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1. All articles must have a high degree of scholarship;
2. All articles must be evaluated thru double-blind system by selected referees for publication;
3. The articles may either be written in English or Filipino. All articles written in either languages must be accompanied by an Abstract which is written in English;
4. All contributions must be original;
5. Articles must use APA style sheet; and,
6. Articles must be typed single-spaced, Times New Roman 11 pts on letter sized (8 x11) paper in not more than twelve (12) pages.

TABLE OF CONTENTS

TABLE OF CONTENTS

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THE WINE INDUSTRY IN THE CORDILLERA ADMINISTRATIVE REGION: Meeting Consumer Preferences

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ABSTRACT

Consequential to the boundless trade and information access, consumers are increasingly becoming internationalized in their demands of quality. This study looked into the quality preferences of wine consumers and assessed the capability of wine processors to respond to these preference demands considering their prevailing production management practices and facilities and equipment. Consumer preferences as to the degree of value expectations for fruit wines along the quality indicators leaned towards sophisticated taste, color and clarity. With an industry structure based on culture, designs are preferred to include elegance and ethnic design touch and with complete product information. Concerning the production management practices, plant locations are on the level of minimum convenience. Facilities and equipment employed are generally considered "household" level including the paraphernalia. Total quality management greatly is greatly affected by the processors' lack of quality control mechanisms to ensure standardization of output. The study's ultimate call is to establish, promote product quality standard strategies, after provision of standardized equipment.

Keywords: Consumer preference, wine industry, quality, production management practices

INTRODUCTION

Acknowledging that Micro, Small and Medium Enterprises (MSMEs) are tonics to economic wellbeing, economic planners of most countries regard the development of MSMEs as a pivotal mechanism in their overall economic strategic planning. In the Philippines, as aptly inferred by Tagay and Ballesteros (2008), the integration of entrepreneurial development to the thrusts of lead government agencies like the Department of Science and Technology (DOST), the Department of Trade and Industry (DTI), and the Commission on Higher Education (CHED), manifests the country's commitment to providing a favorable milieu for MSME proliferation.

Winemaking as a potential economic driver spurred support from concerned government agencies particularly the DTI, DOLE, and DOST. Under the auspices of said agencies, technical and financial assistance were sponsored with the aim of providing alternative and sustainable livelihood for enterprising individuals. The DTI and DOST, through regional offices, started upgrading and promoting the various traditional wines and spirits unique to each region in the Philippines.

In the Cordillera Administrative Region (CAR), winemaking finds its stature not exclusively as a cultural heritage but equitably as a significant medium for socio-economic aspirations. Albeit entrenched on the Cordillera culture, wine making is double edged since it also presents fiscal solutions to developmental goals. In the region, the commercial wine industry holds much potential owing to the diversity of its fruit wine products, the availability of raw materials, increasing wine appreciation, and the support from concerned agencies. The wine industry appears to be experiencing growth, both in terms of consumption per person and prices received for local fruit wines. Wine products from bugnay, strawberries, pineapple, cherries and other fruits are finding their way into the market shelves as evidenced from the Baguio and Benguet trademarks of strawberry wines, the Mountain Province's Lang-ay "bugnay" and other fruit and rice wines and Kalinga's emerging pineapple wine. Thus, the production of wine at the pinnacle of quality through a strong supply management, excellent marketing and distribution have become key objectives for wine producers seeking to keep competitive edge.

Capturing the essence of this study is the statement of DOST Undersecretary Maripaz Perez that improving the wine industry) by Tagay and Ballesteros (2008) can move science and spread cultural beliefs through taste. Lamentably, due to the venture's fledgling stage, the local wine industry faces a multitude of chal-

challenges constraining longevity and sustainability. Most wine producers lack the laboratory facilities, awareness, knowledge, or expertise required to detect and correct faults to ensure consistent quality in their products. This makes it difficult to conform to quality control and quality assurance standards.

Moreover, as in any entrepreneurial venture and in which the wine industry is not exempted, the enduring conspicuousness of the wine industry on the market is founded on the sustainability of relationships with target consumers, whose preferences evolve dramatically. Business management literatures tout consumer preferences as a driving force in the economy. Emphasizing consumer sovereignty, Drucker (1999) contends that customer values are the foundation of any business decision while consumer expenditures will determine business longevity.

Optimistic on results to the above, development strategists advocate the constant search for ingenious marketing strategies which improve consumer perspectives and taste preferences while at the same time aiming to remove barriers against the flourishing of the local wine industry.

From the above milieus, the impetus to conduct this study is further intensified with the doctrine of the "borderless world" where the competitive nature of winemaking has radically changed, providing more rooms for innovation and creativity, chances for alliances, and strategic positioning for elevations at greater heights.

OBJECTIVES

1. To describe the Profile of Wine Processors in terms of facilities and equipment, process flow, production management practices, process capacity management

2. To determine the preferences of local wine consumers in terms of wine attributes, packaging design and price.

3. To determine the challenges facing the local wine industry

METHODOLOGY

This study employed the descriptive qualitative method of research. It employed the descriptive method of research. The study devised two sets of questionnaires. These were designed for wine consumers and eighty four (84) wine processors. There were one hundred eighty six wine consumers who responded. The questionnaire for wine consumers was specifically intended to obtain data relevant to their preference expectations vis-à-vis measures of quality. For wine processors, it was designed to solicit information regarding their profile and venture, production management practices, process flow, facilities and equipment and their process capacity management. Focused Group Discussions (FGD) and interviews were further used. Focused Group Discussion and informal interviews were also used to obtain firsthand insights from wine enthusiasts and consumers on matters concerning their preferences. These were instrumental in understanding the problems and dilemmas facing the wine processors.

FINDINGS

1.Profile of the wine processors

Table 1.1. Profile of wine processors

Nature of Business	F	%
Processor	41	48.81
Re – packer	3	3.57
Retailer	42	50.00
Wholesaler	42	50.00
Combination	48	57.14

Form of Business Organization & Partnership		
Sole Prop	80	95.24
Partnership	2	2.38
Cooperative	2	2.38
Total	84	100
Years in Operation		
0 – 5	24	28.57
6 – 10	43	51.19
11 – 15	17	20.24
Total	84	100
Market Area Coverage		
Town – wide	23	27.38
Province	81	96.43
Region wide	42	50.00
Foreign	0	0
Others	37	44.05

Table 1 shows the extent of wine making as a business venture. They are dominantly sole proprietorship with majority at the longest existence of 6-10 years, supplying mostly the demands of the province. This further implies the vast opportunity for growth, showing lack of saturation and maturity.

Facilities and Equipment

Wine makers in the region are mostly of household level. The household kitchen is used to process wines with equipment of no exclusive use for winemaking only. The survey of plant lay out proved futile as when asked for a blueprint of their plant layout, the respondents did not show any.

Process Flow

In term of process flow, the processors are protective of their process flow, rationalizing that such is part of their trade secrets, hence only the major steps are revealed. Aseptic conditions, however, are of utmost consideration since the wines are prone to contamination if cleanliness is not observed. The common responses elicited from the winemakers are the general process of crushing the fruits, fermentation, clarification, aging and bottling. The time and strategies only vary with how one processor does this, including the type and quality of fruits to be used

Production Management Practices

The wine processors adopt some quality management practices. For quality control, the following methods were commonly used: observation, taste test, and adoption of some good processing practices. In setting quality standard procedures, it came out that wine processors consider the consumer preferences in establishing quality perception. To them, they need to fit to the changing preference of each targeted market. The determination of such preference is done through their own feedback gathering mechanisms, among which is the survey sheet required of them during trade fairs. This is followed by just discerning which type of wine is sold most. The processors assert that when consumer expectations are met, repeat customers are created.

