47. Retrieved from http://journals.sagepub.com/doi/abs/10.1177/1076217516675904?journalCode=gctc

Kramarski, B., & Mevarech, Z.R. (2003). Enhancing Mathematical Reasoning in the Classroom: The Effects of Cooperative Learning and Metacognitive Training. *American Educational Research Journal,* 40(1), 281-310. Retrieved from https://www.researchgate.net/publication/250185049.

Kuhn, D., & Dean, D. (2004). A bridge between cognitive psychology and educational practice. *Theory into Practice*, 43(4), 268-273.

Lai, E.R. (2011). *Metacognition: A Literature Review.* Retrieved from http://www.pearsonassessments.com/research/.

Millis, B.J. (2016). Using Metacognition to Promote Learning. Retrieved from The IDEA Center website: http://www.ideaedu.org/wp-content/uploads/.

Mitchell, M. (2015). *Metacognition: Nurturing Self-Awareness in the Classroom*. Retrieved from http://edutopia.org/users/marilyn-price-mitchell-phd.

Schneider, W. (2008). The development of metacognitive knowledge in children and adolescents: Major trends and implications for education. Mind, Brain and Education, 2(3), 114-121.

Schneider, W., & Lockl, K. (2002). The development of metacognitive knowledge in children and adolescents. In Perfect, T. & Schwartz, B. (Eds.). Applied metacognition. Cambridge, UK: Cambridge University Press.

Schraw, G. (2001). Promoting General Metacognitive Awareness. In H.J. Hartman (Ed.), Metacognition in learning and instruction (pp. 3-16). Dordrecht, The Netherlands: Kluwer Academic.

Schraw, G., & Dennison, R.S. (1994). Assessing metacognitive awareness. Contemporary Educational Psychology, 19, 460-475.

Schraw, G., & Moshman, D. (1995). Metacognitive Theories. Retrieved from http://digitalcommons.unl.edu/edpsychpapers.

Sperling, R. A., Howard, B. C., Miller, L. A., & Murphy, C. (2002). Measures of children"s knowledge and regulation of cognition. Contemporary Educational Psychology, 27, 51-79.

Stel, M., & Veenman, M. (2014). Metacognitive skills and intellectual ability of young adolescents: a longitudinal study from a developmental perspective. European Journal of Psychology of Education, 29, 117-137. Abstract retrieved from http://link.springer.com/article/10.1007/s10212-013-0190-5.

Swanson, H. L. (2014). Does cognitive strategy training on word problems compensate for working memory capacity in children with math difficulties? Journal of Educational Psychology, 106, 831-848.

Weil, L.G., Fleming, S.M., Dumontheil, I., Kilford, E.J., Weil, R.S., Rees, G., Dolan, R.J., & Blakemore, S. (2013). The development of metacognitive ability in adolescence. Consciousness and Cognition. 22, 264-271. Retrieved from http://elsevier.com/locate/concog.

Zare H., & Mohammadi, N. (2011). Effect of metacognitive training on mathematical problems solving in students. Journal of New Approaches in Educational. 2, 161-176.

Asserting instructional leadership in reconstructing the Emilian culture formation course: a CIPP approach

Priscilla R. Moriones, Juanito L. Perando

Emilio Aguinaldo College Cavite, School of Education

Abstract

This study reconstructed the context, input, process, and product (CIPP) of the Emilian Culture Formation (ECF) course through multiple stakeholders" lenses and inputs. Using random sampling, 59 EAC students representing four Schools and four Strands participated in the open-ended questionnaire to assess their learning experiences and realizations of the course parallel with the experiences of five (5) teacher respondents and the interests and concerns of 10 instructional and institutional leaders (IILs) chosen purposively to find congruity and basis for curriculum revision. As the ECF Course intends to cultivate an evolving Emilian culture consistent among students, this study became basis for further developing the content materials and pedagogical approaches to make them culturally accepted, affirmed and practiced. The teaching–learning experiences and the institutional concerns resonated implications on the formulation of curriculum contents and pedagogical approaches and thus require instructional leadership that shall ensure consistency in the course implementation and evaluation. This cultural endeavor entail a lot of commitment and strategy on the part of teacher-facilitators and instructional leaders to: 1)adopt an institutional definition and indicators that embody the ideals and identity of an Emilian; 2) design, write, and publish student-centered ECF Course Modules articulating the EAC Philosophy, Vision, Mission, Objectives, and Core Values; 3) determine contents standard, desired learning outcomes, and pedagogical approaches that the ECF Course Modules shall constitute; 4) program technological, pedagogical, and contents knowledge (TPACK) training of course facilitators; 5) supervise course implementation; and 6) collaborate various stakeholders.

Keywords: curriculum revision; instructional leadership; Emilian culture; Course Modules

INTRODUCTION

The Emilian Culture Formation (ECF) is a unique course. The course embodies the institutional core values of Truth, Virtue, Excellence and Service, stated in the School"s Vision, Mission, and Objectives. It is implemented as an institutional prerogative course that is required to all first-year students in all program offerings of the College and Senior High School strands. Since its inception and implementation in 2015, this ECF envisioned to be a flagship course showcasing the college culture; it is deemed significant to our continuous curriculum development that an evaluation process for a proactive quality assurance of the current implementation of the course, congruent to its intended holistic institutional objectives advancing the goals of 21st century education, be undertaken.

Curriculum evaluation is an important aspect in the educational process. Through this activity, school leaders and curriculum implementers can determine if the planned learning opportunities have actually produced their desired results or these have to be improved. The accountability on instructional leadership puts more emphasis on the learning outcomes for students. Instructional leadership involves setting clear goals, managing curriculum, monitoring lesson plans, allocating resources and evaluating teachers regularly to promote 21st century learning and thinking skills. Quality of instruction is the top priority for the instructional leaders. For a school, education - the kind of knowledge, skills, attitudes, habits that students acquire in their educative process, is the actual product. There are various processes carried out in the school to get this product. Context, Input, Process, and Product (CIPP) is an approach to evaluation, developed by Stufflebeam (2003).Although originally advocated for the curriculum development process, it can be effectively used for course syllabus evaluation.

With the aforementioned views on the importance of instructional leadership in reconstructing the ECF course, this study aimed to determine the validity of the ECF course contents and pedagogical approaches through multiple stakeholders" lenses and inputs, and assess the course learning outcomes for further course development. Specifically, the study aimed to: 1) describe the teaching -learning experiences of the students who took the course and faculty members who were assigned to teach the course; 2) assess congruence of stated learning objectives with the learning outcomes among students who took the course; 3) determine validity of the course content and pedagogical approaches through multi stakeholders lenses and inputs; 4) establish definitions and indicators of the EAC Core Values as the lighthouse of course contents and pedagogical approaches; and, 5) reconstruct ECF course modules based on the findings.

CONCEPTUAL FRAMEWORK

Input evaluation involves an examination of the intended content of teaching (i.e. the skills or strategies the students learn), and relates to deciding the resources and strategies used to achieve curriculum goals and objectives. Besides, the purpose of input evaluation should support the choosing of resources. Process evaluation relates to the implementation of teaching. Based upon results of the pilot test or evaluation, it is necessary for process evaluation to describe the student"s need in order to reconstruct the program. The ways to gather the data of process evaluation are multiple. Product evaluation is the assessment of teaching-learning outcomes. The product evaluation could determine whether the curriculum should be modified, fine-tuned, or terminated. It also could evaluate the output of curriculum activities. Figure 1 shows the CIPP approach in asserting Instructional Leadership inthe Emilian Culture Formation Course evaluation.

Figure 1.
CIPP approach in asserting Instructional Leadership in the Emilian Culture Formation Course evaluation.

CURRICULUM PLANNING AND DESIGN	CURRICULUM IMPLEMENTATION		
Context evaluation	**Input evaluation**	**Process evaluation**	**Product evaluation**
ECF Course Objectives and Contents (Institutional Goals VMO; EAC Core values; Integration of 21st century education goals)	**Teachers' TPACK** Technological Pedagogical Content Knowledge **Instructional Leadership**	**Teaching-Learning** Activities/ Processes Assessment	**Students' learning outcomes Experiences and realizations**

Curriculum Assessment		
Feedback Mechanism	**Data Gathering**	**Reconstruction**
Students learning experiences Teaching experiences School leaders' perspectives	Survey Questionnaire In-depth interview Focus group discussion Modules Workshop Course Piloting	Authenticated 21st century relevant ECF Course Syllabus "21st century student outcomes"

Figure 1. CIPP approach in asserting Instructional Leadership in the Emilian Culture Formation Course evaluation

METHODOLOGY

Research Design

The study employed quantitative and modified qualitative narrative analysis to appraise and substantiate the content, inputs, process and product (CIPP) curriculum evaluation approach. CIPP basically provides a very systematic way of looking at many different aspects of the curriculum development process. Although originally

advocated for curriculum development process, it can be effectively used for course syllabus evaluation. Data in this study were generated from the participants" narrative through open-ended questionnaire. Narrative construction of reality can describe the reality constructed and posited by narrative, which in turn teaches us about the nature of reality as constructed by the human mind via narrative (Bruner, 1991). Participants" experiences and realizations simulate qualitative data to capture and explore changes or retentions that occur over time and the processes involved with these changes (Farrell, 2006) or retentions, and particular life events or transitions (Saldaña, 2003).

Respondents and Sampling Plan

The study covered the implementation of the ECF course from 2015 to 2017. Students who have taken the course from 2015 and 2016 and are now in their third year and second year were randomly chosen as the main respondents in the study. They represented 11 sections of College students with a total population of 370, plus the 32 sections of SHS strands with a total population of 1406. Teacher participants were faculty members who taught the course and who are still employed in the College or in Senior High School. The other participants who were chosen purposively are the institutional and instructional leaders.

Instruments and Data Gathering

The participants answered a survey questionnaire and a semi-structured interview schedule formulated and validated by the researchers. The Survey Questionnaire focused on the attainment of course objectives; extent of contents successfully learned; and pedagogical approaches by both students and teachers. The semi-structured open-ended Interview Schedule encompassed teaching - learning experiences, realizations and suggestions; EAC core values definitions and indicators, were answered by students, teachers and IILs. The respondents were allowed more than two (2) weeks to accomplish answering the instruments. Their responses were deemed here authentic as outcomes of careful thought.

Data Analysis

The students" responses were analyzed in parallel with the responses of the teachers who taught the course, and on the other parts, parallel with the instructional and institutional leaders to find congruity with the written curriculum. Descriptive statistics with verbal descriptors were utilized to interpret the frequencies and ranking priorities in the survey questionnaire. Respondents" statements on open-ended interview

schedule were coded and saturated for indicators to generate thematic syntheses.

RESULTS AND DISCUSSION

A total of 59 student- respondents answered the open-ended questionnaire. There were 30 respondents from the tertiary level coming from the School of Education, Criminology, Medical Technology, Nursing, Radiologic Technology, and Arts and Sciences. From the distributed 120 sets of the same questionnaire, a total of 29 accomplished questionnaires were returned from the Senior High School (SHS) ABM, STEM, TVL, and HUMMS Strands. Their identities were coded with their School or Strand and assigned numbers.

The five (5) teacher - respondents were two (2) faculty members from the School of Arts and Sciences and three (3) teachers from the SHS department. The SHS teacher (code SHS01), a BS Psychology graduate who had no teaching experience, but attended a day orientation in teaching the ECF course. SHS02 is a BTTE graduate with 2 years teaching experience and had no orientation and preparation in teaching the ECF course. SHS05 is also a BS Psychology graduate with 3 years teaching experience, two semesters teaching ECF course and adopted the ECF modules. The two AS Faculty members (code AS 18, AS 20), BS Psychology with MA in Guidance and Counselling, and BSRM with MA respectively, had 3 or more years of teaching and were part of the ECF syllabus revision team in SY 2016. The faculty member who handled the Education and Radiologic Technology ECF classes did not participate in the data gathering being one of the Reviewers and Researchers of this study.

The Institutional and instructional leaders (ILLs) who participated in the open-ended questionnaire consists of four (4) with eleven (11) years employment in the institution; four (4) with 4 to 6 years; two with 1 to 3 years; and one (1) with 7 to 10 years. Their years of employment can help provide insights about the existing cultural climate sought in this study. Instructional leaders are the three (3) Deans of schools and the VPAA; Institutional leaders are seven (7) directors and ranking representatives of the administrative and student services departments; and one (1) pioneer Alumni - employee. Five (5) respondents with more than four years of stay in the institution were part of the consultative and preparatory committee to establish the Emilian Culture Formation course through research, draft the framework, identify the attributes and expected learning outcomes and indicators for students, faculty, and employees, and critique the I AM EMILIAN creed. One respondent was the lead proponent of the course. While another has undertaken the

assessment of the ECF syllabus and facilitated ECF seminar for SHS teachers. Five (5) respondents had no participation nor contribution to the course development. An alumnus-employee-teacher respondent volunteered to share some historical background and experiences.

1. ATTAINMENT LEVEL OF COURSE OBJECTIVES

This part analyzed the congruence of the level of attainment of the eight (8) learning objectives among students who took the ECF course by Schools and Strands with the result from the attainment level reported by the teacher respondents. The levels of attainment were given with the following weight scores and its verbal indicator: 4 = Succeeding (Su); 3 = Satisfying (Sa); 2 = Approaching (A); 1 = Needs Improvement (NI).

Course Objectives:

1. Develop a caring sense of place of Emilio Aguinaldo College
2. Appraise and signify the ideals and legacies of Gen. Emilio Aguinaldo in the current contexts of Filipino society
3. Distinguish and appraise the vision and ideals of the EAC founders, Dr. Paulo Campos and Soledad Dolor
4. Recognize and appraise the roles of EAC leaders, members, and graduates in the achievement of the institution"s goals and objectives as contribution to nation building
5. Develop local and global awareness through socio-geographic-environmental consciousness of today"s world
6. Recognize and appreciate the rich natural and cultural heritage, people, resources, industries, and products of Cavite as contributions of the people of Cavite province in nation-building
7. Examine how the current contexts of the local and global community influences students" nurturing vision of good society
8. Live-out and foster the values of Virtues, Excellence, and Service expected of EAC graduates

Table 1.1 shows that when averaged by Strand, HUMMS attained the course objectives with the highest mean score of 3.94 interpreted as Satisfying; followed by STEM with 3.64 - Satisfying; and ABM with 3.36 - Satisfying. The TVL strand scored average with 2.75 – Approaching, with only a single course objective number 6 attained at 3.0- Satisfying. When averaged by scores of individual course objectives across all strands, objectives number 1, 2, 3, 5, 8, 4, 6, and 7, in succession were all attained at the level –*Satisfying*; and with the mean level attained- *Satisfying*.

Table 1.1

Score, weighted mean and verbal indicators of course objectives attainment among SHS students by Strand

Objectives	ABM9	I	STEM11	I	TVL 7	I	HUMMS 2	I	n=29	Indicator
1	3.44	Sa	3.73	Sa	2.86	A	3.5	Sa	3.41	Satisfying
2	3.44	Sa	3.64	Sa	2.86	A	4	Su	3.41	Satisfying
3	3.44	Sa	3.73	Sa	2.71	A	4	Su	3.41	Satisfying
4	3.44	Sa	3.55	Sa	2.57	A	4	Su	3.31	Satisfying
5	3.33	Sa	3.55	Sa	2.57	A	4	Su	3.28	Satisfying
6	3.22	Sa	3.64	Sa	3	Sa	4	Su	3.38	Satisfying
7	3.33	Sa	3.55	Sa	2.57	A	4	Su	3.28	Satisfying
8	3.22	Sa	3.73	Sa	2.86	A	4	Su	3.38	Satisfying
Mean	**3.36**	Sa	**3.64**	Sa	**2.75**	A	**3.36**	Sa	**3.36**	**Satisfying**

Table 1.2 shows that when averaged by school, the School of Education attained the course objectives with highest level at the mean score 3.43 or *Satisfying*, except on Objective 4 with the mean score 2.6 - *Approaching*; followed by Radiologic Technology at 3.41 or *Satisfying*; BS Psychology with 3.38- *Satisfying*; and MT with 3.15- *Satisfying*. The School of Nursing scored average with 2.78 - *Approaching* pulled by their scores on Objectives 4, 5, and 7. The School of Criminology scored 2.63 with all course objectives attained at the level- *Approaching*. When averaged by scores of individual course objectives encompassing all schools, objectives number 6, 8, 2, and 3 were attained at the level - *Satisfying*, while Objectives number 1, 4, 7, and 5 were attained at the level -*Approaching*.

Table 1.2

Score, weighted mean and verbal indicators of course objectives attainment among College students by School

Objectives	Edu 5	I	MT 5	I	N 5	I	RT 4	I	Crim9	I	BSP2	I	n=33	Indicator
1	3.6	Sa	2.6	A	3.6	Sa	3	Sa	2.33	A	3	Sa	2.93	Approaching
2	3.2	Sa	3	Sa	3.6	Sa	3.25	Sa	2.44	A	3.5	Sa	3.03	Satisfying
3	3.2	Sa	3.2	Sa	3	Sa	3.5	Sa	2.56	A	3.5	Sa	3.03	Satisfying
4	2.6	A	3.2	Sa	2.2	A	3.75	Sa	2.89	A	3.5	Sa	2.93	Approaching
5	3.4	Sa	3.2	Sa	1.6	NI	3	Sa	2.67	A	3	Sa	2.77	Approaching
6	3.8	Sa	3.4	Sa	3.8	Sa	3.75	Sa	2.67	A	3.5	Sa	3.37	Satisfying
7	3.8	Sa	3	Sa	2	A	3.25	Sa	2.56	A	3.5	Sa	2.9	Approaching
8	3.8	Sa	3.6	Sa	2.4	A	3.75	Sa	2.89	A	3.5	Sa	3.23	Satisfying
Mean	**3.43**	Sa	**3.15**	Sa	**2.78**	A	**3.41**	Sa	**2.63**	A	**3.38**	Sa	**3.025**	**Satisfying**

Table 1.3 shows that the attainment level of the course objectives among the teacher- respondents was at 3.13 interpreted as *Satisfying* with objectives 5 and 6 similarly given a mean of 2.8, interpreted as *Approaching*.

Table 1.3

Attainment level of course objectives based on Teacher- Respondents

Objectives	SHS01	I	SHS 02	I	SHS 03	I	AS18	I	AS20	I	n=29	Indicator
1	3.00	Sa	3.00	Sa	3.00	Sa	4.00	Su	4.00	Su	**3.40**	Satisfying
2	3.00	Sa	2.00	A	4.00	Su	4.00	Su	4.00	Su	**3.40**	Satisfying
3	3.00	Sa	3.00	Sa	3.00	Sa	4.00	Su	4.00	Su	**3.40**	Satisfying
4	3.00	Sa	2.00	A	3.00	Sa	4.00	Su	4.00	Su	**3.20**	Satisfying
5	3.00	Sa	2.00	A	3.00	Sa	3.00	Sa	3.00	Sa	**2.80**	Approaching
6	3.00	Sa	3.00	Sa	2.00	A	3.00	Sa	3.00	Sa	**2.80**	Approaching
7	3.00	Sa	3.00	Sa	3.00	Sa	3.00	Sa	3.00	Sa	**3.00**	Satisfying
8	3.00	Sa	4.00	Su	3.00	Sa	1.00	NI	3.00	Sa	**2.80**	Approaching
Mean	**3.00**	Sa	**2.75**	Sa	**3.00**	Sa	**3.25**	Sa	**3.50**	Sa	**3.10**	**Satisfying**

SYNTHESIS

While students gave an overall means of 3.36 and 3.025, *Satisfying*, to the attainment of ECF course objectives, their different levels of orientation and experiences were evident particularly in objectives 1, 4, 5, and 7 which college students rated as *Approaching*. This is evident among the TVL, Nursing, and Criminology groups when averaged by School or Strand. When compared with the responses of teachers on the attainment of the course objectives, their answers did not vary, since teacher-respondents also gave an overall mean of 3.13, interpreted as *Satisfying*. The teachers who taught the course, equipped with the content, pedagogical and technological knowledge and the two (2) groups of students with varied levels of orientation and experiences, both gave a *Satisfying* mark to the attainment level of ECF course objectives.

2. TEACHING - LEARNING EXPERIENCES

In this part, students" learning experiences and realizations were analyzed and paralleled with the teacher- respondents to showcase the processes of delivering teaching and learning activities (pedagogical) of the content materials of the ECF Course. The columns represent the coded respondents" statements, indicators, and themes that emerged. Only the syntheses are presented in cases of individual table which cannot be accommodated in this journal format.

Table 2.1
Teaching-Learning experiences of the course

themes	*Statements/ indicators*
Among Senior High School (SHS) students	
SATISFIED	*Satisfied-A6/ it's good-A7/ A8/ S12/ T23/ fairly justifiable and excellent- S14 / well taught-T21 /really learned a lot/learned many things-A2/ it's the best-S19/ helped me a lot- S15*
	had fun-A9/ S11/ interesting-S12/very applicable-A1/ transformed me- S20/ founders' lives as something you should be proud of-T23/ can be a guidance for us-A8/ learning and exploring-S16
INFORMED	*taught about history of EAC-T27/ taught me real value of VES -T26/ learned province's history-S11/full of information about EAC-S10/ nalaman ko ang history ng EAC at founders nito-T26/Informative-A3/ informed*
	I am more motivated about my study in my course because it focuses more on academics-A5/ not that exciting and informative- A4
among College students	
INTERESTING/ CHALLENGING	*Interesting and exciting-A183/ A181/ challenging/ experienced different vibe history, GMRC, MAPEH)-R136/ full of learning- exposes us to different perspectives and truth of this world-E124/ interview people-E121- exposes to different perspectives/ learned different methods of teacher / encountered people working at EAC to gain insight about various topics-E125// able to understand the founders ideals and meanings of VMO-M146/ able to explore the CV/ understand the people' founders' history and success- R137/ learned a lot - B170*
GOOD	*good foundation for my future-R140/ realistic in learning core values that affects our live and be proud of it-E122/ good experience because we had a good professor and I'm from Laguna (a diff province)-E123/ experienced to be happy in the course-C134/ exposes us to different perspectives-E121 / surpassed my knowledge about EA-M147/ - stimulates the interests developed strong sense of being Emilian-M149/ helped us understand the true meaning of VES-M149/ able to understand the meaning behind the mission, vision, philosophy and objectives-N151/ The Core values can prepare students for future / when they feel toxicity-C126*
WANTING MORE	*we always have assignments and activity that's why we always remember our topics-R138/ Asked to sing national anthem-N152/ and recite the core values - N54/ asked to sing the Philippine anthem, recite the core values of EAC (which is insufficient for the learning we need)-N53 / should be discussed in detail-B170*
	if i am only more inclined -N152/ interested about EA history-N155/ not difficult to understand if you take time - M148
	incoherent answers - C132/C127 (more about their own school)NA -4f
Among Teacher-respondent	
Ok / not oriented/ introduces students	*It was "ok"- SHS01 / was not oriented and trained before teaching- SHS02/ ECF introduces EAC to the students and help to be in with EAC-SHS05.*
SIGNIFICANT	*it is significant "to develop one's own values in congruence with the institutional value"- AS18/ learned "how to control temper" when he start to teach the subject- AS20.*

Table 2.2
Teaching–Learning Activities based on parts successfully learned among SHS students

themes	*indicators statements*
Among SHS students	
ALL	*all - A1/A6/S12/S19*
STUDENT- CENTERED / ACTIVITY- BASED	*learning the core values-A2 / Essays-A7* *creative presentations of the core values- S11/ group discussion-A7/ variety of activities to engage students-H28/ role play about EA-H29 / guided tour-S20/* *performance tasks in line with our curriculum guide-S16/ application of skills-T21/ discipline - A8*
No answer	*NA -A3/A5/A9/S10/S13/S17/S18/T22/T23/T24/T25/T26/T27*
Among college students	
STUDENT-CENTERED / ACTIVITY-BASED	*interviews -E121/E124/E125 (to gain insight)/ Open forum/ sharing of experiences - M147/ M148 (how to develop core values)/ collaboration- E123 (helpful for those unfamiliar with Cavite)/ narrative and documentation -learned by ourselves-B170/ Kawit shrine visit-E124/M146 (enjoyed)/ (dig deeper)-M149/ graphics organizer/ visuals/ narratives-E121// hands-on/ projects -R137/ recite VM and explain- N151/ self-realization-E122/ self-assessment - E124 / core values of EAC-N153*
BRAIN-BASED ACTIVITIES	*brain-based activities/ mnemonics - R136/R138/R140 (writing strategies/ active review)*
	return demo, reports, written and oral recitation-C127/ laboratory works, community service, NSTP, and other extracurricular activities-M150
No answer	*NA -C126/C128/ C129/ C130/ C131/ C132/ C134/ C135/ N154/ N155/A181/A183*
Among Teacher-respondents	
STUDENT-CENTERED	*role playing and- SHS01/ cited student centered approach- SHS02/ lets them explore what's in the school- SHS05 / role play- AS18/ learning by doing, research, report and group study- AS20*

Table 2.3
Self-realizations in Knowledge/ Skills/ Attitudes in the course

themes	*indicators* *statements*
among SHS students	
ESSENTIAL	No answer -*A2/S10/S13/S17/S18/T22/T23/T24/T25/T26/T27* *WE need to apply it in real life situations-A1 / helped me to be better-A6/ to be a good student-S12/ helps to achieve my goals-T21/ made me a true Emilian - S20*
INSTRUCTIVE	*to strive more-A5/S16 and can do more / How to do the right thing-A8/ how to be excellent in studies-S15/ many things-A9/ thought provoking-S14/*
SENSE OF PLACE	*importance of confidence to achieve learning competencies-H28/ importance to know the whereabouts of EAC- H29/ Possible to learn about my province and my school-S11 / Learning is best in EAC-S19*
among college students	No answer - *8f*
SELF- ASSESSMENT/ SELF-CONSCIOUSNESS	*being proud and thankful in living where a true hero lived-E123 / values not just words but self-goals towards living a good life-E124 / able to share information I know about the course and show what was learned after taking the course-R137 / I excel in academics/ become good student/ obedient person-R138 / being an Emilian as great responsibility/ being model of good deeds and / role model of change for the good-M149 / knowing the school culture is good to know how to develop self-E121/ benefit to one self - benefit to school-E121/ knowing your roots knowing how to be fruitful-E121 / Acquiring knowledge enable us to demonstrate proper skills and attitude in teaching-learning process-E122 /*
NATIONAL IDENTITY/ CULTURAL EDUCATION	*being excellent in everything to do is a service to fellow students / being Emilian is to apply how to be good Filipino/ core values as foundation of living as purposeful Filipino-E125 / very important that individual should have these characteristics-N151 / KSA development can be used for the profession-C126/ KSA enhanced and quite developed-A181 / learned different Filipino qualities by learning history and different culture-R136 / That we need to share our knowledge-M148 / attitude comes first before knowledge and skills-R140 / how an Emilian should act in day to day lives-M146 / how to be opened with new/ additional ideas-M147*
	focus on chosen course - duty as Law enforcer as next to God-C128/ law enforcement requires extreme discipline and determination-C135
Among Teacher-respondents	
SIGNIFICANT	*the students embraced the core values- SHS01/ it should be Emilian culture formation- SHS02; realizes that EAC really wants to share knowledge to the students -SHS05* *teaching values is like planting seeds in a soil – what you need to take to grow it- AS18 / by teaching this subject we helps students to be more respectful and responsible to their actions-AS20*

SYNTHESIS ON THE TEACHING - LEARNING EXPERIENCES

The learning experiences and realizations of SHS students sorts from satisfaction and meaningful realizations about taking the ECF course found it informative, while College students found collaborative and interactive learning approach interesting and challenging as it exposed them to different perspectives, different methods of teaching; exposure to the province of Cavite"s products and places; appreciation of the founder"s ideals and meaning of school"s VMO; and consideration of the course as a good foundation for the future and the values realistic to their lives and being proud of it. They associated their fun or good experiences in the course with having a good professor. In some classrooms, students experienced limited reciting of the core values, VMO, and the singing of the national anthem which is considered insufficient for the learning need. Teacher-respondents experienced the course as “ok”; one was not oriented and trained before teaching; one cited ECF introduces EAC to the students and helps them to be “in” with EAC. College teachers found the course significant “to develop one's own values in congruence with the institutional value” and “how to control temper” in teaching the subject.