As to the procedure, the fruits are cleaned thoroughly before crushing. Additionally, sulfur dioxide is used to avoid spoilage. All use food grade plastics in aging wine, while 60% age their wine in a span of 9 to 12 months; and, 47.62% claimed to maintain their wine's alcohol percentage to 80%. The processors admit different ways to measure the proportion of ingredients used in wine processing. While others claim this is

due to their long experience in determining the proportion of ingredients, this makes the produce susceptible to inconsistency in alcohol content, clarity and color. Aging period also varies depending on the market demand. Some age their wines for over one year, but many had shorter periods and maintained 12% alcohol content. Others cannot maintain a steady alcohol level. The stages followed in fruit wine processing is generally the same for most of the processors.

In terms of labeling, wine label information usually include brand name; content and ingredients; manufacturer's name and address; and other information. This is an offshoot of the intervention of the Department of Trade and Industry.

A wine enterprise operation can be commonly described as follows: as to processing area, conditions are of adequate space fit for small scale production. These areas are well-ventilated and with adequate lighting which are just right for a small scale production, but not yet in full conformity with Bureau of Food and Drugs requirements. Albeit this and in general, the wine processors hadcontinually improved the processing areas, facilities, and enterprise layout to copeup with the minimum standards.

Majority of the respondentsproduced their own fruitswhile others procured from other sources outside the province. Other raw materials like sugar and yeast were all acquired from market suppliers. The main ingredients for wine werefruits, sugar, and yeasts.Most processorswere not particular to the quality of fruits; used baking and imported yeast, used boiled water for cooking, and never used additives.

For Mountain Province wine processors, bugnay fruits were the most common fruits processed. Meanwhile in Benguet, strawberry fruits are the most produced due to the high demand from tourists. In Kalinga, the pineapple fruit tops the fruit most largely produced. This preference for the wine processors in the production of wine has been dictated by the demand from the consumers. According to wine processors interviewed, this is shown by the high sales on these fruits. For Mountain Province, the Bugnay fruit has naturally emerged as the top choice due to its distinct taste which was well received by the resident consumers.

Process Capacity Management

In terms of process capacity management, the scope of distribution and market coverage for local fruit wine are limited and confined to the local markets. The produce is good only for walk in buyers during special events up to provincial trade fairs. This is attributed to a common kitchen scale facility.

2. *Consumer Preferences*

Table 2.1. Consumer preferences as to sensory quality indicators.

Attributes / Indicators of Quality	From	Scale →										To	Mean Ave.
		1		2		3		4		5			
		N	%	N	%	N	%	N	%	N	%		
Taste	Dry	1	2	8	16	27	54	7	14	7	14	Sweet	3.22
Color	Ruby Red	2	4	11	22	26	52	7	14	4	8	Colorless	3.00
Scent/ Aroma	Fruity	7	14	13	26	16	32	8	16	6	12	No Odor	2.86
Clarity	Very Clear	8	16	5	10	27	54	8	16	2	4	Murky	2.82
Alcohol Level	15%	7	14	2	4	35	70	1	2	5	10	Less than 10%	2.90

This criterion has been adopted from the study of Tagarino (2010) in his aim to capture consumer preference of strawberry wine consumers in La Trinidad. It was a 5 point scale adapted from the 9point hedonic scale.

The level of preference on the wine attributes in relation to sensory quality indicators reveals a majority that is neutral in preference towards dryness in taste and clarity. For color and aroma, it is evident that light red color and light aroma is preferred. The alcohol level preference leans heavily on at 12% alcohol level.

As to packaging designs, majority prefers packaging with an ethnic design. Accordingly, elegant designsreflect high quality to match the design of imported wines. It is also desired that labels mustbe complete with necessary information about the product and the wine processor.

Furthermore, consumers' expectations rate high on the scale of quality indicators yet express a low price expectation at Php70.00.Balcita (2011) and Mu (2011) cite what consumers look for when buying wine, where price does not even appear in the top factors that influence consumer's liking of wine. The top factors cited according to rank are: packaging (46%), brand (27%), sensory attributes/taste, fruit variety and wine region. However, price (21%) appeared as the second factor that influence consumer's purchase intent of which, the first one is, informed liking which is a combination of sensory and extrinsic attributes (77%). Nonetheless, the studies went to cite that, "there's a lot of good wine out there that doesn't sell because it's at the wrong price or the packaging is bad."

3. Challenges

Table 3.1. Production management challenges

Challenges	Rank
1. Seasonal supply of raw materials	1
2. Competition	1
3. Increase in price of raw materials	2
4. Wastage due to early fermentation	3
5. Inadequate proper fermentation equipment	4
6. Lack of updates on new fermentation procedure standards	5
7. The absence of and high cost of testing and measuring equipment	6
8. Quality standards issues	9

The problems of the processors in production as to why they cannot meet consumer preferences were: seasonal supply of raw materialsand the growing competition (from limited production) with thefresh markets and other processors (preserved/jams);and that the increasing prices of other raw materials like sugar;crude wine turning sour during the fermentation process; inadequate fermentation equipment; and the lack of knowledge about the fermentation procedure standards. The absence of and the high cost of testing and measuring equipment;and the lack of knowledge to use the equipment;and the presence of sediment (quality standard issues) in wine produced.

Table 3.2. Marketing Challenges

Challenges	Rank
Poor market development efforts	1
2.High competition with low/cheap/fake wines	2
3. Increase in price of raw materials	2
4. Wastage due to early fermentation	3
5. Inadequate proper fermentation equipment	3
6. Lack of updates on new fermentation procedure	4
7. The absence of and high cost of testing and measuring	4
8. Quality standards issues	5

The problems affecting marketing were poor market development efforts or lack of marketing programs and strategies; high competition with low/cheap/fake wines,adulterated strawberry wines; limited market outlets, and low market consignment practices. Wine makers lack the initiative to explore distribution outlets and marketing strategies.

CONCLUSIONS

Analysis on the data gathered is instrumental to the following conclusions:

1. The wine processors are in the household level profile. Although by minimum standards, their state is acceptable, in order to maintain the credibility of their products and to safeguard their market, there is an obvious need to upgrade their facilities and equipment.

2. The wine consumers have high quality expectations while looking forward to comparatively low price. This inverse relationship between quality expectation and price essentially shows the empirical connection between efficient production management practices and high consumer expectations delivery. Wine processors, on the other hand cannot fully meet the preferences of the consumers due to their nature of household scale and where 80% are sole proprietorship, thus capital formation is a drawback. This apparently causes the snail paced development in the local wine industry particularly in the area of technology acquisition.

3. There are sensitive problems for fruit wine processors in the area of meeting consumers' expectations on quality level requisites. These problems are inherent in the form of business organization these wine processors are. Despite the existence of most of these processors in the venture for 6-10 years, the findings reveal their crude production processes.

RECOMMENDATIONS

The wine processors must endeavor to upgrade in facilities and equipment by availing of the programs of the DOST and the DTI which assist MSMEs which are low in capital. This infusion of capital for modernizing facilities and equipment will level up their profile, their capacity, and quality assurance processes.

1. To meet consumer preferences, the wine processors must:

    A. introduce innovations responsive to efficient production management practices to substantially reduce price while maintaining significant profit margin;

    B. establish ingenious (*in contrast to technical in manufacturing*) quality control mechanisms;

    C. be sensitive to the implications of a credible label consistent in: *brand name, trade mark, product information and quality guarantee seal*; and,

    D. moderate quality expectation by segmenting their products according to social strata (*elite, common*), gender (*higher alcohol content for men*) and other classifications as they see the need.