On Successfully Learned Course Content

Few SHS students claimed the core values; the founder"s life, history of EAC and the school organization; and the legacy and leadership of Emilio Aguinaldo. College students cited that the core values were taught really well through in-depth discussion and interview of people. A few stated learning a lot from EAC history, concepts of nationalism and patriotism, and the products of Cavite; and the founder"s ideals and vision, very amusing. Some incoherent answers were indicative of their better interest in their chosen course. One teacher respondent cited all of the course contents were learned successfully. The other teachers cited history of EAC; core values; the story of my life (autobiography of Dr. Paulo Campos).

On Less Successfully Learned Course Content

It is noticeable that some topics learned successfully by one School was learned less by another. One student was less successful in learning the timeline of events, while another learned less about the core values. One student stated that all contents were less successfully learned. One had nothing learned successfully as their professor did not elaborate the topics. The incoherent answers were attributed to interest in other courses of study. One mentioned about a teacher not teaching in

their field of expertise. Few college students found none of the course content less successfully learned, with one attributing it to the teacher giving his best. Eight gave no answer. One could not remember, while four were affected by their concern in other and major courses. Two were concerned about the founder"s ideals and legacies, which they considered interesting topics they needed to know, while another two learned less about the ideals and legacies of Emilio Aguinaldo because of the short time given on the topic and still the other about being unable to answer situational questions. The topics nationalism and patriotism left one student confused, while another learned less about the core values, and still another was unable to find out why the school is named after Emilio Aguinaldo. One teacher - respondent stated none of the course topics were less successfully learned. The rest cited history of EA as General; and, the culture and activities.

On Teaching-Learning Activities on Course Content Successfully Learned

The teaching-learning activities found effective are: student-centered and activity-based. Collaborative activities which involve creative presentations, group discussion, varieties of activities to engage students, role play, and guided tour; application of skills through performance tasks were utilized among SHS students. The SOE, MT, and RT also cited collaborative activities, multimedia, experiential, and reflective activities while the RT group was more inclined with brain-based activities. Teacher - respondents cited role playing and simulation for the learning activities; student- centered approach; exploring; learning by doing, research, report and group study.

On Self-Realizations in Terms of Knowledge, Skills, and Attitudes

The major themes in self-realizations in terms of knowledge, skills, and attitude among SHS students were: essential, instructive, and sense of place. Essential cognitive knowledge of Emilian culture was attributed to its application to real life situations, helpful to better self and achieve goals and making a true Emilian. Affective and psycho-motor knowledge instructed them to strive for and do more, how to do the right thing, how to excel, confidence to achieve learning competencies, and sense of place. College students identified the course significant with self-development, self- assessment or self- consciousness, and national identity or cultural education. Teacher - respondents stated that: the students embraced the core values; EAC really wants to share knowledge to the students; teaching values is like planting seeds in a soil

– what you need to take to grow it; and, by teaching this subject we help students to be more respectful and responsible to their actions.

3. COURSE CONTENTS AND PEDAGOGICAL APPROACHES

This part discusses the validity of the course content and pedagogical approaches through multi stakeholders" lenses and inputs.

„Sense of place"

Majority of the respondents from all groups expressed positive sense of security and welcome in EAC, save for a few but also valid apprehensions. These students" impressions of physical security presence around the campus and the felt observation of accommodating, welcoming, familial, or friendly behavior of school faculty, staff and officials are surface indicators of their growing sense of place being reciprocated by the affirmation of the Teacher- respondents and IILs.

Ideals and Legacies of Emilio Aguinaldo

The majority of the respondents provided positive outlook about Emilio Aguinaldo"s leadership and heroism as a leader of the revolution and as President of the First Republic. The seeming absence of critical controversial attributes from among the student responses can be seen here as indication of passive or lack of critical historical discussion in the topic which is an important development of their critical thinking and scientific reasoning.

Table 3
Themes of the Core Values: TRUTH, VIRTUE, EXCELLENCE, and SERVICE

	TRUTH	VIRTUE	EXCELLENCE	SERVICE
among SHS students	IN WORDS IN DEED IN THOUGHT OBSERVED	VALUED OBSERVED	A HABIT A QUALITY A PERFORMANCE	INVOLVES THE LARGER WORLD INDISCRIMINATE/ NON-RECIPROCAL A DUTY FOR OTHERS/ FOR SELF OBSERVED
among college students	REALITY/ FIDELITY	LIVED CHOSEN EXPECTED	CONSISTENT/ A HABIT CONTINUUM OF QUALITY	A LARGER WORLD NON-RECIPROCAL
among teacher respondents	IN DEED PHILOSOPHICAL /CONVENTIONAL	OBSERVED SCHOOL CONVENTIONAL	PERFORMED SCHOOL CONVENTIONAL	OBSERVED SCHOOL CONVENTIONAL
among institutional and instructional leaders	GOD-CENTERED THOUGHT-ACTION ORIENTED MODERN PHILOSOPHICAL	INTEGRAL WITH WISDOM TO CHOOSE ONLY THE RIGHT THING DESIRABLE MORAL QUALITIES OF PERSON MANIFEST IN ACTION ARISTOTELIAN	A HABIT A COMMITMENT AN OUTCOME	INDISCRIMINATE/ LARGER WORLD RESPONSIBILITY SERVANT LEADERSHIP

The Primary Virtues of the Founder Dr. Paulo C. Campos and Mrs. Soledad L. Dolor

Dr. Paulo Campos emerged as a „man of excellence", „man for others", and the man with a progressive love of country, being responsive to local and national development. Mrs. Soledad Dolor is largely unfamiliar; though, she is cited courageous and industrious, dedicated to service, a good woman and a loving mother; and one of the pillars of EAC because of her support and dedication to the vision of Dr. Paulo Campos. She is seen as an admirable example.

Core Values

The EAC Core Values are the lighthouse of course contents and pedagogical approaches. The responses of students about the definition and indicators of the core values are seen in this research as an outcome of their spiraling consciousness in the development of their vocabulary after taking the ECF course.

The data in Table 3 show an abbreviation of detailed themes, indicators and statements of the Core Values, instead of individual table discussions which cannot be accommodated in this journal format.

SYNTHESIS ON THE CORE VALUES

The definitions and indicators of the core values (Truth, Virtue, Excellence, and Service) provided by the students when paralleled with those of the teacher- respondents and IILs somehow indicated multiple and, somewhat inconsistent worldviews of individuals coming from multicultural groups and manifesting the extent of vocabulary gaps as indicators of their growing understanding and acceptance of these set of values in their spiraling consciousness, regarding what they hear and observe as practices in EAC as a community. We see these gaps in the seemingly generic pronouncements but working definitions of the SHS students compared with the more theoretical and discerning views of the College students. We can also sense this from the varying level of conceptual understanding among the teacher- respondents which of course is attributable to their content and pedagogical orientation and preparation for the ECF course. These definitions and indicators of the core values which are prime motivation in establishing a culture with element of consistency is barely satisfactory when perceived within the diverse and larger scope of the IILs given responses.

4. INSTITUTIONAL AND INSTRUCTIONAL LEADERS"INTEREST AND CONCERNS

In this part, the discussion focuses on the interests and concerns of ILL regarding the content, pedagogy, and supervision of the ECF course. For further analysis, archival research about the ideals and legacies of the founder, Dr. Paulo C. Campos, Mrs Soledad Dolor, and General Emilio Aguinaldo and other theoretical-conceptual and cultural-philosophical references were integrated.

Table 4.1 shows that the major themes about the primary interests and concerns among the IILs are: Articulating the EAC VMO and core values; and, Branding. One instructional leader is concerned about streamlining the course content and changing the focus towards the affective domain of learning.

Table 4.1

Primary interests and concerns in offering and delivering the ECF course

themes	**indicators statements**
ARTICULATING THE EAC VMO	***translate the*** *VMO and Core values of the school to the learner cognitive, affective and behavioral aspects- GO/ to* ***articulate the vision and mission*** *of EAC through a course that will engage, empower, and equip Emilians to* ***live by them*** *and the core values of EAC - VPAA /* ***integrate the ideals and legacies*** *of EA in* ***living out*** *TVES - NSTPC/ That the students will be* ***able to understand*** *Emilian value and apply them to their lives/ Registrar /* ***help students*** *better understand the institution - OSAS/* ***educate the students*** *of its history and develop patriotism -AAO*
BRANDING	***"BRANDING"****-DD/ creating a new brand/ breed of learners who can relate the school vision to the community OSAS/ one method of educating and* ***informing various stakeholders*** *of the EAC community on* ***how we live our life****- DRT That the school may be able to establish a strong internal* ***branding*** *from which EAC will be known/ Registrar / towards* ***transforming****/ instilling Emilian character and pride - HRD/ equip Emilians* ***to live by them*** *and the core values of EAC - VPAA* ***living out*** *TVES - NSTPC*
NEED TO CHANGE	***there is a need to change*** *the course syllabus/* ***Streamline the content*** *and* ***focus more on affective domain****/ enculture - DSOE*

Table 4.2

Suggestions/ recommendations on teaching the course

Themes	**Indicators statements**
STUDENT-CENTERED APPROACH (Pedagogical)	*Teaching methods that is* ***more appreciative of*** *EAC can be utilized -GO / more* ***student centered, cooperative and collaborative*** *teaching-learning -DSOE*
(Technological)	***Multimedia*** *approach. using slides and videos then after presentation as questions or ask the students to summarize their observation and write conclusions -DRT /* ***tour*** *them just like a researcher - AAO*
CONTENT VALUE	*numerical focus on historical accounts but* ***on the values to be learned*** *- VPAA / tell the true story and history of EAC - AAO*
ROLE MODEL/ FACILITATOR	***creating a pool of life coaches*** *who will teach the course. these life coaches should* ***possess qualities and character*** *HRD / teacher* ***should be well oriented*** *about the EAC culture. - GO*
	It should start with a facilitation/ faculty member who will show as ***a role model*** *of a true Emilian. Facilitator teaching Emilian should be* ***at least a graduate*** *of EAC whether Manila or Cavite -NSTPC*

Table 4.3
About pedagogical approaches and strategies that can be used in ensuring meaningful teaching–learning activities for this course

themes	indicators statements
INTERACTIVE	***inquiry learning*** *- the students will have the chance to formulate questions and will have the responsibility of solving them - DRT / using inquiry learning directed by* ***situational questions****, problems or challenges to gauge how students react, feel and resolve issues (OSAS) /* ***Interview*** *with personnel/ REG /* ***tour*** *in old EAC pictures, archive, who's the people behind the EAC from past to present (AAO)*
REFLECTIVE	***reflective learning*** *- VPAA*
TRANSFORMATIVE	*it should be more on re-enactment, dramatization, and* ***role-playing*** *of the values integrated in the course outline -NSTP* ***coaching and mentoring, transformative*** *education/ learning -HRD*
BLENDED	*we* ***can try new teaching methods/ approaches*** *whichever is* ***applicable to the learners****.* ***blended learning****, use of blogs, mobile apps and other technology -GO*
	NA - AT/ DD/ DSOE – (*as part of assessment /researcher team)*
Among Teacher respondents	***role playing, simulation****- SHS01 /* ***student centered*** *approach-SHS02 /* ***exploring*** *what's in the school-SHS05/ role play - AS18 /* ***learning by doing****, research, report and* ***group study****-AS20*

SYNTHESIS

On the Primary Interests and Concerns in the ECF Course

Instructional and Institutional leader-respondents with more than four years of stay in the institution were: the lead proponent of the course; members of the consultative and preparatory committee (to establish the Emilian culture formation course through research, draft the framework, identify the attributes and expected learning outcomes and indicators for students, faculty, and employees, and critique the I AM EMILIAN creed); and one undertaken the assessment of the ECF syllabus and facilitated ECF seminar for SHS teachers. Their primary interests and concerns are: 1) **Articulating** the EAC VMO and core values; and, 2) **Branding**. One instructional leader sees the need to change and is concerned about streamlining the course content and changing the focus towards the affective domain of learning.

On Teaching the Course

IILs suggestions and recommendations that emerged are: 1) student-centered approach that is appreciative of EAC, collaborative, multi-media, and interactive with the community; 2) content knowledge that emphasizes values to be learned on historical accounts; 3) role model facilitator possessing qualities and character of a "true Emilian". Pedagogical approaches and strategies should be interactive learning that is *inquiry-based; reflective; transformative; and, blended*. Teaching-learning activities and outcomes should be evaluated through: 1) traditional/standard testing (pen and paper test); 2) Impact assessment (self/ peer/community/ parents); and, 3) authentic/ outcome based

(performance test; projects; holistic; portfolio; rubrics based); and 4) responsive to the expressed interests of the program stakeholders. These suggestions are preferred for a student-centered -activity-based orientation of the ECF course and conforms to the current Outcomes-Based Education (OBE) teaching - learning paradigm.

On Supervision of ECF Course

All of the IILs agreed that supervision is necessary in delivering the course. The major reasons cited are: ensuring vital role of teacher-facilitator; assessment and evaluation purpose; and ensure consistency of learning outcomes or culture. On who should supervise the course, the most answers pointed to the School of Education or School of Arts and Sciences instructional leaders (Dean, Faculty member, Guidance counsellor…) to perform supervision of the ECF course being a general education subject for freshmen. A pool of life-coaches, meaning somebody well-trained and able to facilitate through transformative approach was also suggested. A role model of virtue, excellence and service was also a concern raised.

On Suggested Material Contents and Activities

Suggestions or recommendations about the ECF course content among the SHS students were: more of history and about Cavite (Content); and, to explain philosophy of Emilio Aguinaldo, align topics with current issues, and provide more productive activities (Pedagogical approach). Some College students suggested student-centered pedagogical approach indicated by visiting EAC Shrine and EAC Manila to live one EAC, one Emilian, and educational tour to better appreciate places, to places showing the three (3) core values that might enhance knowledge and get more experience. They emphasized that the Core values should be examined carefully and applied in students' lives. One student believed that the ECF course had been validated by experts who are able to meet the standards. A teacher- respondent suggested activities inside and outside the school, community service, communicate with other people and students and talking about the Core values. The IILs emphasized: 1) cultural dialogue; 2) culture change or character development, values transformation, and application of the values learned; and 3) reflection on societal values.

The suggested materials included values education guidebooks and UNESCO sustainable development goals, and institutional research agenda; life of Emilio Aguinaldo and Dr. Paulo Campos; and, the Bible (Christian literature), and quotes from Emilio Aguinaldo and from the

Bible. For institutional activities, they prefered multiple intelligence showcase; and Emilian Day cultural exposition.

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. Summary

Fifty-nine EAC students representing four Schools and four Strands participated in the open-ended questionnaire to assess their learning experiences and realizations of the Emilian Culture Formation course parallel with the teaching experiences of five (5) teacher-respondents who taught the course; and the interests and concerns of ten (10) instructional and institutional leaders (IILs) to find congruity and basis for curriculum revision.

1. On the attainment of the ECF course objectives

The teachers who taught the course, equipped with the content, pedagogical and technological knowledge and the two groups of students with varied levels of orientation and experiences, both gave a *Satisfying* mark to the attainment level of ECF course objectives. But, while both group of students gave an overall means of 3.36 and 3.025, interpreted as *Satisfying*, to the attainment of ECF course objectives, their different levels of orientation and experiences were evident. It is noticeable that some topics learned satisfactorily by one School is learned less by another. This is evident for individual learning objectives 4, 5, 6, and 7, and among the TVL, Nursing, and Criminology groups when averaged by School or Strand.

2. On the learning experiences of respondents

The positive learning experiences and realizations of the majority of the students are outcomes of course contents that are informative, well-taught, interesting and challenging, and found valuable to their lives. They realized the course to be essential, instructive, and significant in developing self-consciousness and national identity. The pedagogical approaches effective to the contents successfully learned were those of student-centered collaborative and exploratory where teacher-facilitators gave their best by actively engaging their students with in-depth discussion, multimedia and interactive- experiential activities, and application of skills. Those who experienced limited learning associated it with professors not engaging the students with the topics strategically.

3. On the course content

Sense of place

Majority of the respondents from all groups expressed positive sense of security and welcome in EAC, save for a few but also valid apprehensions. These students" impressions of physical security presence around the campus and the felt observation of accommodating, welcoming, familial, or friendly behavior of school faculty, staff and officials are surface indicators of their growing sense of place being reciprocated by the affirmation of the teacher respondents and IILs. This sense of place is key to further notice and appreciate the school environsment, structures and resources, and organizational relationships and institutional traditions and practices (i.e. mind mapping of school, immediate and larger community, conducive places for study and relaxation; facility for environment friendly waste management; presence of fire prevention devices, fire and earthquake drills, conduct departmental processes; charter on school services; availability of food services; rules of conduct; peer and student-mentor relationships; conduct of school activities and programs; accessibility of information; collaborative participation in learning activities; democratic practices inside the classroom and as member of the institution; Clean as You Go, etc.)

The ideals and legacies of General Emilio Aguinaldo

The majority of the respondents provided positive outlook about Emilio Aguinaldo"s leadership and heroism as a leader of the revolution and as President of the First Republic. Though a few recognized the contextual location of his courageous leadership in a war torn nation along with the flaws, the seeming absence of critical controversial attributes from among the students" responses could be seen here as indication of passive or lack of critical historical understanding in the topic which is an important development of their critical thinking and scientific reasoning. Dr. Campos himself honored Emilio Aguinaldo, if not his exploits as a military man, but as a civilian leader, enough to honor him as a national hero. He was to him also the father of Filipino nationalism. Dr. Campos cited *"Together with Bonifacio, they shared the responsibility in infusing the sense of common root and common destiny of the various groups inhabiting the archipelago- nationalism, the love of country and the desire to fight for the country on a national scale…"*

The primary virtues of the founder Dr. Paulo C. Campos and Mrs. Soledad L. Dolor

Dr. Paulo Campos emerged as a „man of excellence", „man for others", and the man with a progressive love of country being responsive to local and national development. Mrs. Soledad Dolor is largely

unfamiliar; though, she is cited courageous and industrious, dedicated to service, a good woman and a loving mother; and one of the pillars of EAC because of her support and dedication to the vision of Dr. Paulo Campos. She is seen as an admirable example, who according to Dr. Campos, "*Aside from my parents and my wife, another lady who came into my life in the course of my professional career was Mrs. Soledad Dolor. She played a big role in the founding of the Medical Center Manila. For many years she was my associate as Chairman of the Board of the UPSI. I have great respect for her gentle, understanding, prudent and always open mind. It was not difficult to have worked with her for over thirty years."*

The CORE VALUES

There are gaps in the depths and scope of seemingly generic pronouncements but working definitions of the SHS students paralleled with somehow theoretical and discerning views of the College students in each of the core values. We also sensed this gap from the varying level of conceptual understanding among the teacher-respondents which of course is attributable to their proficiency and pedagogical orientation and preparation for the ECF course. These gaps among students and teachers" definitions and indicators of the core values, which are surface behavioral indicators in a cultural practice with element of consistency, are barely satisfactory when perceived within the diverse and larger scope of the IILs given responses.

5. On teaching the course

The IILs" primary interests and concerns identified were: 1) *Articulating the EAC VMO and core values*; and, 2) *Branding*. The need to change the course focus and streamlining its content towards the affective domain of learning is also identified. Recommended pedagogical approaches were: 1) *student-centered approach* that is appreciative of EAC, collaborative, multi-media, and interactive with the community; 2) *content knowledge that emphasize values* to be learned on historical accounts; and, 3) *role model facilitator* possessing qualities and character of a "true Emilian". Teaching strategies should be interactive learning that is *inquiry-based, reflective, transformative, and blended*. Learning outcomes should be evaluated through: 1) *traditional/standard testing* (pen and paper test); 2) *Impact assessment* (self/ peer/community/ parents); and, 3) *authentic/ outcomes based* (performance test; projects; holistic; portfolio; rubrics based); and 4) *responsive* to the expressed interests of the program stakeholders.

Suggested material contents and activities

Content materials suggestions included understanding cultural and theoretical philosophical concepts of the School‟s Vision, Mission, Objectives and core values; cultural- anthropological perspectives on Filipino identity and values; critical historical thinking skills standards in contextualizing and appreciating the roles of EAC exemplars (E. Aguinaldo; Dr. P. Campos; Mrs. S. Dolor); reflection guides on Christian literature; geographic-environmental orientation through sustainable development goals by the UN; etc. The suggested institutional activities involve showcasing students‟ multiple intelligence that will culminate in the last phase of the course as Emilian Day cultural exposition.

On ECF Course Supervision

All of the IILs agree that supervision is necessary in delivering the course. The major reasons cited were: ensuring vital role of teacher-facilitator; assessment and evaluation purpose and on consistency of learning outcomes or culture. On who should supervise the course, the most answers pointed to the School of Education or School of Arts and Sciences instructional leaders to perform supervision of the ECF course being a general education subject for freshmen. A pool of life-coaches, or well-trained individuals who are able to facilitate through transformative approach was also suggested. A role model of virtue, excellence and service was also a concern raised.

B. Conclusions

The teaching –learning experiences and the institutional concerns in this study resonate implications with the formulation of curriculum contents and pedagogical approaches and thus requires instructional leadership that shall ensure consistency in the implementation and evaluation of the ECF course.

1. Consistently aiming to achieve the highest level of learning outcomes from the course objectives should be an indicator of competency-based teacher standard on the part of teacher-facilitators and instructional leaders pursuing quality teaching to their student clients. The various attainment levels identified in this study indicate absence of standard competencies on the students‟ learning outcomes, which, in this culture formation course is an important feature. This issue is a major gap in the quality objectives of this institution and should be addressed significantly.

2. As the ECF Course is intended to be a banner course to cultivate an evolving Emilian culture consistent among students, these learning and teaching experiences and realizations explored shall serve as

basis for further developing the content materials and pedagogical approaches to make it culturally accepted, affirmed and practiced. This endeavor entails a lot of commitment and strategy on the part of teacher-facilitators and instructional leaders of the course to craft and implement a Syllabus and Modules that will embody the ideals and identity of an Emilian.

3. It is aimed in the ECF course to develop *caring sense of place* that involves a spiraling concern for school, community, country, and Mother Nature. Developing a caring sense of place as a course objective should be a launching episode in orienting the students to their new academic learning community where they will realize that they belong to a community of learners where education is implicated with harmonious relationship with other stakeholders, sustainable development, and a working sense of environment that is cared for, protected, and nurtured. It is essential that ECF learning activities develop their functional geographic sense, vocabulary, and caring attitude towards other living beings and material resources.