2. The government through concerned agencies should:

    A. make way for knowledge and skills enhancement trainings and seminars on marketing research, financial management, cooperative and taxation; and,

    B. provide economic incentives and technology acquisition packages in soft loans for the wine processors.

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    A. make way for knowledge and skills enhancement trainings and seminars on marketing research, financial management, cooperative and taxation; and,

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K-12 MULTIPLATFORM GRADEBOOK APPLICATION

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ABSTRACT

K-12 Multiplatform Gradebook Application is an automated grading system that can be accessed in computer platform for grading process and mobile platform for viewing of class record. Specifically, the study attained the following objectives: (1) To determine a framework to develop the k-12 multi-platform gradebook application; and (2) To determine the level of usability and the acceptability of the proposed K-12 multiplatform gradebook application. The study was conducted through descriptive and developmental research design. An iterative and incremental development model was used in determining the framework and in developing the system. The developed system was determined very usable with the overall computed mean of 4.88 which was evaluated by 5 IT experts. It was also determined as acceptable with the overall tabulated mean of 4.50 that was evaluated by 139 high school teachers and 2 DepEd supervisors.

Keywords: Gradebook Application, K-12, Multiplatform Gradebook

INTRODUCTION

Computer technology has become an essential tool for easier and faster way of recording information. It can store, organize, and manage voluminous data. Computers served as efficient data storage systems and excellent information processors. With the advent of technology, having a computerized grading system would make the task of recording and computing of grades easier for the teachers.

Grading System in education is a system that is used to compute and analyzed the educational performance and skills of students which is entirely based upon points alone. There are many types of grading system available now. Right from providing an O grade to A grade, to providing a 'pass' or 'fail' alone, many standard based grading systems are incorporated in various schools across the globe according to their own needs and desires.

At Hudsonville Public Schools, Michigan, United States, letter grade is used in grading system implemented last 2015, wherein A is the highest with a numerical range of 93-100, and E is the lowest with an equivalence of 0-59.

In the Philippines, the last country in Asia that implemented the K-12 Grading System is used in assessing student's performance and skills. K-12 Program or the Basic Education Curriculum covers 13 years of basic education from kindergarten to grade 12 with a level of elementary, junior high school, and senior high school. The Department of Education (DepEd), the executive department of Philippine government that managed and governed Philippine system of basic education, implemented the K to 12 Enhanced Basic Education Program based from DepEd Order No.8. series of 2015 or also known as the Policy Guidelines of Classroom Assessment. From the said policy, it uses a standard and competency-based grading system wherein all grades will be based on the weighted raw score of the learners' summative assessment. There will be a standard grade of 60, which is equivalent to 75 in order to pass a specific learning area.

By using technology in grading system, DepEd provides Electronic Class Record (ECR) or also known as E-class record which is used for grading process consistent with the said policy guidelines. The primary purpose of the E-class record is to ensure sustainability and to minimize technical difficulty with the templates designed and simplified from the basic features used in a spreadsheet file.

The E-class record consists of all learning areas in the elementary and high school level. A teacher must have an own copy of the template of subject or specific learning area assigned to him, and input all the data needed in spreadsheet, encode raw scores in every classroom assessment. After that, the grades will automatically be computed and reports will automatically be generated such as summary of final grades.

Information and Communications Technology (ICT) works along with grading system which promotes accuracy in the computation of grades and efficiency of generating class record, grading sheets, and other pertinent reports needed by the school for submission and decision-making purposes. In manual systems, updating is slow, time consuming and prone to errors. Furthermore, the manual process makes different organizations to encountered problems such as repetitive nature of work, slow generation of reports and increasing volume of paper documents. According to Barreno, Arevalo, Abundo, and Laput (2014), Metropolitan Academy of Manila School uses a manual way of computing grades and adding information or records of both students and teachers. The process entails a lot of effort and by computing and storing of data manually the process is prone to error especially for the teacher who handled two or more classes. Through the advent of technology, ICT paved the way for many people to facilitate ICT tools in order to automate these different institutional activities.

In Zayed University in the United Arab Em irates, Bataineh, and Abbar (2007) conducted a survey to assess and measure the usefulness, usability and effectiveness of M-grade, a new mobile-based electronic grade system that was designed to replace the traditional paper-based methods of managing grades in the school system within the gulf region. The new system provides many features and functionalities that assists teacher's recording and managing students' performance assessment. By using the Personal Digital Assistant (PDA) device, teachers are capable of entering and processing student grade data into their electronic grade sheet anytime and anywhere. The application creates final grade report where it can be submitted to the school administration wirelessly. The results of the survey have shown that the new tool is very useful, easy to use and learn, and effective.

In Korea, an online grading system was developed wherein the primary aim is to collect, process, and return the grades produced by the teachers. According to Thompson and Ahm (2012), it is shown and emphasized that this system has a number of advantages over manual grading methods, including scalability, real-time feedback on the status of grading, the reduced potential for human error in compiling grades, the ability for teacher to grade remotely and to revise their grades after submission, the ability for course administrators to easily review grading results and remove statistical outliers from the score set, the ability to return both provisional and final grades to the course faculty, staff, and students in a timely manner, and the ability to archive and export grading data for future use.

In Dagupan City National High School in the Pangasinan, Philippines, Cornel (2010) emphasized that an e-Student Personnel Record can quickly and efficiently help teachers and school administrators interact with each other for a positive education experience. The teacher can record and compute grades, and add comments about study habits. School administrator could see at glance the daily classroom routine and the progression of grades. Students could keep abreast of how well they were on task and their current scores.

K-12 Online Grading System in Agoo West District, Deped Division of La Union, Philippines was developed, validated and tested. Duran (2013) emphasized that the software was highly valid in terms of functionality and automation. Furthermore, the software was highly usable as to content, organization, readability, navigation, user interface design, performance and effectiveness. Moreover, the usability of the software was significant. Hence, the developed software is valid and usable.

Studies or the developed system mentioned above proved that by using technology or application system in grading process is much more effective and efficient medium. However, multiplatform application can be one of the best system development that can be enhanced according to those related studies. In this new generation, multiplatform application installed in both computer and mobile platform is increasingly used by the technology users.

However, applications or programs in mobile platform are an upgrade or maybe an elevation of the programs that is installed in the computer platform. It is exactly as the name implies – technology that is portable. Access is the primary benefit of mobile technology. There are thousands of applications or programs that can help people to stay informed anywhere or anytime. It has a higher efficiency in terms of being more efficient and provides most efficient solution to any businesses and work today with endless possibilities, knowing the appropriateness to use mobile devices as an important aspect in this increasingly connected world. Teacher-empowering technologies include mobile apps which contribute help in teaching and enhancing strategies such as comprising these in a grading system.

The researchers grabbed the opportunity to use this technology for developing a study entitled "K-12 Multi-platform Gradebook Application" wherein it can be both accessed and viewed in both computer and mobile platform. In this way, the developed study will be used more purposively, powerful and meaningful. It is well-suited for managing grades of students compared to the existing e-class record which can lead to duplicate work, limited to single person or PC and without purchasing additional equipment and software, there is no way to back-up the data, leaving it exposed to data corruption or even total loss. With the developed system, convenience in recording, retrieving, and updating student's academic records in an effective and efficient manner can be achieved. Moreover security, accessibility and scalability of the data in a class record are rest assured. Using of this software, teachers could be needlessly wasting hours assessing students with an antiquated system.

STATEMENT OF OBJECTIVES

The primary purpose of this study is to design and develop K-12 Multi-platform Gradebook Application.

Specifically, it was aimed to achieve the following objectives:

1. To determine a framework to develop the k-12 multiplatform gradebook application; and
2. To determine the level of usability and the acceptability of the K-12 multiplatform gradebook application.