4. The discourse about how, why, and what inspired the founder Dr Paulo Campos to name the school EAC shall be an opportunity to discern the ideals and legacies of Emilio Aguinaldo as a Father to the Filipino nation. It is imperative that the Emilians who banner the name of EAC as an educational institution learn from the ideals and legacies of the man. Modules embedded with timeline of events and critical guide questions with suggested references to discourse Emilio Aguinaldo"s brand of leadership in a revolutionary period and in the current contexts in students" lives, to test the scientific reasoning and critical historical thinking skills of the Emilians, are necessary.

5. The EAC Core Values TRUTH, VIRTUE, EXCELLENCE, and SERVICE, are the lighthouse illuminating the school"s Philosophy, Vision, Mission, and Objectives. These core values are also the large feature course contents and guide the pedagogical approaches of the ECF Course. The responses of students about the definition and indicators of the core values are seen in this research as an outcome of their spiraling consciousness in the development of their vocabulary after taking the ECF course. The vocabulary gaps in articulating the core values identified among the stakeholders should be cured and further be enriched with definitive uses of affirmed and accepted core values indicators, adapted from the more theoretical-philosophical and multi-cultural references. This core values articulation should be embedded as multi-referenced conceptual feature readings and each should be given expanded discourse with self-assessment, reflective learning activities.

6. In the EAC pursuit to culture the core values among the Emilians, it is essential to study and discern the exemplars of those virtues. Many names and paragons shall be tackled along the theoretical-cultural discussion of the core values but a culture to be distinct from the insiders and outsiders" view must carry the banners of its founders and its inspiration. It is just humble and proper that the discernment of the EAC core values in the teaching - learning activities feature embedded readings about the life"s achievements of the „man for others" - founder Dr. Paulo C. Campos, and „a good woman" - Mrs Soledad L. Dolor.

7. The IILs" suggestions of how to teach the course; what to emphasize in the contents; and how to evaluate, affirmed mostly the identified needs of the students for more productive activities and core values examination and application, and those of the teacher-respondents. The meeting of these suggestions is preferred for a student-centered, activity-based orientation of the ECF course that conforms to the current Outcomes- Based Education (OBE) teaching - learning paradigm. These suggestions in the content and pedagogy of the ECF course necessarily require equipping the Teacher-facilitator with Technology, Pedagogical, and Content Knowledge package or TPACK.

8. The suggested institutional activities showcasing students" multiple intelligence that will culminate in the last phase of the course as Emilian Day cultural exposition necessarily call for a concerted efforts in the buildup of learning activities in the early phase. This entails a lot of commitment and coordination from each of the stakeholders.

C. Recommendations

Enculturation is a lifelong process and involves the whole EAC village. It cannot modestly be contained in just one semester but the Emilian Culture Formation course which is offered to all freshmen and Grade 11 Senior high School students, can maximize the opportunity to orient the students" consciousness to the geographical, historical, philosophical, and multicultural perspectives of the course towards interdependence and sustainable development as a community of learners. To cultivate an evolving Emilian cultural identity that is realistic, relevant and reflective of „nationalist tradition that consistently pursues advancement and welfare of humanity", the researchers present the following recommendations:

1. adoption of an institutional definition and indicators of the core values, which shall be embedded in the ECF Course Syllabus and Modules relevant to the national and global contexts of the 21st century standard learning competencies, which, in this culture formation

course is an important feature of vocabulary development consistent among students;

2. design, write, and publish Study Modules articulating the EAC Philosophy, Vision, Mission, Objectives; EAC Core Values; and the ideals and legacies of Emilio Aguinaldo, and founder- Dr. Paulo C. Campos, which shall establish the outcomes-based learning competencies of the course integrating the suggested multicultural and theoretical perspectives, content materials, and student-centered holistic development pedagogical approaches;

3. conduct seminar - workshops for the instructional leaders and a number of teacher-facilitators that shall equip them with Technology, Pedagogical, and Content Knowledge package or TPACK for the effective delivery of the ECF course. This shall be a regular instructional development activity to ensure continuous and readily available pool of course facilitators;

4. conduct seminar - workshops for the various departments of the institution to reinforce and make consistent the positive impression of the Emilian culture among stakeholders. This can be achieved through modified pedagogical approach and timeline to the ECF Course Modules for Students;

5. establish an ECF desk to collaborate network of the ECF course facilitators with other stakeholders to accomplish: 1) adaptations of ECF course content, timeframe, and approach; 2) buildup of activities from the early phase of the curriculum up to the culminating activities; and 3) coordination of objectives and propagation of Emilian thoughts, practices, and materials for visible branding in all relevant institution"s academic, research agenda, industry cooperation, community extensions, and celebrations;

6. Supervise implementation of the ECF Course to ensure vital role of teacher-facilitators; assessment and evaluation purpose; and ensure consistency of learning outcomes or culture.

7. Further recommend that the ECF Modules feature the following structure, essential elements; contents; and objectives:

A. Structure: 3 Parts with 9 Modules

PART 1: My EAC Foundation
Module 1: Sensing EAC
Module 2: A Community of Learners -EAC School Philosophy, Mission-Vision-Objectives
Module 3: My Roots - History of Emilio Aguinaldo College /Truth

PART 2 My Cup of Values
Module 4: Virtuous individual / Virtue / Advocacies of our Founder"s inspiration/ Soledad Dolor – "A Good Woman"
Module 5: Excellent Professional / Excellence as a habit / Advocacies of Our Founder / Dr. Paulo C. Campos- "Man for Others
Module 6: Service-Oriented Global Citizen/ Service / *Malasakit*-Compassion/ Filipino Core Values and Social Justice
Part 3: My EMILIAN Legacy and Inspiration
Module 7: General Emilio Aguinaldo Ideals and Legacies - The relevance of Emilio Aguinaldo in making the Filipino nation
Module 8: My Cultural Worth- Cavite in Perspectives / Cavite Cultural Identities
Module 9: PUNLA - I am Emilian Cultural Exposition

B. Elements:

1. Module number and title
2. Introduction
3. Learning outcomes/ objectives
4. Teaching-learning Activities:
    - **Collaborative learning activities (**team building activities/ discussion groups/ group presentations/ performances/ projects/ archival and internet research/ making rubrics)
    - **Conceptual learning activities** (concept mapping/ feature reading/ quotes/ suggested readings with multi-cultural – theoretical- philosophical perspectives/ references/ Vocabulary building activities ex. definitions and indicators of core values)
    - **Interactive learning activities**: (Multimedia enhanced lecture-discussion/ Google mapping/ interviewing…)
    - **Reflective learning activities**: (Self-assessment activities/ writing activities/ drawing activities/ coloring / Reflective guide questions)
    - **Seminar type/ Recollection type learning**: (Aguinaldo lecture series/ Sharing My Cup of Values…)
    - **Experiential learning activities:** / Cavite / Kawit Shrine Tour/ interviewing/ environmental photo-video documentation/ voluntary group travel…)

- **Culminating activities:** (PUNLA* – I Am an Emilian Cultural Expositions/ multiple intelligence showcase/ creative skills application)

C. Contents and Objectives:

PART 1: My EAC Foundation

Module 1: Sensing EAC

- Develop a „caring sense of place" of EAC community
- Manifest enthusiasm and confidence in teamwork with proficient group output
- Construct creative map of EAC and its surrounding Community
- Conduct effective people interaction with interviews

Module 2: A Community of Learners -EAC School Philosophy, Mission-Vision-Objectives

- Demonstrate openness and respect in interacting with different views in analyzing the EAC School Philosophy and Vision-Mission, and Objectives statements
- Reflect agreeably by implicating oneself on Education for Sustainable Development goals
- Interpret the lyrics of EAC Hymn and empathize with its meaning by singing with enthusiasm
- Propose students" actions to maximize and value EAC assets and resources

Module 3: My Roots - History of Emilio Aguinaldo College /Truth

- Appraise the advocacies of the founders in establishing the Emilio Aguinaldo College
- Recognize the critical role of students in Academics, Research and Community Linkages and Service programs of the institution
- Expound the definition and meaning of TRUTH as core value and appraise oneself through the dimensions of critical thought
- Reflect positively on the value of Truth and Critical Thinking in personal and educational goals

PART 2 My Cup of Values

Module 4: Virtuous individual / Virtue / Advocacies of our Founder"s inspiration/ Soledad L. Dolor – "A Good Woman"

- Explain significance and cite indicators of Virtue as one of the Core Values of EAC
- Distill virtues from the ideals and achievements of the founder Soledad Lirio Dolor
- Examine how virtues influences students" vision of good society
- Assess oneself and reflect positively on the value of Virtue and Sharing

Module 5: Excellent Professional / Excellence as a habit / Advocacies of Our Founder / Dr. Paulo C. Campos- "Man for Others"

- Explain significance and cite indicators of academic and cultural competency as manifest of Excellence as one of the core values of EAC
- Appraise the academic and non-academic achievements of the EAC
- Distill virtues and excellence from the ideals and achievements of the founder, Dr. Paulo Campaña Campos
- Assess oneself and reflect affirmatively on the values of excellence, cultural competency, and dignity of labor

Module 6: Service-Oriented Global Citizen/ Service / *Malasakit*- Compassion/ Filipino Core Values and Social Justice

- Explain significance and cite indicators of Service as one of the core values of EAC
- Demonstrate understanding, recognition and appraisal of Filipino identity and Values in service orientation
- Assess oneself and reflect compassionately on the contemporary issues of Philippine and global society

Part 3: My EMILIAN Legacy and Inspiration

Module 7: General Emilio Aguinaldo"s Ideals and Legacies - The relevance of Emilio Aguinaldo in making the Filipino nation

- Discern the ideals and legacies of Emilio Aguinaldo as a Father to the Filipino nation.
- Demonstrate historical thinking skills in discoursing Emilio Aguinaldo"s brand of leadership in a revolutionary period and in the current contexts in students" lives
- Manifest one"s sense of nationalism or patriotism in a reflection about Emilio Aguinaldo

Module 8: My Cultural Worth- Cavite in Perspectives / Cavite Cultural Identities

- Appraise how geographic, cultural, and demographic knowledge can enhance authentic and sustainable development
- Catalogue, map, describe and appraise the cultural traditions, natural and historical landmarks, industries, and products as manifest of virtue, excellence, and service of the people of the Province of Cavite
- Reflect sympathetically on the environmental and social situations of Cavite

Module 9: PUNLA - I am Emilian Cultural Exposition

- Express one"s Emilian cultural values in multiple intelligence and multimedia forms
- Demonstrate celebration of truth, virtue, excellence, and service in the collaborative activities showcasing the Emilian culture
- Affirm the Emilian Creed in a reflective writing

REFERENCES

Blaike, Norman, 2000; *Designing Social Research*; Blackwell Publishers Inc.

Bokova, Irina; *Culture And Development* № 14UNESCO Regional Office For Culture In Latin www.unesco.lacult.org

Bourdieu, P, 1984; *Distinction: A Social Critique of the Judgement of Taste*. London, Routledge.

Bruner, James (1991); *The Narrative Construction of Reality*, Critical Inquiry 18 (Autumn 1991) http://www.semiootika.ee/sysiskool/tekstid/bruner.pdf

Butt, Graham, 2011; *Geography Education and the Future*; Continuum International Publishing Group;

Calairo E.; *Saloobin*/ Sentiments: Aguinaldo Response to Mabini; Cavite Studies Center-DLSUD/Cavite Historical Sites; CSC-DLSUD

Campos, Paulo; Story of My Life (An Autobiography)

De la Torre, Visitacion, 2013; Soledad Lirio Dolor; Tower Book House; ISBN 978-971-95258-2-3

De Leon, Felipe Jr.; *Values in Our Quest for Freedom from an*

Anthropological Viewpoint

Gearon, Liam editor; 2003; *Learning to Teach Citizenship in the Secondary School*; RoutledgeFalmer; ISBN 0-415-27674-8

Kuo-Hung Tseng, 2010; Using *the Context, Input, Process and Product model to assess an engineering curriculum*; *World Transactions on Engineering and Technology Education;2010 WIETE Vol.8, No.3, 2010* 256

Medina, Nieves, 2015; Affirmation of the Emilian Culture and Values: A Tri-Dimensional Integration of Approach for the Stakeholders of EAC-Cavite: A Proposal

Patil, Y, Kalekar, S, 2014; *CIPP Model for School Evaluation*; Research Journal for Humanity Science and English Language; ISSN 2348-3083

Stufflebeam, D.; *the CIPP Model for Evaluation*; The Evaluation Center, Western Michigan Uniuversity, MI, USA, pp 31-35/ 2003; *Context, Input, Process, Product CIPP Approach in Curriculum Evaluation*

Taylor, Gene; a Study of the Parables of Jesus;

Yahaya, A, 2001; *The Using of Model Context. Input, Process and Products (CIPP) In Learning Programs Assessment.*

Woods, Thomas A.; Making Sense of Place, Inc. Defining a 21st Century Education-Full Report (PDF)

K TO 12 TOOLKIT Resource Guide for Teacher Educators, School Administrators and Teachers; 2012; SEAMEO INNOTECH; ISBN 978-971-0487-58-5; http://www.seameo-innotech.org

ISSC and UNESCO (2013), *World Social Science Report 2013, Changing Global Environments,* OECD Publishing and UNESCO Publishing, Paris

Stanford Encyclopedia of Philosophy

UNDP Sustainable Develeopment Goals (SDGs) 2016-2030

UNESCO culture and development agenda 2030

UNESCO - APNIEVE Modules: Learning to Know; Learning to Be; Learning to Do; Learning to Live Together

EAC- Cavite Registrar‟s Enrollment Records (2015-2016)

2017 Edition EAC Cavite Student Manual

Meaningful recognition, work environment and nurse‟engagement in a hospital setting

[1]Obdulia M. Almarez, [1]Giovannah H. Castillo,
and [2]Anna Sincerra Quinio

[1]Emilio Aguinaldo College-Cavite, School of Nursing
[2]Emilio Aguinaldo College – Cavite, School of Midwifery

Abstract

Creating a healthy work environment in hospital setting is crucial to maintain an adequate nursing workforce. In order to achieve a more equal supply and demand of nurses, working environments need to facilitate the retention of skilled staff, embedded, and engaged nurses to help lower operating costs for hospitals. This study sought to find out the types of recognition most meaningful to nurses and the relationships with work environment and nurses" engagement. Baseline data were collected among nurses employed from four different hospitals in Cavite. Responses were gathered using the Recognition questionnaire by Blegen,et.al (1992), and The Healthy Work Environment Assessment tool adapted from AACN, 2014. To describe the nurses" work engagement through a semi-structured interview, a researcher"s made-questionnaire was used. Results revealed with computed Pearson"s r of 0.773627 indicates that a marked correlation between work engagement and meaningful recognition at 0.001 level of significance. A p – value of 0.008066 shows a significant relationship between the two variables. Therefore, as meaningful recognition increases, work engagement also increases. Factors that give enthusiasm to the participants based on their oral responses are salary, handling and caring for patients, and finish work on time, co-workers, improvement of skills and knowledge while working independently. It is essential that the profession look at ways to achieve a satisfied nursing workforce. A comprehensive understanding of what nurses need to feel recognized is important. Private verbal feedback, holding regular meetings, participation in professional growth and development are meaningful to them. Frequent communication between the management and staff promotes a healthy working environment. Staff should be involved in decision making and appreciated through rewards.

Keywords*:* meaningful recognition, work environment, work engagement

INTRODUCTION

The opportunities are great for expanding the roles of nurses, changing the practice of nursing, and shaping the future of healthcare. It is estimated that an additional nurses are needed to meet the needs of new clients both in primary care and acute care in the next decade. With nurses being the largest professional group in a hospital, they are the forefront to prevent and mitigate potential complications as well as implementing quality improvements and the use of evidence-based practice. Retention of nurses in the hospital is the key to safe nursing practice and better patient outcomes. Nursing shortage is persistent and factors contributing to the shortage include a greater demand than supply of nurses and an aging workforce. In order to achieve a more equal supply and demand of nurses, working environments need to facilitate the retention of staff. Retaining skilled, embedded, and engaged nurses as well as attracting qualified candidates can help lower operating costs for hospitals and reduce medical errors (Ritter, 2011).

In one healthy work environment study for nursing practice by Shirey (2006) revealed that creating a healthy work environment is crucial to maintain an adequate nursing workforce; the stressful nature of the profession often leads to burnout, disability, and high absenteeism and ultimately contributes to the escalating shortage of nurses. Implementation of authentic leadership can affect not only the nursing workforce and the profession but the healthcare delivery system and society as a whole. The American Association of Critical Care Nurses in 2005 released a landmark publication specifying 6 standards necessary to establish and sustain healthy work environments in healthcare: skilled communication, true collaboration, effective decision making, appropriate staffing, meaningful recognition, and authentic leadership. Mechanisms can be described by which authentic leaders can create healthy work environments for practice like engaging in the work environment to promote positive behaviors.

In a non-experimental study by Thomas (2012), meaningful recognition and appropriate staffing were identified as predictor variables of decreased intention to leave among direct care nurses in a hospital setting. There was an anomalous finding of authentic leadership as a predictor variable of increased intention to leave. According to Conley (2017), nurse managers have a significant role in staff satisfaction and unit outcomes and therefore need to be engaged in their work to influence others. In addition, Grochow (2012) believed that meaningful recognition leads to higher job satisfaction, stronger commitment to the organization and profession, better delivery of quality patient care and stronger workgroup cohesion and collaboration. This research aimed to: (1) find out the types of recognition most meaningful to nurses ,(2) study

the relationships of meaningful recognition, work environment with nurses" engagement, and (3) determine the differences on the nurses" meaningful recognition, work environment, and engagement in four hospital setting.

METHODOLOGY

Data were collected from 53 nurses employed in four different health care facilities in Cavite. Criteria for selection of hospitals include; tertiary private institutions and with nurses who had been working for at least three years. Results were obtained from participants who voluntarily signed the informed consent to answer survey questionnaire and agreed to support responses through a semi structured interview.

Descriptive correlational and qualitative approach (mixed-method) was utilized. These research designs provide method to examine the types of recognition most meaningful to nurses and study the relationships of meaningful recognition with work environment and nurses" engagement. Data were collected using the Recognition questionnaire by Blegen, Goode, Johnson, Maas, McCloskey & Moorhead, 1992, and The Healthy Work Environment Assessment tool adapted from AACN, 2014. To describe the nurses" work engagement, a researcher made-questionnaire was used. Pearson"s r was utilized to study the relationship of meaningful recognition, work environment with nurses" engagement while T-test to determine the differences on the nurses" meaningful recognition, work environment, and engagement in four hospital settings.

RESULTS AND DISCUSSION

Responses were collected from nurses in four different hospitals in Cavite province with 8 participants from hospital 1, hospital 2 with 16 participants, hospital 3 with 11 participants, and hospital 4 with 18 participants. Inclusion criteria were set for nurses with 3 years employment record and above on their current job and regardless of their unit assignment.

Table 1

The meaningful recognition of participants in different hospitals in Cavite

Statements	H1Nurses WM	H2Nurses WM	H3 Nurses WM	H4 Nurses WM	Descriptive Interpretation
Giving private verbal feedback.	2.88				Moderately experienced
Holding regular meetings to discuss and develop consensus on values related to patient care and management of the unit.		3.50		4.17	Considerably experienced
Encouraging staff nurse to participate in professional activities at national level.			3.91		Considerably experienced
Sending a copy of patient evaluations that compliment the staff nurse to senior nursing management.				4.17	Considerably experienced

Data implied that participants from Hospital 2 and 4 receive considerable recognition from their superior on the statements that they hold regular meetings to discuss and develop consensus on values related to patient care and management of the unit, likewise, superiors of nurses from hospital 4 send the nurses a copy of patient evaluations that compliment the staff nurse to senior nursing management, while nurses from Hospital 3 receive considerable encouragement from their superiors to participate in professional activities at national level. Private verbal feedback from their superiors is the moderate recognition received by participants employed in Hospital 1. The results are supported by the study of Tourangeau and Cranley (2006) where nurses showed the obvious importance of praise and recognition and that superiors should place priority on implementation of strategies that promote satisfaction in the areas of praise and recognition, relationships with co - workers, and with social interaction opportunities. Moreover, the AACN (2005) wrote that “recognition of the value and meaningfulness of one"s contribution to an organization"s work is a fundamental human need and an essential requisite to personal and professional development.

Table 2

The participants’ work environment in different Hospitals in Cavite

Statements	H1 Nurses WM	H2 Nurses WM	H3 Nurses WM	H4 Nurses WM	Descriptive Interpretation
Administrators, nurse managers, physicians, nurses and other staff maintain frequent communication to prevent each other from being surprised or caught off guard by decisions.	3.13			3.39	Moderately experienced
Administrators, nurse managers, and physicians involve nurses and other staff to an appropriate degree when making important decisions.		3.25	3.18		Moderately experienced

It appears that participants from Hospital 1 and 4 agree that they moderately experienced a work environment where administrators, nurse managers, physicians, nurses and other staff maintain frequent communication to prevent each other from being surprised or caught off guard by decisions. Moreover, participants of Hospital 2 and 3 both moderately experienced that administrators, nurse managers, and physicians involve nurses and other staff to an appropriate degree when making important decisions. It shows that there are environmental factors central to maintain healthy working experience such as supportive interpersonal behavior among staff members, positive leadership actions, teamwork and effective communication. Findings correspond to Ducharme et. al, (2017) stating that nurse leaders are integral in enhancing Professional Practice Environment (PPE) and their influence links structures necessary for an environment that supports outcomes.

Table 3

Work engagement of participants from 4 hospitals in Cavite.

Hospital Nurses	Work engagement	Mean	Descriptive Interpretation
H 1 Nurses	I am proud of my work	4.13	Engaged in work a few times a week
	My job inspires me	3.88	Engaged in work a few times a week
	I am enthusiastic about my job	3.63	Engaged in work a few times a week
	I am immersed in my work and I get carried away when I am working	3.5	Engaged in work a few times a week
H 2 Nurses	I am proud of my work	5.44	Engaged in work every day
	My job inspires me	5.25	Engaged in work every day
	I am enthusiastic about my job	5.13	Engaged in work every day
	I feel happy when I am working intensely	5.13	Engaged in work every day
H 3 Nurses	My job inspires me	5.09	Engaged in work every day
	I am proud of my work	5	Engaged in work every day
	At my work, I feel bursting with energy	4.91	Engaged in work every day
H 4 Nurses	My job inspires me	4.83	Engaged in work every day
	When I get up in the morning, I like going to work, and I am proud of my work	4.72	Engaged in work every day

Work engagement shows that participants from hospital 1 are proud of their work, their job inspires them, they are enthusiastic about their job, they are immersed in their job, and they are carried away when they are working, all interpreted as very often which means that they feel engaged in their work a few times a week.

Participants from hospital 2 are always proud of their work. Their job always inspires them, they are always enthusiastic about their job,

and they always feel happy when they are working intensely. This means that the participants are engaged in their work every day.

With regard to participants from hospital 3, their job always inspires them, they are proud of their work and are always bursting with energy at work. The participants also feel engaged in their work every day. Similarly, participants from hospital 4 feel engaged in their work every day indicated by being inspired in their job, liking to go to work upon getting up in the morning and being proud of their work always.

Indicators of work engagement vary among the participants from the 4 hospitals but the highest scoring statements are: “I am proud of the work I do”; “My job inspires me”; “I am enthusiastic about my work”; and; “I am immersed in my work”. The least scoring statement is “When I get up in the morning, I feel like going to work”.

Table 4

The relationship of work engagement to healthy work environment and meaningful recognition among participants from 4 hospitals in Cavite

Indicators	Mean	SD	Pearson - r	p-value	Significance
Work Environment	2.950	0.13064	0.675951	0.013143	Significant
Work Engagement	4.418	0.63416			
Meaningful Recognition	3.060	0.64560	0.773627	0.008066	Significant
Work Engagement	4.418	0.63416			

p<0.05; **p<0.01;*p<0.001 level of significance*

This presents the relationship between work environment, meaningful recognition and work engagement. At 0.001 level of significance, the computed Pearson"s r is 0.675951 which signifies a marked correlation between work environment and work engagement. With a *p – value* of 0.013143, findings show that there is a significant relationship between work engagement and work environment. It indicates that an improvement in work environment consequently improves work engagement.

With computed Pearson"s r of 0.773627 indicates that a marked correlation between work engagement and meaningful recognition at 0.001 level of significance. A *p – value* of 0.008066 shows a significant relationship between the two variables. Therefore, as meaningful recognition increases, work engagement also increases.

Above findings suggest that nursing administrators ought to regularly monitor the nurses" work environment and meaningful

recognition to implement strategies to enhance these thereby maintaining the work engagement of the participants.

Table 5

Difference on meaningful recognition, work environment and work engagement among nurse participants in 4 hospitals in Cavite

Indicators	Nurse Participants			
	H 1 Nurses	H 2 Nurses	H 3 Nurses	H 4 Nurses
Meaningful recognition	2.1977 ^{A}	2.9396 ^{B}	3.4606 ^{C}	3.6444 ^{D}
Work environment	2.7882 ^{A}	2.9845 ^{Bb}	2.9519 ^{Cb}	3.1111 ^{D}
Work engagement	3.4889 ^{A}	4.8819 ^{Bb}	4.7576 ^{Cb}	4.5432 ^{D}

The findings show that at 0.001 level of significance, based on computed p values, and indicated by bold letters there is a significant difference on meaningful recognition among nurse participants from the 4 hospitals.