METHODOLOGY

In this study, descriptive and developmental research design were used. The conduct of an interview was applied in to gather the procedures and guidelines of K-12 grading system, the presently used e-class record and to assure the reliability of information. Procedures or guidelines of K-12 grading system are very essential in developing K-12 Multiplatform Gradebook Application. It is the basis on how the system will work in terms of recording the scores of exams, quizzes, and activities and computing the grades in accordance with the policy of classroom assessment or with the DepEd Order No.8 s.2015.

In determining the framework of the k-12 multiplatform gradebook application, Iterative and Incremental development model was used which includes four phases: Inception, Elaboration, Construction, and Transition. The developed system was measured using Software Usability Measurement Inventory (SUMI) by Veenendaal (1998).and evaluated by 5 IT experts as shown in table 1.

TABLE 1. Distribution of the Respondents for level of Usability of K-12 Multiplatform Gradebook Application

Evaluator	Qualifications	Institution
Evaluator 1	Application Developer	PSU-Lingayen
Evaluator 2	Web Developer	PSU-Lingayen
Evaluator 3	Application Developer	Colegio De Dagupan
Evaluator 4	Web Developer	Colegio De Dagupan
Evaluator 5	Web Developer	PSU-Urdaneta

It was also measured using ISO 9126-1 by McCall (1977) and Boehm (1978) and evaluated by 139 secondary teachers from Mangaldan National High School, Pangasinan and 2 DepEd supervisors from DepEd Division Office Pangsinan I and Regional Office I, City of San Fernando, La Union. Each of the items of the questionnaire that indicates to determine the level of usability and level of acceptability of the developed K-12 multiplatform gradebook application was analyzed and categorized using 5-point Likert Scale and was tabulated using frequency count and mean.

FINDINGS

Framework of K-12 Multiplatform Gradebook Application

Iterative and incremental development model was used to determine the overall framework of the developed system. Harisha (2017) stated that a methodical approach to software development results in fewer defects and, therefore, ultimately provides shorter delivery time and better value. Through this, the following results were found and documented.

Overview of the System

The developed system improved working method of grading process by enhancing the e-class record which is an MS Excel based. It is designed exactly to what the teachers need or suitable in assessing the students in classroom.

The developed system is interactive and user-friendly interface such that even those with little or no knowledge working with the computers can easily operate it. This can be implemented to be used by the whole campus or institution as one tool in classroom assessment. A multiplatform based, wherein the system can run to the computer platform and mobile platform. The administrator and the teachers are the two user requirements of the system. They can both access the computer based system through username and password security where the grading process will take place. But only the teachers can access the mobile based application for viewing of grades or academic records. All entered data in the system will be saved in one database, in other words, all the students' records in the entire school are in one place to avoid data redundancy and loss. The system provides also the capability to back-up the recorded data in present school year and previous school year.

Inception

In this phase, based from the result of the interview (see Appendix F) that is used in the development of the study, the researcher considered or identified the procedure or guidelines of k-12 grading system based from the DepEd Order No.8 s.2015 (pls refer to page 17). It shows the steps on how the grades are computed or how the teachers do the grading process.

Another factor considered in the developed system is the e-class record. This is an automated grading system using MS Excel implemented by the DepEd last school year 2015-2016. This is used to identify what information or data should be included in the system such as student's information, school details and reports generated.

K-12 grading system and e-class record are carefully studied as the basis in the functionalities and structure applied to the developed system.

Elaboration

After the requirements has been identified and studied during inception phase, overall architecture and visual models were presented in this phase. It helped the researcher in visualizing the design and features of the system.

Figure 1 shows the system architecture of the developed K-12 Multiplatform Gradebook Application in local networking to the specified school or campus. Technically, the system is composed of three components. The first component functions as the server computer. It enables the administrator to save all the data that comes back and forth to a single database which can be accessed by the teacher. The administrator also control the back-up process, including how often back-ups are performed, whether to back-up the data in whole school year or just the data that has changed during the school year. The administrator acts as a controller of the system. The second component represents the access control of the teacher through desktop computer with a wifi receiver for server connection or with a laptop device, wherein the teacher can add academic records of their students and generate reports such as grade sheets, final grades, and summary of grades. The third component signifies the access of the teacher from the server through mobile devices in viewing academic records of their students. The mobile phone should be connected with the IP address of the server computer.

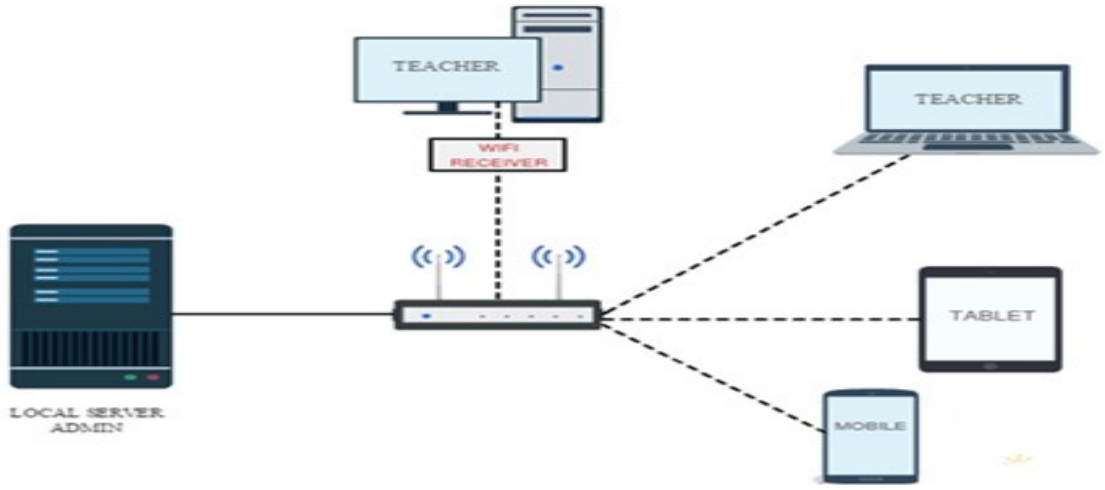


Fig 1**.** System Architecture Diagram of K-12 Multiplatform Gradebook Application

Figure 2 shows the Use Case Diagram portraying the whole feature of the developed system.

The administrator and the teacher are the user requirements of the system. The primarily role of administrator is to control or to handle the server of the system such as teacher's account, school details, subjects and section, student's information, database content, grade sheets, viewing the progress report of the students through a graphical representation, data reset and data back-up. Administrator will be the principal of the school or any authorized user. Local database synchronization is facilitated only by the administrator or principal.

Teacher has limited access to the system. Adding raw scores to academic records to an assigned subjects and students to him is the main function of the teacher. The teacher has also the capability to update his account after logging-in to the system. Also, he can generate reports such as academic records per quarter, summary of final grades of the whole school year with the capability of viewing the progress reports through graphical representation (see Plate 10).

With the synchronization of the database remotely to the mobile devices, teacher can then view the academic records from it. To be clearly stated, the data that comes back and forth to the server computer should be connected through local networking with the mobile phone with the use of application. Additionally, he can filter the academic records by highest-lowest or lowest-highest of the scores per area and final grade, in order to monitor the ranking of the students.

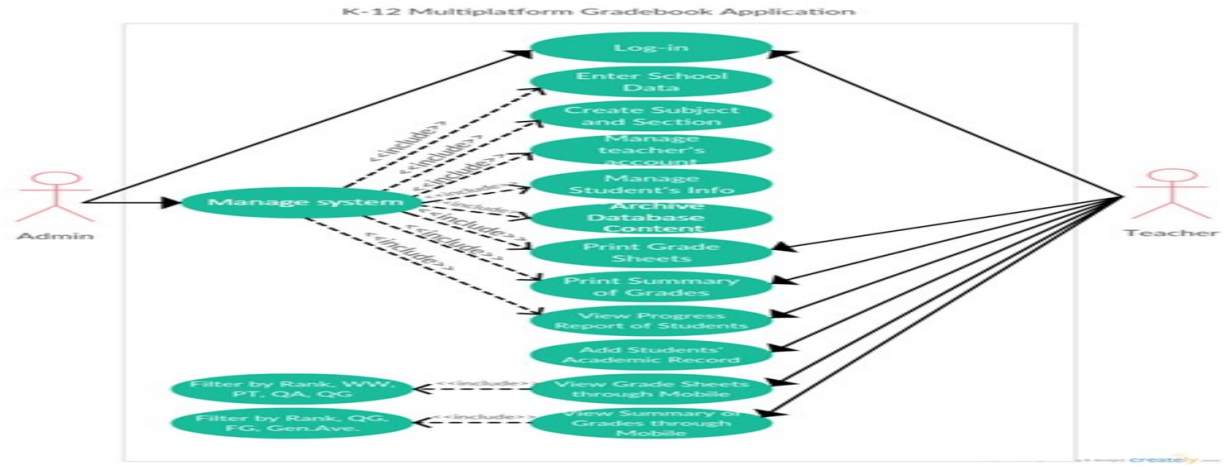


Fig 2 . Use Case Diagram of K-12 Multiplatform Gradebook Application

Legend: *WW- Written Work, PT-Performance Task, QA-Quarterly Assessment, QG- Quarterly Grade, FG – Final Grade*

Construction

This presents the system design and fully developed K-12 Multiplatform Gradebook Application, which includes the build iteration and functionalities of the system.

The Administrator can access various pages of the system which is depicted in Plate 1 to Plate 14. The Plate 1 shown below enables the administrator to log-in to the system with username and password security for him to manage the system such as adding student's information in the list, registration of teachers, viewing and printing academic records and summary of grades, adding sections and subjects in the present school year, archiving database contents and resetting or clearing the grades for another school year, and updating school details.

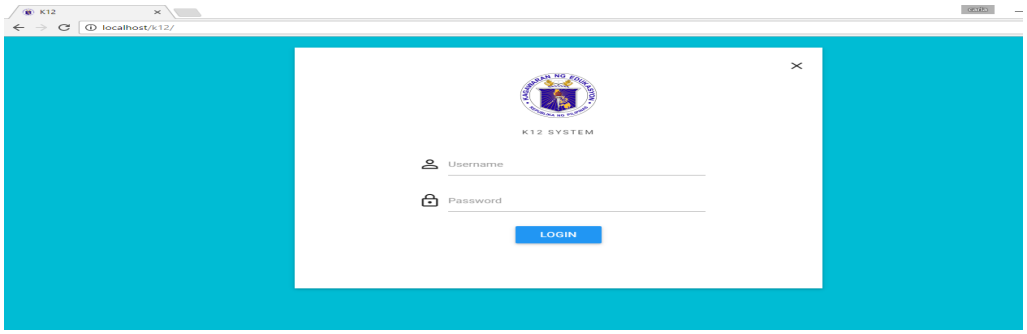


Plate 1. Log-in Page

Plate 2 to Plate 4 shows the page where the administrator can add and view the list of students that are enrolled in the school. Administrator can add the students individually in the database of the system which is presented in Plate 2, or importing the list of students from MS Excel with *csv* file format as displayed in Plate 3. List of added students in the database of the students can be viewed or searched in the Students List as presented in Plate 4.

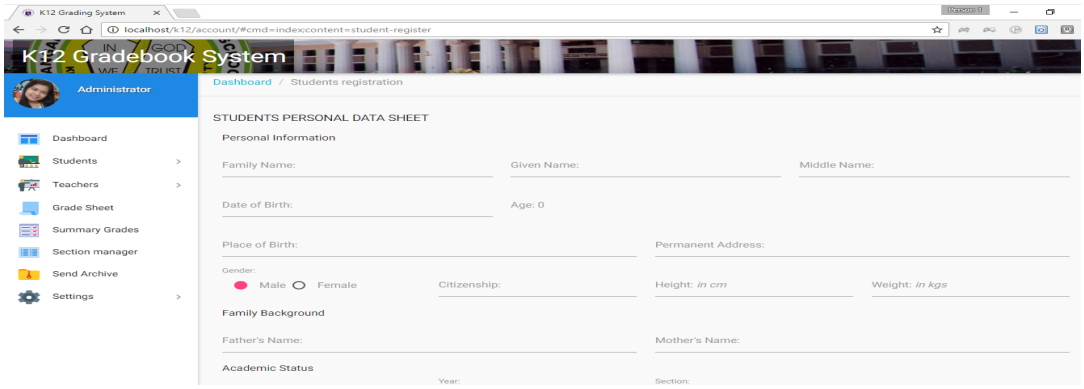


Plate 2. Adding Student's Information to the System

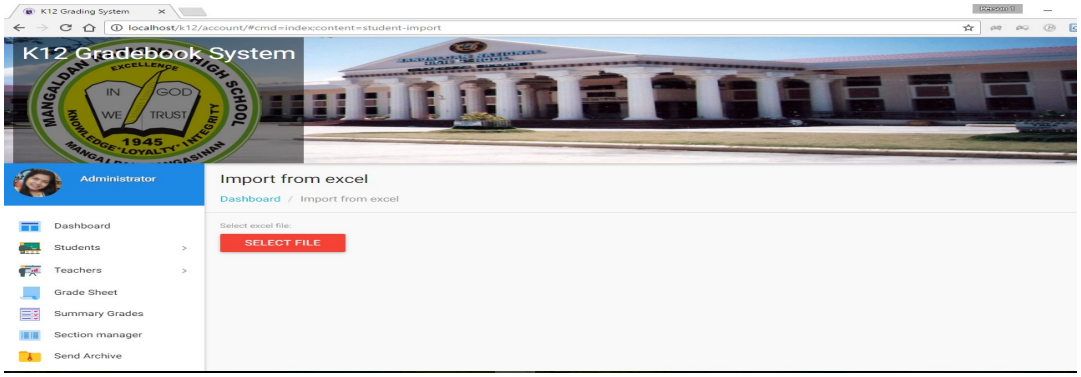


Plate 3. Importing Students' Data from MS Excel

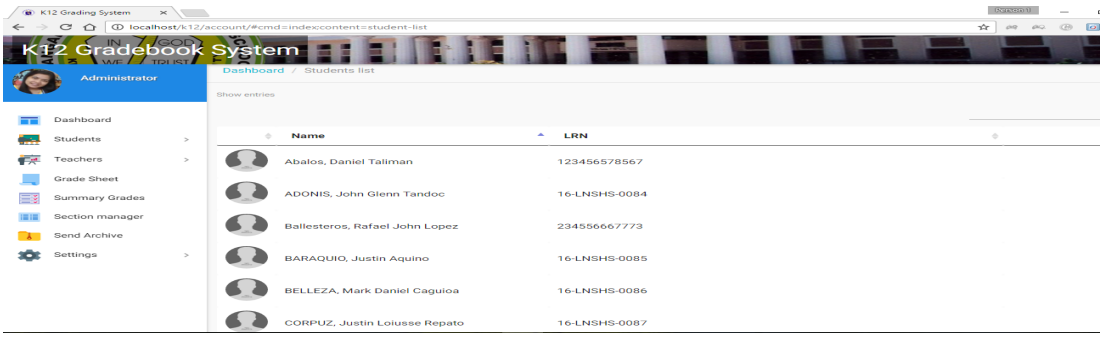


Plate 4. Students List

Plate 5 and 6 illustrates the registration of teachers in the system. Administrator is responsible in adding teacher's account for them to access the system as shown in Plate 5. After registering teacher, assigning to subjects they will teach and sections they will handle was followed as presented in Plate 6.