With regards to work environment, a significant difference is found among the participants from Hospital 1 and from Hospitals 2, 3 and 4; between participants from Hospital 2 and Hospital 4; and between participants from Hospital 3 and Hospital 4. However, there is no significant difference on work environment between participants from Hospital 2 and Hospital 3.

Furthermore, there is a significant difference on work engagement among participants from Hospital 1 and Hospitals 2, 3 and 4; between participants from Hospitals 2 and 4; and between Hospitals 3 and 4. However, there is no significant difference regarding work engagement between participants from Hospital 3 and Hospital 4. This indicates that work engagement of nurses are similar in some hospitals but may vary in some.

The concept of nurse engagement describes nurses" commitment to and satisfaction with their jobs. Engagement influences nurses" performance, and therefore, it also has an impact on health-care outcomes. This is a result of the interaction between positive work environment and recognition that they receive from the management, their co – worker, clients and other people. Social support from the organization plays a great role as well as leadership factors.
Nursing leaders can contribute much to improve nurse"s work engagement by fostering a work climate and job satisfaction that will improve work engagement over time.

Table 6

Summary of Oral responses on Work engagement among the Nurse participants in 4 hospitals

Work engagement	H 1 Nurses	H 2 Nurses	H 3 Nurses	H 4 Nurses
1. Factors that give enthusiasm	Salary	Handling and caring for patients	Helping other people and finishing work on time	Co-workers; Improvement of skills and knowledge while working independently
2. Factors desired that are not present in the work setting	Higher salary	Increase in salary and additional benefits	Latest technology	Additional rewards and salary
3. Importance of going to work or staying home	Going to work	Going to work	Going to work	Going to work
4. Preference of working intensely	No	Yes	Sometimes when the situation calls for it	Yes
5. Feeling when there is less work	Happiness	Boredom	Boredom	Relaxed and less stressed
6. Situations encountered that gives pride to profession	Gratitude from patients and relatives	Being appreciated by patients for everything done to them during their stay in the hospital; rendering quality care to patients	Saving lives and rendering bedside care	Gratitude and praise from patients and relatives and when patients get discharged from the hospital
7. Instances of being happy for or proud of work done	Compliments from other people about the work done	When patients appreciate the care they receive	When patients get well and discharged from the hospital	When many patients recover from their illness and are thankful for the care they receive; when commended by the management for the work and ideas shared
8. Being affected by situations (rewarding or not) on their motivation or engagement	Yes, rewards give more motivation	No	No, motivation comes from the passion to treat sick people	Yes, rewarding situations motivate people to work
9. Situations that gives motivation to work	Increase in salary, less workload, training, updated equipment, reward and compliments	Presence of co-workers who are very helpful during toxic times	Seeing sick people that needs nursing care and services	Praise and recognition from the management, superiors and co – workers

Compliments from other people, when patients recover from illness and appreciate the care that they receive, and when they are commended by the management for their work are instances that make the participants proud of their work.

The participants get their inspiration and motivation to work from having an increase in salary, presence of helpful co-workers during toxic times, seeing sick people needing nursing care and services and praise and recognition from the management, superiors and co-workers.

The factors that give the participants enthusiasm are salary, handling and caring for patients, helping other people and finishing work on time, co-workers; and improvement of skills and knowledge while working independently.

The participants feel happy when working intensely while they feel bored when there is less work to do. They also feel like going to work every day.

CONCLUSION

The type of recognition most meaningful to the participants are giving private feedback, encouraging staff nurses to participate in professional activities at national level, sending a copy of patient evaluations that complement the staff nurses to senior management, and holding regular meetings to discuss and develop consensus on values related to patient care and management of the unit.

Work environment that the participants regard as healthy are when administrators, nurse managers, physicians, nurses, and other staff maintain frequent communication to prevent each other from being surprised or caught off guard by decisions, and when the management including physicians involve the nurses and other staff members to an appropriate degree when making important decisions.

Indicators of work engagement among the participants are being proud of the work they do; being inspired by their job, and being enthusiastic and immersed in their work.

When recognition is more meaningful and the work environment is healthier, there is a consequent improvement in work engagement among the participants.

Work engagement varies among the participants depending on recognition that they receive and their work environment.

Implications

With the increased demand for nurses, it is imperative to retain practicing nurses as well as grow the workforce.

Nursing practice. It is essential that the institutions look at ways to achieve a satisfied nursing workforce. A comprehensive understanding of what nurses need to feel recognized is important. Private verbal feedback, holding regular meetings, participation in professional growth and development are meaningful to them. Frequent communication between the management and staff promotes a healthy working environment. Staff should be involved in decision making and appreciated through rewards.

Education. Nursing schools need to teach standards of a healthy work environment and techniques for team building. Related learning experiences are valuable for new nurses to give support and encouragement to them for their future practice.

Research. More research needs to be done to procure a better understanding of engagement, work environment and desired recognition behaviors. Another possible area is the role of age in recognition. Older nurses who make more money may seek out different recognition than a younger nurse who does not make as much. Furthermore, garnering a better understanding of why nurses disengage is essential. That nurse is seeking other opportunities that may or may not have anything to do with recognition and work environment in their current role.

REFERENCES

American Association of Critical-Care Nurses (AACN) (2005). *AACN standards for establishing and sustaining healthy work environments: A journey to excellence.*

Bigajski, A. et al (2017). *The Importance of factors related to Nurse Retention: Using the Baptist health Nurse Retention*

Blegen, M. A., Goode, C. J., Johnson, M., Maas, M. L., McCloskey, J. C. & Moorhead,

S. A.(1992). Recognizing staff nurses job performance and achievements. *Research in Nursing & Health*

Conley, K. (2017). *Nurse Manager Engagement: Strategies to Enhance and maintain Engagement*

Ducharme, M. et al (2017). *Leader Influence, The Professional Practice Environment, and Nurse Engagement in Essential Nursing Practice.*

Psychological Associates & daisy Foundation (2009). *Literature Review on Meaningful Recognition in Nursing*

Ritter, D. (2011). The relationship between healthy work environments and retention of nurses in a hospital setting. *Journal of Nursing Management*, http://dx.doi.org/10.1111/j.1365-2834.2010.01183

Shirey, M. (2006). *Authentic Leaders Creating Healthy Work Environment for Nursing Practice.*

Thomas, A (2012). *Relationship of healthy work Environment to Retention of Direct care Nurses in a Hospital Setting*

Retrospective analysis of academic performance and licensure examinations results of biomedical graduates in Emilio Aguinaldo College – Cavite

Caridad C. Lintao

School of Nursing, Emilio Aguinaldo College-Cavite

caridadlintao@yahoo.com

Abstract

The performance of graduates in licensure examinations is a positive measure of the quality education a school provides. It is an indicator of the kind of educational training and learning which the students received from their school. This study utilized mixed method of research and purposive sampling in gathering information. The participants were Biomedical Sciences graduates, batch 2013 – 2017 of Emilio Aguinaldo College – Cavite, who took their respective licensure examination. The findings showed that the factors often affected academic performance of the participants were appropriate instructional materials used in the subject matter and teacher-made tests to improve their comprehensive learning. In terms of school environment, the participants were often affected by using library facilities during review and complying immediately to the requests for Professional Regulation Commission (PRC) requirements in taking the licensure examinations. In support system, the family financial support often affects academic performance while undergoing licensure examination. The excellent performance of students was recognized through scholarship or tuition fee discount for review. In retention policy, the participants were often affected by their academic performance if the faculty members and administrators conducted enrichment test programs like comprehensive examinations, qualifying examinations, diagnostic tests, achievement tests, and oral revalidations. Completion of requirements in the subject matter per semester was strictly implemented. In qualitative analysis, the problems often encountered by the participants prior to taking the licensure examination include self – confidence, concentration, knowledge of the subject matter, study habit, emotional preparation, and stress. Using Spearman"s Rho and Paired Sample T-test, the result showed a high significant correlation between the graduates" academic performance and their licensure examination results.

Keywords*:* Academic performance, licensure examination, instructional strategies and materials, environment, support system, retention policy.

INTRODUCTION

The average percentage of the performances of Emilio Aguinaldo College – Cavite biomedical sciences graduates in their respective licensure board examination for the past years are: (1) Midwifery (April 2012 – April 2017) - 19 out of 25 passed the licensure examination with average national passing percentage of 45.94%; (2) Medical Technology (September 2015 – August 2017) - 42 out of 43 passed the licensure examination with average national passing percentage of 80.47%; (3) Nursing (July 2012 – June 2017) - 170 out of 332 passed the licensure examination with average national passing percentage of 43.56%; (4) Physical Therapy (August 2017) - 4 out of 11 passed the licensure examination with the national passing rate of 62.80%; and (5) Radiologic Technology (July 2015 – June 2017) - 33 out of 64 passed the licensure examination with average national passing percentage of 44.22% (EAC Registrar, 2017).

Passing the licensure examinations given by the Professional Regulations Commission (PRC) can be one of the greatest achievements in a college graduate"s life. The examination is intended to prove the graduate"s knowledge, skills and qualifications in a particular profession. Moreover, the performance of the graduate from an institution who take the licensure examination determines the quality of education the school provides, which eventually guarantees the efficiency and effectiveness of its graduate"s application of the things he/ she has learned in his/ her chosen profession/ career. The main objective of this study was to determine if the academic performance of the participants directly affected their performance in the licensure examinations. The researcher identified the following:(1) the contributing factors affecting academic performance of students in terms of a) instructional strategies and materials, b) school environment, c) support system, and d) retention policy; (2) the significant correlation between participants" academic performance and their licensure examinations results; (3) the problems encountered by the participants prior to taking the licensure examination. This study would be beneficial to the Emilio Aguinaldo College – Cavite biomedical sciences graduates because it would give further information on the contributing factors in successfully passing licensure examinations. This study will help the students to reduce failing grades as preparation and support are given to them. This study can build behavioral motivation to enable them to pursue their professional growth in learning. It will strengthen their cognitive capabilities in analyzing situations and decision making. This study will also benefit the institution as far as implementation of the different curricula is concerned.

METHODOLOGY

This study utilized mixed method of research and purposive sampling in gathering information. The participants were biomedical sciences graduates, batch 2013 – 2017 of Emilio Aguinaldo College – Cavite. The utilized questionnaire was self – made by the researcher, which was validated and pilot tested. The result of .837 using Cronbach"s Alpha showed that all terms in the questionnaire were moderately valid and reliable. The questionnaire was subdivided into three parts:

Part I – participants" profile; Part II – contributing factors affecting academic performance of participants" in terms of; instructional strategies and materials, school environment, support system, and retention policy; Part III – qualitative questionnaire pertaining to problems encountered by the participants prior to taking the licensure examination. The researcher wrote a letter addressed to the participants for their approval and informed consent before the actual administration of the research instrument. The participants of this study were 55 biomedical sciences graduates from Emilio Aguinaldo College – Cavite. The researcher utilized frequency distribution and percentage, weighted mean, Spearman Rho Correlation and Paired Sample T – test for the analysis of data.

RESULTS AND DISCUSSION

The findings show that biomedical sciences graduates, batch 2013 – 2017 were aged 20 – 24 years old, mostly female, and with a general weighted average of 2.00 to 2.50 in their academic performance, 1st takers in their respective licensure examination with board rating of 75% to 80%. Majority of the participants came from nuclear type of family. Their work related to their profession, gave a family income of P10, 000 to 20,001 monthly.

Table 1
Participants' Profile (n = 55)

Variables		Frequency	Percentage
Age	20 – 22 years old	19	34.5
	23 – 24 years old	18	32.7
	25 – 26 years old	5	9.1
	27 – 28 years old	6	10.9
	29 – 30 years old	5	9.1
	31 years old -above	2	1.8
Gender	Male	12	21.8
	Female	43	78.2
Year Graduated	2013	7	12.7
	2014	3	5.5
	2015	10	18.2
	2016	15	27.3
	2017	20	36.4
Course Finished	Graduates in Midwifery	16	29.1
	BS Medical Technology	7	12.7
	BS Nursing	22	40.0
	BS Physical Therapy	2	3.6
	BS Radiologic Technology	8	14.5
Frequency of Licensure Examination Taken	1st	53	96.4
	2nd	1	1.8
	3rd	1	1.8
Type of Family	Nuclear	40	72.7
	Extended	6	10.9
	Blended	1	1.8
	Single parent	8	14.5
Work Related to Profession	Yes	54	98.2
	No	1	1.8
Family Monthly Income	Below P5,000	1	1.8
	P5,001 – P10,000	10	18.2
	P10,001 – P15,000	16	29.1
	P15,001 – P20,000	12	21.8
	P20,001 and above	16	29.1
General Weighted Average (GWA)	Failed = 5.00 (74% below)	0	0
	Passed = 3.00 (75%)	0	0
	Fair = 2.75 (76% - 78%)	8	14.5
	Good = 2.00 – 2.50 (79% - 87%)	36	65.5
	Very Good = 1.50–1.75 (88%-93%)	11	20.0
	Excellent = 1.00 1.25 (94% - 100%)	0	0
Board Rating	75% – 76%	13	23.6
	77% – 78%	15	27.3
	79% – 80%	10	18.2
	81% – 82%	5	9.1
	83% – 84%	2	3.6
	85% – 86%	6	10.9
	87% – 88%	4	7.3

Table 2

Contributing Factors Affecting Academic Performance of Graduates in terms of Instructional Strategies and Materials

A. Instructional Strategies and Materials	**Mean**	**Interpretation**
1. Instructional materials used are appropriate to the subject matter.	4.4	Often
2. Teaching strategies encourage students to think critically and do problem solving.	4.23	Often
3. Teacher-made tests can improve student"s comprehensive learning.	4.38	Often
4. Remedial examination is given to those who have low grades.	3.67	Often
5. The faculty member gives regular feedback to students regarding their performance.	3.78	Often
Total Weighted Mean	**4.09**	**Often**

Table 2 shows that the factors that often affected academic performance of participants were appropriate instructional materials used in the subject matter and teacher-made tests to improve student"s comprehensive learning.

The effective teaching strategies used and the appropriate instructional material promoted student learning, (Cuya and Elicay, 2018).

The teachers" teaching style empowered students to engage more active participation. It enhanced students" self-learning, critical thinking and reasoning to overcome the challenges of globalization, (Lavastilla, 2013).

Nowadays, students utilized new trend of learning to cope with the fast-moving technology. The extent of students" learning was enhanced through the strategies utilized by the teachers. They preferred instructors who utilized new forms of instructional media, like the use of power point presentation, film showing, and other new devices. Students felt bored during the lecture because they could not understand the topic, and the instructors failed to motivate them due to the teaching styles used (Achacoso, 2017).

The quality of multiple choice items used in examinations was assessed through statistical item analysis. There was a significant moderate linear relationship between the item difficulty and item

discriminatory coefficient. Discriminatory item was more affected by the selection of distractors that were positively correlated with the test score. The instructors should regularly conduct test item analysis to improve the quality of their multiple - choices tests and modify distractors that impair the discriminatory item (Calixtro, 2017).

Table 3

Contributing Factors Affecting Academic Performance of Graduates in terms of School Environment

B. School Environment	**Mean**	**Interpretation**
1. School administrators allow the graduates to use library facilities during board review.	4.09	Often
2. The school provides a room conducive to learning during the board review.	3.43	Sometimes
3. The school conducts in - house review programs to its graduates.	2.9	Sometimes
4. The librarian allows graduates to use and borrow books that could enhance their knowledge during the board review.	3.63	Often
5. The school complies immediately to the requests for Professional Regulation Commission (PRC) requirements in taking the licensure examinations.	4.07	Often
Total Weighted Mean	**3.62**	**Often**

Table 3 shows that the participants were often affected by the school environment in their academic performance like using library facilities during board review and complying immediately to the requests for Professional Regulation Commission (PRC) requirements in taking the licensure examinations.

Study techniques preferred among the biomedical students were found not significant in high grade point average were ensured silence and no interruptions during studying as compared to the lower grade point average students. This can emphasize the necessity of having private studying areas for the students (Tan, 2015).

The graduates were also affected by the delay submitting requirements for taking licensure examination. Buchanan, et al. (2004) cited by Charron and Lowe (2009) mentioned that delay in taking initial board exam and length of time being away from school were factors influencing perceived difficulty in passing the board examinations.

Table 4

Contributing Factors Affecting Academic Performance of Graduates in terms of Support System

C. Support System	Mean	Interpretation
1. Excellent performance of students is recognized through tuition fee discounts, awards, recognition, and scholarship.	3.8	Often
2. Faculty members give enhancement programs such as review in the professional course, attendance to seminars, and analysis of cases thru film viewing.	3.7	Often
3. Assistance or aid is granted to the graduates like scholarship and funding review for licensure examination.	3.25	Sometimes
4. Teachers and administrators conduct monitoring and evaluation of progress to help graduates during the board review.	3.61	Often
5. The family supports the financial needs of a student who will undergo the licensure examination.	4.43	Often
Total Weighted Mean	**3.75**	**Often**

Table 4 shows that the participants were often affected by family financial support on academic performance while undergoing licensure examination and that the excellent performance of students is recognized through scholarship or tuition fee discount for review.

The students learn better if they are from an above-average or average income family because they have books, papers and other materials needed during study (Credé and Kuncel, 2013). This is similar to the study undertaken by Villi, et., al., (2013) where the family monthly income affected students in various aspects of learning that include class attendance, entry qualifications, tuition fee and materials needed during study. According to Ghosh, et. al. (2017), socioeconomic background significantly affected academic performance. However, it showed a significant association between students who had difficulty in understanding the medium of instruction and poor academic performance.

Depression, academic burnout and stress are more common stressors experienced by the biomedical students affecting their academic performance. Parental and peer pressure had been significantly related to student's mental wellbeing and levels of stress. Poor academic performance of the graduates would be significantly rejected by their parents and friends. This might result to increased psychiatric morbidity and affected academic performance (Mandal, et., al., 2017).

Table 5

Contributing Factors Affecting Academic Performance of Graduate's in terms of Retention Policy

D. Retention Policy	Mean	Interpretation
1. Policies on admission and retention are clearly understood by the students and are strictly implemented.	4.07	Often
2. Completion of requirements in the subject matter per semester is strictly implemented.	4.38	Often
3. Faculty - student consultation sessions enhance student"s awareness on individual academic performance.	3.92	Often
4. Faculty members and administrators conduct enrichment test programs like comprehensive examinations, qualifying examinations, diagnostic tests, achievement tests, and oral revalidations.	4.4	Often
5. Policies on attending class discussion and participation are strictly implemented.	4.29	Often
Total Weighted Mean	**4.21**	**Often**

Table 5 shows that the participants were often affected in their academic performance if the faculty members and administrators conduct enrichment test programs like comprehensive examinations, qualifying examinations, diagnostic tests, achievement tests, and oral revalidations. Completion of requirements in the subject matter per semester is strictly implemented.

In traditional curriculum, students were evaluated based on written and practical examinations. Student cumulative point grade was significantly correlated to their diagnostic examinations, (Rabe, 2013).

The students with excellent performance on admission profile were most likely to pass the licensure examination. The admission profile included qualifying examination, diagnostic test, achievement test, comprehensive examinations, and oral revalidation. It is imperative to the college to adhere to the admission policies and to institute teaching learning strategies to assist the students achieve an excellent academic performance, thereby, passing the licensure examination (Banua, 2010).

On the contrary, the study made by Herbosa, et., al., (2010) showed student performance in their licensure examination was not significantly related to their academic grade and comprehensive achievement test.

Achievement of enhanced academic performance was a product of personal determination and cognitive development, while the

participants‟ profile did not significantly influence academic performance (Bacolod, et., al., 2013).

Table 6

Summary of Contributing Factors Affecting Academic Performance of Graduates

	Mean	Interpretation
A. Instructional Strategies and materials	4.09	Often
B. School Environment	3.62	Often
C. Support System	3.75	Often
D. Retention Policy	4.21	Often
Total Weighted Mean	**3.91**	**Often**

The first contributing factors that often affected the academic performance of the participants were instructional strategies and materials, while the school environment is last.

The different preparation and strategies used by the graduates in taking licensure examinations revealed that male and female students differed in terms of time management spent three to four months to review for their exam, memorization, and mnemonics was common. Most of graduates took review sessions in review centers. Other students were not effective in reviewing since they do not like reading books and other references which were found helpful. Majority of the graduates preferred quiet environment during review and spent six to seven hours in rest and sleep. Family income also affects students in terms of enrolling to review centers. It was suggested that students should also find time to relax and unwind even though they under rigid review for the exam (Jose, et., al., 2010).

Table 7

Problems Encountered by the Participants Prior to Taking the Licensure Examination

1. Self – confidence	9. Support from loved one/ family
2. Concentration	10. Lack of review program
3. Knowledge of subject matter	11. Faith
4. Study habit	12. Self – Trust
5. Emotional preparation	13. Comprehensive skills
6. Stress	14. Problem solving skills
7. Health condition	15. Physical condition of examination venue
8. Financial constraints	

Based on Table 7, the problems often encountered by the participants prior to taking the licensure examination include; self – confidence, concentration, knowledge of the subject matter, study habit, emotional preparation, and stress.

Lack of concentration on the topic discussed was a reason for low performance in the licensure examination. The dyadic alternative learning could sustain open communication between teachers and students working together in participative learning (Licht, 1993, cited by Savage, 1998). The students had opportunity to take more responsibility for their own learning and encouraged cooperation and active learning. It enhanced student"s self-efficacy and self-esteem without negative judgment. Friend"s Enhanced Education through Dyad learning (FEED) diminishes superiority and inferiority complex hastened sense of accountability, emotional and educational support and lastly, promoted constant peer interaction. Through this strategy, the participants learned their lessons, thereby, increasing and advancing their knowledge about the subject, allowing them to perform better in the academics (Western Mindanao State University, 2012).

Most people had a certain innate fear of exams, which adversely affected their performance. Knowing the structure, content and scope of the exam often helped reduce that fear (Nemivant, 2007).

There was no significant difference between students with higher grade point average who studied for longer hours during the weekend, and the students with low grade point who had an average study for more than 8 hours/day during the weekend. Study habits among biomedical students with high and low grade point averages were of no significant difference in terms of the sources of studying and information gathering such as books, handouts, videos, or self-taken notes. The study skills like highlighting and skimming or reading before attempting to memorize the material were significantly more commonly used among students with high grade point averages (Perez, 2015).

The study made by Cortright, et., al.,(2011), stressed the fact that students preferred information to arrive in a variety of modes, and that students did not learn by simply sitting in a classroom listening to the educator and memorizing assignments. To achieve meaningful education, the learning process must be interactive, allowing students to relate this knowledge to past experiences and apply it to their daily lives. There was no significant difference in social activities during examination period. The high grade point average students spent more time to prepare for examination while the low grade point average tended to sleep more during the examination periods and had no chance to complete their study material before the exam. This may result to

students with low grade point average to cheat during their exam, while those high grade point average students were found helping other students to cheat from their own answers.

Table 8

Significant Correlation between Graduates' Academic Performance and Their Licensure Examination Results

Spearman's rho		Decision
Correlation Coefficient	.661	Accept Ha; Reject Ho
Sig. (2-tailed)	.000	
N	55	

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	GWA - Board Result	-76.92309	3.86658	.52137	-77.96837	-75.87781	-147.54	55	.000

Using Spearman"s Rho and Paired Sample T-test at .000 level of significance with correlation of .661, the result showed a high significant correlation between graduates" academic performance and their licensure examination results.

Through the college learning environment, learning materials, and instructional pedagogy, faculty, educators, and college administrators can help students succeed. Students who have a good understanding of the contents being taught are more motivated and have a positive attitude in their schoolwork. Students know that it is their responsibility to do well in schoolwork, but many students need support from their parents and instructors to keep them interested. The reason why students fail in their subject include: (1) lack of academic preparedness for college courses – foundation skills like write clearly, comprehend reading, and follow instructions; (2) lack of learning and study skills - note-taking, reading, and scientific reasoning; and (3) lack of organizational skills - time management and setting priorities (Adams, et., al.,2013).

The factors that may lead to failing grade in licensure examination include (1) lack of effective study habit, (2) lack of family support or motivation, (3) family problems, (4) peer pressure, (5) lack of time management, (6) unpreparedness, (7) self-review, and (8) financial constraint (Bañico, et. al., 2007).

There are three main factors for students to get failing grades in their subjects. These are (1) Student related factors - unwilling to exert effort in reading books and learning materials before class and do not complete their requirements; (2) Personality and socioeconomic issues – lack of support from their family and school resulting to poor self - esteem and poor self -confidence. Students feel isolated and do not engage in some school activities. Some graduate students, due to lack of resources and financial support want to take board examination but cannot afford transportation fare to get to a review center and to sustain their needs, they prefer to be absent in the review class; and (3) Failures of the educational system consisting of two categories; (a) faculty instruction and behavior; and (b) facilities, materials, and delivery system. The faculty should use various strategies in teaching students. Some students do not experience warmth, care and relentless support from their teachers (Blue, 2012).