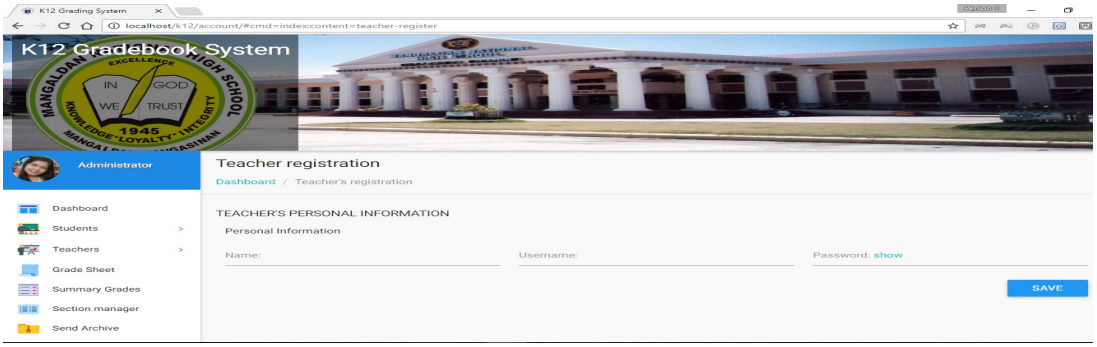


Plate 5. Registration or Adding Teachers Account

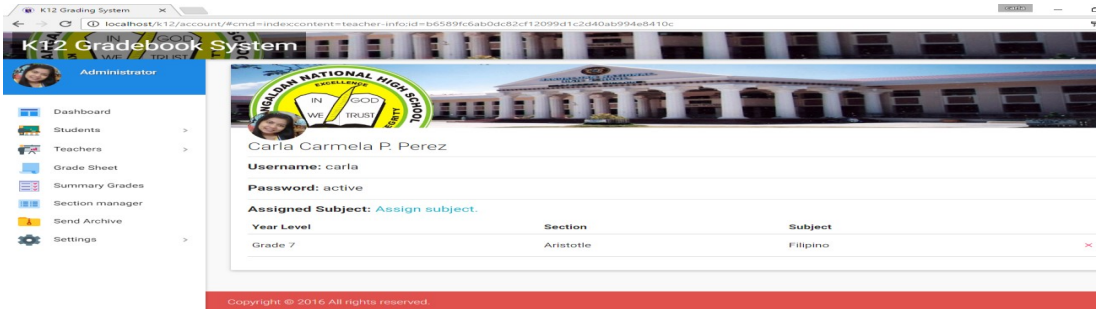


Plate 6. Assigning Section and Subjects to Teacher

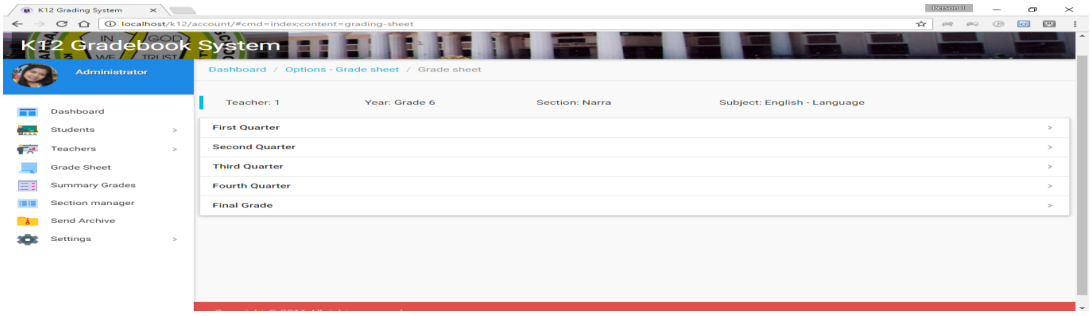


Plate 7. Grade Sheet for the Whole Quarter

Administrator can view the academic records of each section and their subject in the specified year level that was assigned to each teacher which is presented in Plate 7 and 8. Plate 7 shows the grade sheets for the whole quarter and final grades for four quarters with a sample grade sheet or academic record in first quar-

quarter depicted in Plate 8.

Summary of grades per section can also be viewed by the administrator as shown in Plate 9 and 10. Plate 9 signified the summary of grades per quarter. Moreover, progress report of the students per quarter can be viewed by graphical presentation as shown in Plate 10.