CONCLUSIONS

The participants were biomedical science graduates, batch 2013 – 2017, aged 20 – 24 years old, mostly female, and with general weighted average from 2.00 to 2.50, 1st takers in their respective licensure examination with board rating 75% to 80%. Majority of them came from nuclear type of family. Their work, related to their profession, gave a family income of P10,000 to P20,001 monthly. Participants were often affected by (1) appropriate instructional materials used in the subject matter and teacher-made tests to improve student"s comprehensive learning, (2) used library facilities during review and complying immediately to the requests for Professional Regulation Commission (PRC) requirements in taking the licensure examinations, (3) the family financial support while undergoing licensure examination and the excellent performance of students is recognized through scholarship or tuition fee discount for review, and (4) if the faculty members and administrators conduct enrichment test programs like comprehensive examinations, qualifying examinations, diagnostic tests, achievement tests, and oral revalidations and completion of requirements in the subject matter per semester is strictly implemented. In qualitative analysis, problems often encountered by the participants prior to taking the licensure examination included self – confidence, concentration, knowledge of the subject matter, study habit, emotional preparation, and stress. There was a high significant correlation between graduates" academic performance and their licensure examination results. This study showed a need for improving the currently implemented programs in continuing education of the graduates used by the institution.

RECOMMENDATIONS

The teachers should utilize different instructional materials and strategies appropriate to the subject matter to motivate student"s active participation. They should engage in seminars and trainings on teaching strategies to enhance their skills. They should have an initiative to monitor and support students" academic performance and have an open communication to build trust and learning motivation.

The school administrator and higher educational institutions can utilize the results of this study as bases in developing programs for continuing education of graduates. They should support teachers enhancing teaching strategies skills and providing instructional materials. They should organize several programs to enhance graduates academic performance and passing the licensure examination. The institution should allot budget for review fees scholarship to support the needs of graduates with at least one year return service to hospital based institutions.

The Administrator of the City Government can utilize the results of this study as basis for providing a scholarship program to the graduates that will motivate them to pursue their professional growth in learning.

REFERENCES

Achacoso, Jas Pearl, et., al., (2017) Learning Styles and Experiences in Medical - Surgical Nursing Lecture. College of Nursing - Liceo De Cagayan University Philippine Council for Health Research and Development, Herdin Record #: PCHRD13030111253042

Adam G., et., al., (2013). Why do students fail? In a collection of papers on self-study and institutional improvement, 2013, 35–51. Chicago: The Higher Learning Commission.

Baang, Milger A. (2017), Investigating the Macro Perspective Affecting the Passing Rate in Board Examinations: A Take-off Point in Designing a Causal Model, International Journal of Learning, Teaching and Educational Research p-ISSN: 1694-2493eISSN:1694-2116Vol. 15, No.4, pp. 108-120, ©IJLTER

Baang, Milger A., (2017). Passing the Licensure Examinations Given by the Professional Regulation Commission

Bacolod, Ameil Claire D., et., al., (2013) Contributing Factors Affecting the Level of Academic Performance among Nursing Students of University of the Visayas, College of Nursing, Banilad, Mandaue City, Herdin Record #: R07-UVGMC-13042309491882

Bañico, L., et. al., (2007) Predictors of Nurses‟ Licensure Examination Performance of Graduates in Cebu Normal University, Philippines.

Banua, Alma S., (2010) The Performance of Graduates in the Nurses‟ Licensure Examination. Herdin Records#:R05-BCHRD – 1709141905247

Blue, Laura. 2012. Motivation, not IQ, matters most for learning skills. Child Development. http://healthland.time.com/2012/12/26/motivation-not-iq-matters-most-for learning -new-math-skills/.

Buchanan, et., al,.(2004). Preparing for success on the revised CPA exam. Journal of Accountancy

Calixtro Jr., Rufo S., (2017) Item Test Analysis of Multiple Choice Final Examination: Difficulty Index, Discriminatory Coefficient and Distractor Analysis, Herdin Record#: R04A-UPHBL-1807011082035

Cortright RN, Lujan HL, Cox JH, DiCarlo SE. Does sex (female versus male) influence the impact of class attendance on examination performance? .PubMed.

Credé M. and Kuncel NR., (2013) The Study Skills, Habits, Attitude and Motivation Exhibit Relationships with Academic Performance. PubMed

Herbosa, Jhoanna., et., al., (2017) Factors Affecting the Performance of Letran Calamba Nursing Students Batch 2009 in Nursing Licensure Examination.

Jose, Anna Therese D., et., al., (2010) An Assessment on the Strategies utilized by the Nursing Licensure Exam Passers of Colegio De San Juan De Letran Calamba.

Lavastilla, Sandra G. (2013) Teaching Styles and Student Achievement of the First Year Dentistry Student of Cebu Doctors' University-College of Dentistry for Academic Year 2010-2011: Basis for Enhanced Teaching and Learning Strategies. Herdin Record #: R07-CDU-13031909421645

Nemivant EB, (2007) The new R.N. licensing examination in the United States: its implications to foreign nurse graduates. Herdin Record #: PCHRDPC912222 of first year medical students at the UERM-MMC College of Medicine. Herdin Record #: PCHRDPC051182. Department of Physiology, University of the East Ramon Magsaysay Memorial Medical Center, UERMMMC Philippine Council for Health Research and Development Library

Perez, Candido, Ph.D. (2015) Performance of BS Accountancy Graduates in the CPA Licensure Examination: Basis of Enhancement, Laguna Journal of Multidisciplinary Research Vol. 4 No.3

Rabe, Milagros B., (2013) The relationship between diagnostic examination test scores and grade point averages of two group

Savage, James M. (1998), Use of the Dyadic Alternative to make Learning more Active, Collaborative, and Fun, Natural Resources and Environmental Issues: Vol. 7, Article 70. http://digitalcommons.usu.edu/nrei/vol7/iss1/70

Tan, Jade Ballado (2015) Performance In The Accountancy Licensure Examination Of The University Of Eastern Philippines: A Look At Curriculum And Instruction

Villi Jayanth, et., al., (2013) Contributing to Academic Performance of Students in Tertiary Institution in Singapore, School of Health Science, Ngee Ann Polytechnic , 535 Clemente Road, Singapore

Western Mindanao State University, (2012) Friends Enhanced Education through Dyad learning (FEED Learning) Department of Science and Technology IX, Herdin Record #: R09-ZCHRD-11141102110688,

World Confederation for Physical Therapy (2011), Academic and Clinical Program for Physical therapy

Exploratory factor analysis of agentic engagement scale (AES) toFilipino Senior High School Students

Herman L. Briñas, Riza D. Mabiling

Center for Counseling, Career and Student Development
Emilio Aguinaldo College

herman.brinas@eac.edu.ph,riza.mabiling@eac.edu.ph

Abstract

Agentic Engagement (AE) is a new construct and argued as the fourth aspect of student engagement (Reeve and Tseng 2011; 2012; 2013). AE is defined as the action of students in taking initiatives that contribute to teaching and learning (Reeve, 2012). This study investigates the prevalence of Agentic Engagement in the Philippine setting, specifically among the senior high school students by conducting an exploratory analysis to Agentic Engagement Scale (AES) by Reeve and Tseng (2013). Cronbach alpha test of reliability and Principal A xis Factoring (PAF) were utilized. The participants were 102 senior high school students from a private college. The result found the prevalence of such construct among the participants. Also, the result showedd that AES is a unidimensional measure.

Keywords: agentic, agentic engagement, agentic engagement scale, self-determination theory

INTRODUCTION

Fredricks et. al., (2004) and Jimmerson et. al., (2003) in Furlong (2008) Stated that student engagement as a well-known construct primarily has three components (behavioral, emotional, and cognitive). However, through different factors such as levels of teacher"s support for autonomy, students may not perform similarly with the others. In support to such concern, Reeve and Tseng proposed the fourth component, the agentic engagement (AE). As defined by Reeves and Tseng, AE is the students" constructive contribution into the flow of instruction they receive. The usual flow of teaching and learning process which is linear overlooks the student"s agentic involvement in the learning process (Bandura, 2006). This means that AE is necessary to be explored if it is an acceptable construct to be considered as the fourth component of student engagement.

According to Veiga, Reeve, Wentzel and Robu (2014) student engagement has been one of the focus of discussion that relates to academic success and school dropout. One of the most important measure and construct in student engagement is Agentic Engagement Scale (AES). According to Skinner, Kindermann and Furrer (2009), engagement refers to the student"s involvement in a learning activity. Engagement is necessary to be assessed as it was revealed by many studies its relationship to learning, achievement and academic progress (Jang, Kim & Reeve, 2012), As noted by Reeve (2012) engagement is a contributor to the learning process. It is susceptible to external support such as feedback from teachers and it is an indicator of teachers" efforts to motivate their learners. Reeve and Tseng (2011) coined the term “agentic engagement” to describe a learner"s constructive contributions for their own learning process learners go through with teachers and peers.

This research is an initial step in assessing and understanding agentic engagement construct among the Filipino senior high school students. The result can be a basis of understanding the teaching learning condition and will contribute to the general body of knowledge in Educational Psychology and other related discipline.

Agentic Engagement is defined as students" constructive contribution into the teaching and learning process. Bandura (2006) emphasizes that agametic involvement is overlooked in the linear model of teaching ang learning. Bandura further stated that if students act agentically it increases their chances of experiencing both strong motivation and meaningful learning. This proposed argument of Bandura is further supported by following Ryan and Deci"s (2000) concept of constructive classroom motivation. According to the self-determination

theory, intentional behaviors can be motivated by either autonomous or controlled forms of regulation (Tsai, Kunter, Ludtke and Ryan, 2008). Also, autonomous learner has the ability to set goals, implement strategies to attain goals, and identify relevant resources (Aliponga, Gamble and Ando, 2011).

The Agentic Engagement Scale (Reeve, 2013) is a 5-item instrument designed to assess agentic engagement. Its items include the following: “I let my teacher know what I need and want; I let my teacher know what I am interested in; During this class, I express my preferences and opinions; During class, I ask questions to help me learn; and When I need something in this class, I'll ask the teacher for it.” The scale has been used with elementary and secondary school students as well as with university students.

The AES uses a 7-point response scale that ranges from 1 (strongly disagree) to 7 (strongly agree). Reeve Reeve and Lee (2013) reported high levels of internal consistency, with a range of alphas from 0.81 (for middle school students) to 0.86 (for university students). These studies reported strong predictive validity of student achievement as well as clear discriminant validity to separate agentic engagement from the three other aspects of engagement (behavioral, emotional, and cognitive). Agent connotes to being autonomous which also means to influence intentionally.

On the assumption that AE could be confounded with other student characteristics (Reeve, 2011) and based on the presented literatures, the study will investigate the following assumption and hypothesis:

Assumption: Agentic Engagement is a construct that exists among Filipino Senior High School participants.

Hypothesis: The Agentic Engagement Scale (AES) is reliable and a single-factor measure.

METHODOLOGY

One hundred two (102) Filipino Senior High School students with 44 males and 58 females were the participants of the study. They were selected via non-probability sampling, specifically, convenience type. This type of sampling selects the participants based on their availability and characteristics that fit to the objective of the study (Creswel, 2012). In this case, they should be Senior High School students who are currently enrolled. This study attempted to explore and prove the

existence of AE construct in the Philippines which was previously tested in Korea. The samples are grade 12 Senior High School students from Emilio Aguinaldo College, Cavite campus with age ranging from 17-19 years old.

The design is quantitative, using the Exploratory Factor Analysis (EFA)approach. This study utilized two approaches the reliability coefficient using Cronbach Alpha and the exploratory Factor Analysis(EFA) specifically , Principal Axis Factoring (PAF). These approaches aimed to establish the validity of the test in the Philippine setting through Filipino Senior High School students" sample. Both procedures were tested and computed using SPSS software version 20.

AES is developed by Reeve and Tseng (2011) and was found to have high levels of consistency with alpha of 0.81 (middle school) and .86 (university or college students). It has five items that requires the participant to respond to the 7-point scale. Aside from its reported strong validity, it has a clear discriminant validity that separates to three other aspects of engagement (emotional, behavioral and cognitive)

The study followed four procedures:

Step 1. Identifying the participants of the study that includes sending of communications to the institutions then, wait for the approval including the duly signed informed consent;

Step 2. Test administration of the scale;

Step 3. Scoring and data analysis using Cronbach Alpha and EFA; and

Step 4; Analysis and propose recommendations based on the result.

RESULTS AND DISCUSSION

Since it was previously proposed by Reeves (2012) that AE is the fourth component of student engagement, Promax was used and the SPSS tool was pre-set into four factors the first is assumed to the AE while the remaining three were behavioural, emotional, and cognitive. As a preliminary measure, a Cronbach analysis was conducted to test the reliability of the measure.

Reliability. After running the data in the SPSS software, the computed Cronbach Alpha value result was α = .696 as presented in Table 1. Based on the rule of thumb proposed by George and Mallery (2003), .696 is classified as “good”. However, in terms of inter-item

correlation (see Table 2), there are six items (three combinations) (3, 1; 4, 2; 5, 1) that yielded an unacceptable level of correlations to other items. The result seemed to be not indicative of unidimensional properties of the scale. Initially, it suggested that AES is not a single factor measure.

Table 1

Coefficient Result

Reliability coefficients	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
	.696	.696	5

Table 2

Inter-item Correlation Matrix

Inter-Item Correlation Matrix					
Items	1.	2.	3.	4.	5.
1.	1.000				
2.	.298	1.000			
3.	**.155**	.384	1.000		
4.	.442	**.181**	.335	1.000	
5.	.**198**	.392	.430	.329	1.000

Exploratory Factor Analysis (EFA): Principal Axis Factoring (PAF). Since there were prior study and validation of the AES that yielded strong internal consistency such as the result of work of Reeve and Tseng (2013), this current study applied PAF (principal axis factoring) instead of PCA (principal component analysis) which is commonly used in EFA. Pett et.al., (2003) recommended using PCA only for an EFA with a purpose of establishing preliminary solutions. According to Burton and Mazerolle (2011), PAF is useful if the researchers" goal is to determine the existing factors related to a set of items. Also, PAF allows computing the goodness of fit of the model that permits statistical significance testing of factor loadings and correlations among factors and the computation of confidence intervals (Fabrigar; Wegener et. al., 1999).

Table 3

KMO and Bartlett's Test

Test		Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.664
Bartlett's Test of Sphericity	Approx. Chi-Square	88.329
	df	10
	Sig.	.000

Table 3 shows the Kaiser-Meyer-Olkin Measure of Sampling Adequacy wherein it yielded a computed value of .664. It is higher than the cut-off value of .50 that can be classified as mediocre; therefore, AES data set is suitable for exploratory factor analysis. Also, the Barllett"s test of sphericity χ^2 (45) = 88.329, p< .000 showed that a patterned relationship existed between items. It means that a factor analysis specifically, exploratory was appropriate to use.

Table 4

Total Variance Explained

Factor	Extraction Sums of Squared Loadings			Rotation Sumsof Squared Loadings
	Total	% of Variance	Cumulative %	Total
1	**1.817**	**36.338**	**36.338**	**1.336**
2	.558	11.164	47.502	.807
3	.314	6.282	53.784	1.308
4	.085	1.705	55.489	1.386

Extraction Method: Principal Axis Factoring.

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

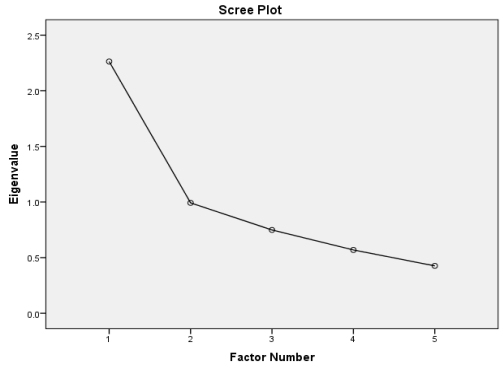


Figure 1. Scree plot of Agentic Engagement Scale (AES)

The total variance table explains the determined factors of the AES following the rule of thumb in identifying factors, wherein, an eigenvalue greater than one qualifies to be a factor. The result identified only one significant factor. It suggested that the five items of the measure are associated as reliable measure of the AE construct.

The cumulative percentage of the one factor (AE) is 36.338 that explain 36 percent of the total variance. Furthermore, the two identified factors were further confirmed by the screen plot in Figure 1. The factors were also identified by one as the minimum eigenvalue to qualify as factor.

Table 5

Factor Matrix[a]

Items	Factors			
	1	2	3	4
4.	.635	.379	-.277	.004
5.	.621	-.242	-.097	-.225
3.	.618	-.290	-.187	.183
2.	.595	-.261	.351	.030
1.	.541	.451	.264	.011

Extraction Method: Principal Axis Factoring.
a. 4 factors extracted. 17 iterations required.

To be labeled and considered as significant factor, a factor should have at least three item loadings (Tabachnik & Fidell, 2007). In the case of this study, factor 1 contains five item loadings and no items loaded in the three other pre-set factors (relating to the engagement

factors). Item number one came out as crossloader but the value is greater in factor one (.541) which means that, it can be assumed and considered to be loaded to factor one. Crossloading items should have a value of at least .32 and higher to be considered significant (Costelo & Osborne, 2005) and its value should be higher from its counterpart. The decision is to retain the factors and the items since all were statistically acceptable. The result further reveals that the five identified items under factor one is indicative of AE construct among the participants.

Table 6

Summary of Item Loadings and Cronbach Alpha

Factors	Items	Total	Cronbach Alpha (α)
Factor 1 (AES)	1, 2, 3, 4 ,5	5	.696
Factor 2, 3, 4			

Table 6 summarizes the factor and its respective item loadings. Five items were identified under factor one. As previously stated, the AES is a unidimensional measure. Therefore, the hypothesis and assumption that AES is a unidimensional measure is confirmed.

CONCLUSION

This current study confirms that AES is reliable at (α =.696) Cronbach Alpha. This result obtained a lower alpha level than the work of Reeves and Tseng (2013). It can be claimed that the scale truly possesses high internal consistency. In the correlation table, though there were items that did not meet the standard value correlation of at least >.30., it still yielded a good result in the factor loadings. The result further indicated that AES is a unidimensional measure. The hypothesis of Reeves on agentic engagement as the fourth component of student engagement is further established in this current study. Furthermore, if students act agentically, it increases the chance of experiencing strong motivation and meaningful learning.

This current study further emphasized the importance of independent form of regulation wherein, independent learner has the natural ability to set goals, implement strategies to attain goals, and identify relevant resources (Aliponga, Gamble & Ando, 2011). A Confirmatory Factor Analysis (CFA) is recommended for future study and investigate further qualitatively this construct in the teaching and learning processes. Agentic construct can be also studied outside the classroom

through new subject areas of the K-12 programs specifically on how it affects performances across subject areas of different tracks and strands.

REFERENCES

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-efficacy beliefs of adolescents*, *5*(1), 307-337.

Burton, L. J. & Mazerole, S. M. (2011). Survey instrument validity part 1: Principles of construct for all students. Psychology in the Schools, 45(5), 365-368.

Costello, A. B., & Osborne, J. W. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. Practical assessment, research & evaluation, 10(7), 1-9.

Creswell, J. W. (2012) Educational research: Planning, conducting, and evaluating definitions and new directions. Contemporary educational psychology. 25, p.54-57 exploratory factor analysis. Tutorials in quantitative methods for psychology. 9(2), p79-94 DOI:10.20982/tqmp.09.2. p079

Fabrigar, L. R., Wegener, D. T., et al. (1999). Evaluating the use of exploratory factor analysis in psychological research. Psychological methods 4: 272-299. Retrieved from http://ww.w.statpower.net/Content/312/Handout/Fabrigar1999.pdf

Furlong, M. J., & Christenson, S. L. (2008). Engaging students at school and with learning: A relevant construct for all students. Psychology in the Schools, 45(5), 365-368.

George, D., & Mallery, P. (2003). SPSS for Windows step by step: A simple guide and survey instrument development and validation in athletic training education research. Athletic training education journal. 6(1), 27-35.

Jang, H., Kim, E. J., & Reeve, J. (2012). Longitudinal test of self-determination theory's motivation mediation model in a naturally occurring classroom context. Journal of EducationalPsychology, 104(4), 1175.

Pearce, S., & Yong, A.G., (2013) A beginner"s guide to factor analysis: Focusing on of factor analysis for

instrument development in health care research. California: Sage pub. Inc. p643-677.Retrievedfromhttps://eclass.uoa.gr/modules/document/file.php/PPP431/Tab%26Fid2007_643- 671.pdf

Pett, M. A., Lackey, N. R., Sullivan, J. J. (2003). Making sense of factor analysis: The use qualitative and quantitative research. (4th Ed.) Pearson Education Inc. p143, 145recommendations for getting the most from your analysis. Practical assessment, research & evaluation. 10(7). p.1-9. Retrieved from http://pareonline.net/pdf/v10n7.pdf

Reeve, J. (2012). A self-determination theory perspective on student engagement. In Handbook of research on student engagement (pp. 149-172). Springer, Boston, MA.

Reeve, J. (2013). How students create motivationally supportive learning environments for themselves: The concept of agentic engagement. Journal of Educational Psychology, 105(3), 579.

Reeve, J., & Tseng, C. M. (2011). Agency as a fourth aspect of students‟ engagement during learning activities. Contemporary Educational Psychology, 36(4), 257-267.

Ryan, R. M., & Deci, E.L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. American psychologist.55(1). p.68-78. Retrievedfromhttps://msu.edu/~dwong/CEP991/CEP991Resources/Ryan%26Deci-SDTIntrMot.doc

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection: Conceptualization and assessment of children's behavioral and emotional participation in academic activities in the classroom. Educational and Psychological Measurement, 69(3), 493-525.

Tabachnick, B. G., & Fidell, L. S. (2001). Principal components and factor analysis. Using multivariate statistics, 4, 582-633.

Veiga, F., Reeve, J., Wentzel, K., & Robu, V. (2014). Assessing students‟ engagement: A review of instruments with psychometric qualities. In I Congresso Internacional Envolvimento dos Alunos na Escola: Perspetivas da Psicologia e Educação (pp. 38-57)

The emphatizing quotient, systemizing quotient and motivationto learn science among foreign students at Emilio Aguinaldo College Cavite

Ma. Josefina S. Malanyaon and Vilma D. Agaser

Emilio Aguinaldo College, School of Arts and Sciences,

sahagunmarijo@gmail.com

Abstract

This study dealt on motivation to learn science and cognitive style (empathizing and systemizing quotients). The concept of cognitive style proposes the interplay of two core psychological dimensions: empathizing and systemizing. The so called-EQ score (empathizing quotient score) and the SQ score (systemizing quotient score) were used to measure the empathizing and systemizing dimensions respectively. The motivation to learn science was measured through the Science Motivation Questionnaire (SMQ), which reflects the operationalization of five basic motivational constructs. The researchers involved a sample of 120 Indian students who are taking B. S. Biology and B. S. Psychology programs at Emilio Aguinaldo College-Cavite, 18 to 21-year-old, stratified by their sex and science orientation. The data showed a highly significant difference between empathizing and systemizing quotients and no correlation between the motivation to learn science and cognitive style (empathizing and systemizing). The implications of these findings are discussed especially in the light of school science and research.

Keywords: cognitive style, brain type, emphatizing quotient, systemizing quotient, typology

INTRODUCTION

People differ to the extent that they relate to social world or to rule-governed systems of the physical world. The empathizing–systemizing (E-S) theory explains these differences in terms of the two orthogonal dimensions. Empathizing is the drive to identify others" emotions and thoughts and to respond to them with an appropriate emotion. Systemizing is the drive to analyze systems in terms of the rules that govern them, and the drive to construct systems. Although stated as drives, systemizing and empathizing are also understood as cognitive styles and behavioral tendencies (Kidron et al., 2018).

Systemizing requires attention to detail as a prerequisite to understand systems, but also the ability to integrate them into functional wholes. Empathizing, in addition to the skill of interpreting verbal and nonverbal signals and inferring the person"s underlying mental state, involves this information triggering an appropriate emotional reaction. Both drives are manifested in everyday situations, and the stronger the drive, the more it is employed (Baron-Cohen, 2014). One of the major causes for concern of science education is the “swing away from science” (Osborne, 2003). Issues of motivation and attitudes are particularly relevant in science. A number of studies indicate that boys have a more positive attitude towards science education than girls and this trend is seen most profoundly in studies which do not differentiate between science subjects but rather investigate the general attitude of students toward science lessons (Guerrero et al., 2017). Individuals do not approach scientific tasks in the same manner. The focus is on the general attitude of students toward science lessons, which serves as basis for both intellect and motivation in learning.

This study aims to determine the emphatizing quotient, systemizing quotient and motivation to learn science among foreign students (BS Biology and BS Psychology) at Emilio Aguinaldo College – Cavite. Specifically it intends to determine the following: typology of the participants in terms of their emphatizing and systemizing quotients and brain types; typology of the participants in terms of motivation to learn science; and significant relationship between cognitive styles and motivation to learn science.

To measure the hypothetical drives to systemizing and to empathizing two self-report questionnaires were designed: The Systemizing Quotient (SQ) and the Empathy Quotient (EQ). The SQ measures the ability to systemize across various domains and situations. The SQ was composed of 40 scoring items and 20 filler items; the items are sex-neutral and overall the questionnaire has better statistical properties. The EQ measures the cognitive and the affective aspects of

empathy in various situations. It includes 40 scoring items and 20 filler items.

METHODOLOGY

This study utilized the descriptive correlational method characterized as a survey approach to investigate the correlation of motivation to learn science and cognitive style (brain type).

This approach is an essential guide to one"s thinking such as knowledge of facts concerning the conditions to be presented, conditions desired, and knowledge to be gained from students that deals with causation.

In the study, the variable cognitive style had already occurred and no attempt was made to manipulate or control them.

Population Frame and Sampling Scheme

The participants of the study were Indian nationals enrolled in the BS Psychology and BS Biology programs of Emilio Aguinaldo College-Cavite, and were identified through purposive sampling technique. It consisted of 120 participants with ages ranging from 18 to 21.

Participants of the Study

The participants were 120 3rd year to 4th year foreign students who are taking up BS Psychology and BS Biology programs under the School of Arts and Sciences of Emilio Aguinaldo College-Cavite. Out of the total number of participants, 72 are males and 48 are females.

Data Gathering Instrument

The SMQ and the Baron-Cohen ES Test were used as prime instruments in gathering data and information to find the correlation of learning science and cognitive style (empathizing and systemizing) of students.

The questionnaires consist the following parts:

1. **Science Motivation Questionnaire** in which students responded to 25 statements that are intended to assess the five (5) components of motivation: intrinsically motivated science learning and extrinsically motivated science learning, relevance of learning science to personal goals, responsibility (self-determination) for learning science, confidence (self-efficacy) in learning science, and anxiety about science assessment.

The scale is usually self-administered and designed for general student population. Responses are made on a 5-point scale where 1=never, 2=rarely, 3=sometimes, 4=usually, 5=always. The SMQ maximum total score is 150 and the minimum is 30. A student"s total SMQ score is interpreted in the following way:

Score Interpretation

30-59	never to rarely (very low motivation)
60-89	rarely to sometimes (low motivation)
90-119	sometimes to often (moderate motivation)
120-150	often to always high motivation

As to the reliability of the instrument, Cronbach"s Alpha ranges from 0.88 to 0.91. Students" scores are significantly related with high school preparation in science, college science and the relevance of science to their careers. As to its validity, an exploratory Factor Analysis suggests a good model fit.

2. **ES Test of Cognitive Style** the combined version of the SQ and the EQ questionnaire by Baron-Cohen (Baron-Cohen, 2004) was used. It provides an EQ score, which can be used in conjunction with an SQ score, to determine the EQ SQ brain type. Both the SQ and the EQ questionnaire are 60-item, forced choice format, containing 40 cognitive style items and 20 control items. On both the EQ and the SQ, participants were asked to respond “definitely agree”, “slightly agree”, “slightly disagree” or “definitely disagree”, and approximately half the items were scored in reversed to avoid response bias. Scores on both the SQ and the EQ range from 0 to 80.

The testing of the reliability (internal consistency) of the used

questionnaires was essential. Cronbach alpha coefficients were α=0.897 for SQ (40 items), and α=0.911 for EQ (40 items) indicating that 87%, 90%, and 91% respectively of the variance of the total scores on these questionnaires could be attributed to systematic variance. This means that the questionnaires have preserved their high internal consistency in the new context.

Data Gathering Procedures

For the ES Test, a permission to use the instrument was sought through e-mail to admin@autismresearchcentre.com. he allotted time to answer the two sets of questionnaires (120 items) was 10-20 minutes. After which, the questionnaires were personally retrieved by the researcher. The floating of the instrument was done in two days. The researchers were subject teachers of the participants. They administered the instruments in the classroom 20 minutes before dismissal of classes.

Data Analysis

As to the EQ test, for the empathizing test, the score was 2 points if the participants answered strongly agree and one point for slightly agree for the following items: 1, 6, 19, 22, 25, 26, 35, 36, 37, 38, 41, 42, 43, 44, 52, 54, 55, 57, 58, 59, 60 and 2 points for strongly disagree and one point for slightly disagree for items 4, 8, 10, 11, 12, 14, 15, 18, 21, 27, 28, 29, 32, 34, 39, 46, 48, 49, 50.

As to the SQ test, 2 points for strongly agree and one point for slightly agree for the following items: 1, 4, 5, 7, 13, 15, 19m 20, 25, 29, 30, 33, 34, 37, 41, 44, 48, 49, 53, 55 and 2 points for answering strongly disagree and 1 point for slightly disagree for the following items: 6, 11, 12, 18, 23, 24, 26, 28, 31, 32, 35, 38, 40, 42, 43, 45, 51, 56, 57, 60.

Statistical Treatment of Data

The following statistical tools were used to analyze the gathered data:

1. Frequency count and percentage was used to present the distribution of the participants

2. The weighted mean was computed to determine the motivation of the participants in learning science.

3. T-test (two tailed) was used to compute for the significant difference between the cognitive styles (emphatizing and systemizing quotients).

4. The Pearson Correlation Coefficient (r) was computed to determine the correlation of cognitive style and motivation to learn science.

RESULTS AND DISCUSSION

Table 1

Typology of the participants in terms of their emphatizing and systemizing quotients

E Score	Description	N	%
0-32	Low	42	35
33-52	Average	71	59.19
53-63	Above High	7	5.8
64-80	Very High	0	0
80-up	Maximum	0	0
Total		**120**	**100**

S Score	Description	N	%
0-19	Low	3	2.5
20-39	Average	97	80.83
40-50	Above High	18	15
51-80	Very High	2	1.66
80-up	Maximum	0	0
Total		**120**	**100**

Table 1 shows that 59.16 % of the participants belong to the range of 33-52, which suggests that they have an average ability for understanding how other people feel respond appropriately and treat people with care and sensitivity. Next, 35% of the participants belong to the range of 0-32, which is suggestive of having a lower than average ability for understanding how other people feel and responding appropriately. Then 5.8 % belonging to the range of 53-63, has an above average ability for understanding how other people feel and responding appropriately, knowing how to treat people with care and sensitivity.

It also shows that majority of the participants, 97 or 80.83 % belong to the range of 20-39 which indicates having an average ability for analyzing and exploring a system, followed by 18 or 15% which belong to the range of 40-50, an above average ability for analyzing and exploring a system.

Table 2

Typology of Participants in terms of Brain Types

Description	Brain Type	N	%
Empathizing	Female Brain	69	57.5
Systemizing	Male Brain	48	40
Empathizing= Systemizing	Balanced Brain	3	2.5

Table 2 shows that majority of the respondents have female brains (57.5% or 69), 40 % or 48 have male brains and 3 or 2.5% have balanced brain. Since majority of the respondents have female brains, it means that there are more empathizers than systemizers.

Participants that score higher on average on EQ are classified as type E or empathizers and those that score higher on average on SQ and are classified as type S or systemizers. The imbalance between the empathizing score and the systemizing score is critical for classifying types. This is based in part on Baron-Cohens argument that people with low ability for empathizing or systemizing may use the other to compensate.

To cite an example, if one student has difficulty empathizing, he/she can become high on systemizing. More men than women have systemizing brains and, simply because of this, the systemizing brain has been called the “male” brain. It does not mean that women cannot be systematic. More women than men have empathizing brains, but it does not mean that men cannot have empathy. Thus having extreme empathy (low or high) or extreme systemizing (low or high) is more important than the balance between the two constructs. In the study, the S group could include students with average or below average scores on SQ if their EQ scores are low enough. Similarly the E group could include students with average or below average scores on EQ if their EQ scores are low enough. If the EQ and SQ each measure meaningful constructs, then it is worth exploring the scheme (type) that are based on each own rather than on the difference between them (Ingalhalikar et al., 2010).

Table 3

Comparison of Cognitive Styles

Cognitive Styles	mean	SD	t-test (two-tailed)	*p-value*
SQ	32.83	63.893	-3.45	0.0008
EQ	36.33	87.535		

Table 3 shows the high significant difference between SQ and EQ. (p=0.0008) which is below p< 0.001. One final central claim of the E–S theory is that, on average, more males than females have a brain of type S, and more females than males have a brain of type E. The evidence for female superiority in empathizing is reviewed in Baron-Cohen, 2002 and includes the finding that women are better at decoding non-verbal communication, picking up subtle nuances from tone of voice or facial expression, or judging a person"s character. The evidence for a male advantage in systemizing is also reviewed (Baron-Cohen et al. 2002) and includes the findings that mathematics, physics and engineering (which all require a high degree of systemizing) are largely male in sex ratio. Hence, in this research the authors found out that among the participants (majority are male) EQ has a higher mean score ($\dot{x}$ =36.33) than SQ ($\dot{x}$ =32.83).

Based on the study of Richler, et.al.(2004) ,the strength of the correlation between EQ and SQ reflect the fact that systemizing and empathizing are wholly different kinds of process. Although, there is some trade-off between the performances on these two instruments, there is no necessary trade-off. This confirms predictions from the E–S theory. Again as predicted in Richler, et al., (2004) study, people with AS/HFA (Asperger Syndrome/ High Functioning Autism)scored significantly higher on the SQ, and significantly lower on the EQ, compared with matched controls(non-AS/HFA/normal adults).The latter result replicates the finding on empathy measures from the earlier study of Baron – Cohen (2002).

Table 4

Mean and Verbal Interpretation of the participants' motivation to learn science

Mean	Verbal Interpretation
4.41	The participants believe and think that they can use the skills and learnings in the Institution in their future career.

Note: Complete table attached as appendix.

Table 4 shows the mean ranging from 3.74 to 4.73 which indicate that majority of the participants in this study are motivated to learn science as their foundation (learning & skills) in their future careers in Medicine. This is the reason why they are enrolled in their specific courses and as well in this Institution. The said courses (BS Biology & BS Psychology) are pre medical courses for medicine.

Table 5

The frequency distribution of the components of motivation

Components of motivation	*f*	*%*
1. Intrinsic		
High motivation	88	73.33
Moderate motivation	31	25.83
Low motivation	1	0.83
Very low motivation	0	0
2. Self-efficacy		
High motivation	84	70
Moderate motivation	35	29.17
Low motivation	1	0.83
Very low motivation	0	0
3. Self determination		
High motivation	76	63.33
Moderate motivation	36	30
Low motivation	8	6.67
Very low motivation	0	0
4. Grade motivation		
High motivation	76	63.33
Moderate motivation	36	30
Low motivation	7	5.83
Very low motivation	1	0.83
5. Career motivation		
High motivation	94	78.33
Moderate motivation	23	19.16
Low motivation	3	2.5
Very low motivation	0	0

Table 5 shows that among the components of learning science the participants are highly motivated in terms of career (rank 1), intrinsic (rank 2), and self-efficacy (3).Thus, India which is located in both eastern and northern hemisphere of Asia, culturally, put high value in education just like other East Asian countries like China, Japan, and Singapore (Kim and Lee, 2010).

Table 6

Typology of the participants in terms of motivation to learn science

Score	Description	N	%
120-150	High Motivation	85	70.8
90-119	Moderate Motivation	32	26.6
60-89	Low Motivation	2	1.66
30-59	Very Low Motivation	1	0.83

Table 6 shows participants" SMQ score indicating a high motivation to learn science (85 participants or 70.8% of the total participants) and moderate motivation with 32 participants or 26.6 % of the total participants. This is followed by low motivation with 2 or 1.66% of the total respondents. Only 1 of the respondents scored in very low motivation.

Student motivation is a tool used by researchers to clarify the degree to which students show effort and interest in their pursuits, regardless of whether the teacher desires these tasks. Relevance of science is also crucial to motivate students in learning the subject.

For example, students may be motivated for health reasons, thinking that understanding the basic concepts in Biology is relevant to health issues that confront those issues such as diet, eating disorders, conception and sexually transmitted disease.

On the other hand, students with low motivation to learn science have little need to understand basic concepts of Biology or other science subjects, thinking that these basic concepts of science are irrelevant for their major/area of specialization, without considering the possibility that they might someday work for corporations, hospitals, clinics and that an understanding of biology and other science subjects concepts could play a significant role in their careers. So in order to better understand students" motivation in science learning, further qualitative research should be conducted for assessing the interaction of different environmental and social factors (Lai, et.al, 2012).

Table 7

Correlation between motivation to learn science and emphatizing quotient of the participants

	Pearson's r value	p
EQ Motivation	0.011	0.901
SQ Motivation	-0.058	-0.527

Table 7 shows that there is a negligible correlation of the Pearson r value which is 0.011. The probability value of 0.901 denotes that there"s no significant relationship between motivations to learn science since the p value is greater than α value which is 0.05. Cognitive style is a basic variable of motivation to learn science. If empathizing is the drive to deal with mental states, it could be that a strong interest in mental things could simultaneously diminish engagement in science, explicitly dedicated to physical things.(Correlation plot attached as appendix.)

It also shows that there is a negligible correlation of the Pearson r value which is -0.058. The probability value of -0.052 denotes that there"s no significant relationship between systemizing quotient and motivation to learn science since the p value is greater than α value which is 0.05. There is no correlation between motivation to learn science and systemizing quotient of the students. Engagement in science depends primarily on the SQ of a person. If the systemizing cognition of a student is strong, then they will show a high engagement in science and the reverse of it. On average, men are more motivated to learn science than women, because they are on average, stronger systemizers. In terms of empathizing, the same holds true for women who are more likely to be less systemizing.

CONCLUSIONS

The typology of participants in terms of empathizing questionnaire shows that half of the participants belong to the range of 33-52 (average ability). Only 5.8% belong to the highest range of empathizers 64-80 (very high ability). Only 5.8 % belong to the highest range of emphatizers" 64-80 (very high ability); while systemizing questionnaire reveals that majority of the participants, 97 or 80.83 %, belong to the range of 20-39 (average ability for analyzing and exploring a system). The lowest percent (1.66%) or 2 participants were in the range of 51-80 (very high ability).

The typology of participants in terms of cognitive style (brain types) explains that majority of the participants have female brains (57.5% or 69), 48 % or 48 have male brains and 3 or 2. 5% have balanced brain.

The typology of the participants in terms of motivation to learn science showed high motivation to learn science (85 or 70.8% of the total participants). Next is moderate motivation with 26.6 % of the total participants followed by low motivation with 2 or 1.66% of the total participants. Only one (1) scored very low motivation.

There is a **high significant difference** between the cognitive styles (empathizing and systemizing quotients) . The participants scored high in career motivation and majority of them are emphatizers so it shows that even their brains are not in line with their chosen field of study which is Medicine. Their career motivation made them pursue the field of Medicine in the future.

There is **no significant correlation** between motivations to learn science with emphatizing quotient; the same with motivation to learn science with systemizing quotient.

RECOMMENDATIONS

The following recommendations are based on the findings and conclusion of the study.

1. For **students** to enhance and develop their systemizing ability in order to learn science through a science program or interactive science curriculum that presents science in meaningful context; to ensure that programs are relevant to students as well as societal needs, providing opportunities for students to explore the process of science, its applications and implications; and to examine related technological problems and issues. By doing so, students become aware of the role of science in responding to social and cultural change and in meeting needs for a sustainable environment, economy and society.

2. For the **faculty** to become aware of their students' systemizing and empathizing styles, either by direct observation or by using a survey instrument. It is also important that the teachers' pedagogy shall address all the different cognitive styles of the students. Such insight could inspire teachers to adapt their instruction to help low systemizing students (or the opposite in the case of teachers/classes that tend to emphasize empathizing). The researcher hopes that those who teach in „science education programs" can create and teach curricula that focus on

developing both systemizing and empathizing cognitive styles so that students and graduates of Emilio Aguinaldo College – Cavite will have more career options available for them and not suffer the current damaging impact on motivation, low systemizing and hence on achievement and persistence.

3. For the **future researchers** to conduct study that will help science teachers identify their motivation to learn science and cognitive style for the enhancement of their cognitive style to cater to the needs of their students. If teachers are aware that the daily work of being a teacher requires empathizing and the academic organization is dominated by systemizing, then it is in this realm that a study or research be conducted to determine such cognitive style and how it will influence their motivation into teaching science.

REFERENCES

Baron-Cohen, S. (2002). The Autism:EmphatizingSystemizing (E.S) Theory.CambridgeUniv.CambridgeUK.

Baron-Cohen S, Cassidy S, Auyeung B, Allison C, Achoukhi M, Robertson S, et al. (2014) Attenuation of typical sex differences in 800 adults with Autism.

Guerrero,Osborne, Simon, and Collins (2017) PLOS : September 10, 2017.

Ingalhalikar M, Smith A, Parker D, Satterthwaite TD, Elliott MA, Verma R, et al. (2010) Sex differences in the structural connectome of the human brain

Kidron, R. , Leon Kaganovskiy, and Simon Baron-Cohen (2018). Emphatizing – Cognitive styles: Effects of sex and academic degree. PLOS: March26,2018 http://doi.org/10.1371/journal.pone.094515.

Kim J and Lee SJ.(2010) Reliability and validity of the Korean Version of the Empathy Quotient Scale. Psychiatry Investigation

Lai M, Lombardo M, Chakrabarti B, Ecker C, Sadek S, Baron-Cohen S, et al.(2012) Individual differences in brain structure underpin empathizing–systemizing cognitive styles in male adults.

Ruigrok A, Salimi-Khorshidi G, Lai M, Baron-Cohen S, Lombardo M,

Suckling J, et al. (2014)A meta-analysis of sex differences in human brain structure.

Takeuchi H, Taki Y, Sassa Y, Hashizume H, Sekiguchi A, Fukushima A, et al. (2014) Regional gray matter volume is associated with empathizing and systemizing in young adults.

An exploration on the factors that influence the commission of an offense of children in conflict with the law in the City of Dasmariñas, Cavite, Philippines

Leah Cada, Regerine Pascual, Darwin Palado

School of Arts and Sciences, Emilio Aguinaldo College

queenleah_22@yahoo.com

Abstract

Growing number of children in conflict with the law (CICL) is a steadfast concern in the Philippines. Thus, this study mainly focused on exploring the factors that influence the commission of offenses of CICL in the city of Dasmariñas, Cavite. The study used a descriptive research design and was employed among 27 participants from Bahay Kalinga under the supervision of the City Service Welfare Development (CSWD) of Dasmariñas, Cavite. They are selected through purposive sampling. A researcher-made assessment tool was used to measure the level of influence of several factors which were further classified as individual, family, school, peer group and community. Prior to data collection, the instrument was validated by experts and obtained a reliability score of 0.73 (α=0.732). The data gathered were statistically analyzed. The study revealed that the factors such as individual and peer group have moderate influence whereas family, school, and community have minimum influence to the CICL to commit offenses. Thus, it is recommended that the institutions alike should focus on individual and peer group related rehabilitation program and strengthen the existing programs.

Keywords: children in conflict with the law, Factors that influence commission of offenses, City Service Welfare Department, Bahay Kalinga

INTRODUCTION

According to the United Nations Children"s Fund (UNICEF, 2006), the term „children in conflict with the law" refers to anyone under 18 who comes into contact with the justice system as a result of being suspected or accused of committing an offense. Most children in conflict with the law have committed petty crimes or such minor offences as vagrancy, truancy, begging or alcohol use. Some of these are known as „status offences" and are not considered criminal when committed by adults. In addition, some children who engage in criminal behaviour have been used or coerced by adults. Too often, prejudice related to race, ethnicity or social and economic status may bring a child into conflict with the law even when no crime has been committed or result in harsh treatment by law enforcement officials.

In the area of juvenile justice, UNICEF aims to reduce incarceration while protecting children from violence, abuse and exploitation. It promotes rehabilitation that involves families and communities as a safer, more appropriate and effective approach than punitive measures. Justice systems designed for adults often lack the capacity to adequately address these issues and are more likely to harm than improve a child"s chances for reintegration into society. For all these reasons, UNICEF strongly advocates diversion (directing children away from judicial proceedings and towards community solutions), restorative justice (promoting reconciliation, restitution and responsibility through the involvement of the child, family members, victims and communities), and alternatives to custodial sentencing (counselling, probation and community service).

As stated in Articles 37 and 40 of the Convention on the Rights of the Child (1989), children in conflict with the law have the right to treatment that promotes their sense of dignity and worth takes into account their age and aims at their reintegration into society. Also, placing children in conflict with the law in a closed facility should be a measure of last resort, to be avoided whenever possible. The convention prohibits the imposition of the death penalty and sentences of life imprisonment for offenses committed by persons under the age of 18.

In line with this, Senator Francis “Kiko” Pangilinan authored the Juvenile Justice and Welfare Act of 2006 that shall cover the different stages involving children at risk and children in conflict with the law from prevention to rehabilitation and reintegration. It advocates on children„s right which brings benefits to the children.

The Juvenile Justice and Welfare Council (JJWC) under the Department of Justice has issued the implementing rules and regulations

of R.A. No. 9344, or the “Juvenile Justice and Welfare Act of 2006”. It cites Article 40 of the United Nations Convention on the Rights of the Child, which provides that the members states have the duty to recognize “the right of every child alleged as, accused of, adjudged, or recognized as, having infringed the penal law to be treated in a manner consistent with the promotion of the child"s sense of dignity and worth taking into account the child"s age and desirability of promoting his/her reintegration”; that “whenever appropriate and desirable, the State shall adopt measures for dealing with such children without resorting to judicial proceedings, providing that human rights and legal safeguards are fully respected”; that the member states “shall ensure that children are dealt with in a manner appropriate to their well-being by providing for, among others, a variety of disposition measures such as care, guidance and supervision orders, counseling, probation, foster care, education and vocational training programs and other alternatives to institutional care”.

A main feature of R.A. No. 9344 is that CICL are required to undergo a “diversion program” which refers to “an alternative, child-appropriate process of determining the responsibility and treatment of a child in conflict with the law on the basis of his/her social, cultural, economic, psychological or educational background without resorting to formal court proceedings” but unfortunately, because of the lack of resources, the law is not properly and fully implemented.(Juan Mission One Hope for the Children-in-Conflict with the Law, 2009).

However, in April 13, 2017, his Excellency Rodrigo Duterte, President of the Republic of the Philippines commented on the above-mentioned legislation and blamed the author of the law saying that Juvenile Justice Law is encouraging youth to commit crimes. According to Duterte the said law raises the Minimum Age of Criminal Responsibility (MACR) from nine (9) years old to Fifteen (15) years old. Further, the law states that if the children are caught in possession of illegal substances or any crime, the social welfare department must take them into custody for rehabilitation (Rappler, 2017).

Furthermore, as cited in the study of Hernandez et al., (2016), the increasing number of CICL in the Philippines is wholly alarming. Also, based on the report of the Juvenile Justice and Welfare Council, there are over 11, 000 Filipino CICL as of 2009 and most of them came from low – income families and have stopped schooling. Most of the children are males between the ages of 14 to 17 years old.

In addition, the study of Quinicot et al., (2015), cited that there were 35 clients catered by the City Service Welfare Department (CSWD) in Dasmariñas City, Cavite.

The researchers saw that there is a growing need to study the factors that influence the commission of offenses of children in conflict with the law in the City of Dasmariñas, Cavite. In exploring such factors, the institution may focus on those areas for rehabilitation and preventive measures.

METHODOLOGY

This study utilized quantitative method of data collection. A descriptive research design was used in this study. According to Ethridge, D.E. (2014) descriptive research can be explained as statement of affairs as they are no control over variable. Moreover, “descriptive studies may be characterized as simply the attempt to determine, describe or identify what is.

The participants of the study were clients of Bahay Kalinga in the City of Dasmariñas, Cavite under the supervision of the local City Service Welfare Department (CSWD) through which an endorsed letter to the City Municipal was given. The participants were chosen based on the following criteria (a) must be legally labeled as child in conflict with the law; (b) presently held/catered at Bahay Kalinga. (c) chronological age should not exceed 19 years old or lower than 12 years old which was based on purposive sampling technique. Total enumeration was employed. A total of 27 participants were gathered.

To obtain the data, a researcher-made assessment tool that measures the factors that influence the commission of offense of children with conflict with the law was implemented to obtain different scores or level of factors such as Individual, family, school, peer group, and community. The instrument was validated by experts and obtained a reliability score of .73 (α=0.732). Poverty was not included in the factors since according to the study of Quinicot et al.,.(2015) the, fact that a large number of the crimes committed by juvenile offenders were crimes against property – usually theft and robbery – already indicates the economic difficulties that push them into criminal activities. Poverty, together with dysfunctional family relationships and negative peer influence, is a major factor that pushes the youth toward lawlessness (Soriano, 2001).

The data gathering was conducted with supervision of a licensed psychometrician. The data gathered were analyzed using statistical treatment such as frequency distribution, percentage, and general weighted mean.

RESULTS AND DISCUSSION

Table 1

The frequency distribution of demographic profile of the participants

		Frequency	Percentage
Age	14-15	3	11.11
	16-17	16	59.26
	18-19	8	29.63
Sex	Male	23	85.19
	Female	4	14.81
Highest Educational Attainment	Primary	18	66.67
	Secondary	9	33.33
	Tertiary	0	0

The table 1 shows the ages of the respondents. There were 0 participants ages 12 to 13 years old equivalent to 0%, 3 participants ages 14 to 15 years old equivalent to 11.11%, 16 participants ages 16 to 17 years old equivalent to 59.26%, and 8 participants ages 18 to 19 years old equivalent of 29.63%.

As cited in the study of Daryl et al., (2018) which is based on Moore (2010), youth under ages 12-17 suffer 2.3 times more violent crime than the population as a whole, including 2.4 times as much assault and 1.8 times as much robbery.

The Table 1 also shows the gender/sex of the participants. Twenty three participants were males equivalent to 85.19%, and 4 participants were female equivalent to 14.81%.