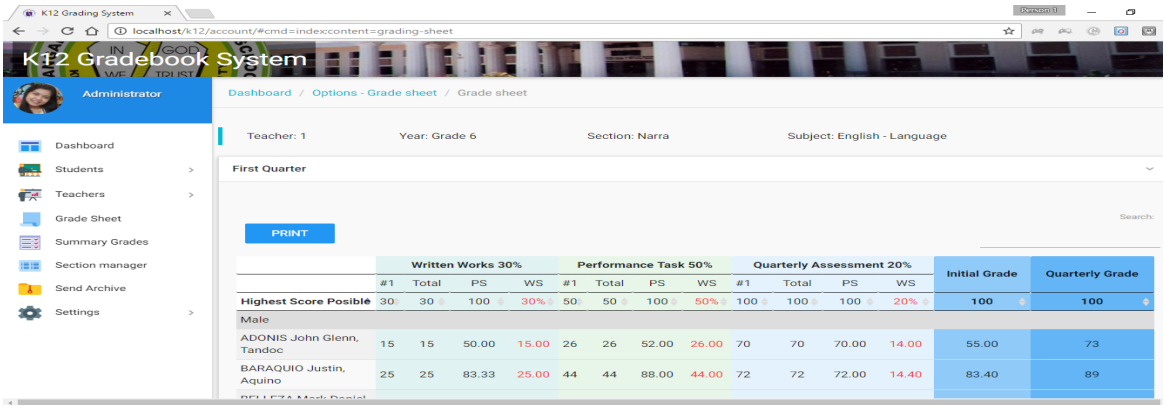


Plate 8. Sample Grade Sheet

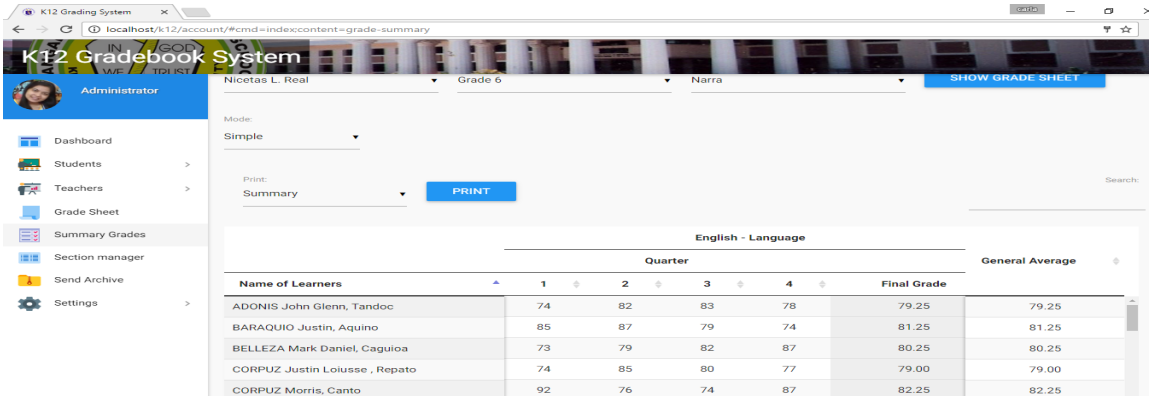


Plate 9. Summary of Grades for the Whole Quarter

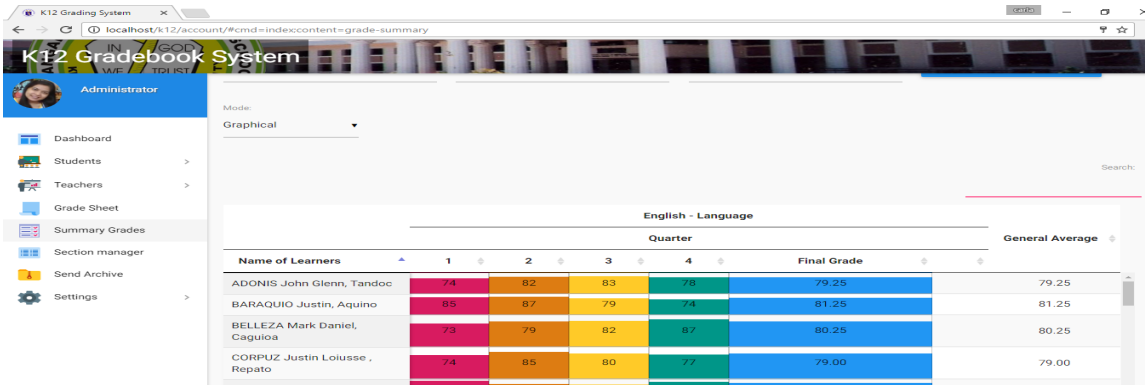


Plate 10. Progress Report of the Students per Quarter

Adding of sections and subject before the start of the school year can be performed by the "section manager". All year level from grade 1 to grade 12 is already comprised in the section manager page as presented in Plate 11. To add sections and subjects, the admin must click the *add section* or *add subject* icon at the right side of each grade level as displayed in the same Plate. Plate 12 and 13 showed the way how to add sections and subject. The administrator is responsible also to specify the percentage of written works, performance tasks, and quarterly assessment according to the grading system rule from DepEd or the desired adjustments as presented in Plate 13.

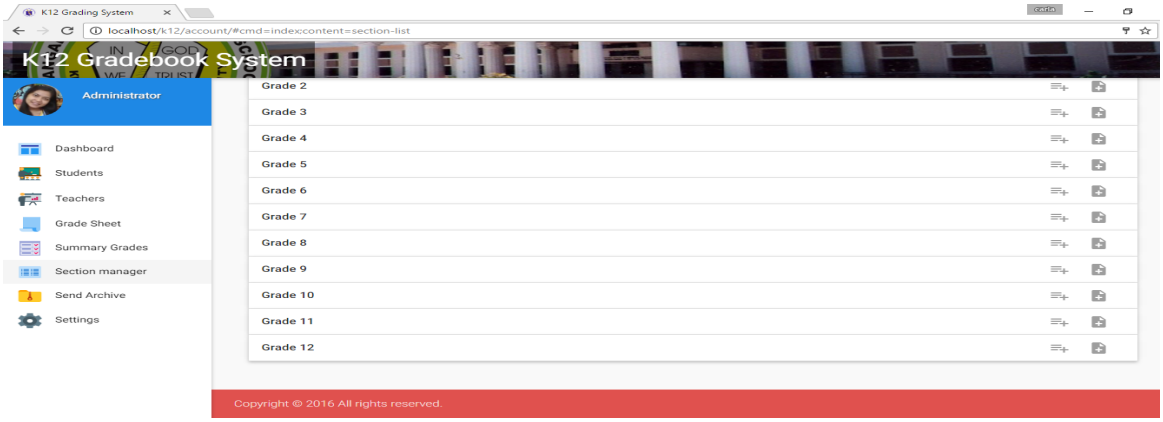


Plate 11. Section Manager

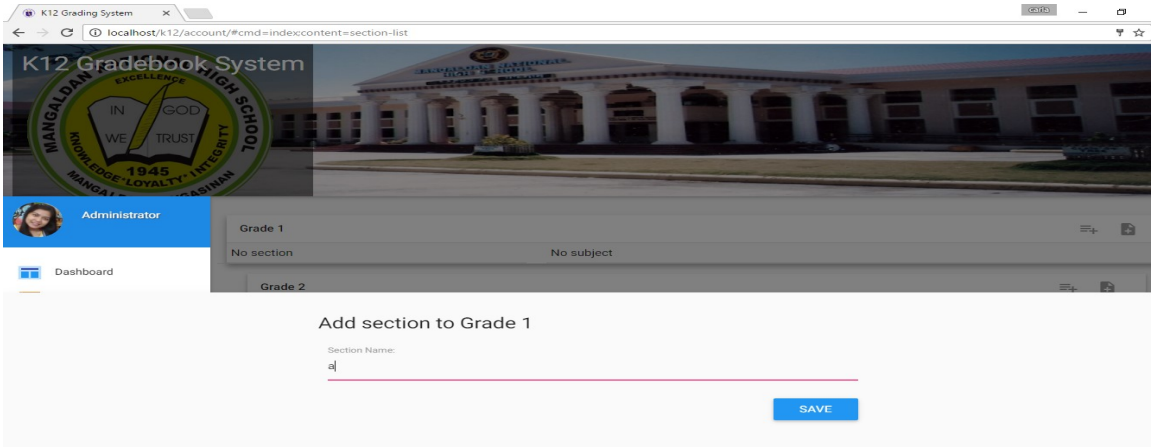


Plate 12. Adding Section

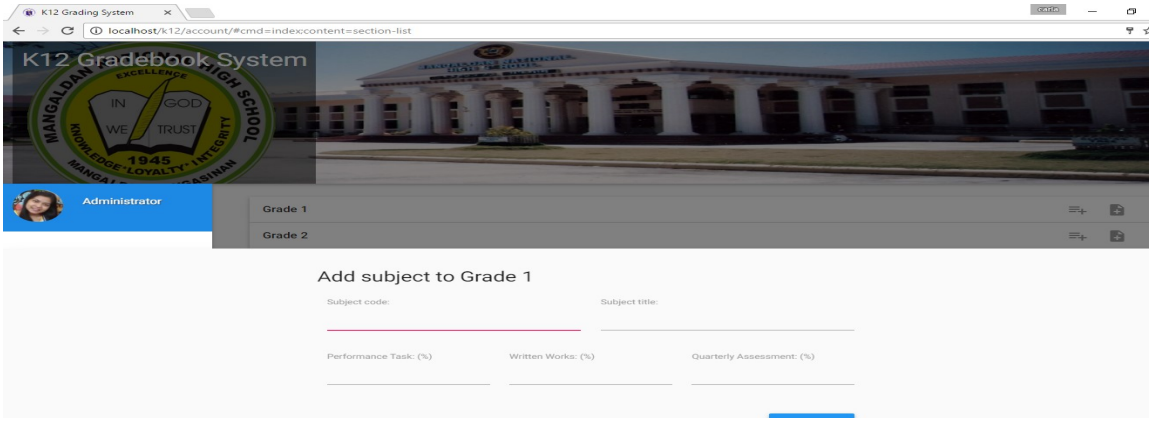


Plate 13. Adding Subject

Plate 14 shows the archiving database contents, resetting the grades for another school year, and viewing the records from previous school year. It displays the latest date of database backup to remind the user when is the last back-up date.

Plate 15 to 19 represented the account accessed by the teacher. After logging-in the system the teacher allows to view grade sheet, summary of grades and account info. Plate 15 and 16 depicted the grade sheet for the whole quarter. The teacher can add scores of students to every component such as written work, performance task, and quarterly assessment in grade sheet by clicking the add grade in each quarter as presented in Plate 17.