According to Shoemaker‟s (2014), study and self-report data in a coastal city in southern Philippines, males have more risk to become delinquents than females.

Lastly, Table 1 shows the highest educational attainment of the participants. There were 18 participants, who have reached primary level equivalent to 66.67%, 9 participants have reached secondary level equivalent to 33.33%.

Table 2

Weighted Mean of Factors influencing commission of an offenses

Factors	Weighted Mean	Interpretation
Individual	2.44	Moderate
Peer group	2.30	Moderate
School	2.22	Minimal
community	2.18	Minimal
Family	2.05	Minimal

Table 2 shows the distribution and responses and mean scores per factors. Findings show that individual factors ($\dot{x}$ =2.44) and per group factors ($\dot{x}$ =2.30) have moderate influence on the commission of crime. Meanwhile, school factors ($\dot{x}$ =2.22), community factors ($\dot{x}$ =2.18) and family factors ($\dot{x}$ =2.05) have minimal influence.

It shows that individual factors appeared as the leading factor influencing the commitment of offenses affirmed by the participants. Likewise, findings indicated that family factor is the least that affects CICL in committing offenses.

According to Seigel, Welsh and Senna (2007), adolescence is a time of trial and uncertainty for many youths. They may become extremely vulnerable to emotional turmoil and experience anxiety, humiliation, and mood swings. Adolescent also undergo a period of biological development that proceeds at a far faster pace than at any other time in their lives except infancy. Over a period of a few years, their height, weight, and sexual characteristics change dramatically.

In later adolescence (ages 16 to 18), youths may experience a life crisis that famed psychologist Erik Erickson labeled the struggle between ego identity and role diffusion. Ego identity is formed when youths develop a firm sense of who they are and what they stand for. Role diffusion occurs when they experience personal uncertainty, spread themselves too thin, and place themselves too thin, and place themselves at the mercy of leaders who promise to give them a sense of identity they cannot mold for themselves. Psychologist also fined that the late adolescence is a period dominated by the yearning for independence from parental domination. Given this explosive mixture of biological change and desire for autonomy, it is not surprising that the teenage years are periods of rebelliousness resulting to conflict with authority at home, at school, and in the community.

Moreover, Karl G. Hill et al (2013) stated that adolescents who have membership in gangs are more frequently involved in serious delinquency compared to those who are not members of the gang. Logistics regression was used to identify risk factors at ages 10 through 12 which are predictive of tendencies to join a gang between the ages of 13 and 18. Adolescent who were exposed to multiple factors were much more likely to join a gang.

According to Furlong et al (2015), similarly to some statement, children"s who"s difficult to control anger is often associated with high risk. Anger can affect the children or adolescent to consequently risk for aggression in youths (Cornell et al., 2014). According to Coie et al., (2012), peer relationship is an important factor to understand and assess a youth at risk in behavioral aggression. Peer relationships have two distinct related processes to define negative peer relationship in children and in adolescents. This includes peer rejection and delinquent peer affiliation.

CONCLUSIONS

Based on the above results, the following conclusions were drawn:

1. It is therefore concluded that most participants sheltered in Bahay Kalinga were 16 to 17 years old; male and finished primary level as their highest educational attainment.

2. Also, it is therefore concluded that the factors that influence the commission of crime of the participants in terms of individual and peer group factors were moderately influential, whereas areas of school, community, and family were minimally influential. This denotes that the first two factors have greater influence on the participants and children in conflict with the law alike rather than external factors such as school, community and family.

RECOMMENDATIONS

Based on the above conclusions, the following recommendations were drawn:
1. The researchers recommend for the institution to enhance intervention plan for CICL which focuses on individual factors such as controlling oneself or anger; or how to not be swayed by peer pressure or peer group.

2. The researchers recommend the institution to host a seminar or awareness campaign regarding the factors in increasing population of CICL and incorporate solutions on how to alleviate the certain problem.

3. The National and Local Government should improve the already existing preventive program for CICL.

4. It is recommended for the adolescents to be wary on what they are doing to avoid committing an offense. Adolescents are recommended also to engage themselves in activities that would keep them busy to avoid doing unnecessary things such as factors that trigger offenses.

5. The researchers of this study recommend the future researchers to explore other factors, such as gender difference, the place of residence before entering the institution, the length or the period they have committed crime, and the types of the crime committed that might affect an individual in the commission of a crime. They could may also conduct a follow - up study to test the reliability and validity of the research and increase sample or employ other sampling technique.

REFERENCES

Alampay, L. P. (2006). Risk factors and causal processes in juvenile delinquency: Research for implications for prevention. *Philippine Journal of Psychology*, Vol 39 No 1, pp. 195-228.

Cajili, R. A. (2012). *Socio-demographic factors as correlates to mental ability and interpersonal relations of children in conflict with the law.* Children's Right Project, Community Law Centre, and University of Western College. (2006). *Children Used by Adults to Commit Crime: Children's Perceptions of their Use by Adults in the Commission of Offenses*. The International Labour Organization. Retrieved October 21, 2014 from http://www.childjustice.org.za/publications/ Childrens_Perceptions.pdf.

De Ramos, C. J., Regalado, Ma. A. C., Tenorio, N.(2015), *An Assessment on the factors that Influence the Commission of Crimes among Selected Male Children in conflict with the law*

Dingal, R. J. (2000). *A correlative analysis of the behavioral processes of the youth offenders in Regional Youth Rehabilitation Center in Ayala, Magalang, Pampanga: A basis for guidance and counseling interventions.*

Feist, G. J., & Rosenbergm E. L. (2010). *Psychology:*

Making Connections. McGraw-Hill Higher Education. Hess, K. M., Orthmann, C. H., and Wright, J. P. (2012). *Juvenile Justice*, 6th Ed. Cengage Learning.

Hernandez, K. J., Lavarez, C. A., Pedillaga, K. F, (2016) *The Lived Experiences of Selected Children in Conflict with the Law (CICL) in Dasmariñas, Cavite*.

Lahey, B. B. et. al (2007). Sex differences in the causes of self- reported adolescent delinquency. *Journal of Abnormal Psychology*. Vol 116 No.2 236-248.

Leary, M. R. (2010) Descriptive Research. *Introduction to Behavioral Research Methods.* Retrieved from March 3, 2014 from http://wps.ablongman. com/ab_leary_resmethod_4/11/2989/765402.cw/index.html.

McLeod, Saul. 2008. Erik Erikson. *Simply Psychology*. Retrieved October 22, 2014 from http://www.simplypsychology.org/Erik Erikson.html#identity

Muncie, J. (2004). *Youth Crime.* Sage Publications.
Myers, D. J. and DeLamater, J. D. (2012). *Social Psychology*. Wadsworth
Publishing Co.

Omaga-Diaz, H. (2011). *Krusada: Juvenile Delinquency*. ABS-CBN News. Retrieved February 25, 2014 fromhttp://www.abscbnnews. com/current-affairs-programs/ 11/21/11/krusada-juveniledelinquency.

Passer, M. W., & Smith, R. E. (2009). *Psychology: The Science of Mind and Behavior*, 4th Ed. McGraw-Hill Companies, Incorporated.

Patterson, C. J. (2013). *Child Development*. McGraw-Hill Higher Education.

Quinicot, J., Satsatin, L. M., Digma, C. J. (2015) *Proliferation, Risk Factors and Preventive Measures among Juvenile Delinquents in Selected Areas in Cavite*

Ramirez, M. G. R. (2004). *Research on the stuation of the children in conflict*

Richards, Patti. (2013). *How does peer pressure affect juvenile*

delinquency. Livestrong.com. Retrieved October 16http://www.livestrong.com/article/ 562252-how-does-peer-pressure-affect-juvenile-delinquency.

.

Santrock, J. W. (2009). *Child Development*, 12th Ed. McGraw-Hill Higher Education.

Santrock, J. W. (2009). *Life-Span Development*, 12th Ed. McGraw-Hill Higher Education.

Schiller, Johann. (1800). *Crime and Criminality*. Retrieved October 17, 2014 from http://www.des.ucdavis.edu/faculty/Richerson/BooksOnline He16-95.pdf.

Siegel, L. J., & Welsh, B. C. (2012). *Juvenile Delinquency: Theory, Practice and Law.*Wadsworth Cengage Learning.

Springer, D. W., & Roberts, A. R. (2010). *Juvenile Justice and Delinquency.* Jones and Barlett Publishers, Inc, United States.

The United Nations Children"s Fund (UNICEF) (2006)

Street foods: challenges and practices

[1]Christian Eric Laureles, [1]Jeramayne Dahl Estares
and [2]Frederick A. Andal

[1]School of Tourism and International Hospitality Management
[2]School of Education, Emilio Aguinaldo College

erikaandalchoi@gmail.com

Abstract

Street food satisfies the food consumption of a significant population in Dasmariñas City, Cavite. It provides a low-cost, affordable and yet with gustatory attributes to the taste palate of the consumers. These foods though, have potential risks to the consumers in terms of food safety issues linked to them. Thus, the study determined the challenges faced by the street foods and assess the food safety and hygiene practices of the street food vendors in Dasmariñas City, Cavite. The study employed a qualitative design using inductive coding methods. Semi-structured interviews were conducted, face to face and one-on-on, and recorded the questions asked to the participants were based on the findings that emerged from the literature. The results revealed that the street food vendors were aware of their working conditions and the risk on their physical environment where they are working. They were also aware of the hygienic practices in preparing and serving food and have variable knowledge on food safety. As an indirect driver of the economy, street food vending should not be ignored. The collaboration of all stakeholders toward strengthening and proper enforcement of public policies to ensure safety practices for a safer and healthier society is recommended.

Keywords*:* working conditions, occupational hazards, food safety, food hygiene

INTRODUCTION

Street food has been defined as ready-to-eat foods prepared or sold by vendors on the street and other public places (Abraham & Krishnan, 2017; Kharel, Palni & Tamang, 2016; Khairuzzaman, Chowdhury, Zaman, Mamun & Bari, 2014). The variation on the street food preparation in terms of ingredients, processing and methods of marketing consumption reflects the local culture (Habib, 2016) and represents cuisine in the area where the street food is sold (Abraham & Krishnan, 2017). Street foods are appreciated for their unique flavor and convenience and maintaining the nutritional value of traditional foods (Kharel et.al., 2016).

While street food is a source of important ready-to-eat nutrition and provide a low-cost meal for the urban poor population, the health risk possessed by such foods may outweigh its benefits (Habib, 2016). The sector is fraught with unwholesome activities which have been reported to pose serious concerns over the safety of the practitioners especially the health of the consumers (Alimi, 2016; Alimi, Shittu & Sanni, 2014). With the poor monitoring and control on street food preparation and production, it is sold in an unhygienic manner which is believed to be a major contributor to food and waterborne diseases (Habib, 2016; Khairuzzaman et al., 2014).

Literatures suggest that street foods indicate that there are several reasons why street food is unhygienic and pose a public health risk (Abraham & Krishnan, 2017). Janie and Marie (2013) reported that food vendors are poor, illiterate with little knowledge in food handling and safety, maintain clean environment, sanitation and hygiene or lack knowledge on aspects such as food display modes, service, hand wash procurement and potable water. Food is a biological product and supports many microorganisms, bacteria and pathogens responsible for diseases such as diarrhea (Chakravarthy, 2013). Nurudeen, Lawal & Ajayi (2014) noted that the chemical additives like colorants and preservatives are also a source of food contamination. Further, Brown, Lyons, & Dancoko, (2010), foods are prepared and sold in environmentally unhygienic conditions and may not be protected from flies and dust (Khairuzzaman et al., 2014).

World Health organization (WHO) in 2006 came up with five key points to ensure food hygiene as part of their global strategy to decrease

the burden of food and waterborne diseases: keeping clean, separating raw and cooked food, cooking thoroughly, keeping food at safe temperatures and using safe water and raw materials. These explain basic principles that should practice all over the world to prevent food and waterborne diseases (World Health Organization, 2015).

The study was conducted in Dasmariñas City, a first-class city in the province of Cavite, Philippines and is one of the most densely populated in the province. The growing congestion and outward urban expansion of the Metropolitan Manila Area has led to rapid development of the city. This inevitable growth is manifested by the influx of industries, the presence of large educational and health institutions, and the growing number of subdivisions elevating its economy. Based on the 2015 census, Dasmarinas is a home of 659, 019 people. Due to the large-scale migration, street food vending has become a growing informal sector in the urban areas not only in Dasmarinas, but in the other country as well (Habib, 2016).

The research study examines the challenges of street food in Dasmarinas City Cavite. This determined the problem of street food safety and hygiene from the point of view of the street vendors.

METHODS

Qualitative, inductive coding methods was employed in this study as this method aims to determine the thoughts and experiences of a particular group of people involved in a particular action (Habib, 2016; Mamun et al., 2016). Semi-structured interview approach was taken for its suitability for exploring attitudes, values, beliefs and motives. The researcher interviewed 21 street food vendors along the stretch of Gov. D. Mangubat Avenue, Dasmariñas City.

The interview focused on hygiene standards that the street vendors are following, the importance of food safety and hygiene in attracting customers, and the assistance that they are looking for from the government to help them implement food safety and hygiene standards. All the interviews were one on one interviews, face to face and audio-taped. The topic guide was developed based on findings emerged from the different literature.

A copy of an invitation letter was first shown and read to the potential participants. An information sheet was later issued and a consent form was signed. The consent form and information sheet carried clear information about the study background and complete instruction for the participants.

RESULTS AND DISCUSSION

The Socio-demographic Profile of the Street Food Vendors

There is no actual record or data of street food vendors enumerated in the formal sector of Dasmariñas City. Street food vendors are identified as the informal sectors where their business is unstable and belongs to marginal economic community.

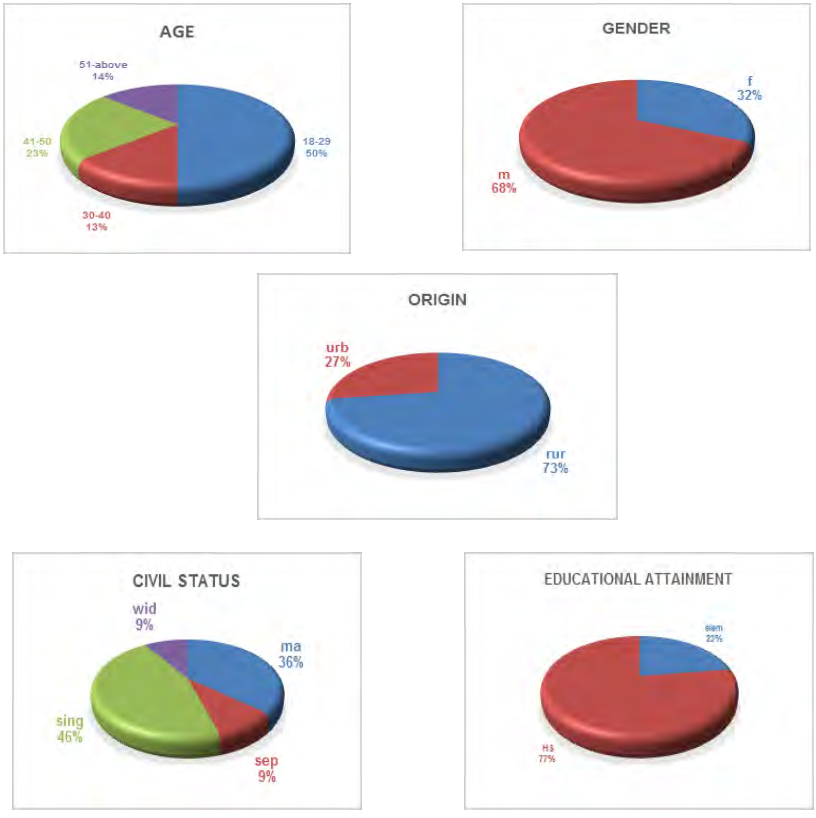


Figure 1. The profile of the street food vendors participated in the study

Participants of the study are both males and females, single, married, separated and widowed; operate as street food vendors with the age range from 18 to 60 years old. Majority of the street vendors are in the age range from 18 to 29 years of age. Most of the participants have rural origin and decided to live in the City for their business operations. In terms of educational attainment, it is comparatively low and in the case of the majority of the participants, education level varied from elementary level to secondary level. For the street food vendors" socio-economic backgrounds, all of them believed they were unstable and financially constraints.

Density of street food vendors vary in different parts of Dasmariñas City. Most of these vendors are located near the parks, educational institutions, market areas and other establishments where people come and go. Habib (2016) supported the findings of the study on the location of the street vendors in Dhaka City.

Street food vendors are a self-employed category of small-scale entrepreneurs. They are not dependent on any institutional structures to find their livelihood (Khairuzzaman et al., 2016). Their business depends on individual strengths and the support from their own family, friends and networks. Street food vending is the main source of living and their family depends on it. According to Khairuzzaman et al., (2016), the economic activities of the street food vendors have not only provided a source of livelihood to the vendors and their family but also have reduced the plight of their becoming an economic and social burden on the state.

Street food satisfies the food consumption need of a significant sector of the population (Khairuzzaman et al, 2016). The food sold is relatively inexpensive prices and readily available (Alimi, 2016). Street food therefore, not only meets the food requirement of the sector of population but also the busy customers who do not have much time to prepare their food at home.

A total of 21 interviews were conducted. Among the 21 interviewees, 13 street vendors served food hot, 2 vendors served food cold, 2 vendors serve pre-cut fruits and 2 vendors serve different types of drinks. To maintain the anonymity of the participants, the researcher used three identification letters for the different types of food serving: SFH for food served hot, SFC for food served cold, SFP for pre-cut fruits and SFL for different types of drinks. An overview on the street food vendors are presented in Table 1.

Table 1

Overview of street food vendors

Participants	Street foods	Approx. Customer/ day	Approx. Income/ day
SFC1	Ice Crumble	200	1000 - 1500
SFC2	Dirty Ice Cream	150	1000 - 1500
SFH1	Lugaw	100	1000 - 1500
SFH2	Lugaw	100	1000 - 1500
SFH3	Kwek-kwek	400	1000 - 1500
SFH4	Fish Ball/Kikiam	150	800 - 1000
SFH5	Maruya	200	1000 - 1500
SFH6	Chicken Skin	70	1000 - 1500
SFH7	Mais (Corn)	100	1000 - 1500
SFH8	Pares 2x	150	1000 - 1500
SFH9	Ihaw - ihaw	200	1500 - 2000
SFH10	Peanut	100	800 - 1000
SFH11	Boiled Egg	50	400 - 500
SFH12	Potato Swirls	80	500 - 800
SFH13	Hotdog	150	1000 - 1500
SFP1	Precut Mango	80	800 - 1000
SFP2	Precut Guava	50	300 - 500
SFL1	Sago-gulaman	70	800 - 1000
SFL2	Orange Juice	100	500 - 800
SFL3	Melon Juice	100	500 - 800
SFL4	Pineapple Juice	100	500 - 800

Two major themes emerged from the data regarding the challenges faced by the street food vendors the city in Dasmariñas City: the working conditions and occupational hazards and the safety of the street foods.

Working Conditions and Occupational Hazards of Street Food Vendors

The Gov. D. Mangubat Avenue, Burol Main is undergoing an extensive road widening construction which greatly affects the business conditions of the street food vendors in the area. When asked about what they would do now that the place where they usually stay is undergoing construction, "*…wala naman po tayong magagawa, kasi po*

ganun talaga, hahanap po ulet kami ng ibang tambayan... di nga lang po masyado mabenta kasi madami nagtitinda dun saka wala masyado estudyante" (SFH5). Another scenario was narrated by most of the street food vendors, "…*malalaki ang sasakyan na ginagamit sa pagbubungkal ng lupa, nakakatakot para sa aming kaligtasan, kakarampot na nga ang kinikita maoospital ka pa kapag nasagi ka ng mga sasakyan".* (SFH3).

Most of the street vendors interviewed were serving students from different educational institutions located along the Mangubat Avenue. The road widening construction really affects the income of the street food vendors. Several literatures cited that street foods are usually located near the parks and other educational institutions; others are in the markets and near the church (Khairuzzaman et al., 2016; Imathiu, 2017; Habib, 2016).

Street food vendors faced unique kinds of livelihood risks due to the physical conditions of the environment in which they work. Khairuzzaman et.al., (2016) added that the most pressing and ongoing risks for many street vendors is the possibility that the local government authority will forcibly remove them from the streets. Just like formal business, street vendors are less productive in an unstable institutional environment where rules are unpredictable and irregular (Bhowmik, 2010; Street Vendors in Women in Informal Employment, n.d.).

Street food vendors also face occupational hazards as well. The physical environment in which they work typically lack proper infrastructure. When asked about their own personal safety, "…*kung sakali na lumakas ang apoy, nasunog, wala tayong extinguisher, buhusan ko na lang ng tubig… kung gasul naman ang gamit katulad nito, patayin sa gasul, dapat alisto ka rin sa mga bagay na yan"* (SFH8). Street vendors are exposed to harm from the improper provision of fire safety equipment and in improper regulation of traffic in commercial areas. They are also exposed to high concentration of air pollutants and inclement weather conditions, "*…maalikabok po talaga lalo na ngayon na ginagawa ang kalsada, nagtatakip na lang po ng ilong…wala po akong mask na dala ngayon nakalimutan ko po sa pagmamadali, kamay na lang po muna"* (SFH9).

Given the growing numbers of the street food vendors and the customers who patronized them, the issues and problems that the vendors encountered need special attention of the authorities concerned. Income and earning risk are also common to street vendors. When asked if they experience harassment, *"…nanghihingi lang po ng mani, binibigyan na lang po, mani lang naman po eh. Pero pera, di ko naman po nararanasan yun, sana wag na talaga"* (SFH10). Benjamin (2011) stated that harassment on part of the local authorities includes evictions,

confiscations of merchandise and demands for bribes. It is good to know that in the City of Dasmarinas, there is no such recorded harassment cases so far.

The street vendor with a fixed structure in a designated market may be more likely to hold a license or permit. In turn, they would be less exposed to certain types of risks. A street vendor who works as employee selling a particular kind of product may be better protected by law (Khairuzzaman et al., 2016).

Safety of Street Foods

The numerous advantages offered by the street foods to food nutrition and security need to be considered alongside several food safety issues as foods prepared and exposed for sale may become contaminated by pathogenic microorganisms as well as hazardous chemicals (Imathiu, 2017; Rane, 2011). The street food vendors were aware that contaminated food can be a source of diseases such as stomach pains and diarrhea. However, they did not believe that food prepared in their carts were unhygienic, *"naghuhugas po kami ng kamay at naglalagay ng plastic sa kamay pag nagtatalop ng mangga, malinis din po ang tubig namin kung saan namin hinuhugasan ang talop na mangga"* (SFP1). Another scenario was narrated by the street vendors, "*mineral water po gamit naming tubig, yung yelo naman po tube ice po siya, minsan lang talaga napapagamit din kami ng ordinaryong yelo, pero so far naman po, wala namang sumasakit ang tiyan"* (SFL1-4).

In the interview conducted, the street food vendors were aware of the hygienic practices in preparing and serving food. They were able to narrate practices in which indirect contact with the food they served is important. Several researchers cited by Alimi (2016) stated that most street food vendors have knowledge of hygienic practices, but majority of them do not put the knowledge into practice (Muyanja, Nayiga, Brenda & Nasinyama, 2011; Lues, Rasephei, Venter & Theron, 206; Omemu & Aderoju, 2008). Although street vendors exhibit good personal cares, they were negligent to compliance with adequate hygiene practices at the preparation in the vending sites (Muyanja et.al., 2011).

When they were asked on how they disposed their leftovers, "*meron po kaming basurahan, sa gilid po ng cart nakatali… di naman po nilalangaw, minsan lang pag masyado nang marami yung sauce saka*

tirang pagkain, ayun na, magkakalangaw na, bugawin na lang po." (SFH4). Another scenario was narrated when the same question was asked "*… ay di po, sinisiguro po natin na malinis ang paligid at dapat walang langaw, yan ang bentahe natin eh, dapat malinis"* (SFH8).

Muyanja et.al., (2011) reported that overflowing of garbage bins was a common site in most street food vendors‟ cart. Heaps of garbage around the vending sites could serve as breeding points for rodents, insects and flies which promote proliferation of microorganisms and increase the risk of contamination of foods and transmission of diseases (Umoh & Odoba, 1999; Mensah, Yeboah-Manu Owusu-Darco & Ablordey, 2002).

Another major risk factor identified among the interviewed street vendors is the use of paper or polybags, "…*mas convenient po ito, di na po maghuhugas, basta maayos lang na itatapon, may basurahan naman po tayo"* (SFH1-2). Most of the vendors were found to serve street foods on paper or paper-made polybags. Other vendors who are using plastic plates for serving food are often found to put paper on these plates (Habib, 2016).

Another very common practice observed among the street food vendors is using the unclean towel to clean the carts, utensils or even clean their hands. Habib (2016) noted the same observation of repeated use of the unclean towel. However, it is good to know that the street vendors cover their food to avoid flies and other insects to harbor on the food. Some of them also provide safe drinking water for their customers.

When asked about taking license from the government, most of them disagreed, "*naku boss, mahirap yata yun, kasi tax yun eh, wala naman po tayo masyadong kinikita,tapos tax-san pa, paano pamilya namin niyan"* (SFC1). "…*kahit naman po sabihin natin na para sa atin din yun, una wala kasiguraduhan ang kita namin, maganda lang pag ganito may estudyante… sigurado babayad kami sa rehistro"* (SFC1, SFH1).

Habib (2016) reported that in Dhaka City, most of the interviewed street hawkers were not willing to take a license. In a small business such as street food vending, license is not a requirement. Even the vendors who are willing to take the license said it will be a long process

and expressed their concern that they might even have to pay bribe to get one.

Interviewees agreed that they should have proper education about food safety. This will help them to solve some issues concerning street food safety and hygiene. Some of them disagreed that the level of education they have is a hindrance to understand the way they run their business. But others agreed that education at any level has something to do with their lack of knowledge about food safety and hygiene. Further, they are all willing to attend to any sort of training regarding food safety and hygiene. Moreover, financial assistance will also help them improve their street food business. On the other hand, they are not open to the suggestion that for the government to offer them a place to fix their business where they can sit and sell every day. Most of them prefer to transfer from one place to another.

CONCLUSION

Street food vendors faced several challenges such as working conditions, occupational hazards and food safety, and hygiene. The street food vendors were aware of the food safety and hygienic practices and were able to prepare and serve food for the customers. Street vendors were also aware that the unhygienic practices resulted into contamination of the food. Therefore, proper training on food safety and hygiene should be given to the street food vendors to improve the quality of their food. Financial support from the government is also considered to uphold the unstable economy of the street food vendors.

Street food vending is considered as indirect driver of economy that should not be ignored. Aside from providing a living for most of unemployed population, it also plays a critical role in serving affordable and convenient foods that ensure food security and alleviate hunger.

REFERENCES

Abraham, S. & Krishnan, T. (2017) An analysis of how street food in India can be made safe food. ISSN (Print): 2393-8374. Volume 4, Issue 12, 2017

Alimi, B. A. (2016) Risk factor in street food practices in developing countries: a review Science Direct. Food Science and Human Wellness 5 (2016) 141 – 148

Benjamin, E. (2011) Street food governance in Dhaka (Bangladesh) the

appropriation of the street vending spaces and the informal politics of exploitation, Proceedings of the International conference, Session 27, Amsterdam, The Netherland, July 2011.

Bhowmick, S. (2010) Street vendors in the global urban economy, Routledge: Taylor and Francis, New Delhi, India.

Brown, A., Lyoms, M., Dankoco, I. (2010) Street traders and the emerging spaces for urban voice and citizenship in African cities. Journal of Urban Studies, Vol. 4 47 (3), pp. 666-683.

Chakravarthy, I. (2013) Street food vendors food safety requirements. Government of West Bengal, Public Health Engineering Department.

Habib, K. (2016) Understanding challenges faced by street fod vendors to maintain street food hygiene in Dhaka City. Journal of Food and Nutrition Sciences 2016; 4(4): 78-85

Imathiu, S. (2017) Street vended foods: potential for improving food and nutrition security or a risk factor for foodborne diseases in developing countries? Current Research in Nutrition and Food Science. ISSN:2347-467X, Vol. 05, No.(2) 2017, pg.55-56

Janie, PMT. (2010) Stret food – a hygienic perspective. New York, ACM Press.

Khairuzaman, Md., Chowdhury, F.M., Zaman, S., Mamun, A. Bari, L. (2014) Food safety challenges towards safe, healthy and nutritious street foods in Bangladesh. International Journal of Food Science. Hindawi Publishing Corporation

Kharel, N., Palni, U., Tamang J. (2016) Microbiological assessment of ethnic street foods of the Himalayas. Journal of Ethics Foods. (2016) 235 – 241.

Lues, .F., Rasephei, .R., Venter, P., Theron, M.M. (2006) Assessing food safety and associated food handling practices in street food vending, Int. J. Environ. Health Res. 16 (2006) 319-328

Mamun, A., Rahman, S., Turin, T. (2013) Microbiological quality of selected street foods items vended by school-based street food vendors in Dhaka, Bangladesh. International Journal of Food Microbiology, 166(3) 413-418.

Mensah, P., Yeboah-Manu, D., Owusu-Darko, K., Ablordey, A. (2002)

Street foods in Accra, Ghana: how safe are they? Bull. World Health Org. 80 546-554

Muyanja, L., Nayiga, N., Brenda, G., NAsinyama (2011) Practices, knowledge and risk factors of street food vendors in Uganda, Food Control 22 (2011) 1551-1558

Nurdueen, A. A., Lawal, A. O., and Ajayi, S.A. (2015) A survey of hygiene and sanitary practices street food vendors in the Central State of Northern Nigeria. Journal of Public Health and Epidemiology, Vol. 6 (5), pp. 174 – 181.

Omemu, A.M., Aderoju, S.T. (2008) Food safety and knowledge and practices of street food vendors in the city of Abeokuta, Nigeria, Food Control 19, 96-402

Rane, S. (2011) Street vended food on developing world: Hazard analysis. Indian Journal of Microbiology, vol 51, pp100 – 106.

Street vendors in Women in informal economy. Globalizing and Organizing (WIEGO). http://wiego.org/informal - economy/occupational-groups/street-vendors

Umoh, V.J., Odoba, M.B. (1999) Safety and quality evaluation of street foods sold in Zaria,Nigeria, Food Control 10

World Health Organization. (2015) The five keys to safer food program. [Online] February 2015. http//:who.int/foodsafety/customer/5keys/en/

Knowledge, Attitude and Practices of International Hospitality Management Students of EAC Cavite on Food Handling, Safety and Hygiene: Implications to Instructional Designs in Culinary Studies

[1]Supachai A. Basit, [2]Lenny Veroya, [2]Christian Eric Laurales, [2]Jeramayne Dahl Estaris and [2]Rebecca Miranda

[1]School of Medical Technology, Emilio Aguinaldo College Cavite
[2]School of Tourism and International Hospitality Management, Emilio Aguinaldo College Cavite

Abstract

The transmission of foodborne illnesses could be attributed to the knowledge, attitude and practices (KAP) in food handling, safety and hygiene of food service sectors stakeholders. This study aims to determine the KAP of culinary students in the aforementioned area. The findings revealed that the culinary students of Emilio Aguinaldo College (EAC) are perceived to be knowledgeable ($\dot{x}$ =3.667) in various aspects of food safety. Results also indicated that they have an ideal attitude towards food hygiene ($\dot{x}$ =3.697) and display best practices in maintaining food safety and hygiene ($\dot{x}$ = 3.877). Moreover, statistical analysis revealed that both sex and age are not significantly associated with KAP of the respondents towards food handling, safety and hygiene. The results affirm the importance of considering the baseline KAP of the study participants in enhancing the instructional design of curriculum in various culinary courses.

Keywords: culinary, food safety, food hygiene, food handling, KAP

INTRODUCTION

Food safety is a global concern as occurrences of foodborne illnesses have been threatening public health in both developing and developed countries (Stratev et al, 2017). It is reported that 1 out of 10 people is afflicted with foodborne related illnesses and approximately more than 91 million people are mostly affected in developing countries (WHO, 2015). Giving safe food that is food without physical, chemical, microbiological contaminants and will not cause any health disorder when consumed, should be of utmost priority in food services (Barjaktarovic-Labovic et al, 2018). In the Philippines, there were a total of 24,084 cases of food and waterborne disease such as acute bloody diarrhea, cholera, rotavirus, hepatitis A and typhoid fever (Epidemiology Bureau-Department of Health, 2017). Lack of knowledge on food safety among food handlers could be a potential factor for the transmission of foodborne pathogens (Pichler et al, 2014).

Culinary students undergo practical and intensive trainings through applying learned theoretical elements in classes into real simulations in the kitchen (Jeinie et al, 2016). Understanding the perception of food handlers such as culinary students is of paramount importance in achieving the goals of food safety education (Stratev et al, 2017). Hence, it is not surprising that the multimillion dollar industry has been playing an active role in objectively measuring the knowledge, attitude and practice (KAP) of food handlers in various sectors of food services such as in fisheries (Agueria et al, 2018), veterinary medicine (Stratev et al, 2017), mobile food handlers (Ismail et al, 2016), butcher shops (De Boeck et al, 2016), hospital food service staffs (Osaili et al, 2017), migrant workers (Woh et al, 2016) and culinary interns (Jeinie et al, 2016) among others.

In this study, the KAP of EAC-C culinary students in food handling, safety and hygiene was evaluated through a modified instrument. The findings of the study may be utilized by instructional designers in culinary studies especially in formulating course instructional objectives and contents.

MATERIALS AND METHODS

Research Locale and Population

The study was conducted in Emilio Aguinaldo College-Cavite (EAC-C) School of International Hospitality Management. Culinary students who are officially enrolled during the first semester of academic year 2018-2019 were the study participants. A total 15 of students

agreed to participate in the study. There are 12 females and 3 males. The age range of the respondents is between 19 and 24 years old ($\dot{x}$ = 21.33, SD= 1.80).

Research Instrument

The KAP instrument was adopted from the study of Zulkifly et al (2013). The instrument has a reliability score .80 (α=.804). Only those students who are enrolled in the culinary program and have agreed to participate in the study were asked to answer the survey questionnaire. The questionnaire employed a four-point Likert-Scale were 4 is equivalent to strongly agree, 3 is equivalent to agree, 2 is to disagree and 1 is to strongly disagree.

Data Analysis

Chi square test of association is utilized to determine if there is a significant association between sex and the KAP of the study participants in food handling, safety and hygiene. In addition, Pearson product moment of correlation is used to determine if age is significantly related to the KAP of the culinary students on food handling, safety and hygiene. All data are processed using a licensed SPSS software version 22.

RESULTS

Knowledge of Culinary Students on Food Handling, Safety and Hygiene

Table 1 summarized the knowledge of the study participants on food handling, safety and hygiene across different sexes.

Table 1

Knowledge of study participants on food handling, safety and hygiene across different sexes (n=15)

Item	Knowledge Questions	Mean	SD	Chi-Square	P value	Interpretation
1	After washing their hands, employees should avoid touching their hair.	3.933	0.051	1.224	0.268	Not significant
2	The most important rule in foodservice personal hygiene is that employee must wash their hands often.	3.933	0.051	1.224	0.268	Not significant
3	Foodborne illnesses are diseases that are carried or transmitted to people by food.	3.6.00	0.737	2.764	0.251	Not significant
4	The most important factor to control the growth of bacteria is temperature and time.	3.867	0.188	2.637	0.104	Not significant
5	When holding hot foods for service, it is required to that internal food temperatures are taken at least every two hours.	3.667	0.723	1.272	0.529	Not significant
6	The temperature danger zone for potentially hazardous food is 41 to 140oF.	3.667	0.817	0.938	0.626	Not significant
7	Under running water that is 70oF or less is an acceptable method for thawing frozen food.	3	1.253	0.77	0.857	Not significant
	OVERALL MEAN	3.667				

It can be gleaned from Table 1 that the study participants strongly agreed on all the knowledge items in the survey instrument with an overall mean of 3.667. Moreover, the results of Chi square test of association across all knowledge items indicate that there is no significant association between the sex and the knowledge of the study participants towards food handling, safety and hygiene.

Table 2

Knowledge of study participants on food handling, safety and hygiene across all ages (n=15)

Item	Knowledge Questions	Mean	SD	Pearson r	P value	Interpretation
1	After washing their hands, employees should avoid touching their hair.	3.933	0.051	0.051	0.205	Not significant
2	The most important rule in foodservice personal hygiene is that employee must wash their hands often.	3.933	0.051	0.205	0.464	Not significant
3	Foodborne illnesses are diseases that are carried or transmitted to people by food.	3.6	0.737	0.054	0.849	Not significant
4	The most important factor to control the growth of bacteria are temperature and time.	3.867	0.188	0.188	0.502	Not significant
5	When holding hot foods for service, it is required to that internal food temperatures are taken at least every two hours.	3.667	0.723	-0.018	0.948	Not significant
6	The temperature danger zone for potentially hazardous food is 41 to 140^{o}F.	3.667	0.817	-0.259	0.351	Not significant
7	Under running water that is 70^{o}F or less is an acceptable method for thawing frozen food.	3	1.253	-0.063	0.832	Not significant
	OVERALL MEAN	3.667				

Moreover, the results of Pearson product moment of correlation indicate that there is no significant relationship between the age and the knowledge of the culinary students towards food handling, safety and hygiene.

Attitude of Culinary Students on Food Handling, Safety and Hygiene

Table 3 summarized the attitude of the study participants on food handling, safety and hygiene across different sexes.

Table 3

Attitude of study participants on food handling, safety and hygiene across different sexes (n=15)

Item	Attitude Questions	Mean	SD	Chi-Square	P value	Interpretation
1	I think sanitation is an important part of my job responsibilities	3.933	0.258	1.224	0.268	Not significant
2	I believe that good employee hygiene can prevent foodborne illness.	3.8	0.414	4.286	0.117	Not significant
3	I think that it is the responsibility of all food handlers to ensure that food is safe to serve.	3.667	0.817	4.286	0.117	Not significant
4	I am willing to change my food handling behaviors when I know that they are incorrect.	3.8	0.561	2.637	0.267	Not significant
5	I am willing to obtain more food safety knowledge.	3.933	0.258	1.224	0.268	Not significant
6	It is more important to have tasty food rather than safe food	3.6	0.4	4.286	0.117	Not significant
7	I select a place to eat based on its reputation for good sanitation and cleanliness.	3.8	0.414	0.268	0.605	Not significant
8	I think that managers should educate employees on personal hygiene and sanitation regularly.	3.867	0.352	0.01	0.919	Not significant
9	I think that only cooks should receive food safety training.	3.9	0.1	6.964	0.073	Not significant
10	I believe that food safety knowledge not only benefits my work but also my personal life.	3.6	0.828	2.094	0.351	Not significant
11	I am willing to attend a food safety training course.	3.6	0.352	0.9	0.919	Not significant
12	I believe that food safety knowledge would make me more confident about my work.	2.867	0.352	0.01	0.919	Not significant
	OVERALL MEAN	3.697				

It can be seen from Table 3 that the study participants strongly agreed on all the attitude items in the survey instrument with an overall mean of 3.697. Moreover, the results of Chi square test of association across all attitude items indicate that there is no significant association

between sex and the attitude of the study participants towards food handling, safety and hygiene.

Table 4

Attitude of study participants on food handling, safety and hygiene across all ages (n=15)

Item	Attitude Questions	Mean	SD	Pearson r	P value	Interpretation
1	I think sanitation is an important part of my job responsibilities	3.933	0.258	0.051	0.856	Not significant
2	I believe that good employee hygiene can prevent foodborne illness.	3.8	0.414	-0.374	0.17	Not significant
3	I think that it is the responsibility of all food handlers to ensure that food is safe to serve.	3.667	0.817	0.324	0.239	Not significant
4	I am willing to change my food handling behaviors when I know that they are incorrect.	3.8	0.561	0.212	0.447	Not significant
5	I am willing to obtain more food safety knowledge.	3.933	0.258	0.051	0.856	Not significant
6	It is more important to have tasty food rather than safe food	3.6	0.4	-0.374	0.17	Not significant
7	I select a place to eat based on its reputation for good sanitation and cleanliness.	3.8	0.414	-0.192	0.494	Not significant
8	I think that managers should educate employees on personal hygiene and sanitation regularly.	3.867	0.352	-0.038	0.894	Not significant
9	I think that only cooks should receive food safety training.	3.9	0.1	-0.579	0.024	Significant
10	I believe that food safety knowledge not only benefits my work but also my personal life.	3.6	0.828	0.192	0.494	Not significant
11	I am willing to attend a food safety training course.	3.6	0.352	0.188	0.502	Not significant
12	I believe that food safety knowledge would make me more confident about my work.	2.867	0.352	0.188	0.502	Not significant
	OVERALL MEAN	**3.697**				

Moreover, the results of Pearson product moment of correlation indicate that there is no significant relationship between the age and the attitude of the culinary students towards food handling, safety and hygiene except for item 9. In item 9, the perception that food safety training shall only be received by cooks is inversely proportional to the age of the study participants.

Practices of Culinary Students on Food Handling, Safety and Hygiene

Table 5 summarized the practices of the study participants on food handling, safety and hygiene across different sexes.

Table 5

Practices of study participants on food handling, safety and hygiene across different sexes (n=15)

Item	Practices Questions	Mean	SD	Chi-Square	P value	Interpretation
1	I use gloves or utensils to handle food that is ready-to-eat.	3.733	0.593	2.946	0.229	Not significant
2	I use a separate clean utensil for each food item	3.800	0.414	0.268	0.605	Not significant
3	I wash my hands with soap and water before working with food.	3.933	0.258	0.938	0.333	Not significant
4	I wash raw items before using it.	3.933	0.258	0.938	0.333	Not significant
5	I store chemical in a non-food storage item.	3.868	0.516			Not significant
6	I store raw food item in an area separate from cooked food.	4.000	-	-	-	Not significant
	OVERALL MEAN	**3.877**				

It can be seen from Table 5 that the study participants strongly agreed on all the practices items in the survey instrument with an overall mean of 3.877. Moreover, the results of Chi square test of association across all practices items indicate that there is no significant association between the sex and the practices of the study participants towards food handling, safety and hygiene.

Table 6

Practices of study participants on food handling, safety and hygiene across all ages (n=15)

Item	Practices Questions	Mean	SD	Pearson r	P value	Interpretation
1	I use gloves or utensils to handle food that is ready-to-eat.	3.733	0.593	0.29	0.295	Not significant
2	I use a separate clean utensil for each food item	3.800	0.414	0	1	Not significant
3	I wash my hands with soap and water before working with food.	3.933	0.258	-0.41	0.129	Not significant
4	I wash raw items before using it.	3.933	0.258	-0.41	0.129	Not significant
5	I store chemical in a non-food storage item.	3.868	0.516	0.051	0.856	Not significant
6	I store raw food item in an area separate from cooked food.	4.000	-	-	-	Not significant
	OVERALL MEAN	**3.877**				

Moreover, the results of Pearson product moment of correlation indicate that there is no significant relationship between the age and the practices of the culinary students towards food handling, safety and hygiene.

DISCUSSION

The findings of our study support existing literatures. Our culinary students, regardless of sex and age, are knowledgeable in different aspects of food handling, safety and hygiene. Hygiene practices and procedures from food preparation to preservation (e.g. thawing) are observed to prevent transmission of foodborne pathogen and other environmental factors from causing food spoilage and eventual outbreak of foodborne illnesses. Our findings are parallel with the findings from other literature that sectors such as food service staffs in the hospital (Osaili et al, 2017) and in the restaurants (Pichler et al, 2014) are knowledgeable in food safety. However, despite of the scores and the perceived fair knowledge of our culinary students in this area, it is still important to triangulate these findings with the actual practices of students. The findings of our study affirmed the importance of outcomes-based education in ensuring that knowledge gained by the culinary students are translated into actual practice either in the school laboratory or in work simulation. Evaluating the knowledge of food

handlers such as the culinary students is the primordial step in the proper planning of food safety training (Zanin et al, 2017). This is vital for the furtherance of instruction in this area of culinary studies.

The attitude of our students, regardless of age and sex, is also vital in ensuring food safety. Based on the results of the study, it can be perceived that our culinary students have the "proper attitude" in delivering food handling, safety and hygiene. The findings also assert the willingness of our students to undergo training in food safety. Having a correct attitude on this aspect is vital since attitude is directly proportional to the level of awareness on food safety (Agueria et al, 2018). Although the attitude of many adolescents is primarily due to parental influences (Teh et al, 2016), the reinforcement of the ideal attitude in food safety can be done as part of the curricular objectives in culinary studies, thus, formulating course objectives and instructional designs should consider the affective domains to improve the attitude of the culinary students towards food safety. It is because the work attitude will significantly impact the intentions of employees and/or culinary students to perform safe food handling practices.

Practices in food safety are the actual outcome of the culinary students" knowledge and attitude regardless of their sex and age. The practices of students in food safety are significantly influenced by their knowledge and attitude. In our study, the culinary students rated their practices within the same category i.e. "strongly agree" as their knowledge and attitude. The findings are parallel with the findings of Lagerkvist (2018) where they postulated that the level of confidence of food handlers in food safety measures influence their food safety practices. Assessment of food handlers" knowledge is vital to achieve the food hygiene practices (Barjaktarovic-Labovic, 2018). Acknowledging the risks in food handling will also ensure safe practices (Wu et al, 2017), thus, it is important to understand the relationship between knowledge and practices in food safety.

Educational institutions such as EAC-C should also play an influential role in ensuring food safety by consistently incorporating this area of practice in instructional design. Various food sectors including educational institution play an essential role in maintaining food hygiene practices (Ababio et al, 2015). Educators should always consider the baseline knowledge of students in food handling, safety and hygiene to eventually improve their attitude. This will eventually be translated into best practices as the desirable exit competencies in an outcomes-based education environment.

REFERENCES

Ababio PF, P. Lovatt (2015)A review on food safety and food hygiene studies in Ghana. Food Control. 47 (92-97).

Agüeria DA, C. Terni, V. Manuel Baldovino, D. Civit (2018). Food safety knowledge, practices and attitudes of fishery workers in Mar del Plata, Argentina. Food Control. 91 (5-11).

Barjaktarović-Labović S, B. Mugoša, V. Andrejević, I. Banjari, L. Jovićević, D. Djurović (2018). Food hygiene awareness and practices before and after intervention in food services in Montenegro. Food Control. 85(466-471).

Martinović, J. Radojlović (2018). Food hygiene awareness and practices before and after intervention in food services in Montenegro. Food Control. 85 (466-471)

De Boeck E, L. Jacxsens, M. Bollaerts, M. Uyttendaele, P. Vlerick (2016). Interplay between food safety climate, food safety management system and microbiological hygiene in farm butcheries and affiliated butcher shops. Food Control. 65 (78-91).

Epidemiology Bureau – Department of Health (2018). Available on line https://eb.doh.gov.ph/wp-content/uploads/2018/08/2018_Monthly_FWBD_Report_N6.pdf. Downloaded November 3, 2018.

Ismail FH, C. Tamby Chik, R. Muhammad, N. Mat Yusoff (2016). Food Safety Knowledge and Personal Hygiene Practices amongst Mobile Food Handlers in Shah Alam, Selangor. Procedia Social and Behavioral Sciences. 222 (290-298)

Jeinie MH, N. Md Nor, M. Shazali Md. Sharif, M. Saad.Food Hygiene and Safety among Culinary (2016. Intern: Questionnaire for FHS quality. Procedia Social and Behavioral Sciences.222 (299-305).

Lagerkvist CJ, F. Amuakwa-Mensah, J. Tei Mensah (2018). How consumer confidence in food safety practices along the food supply chain determines food handling practices; Evidence from Ghana. Food Control. 93 (265-273)

Lee J, B. A. Almanza, S. Jang, D. C. Nelson, R. F. Ghiselli (2013). Does transformational leadership style influence employees" attitudes

toward food safety practices? International Journal of Hospitality Management. 33 (282-293)

Osaili T, B. A. Obeidat, W. A. Hajeer, A. A. Al-Nabulsi (2017). Food safety knowledge among food service staff in hospitals in Jordan. Food Control. 78 (279-285)

Pichler J, J. Ziegler, U. Aldrian, F. Allerberger (2014). Evaluating levels of knowledge on food safety among food handlers from restaurants and various catering businesses in Vienna, Austria 2011/2012. Food Control. 35 (33-40).

Stratev D, O. A. Odeyemi, A. Pavlov, R. Kyuchukova, F. Fatehi, F. A. Bamidele (2017). Food safety knowledge and hygiene practices among veterinary medicine students at Trakia University, Bulgaria. Journal of Infection and Public Health. 10 (778-782).

Teh NSA, M. Ramadan Ab Hamid, U. Mohlisi Mohd Asmawi, N. Md Nor (2016). Food Hygiene"s Knowledge, Attitudes and Practices between Urban and Suburban Adolescents. Procedia Social and Behavioral Sciences. 234 (36-44).

Woh P, K. Lin Thong, J. Marian Behnke, J. W. Lewis, S. N. Mohd Zain (2016). Evaluation of basic knowledge on food safety and food handling practices amongst migrant food handlers in Peninsular Malaysia. Food Control. 70 (64-73)

Wu S, S. C. Ricke, K. R. Schneider, S. Ahn (2017). Food safety hazards associated with ready-to-bake cookie dough and its ingredients. Food Control. 73 (986-993)

Zanin LM, D. Thimoteo da Cunha, V. Vera de Rosso, V. Dias Capriles, E. Stedefeldt (2017). Knowledge, attitudes and practices of food handlers in food safety: An integrative review. Food Research International. 100 (53-62)

Zulkifly MI, MH Hanafiah, MM Salleh and MR Jamalludin (2013). Assessing knowledge, attitude and practices on food safety among food handlers Universiti Teknologi Mara. Hospitality and Tourism. DOI: 10.1201/b16064-115.

Emilio Aguinaldo College – Cavite
Journal of Multidisciplinary Research

The EAC Journal of Multidisciplinary Research is published annually by the Emilio Aguinaldo College-Cavite through its publication office.

EDITORIAL BOARD

ISSN 2651 – 7779

Gov. D. Mangubat Avenue, Burol Main,
City of Dasmariñas, Cavite 4114, Philippines
http://www.eac.edu.ph/cavite / (046) 416-4341 to 42

Research and Development Office
Local 7139