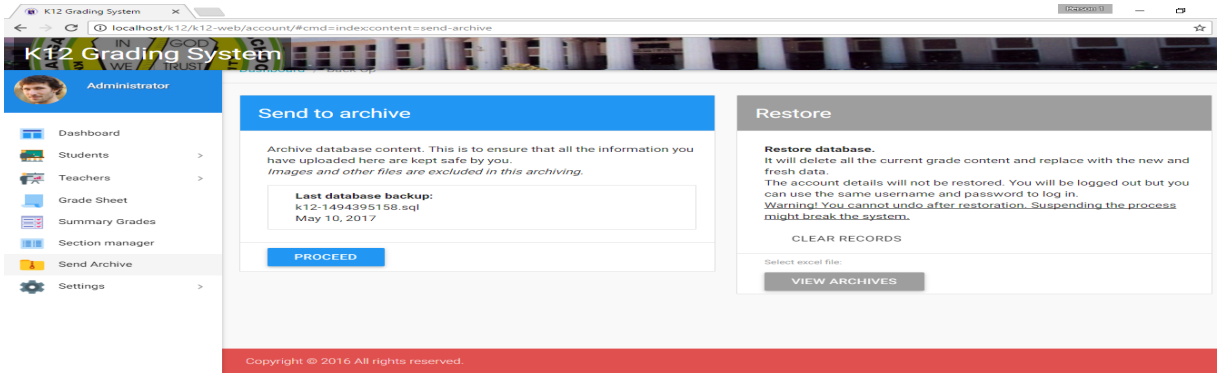


Plate 14. Archiving and Restoration Content

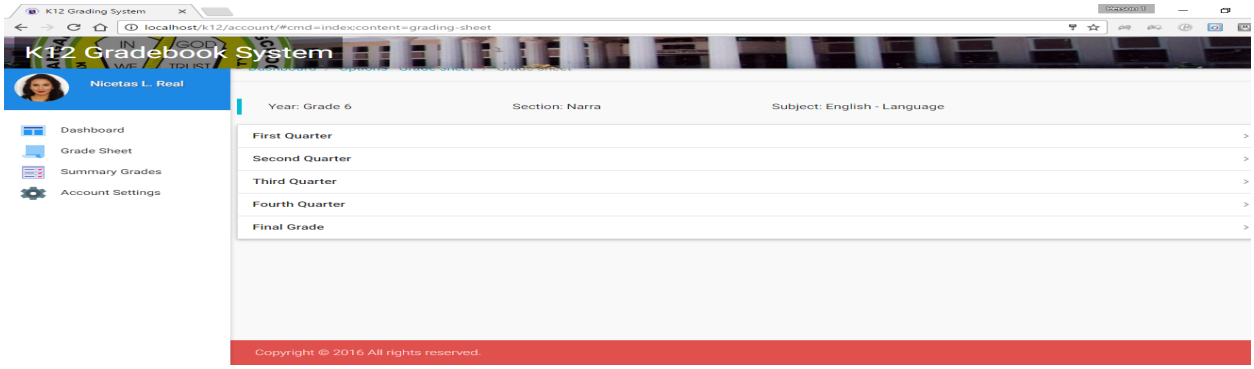


Plate 15. Grade Sheets for the Whole Quarter

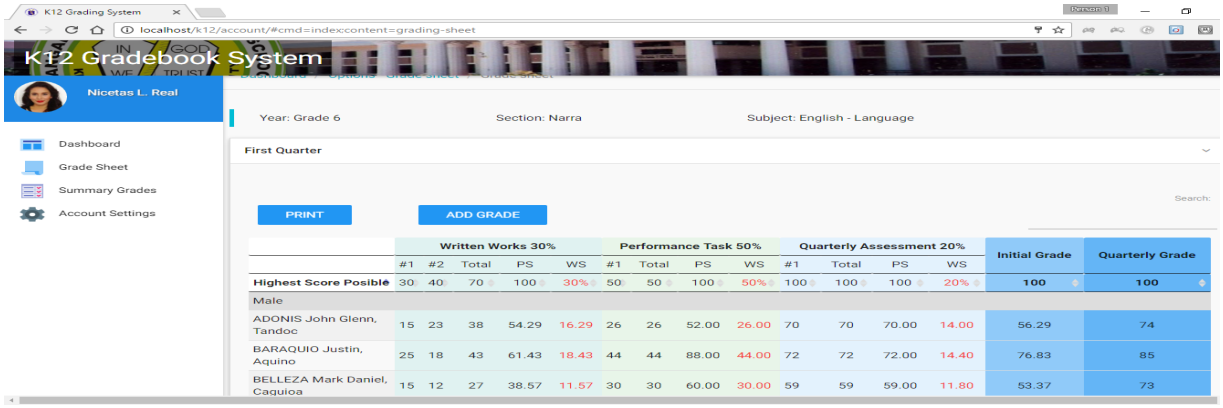


Plate 16. Sample Grade Sheet for a Quarter

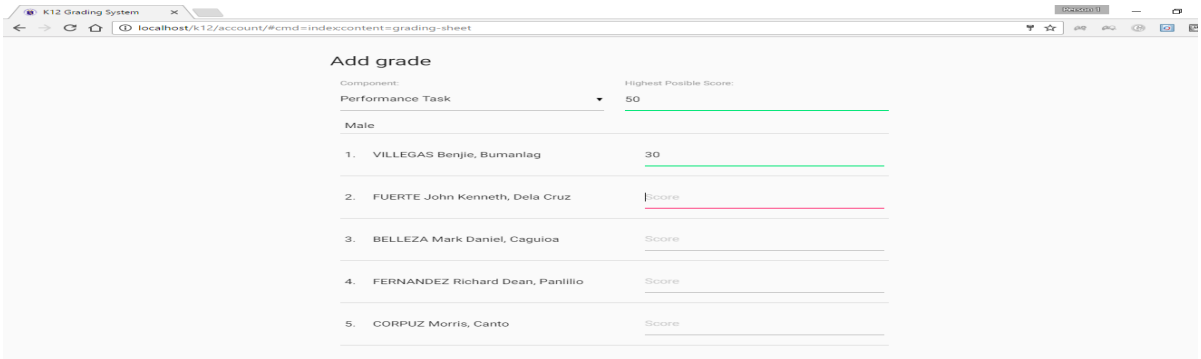


Plate 17. Adding Scores/Grades to a Specified Component

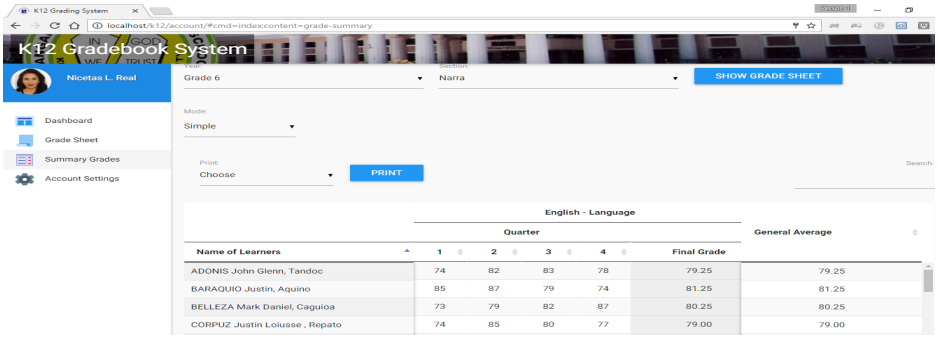


Plate 18. Summary of Grades

Plate 18 shows the summary of grades for four quarters with the general average. Teachers can also view the progress report of his students comparing the grades per quarter presented in visual graphics as seen in Plate 19.

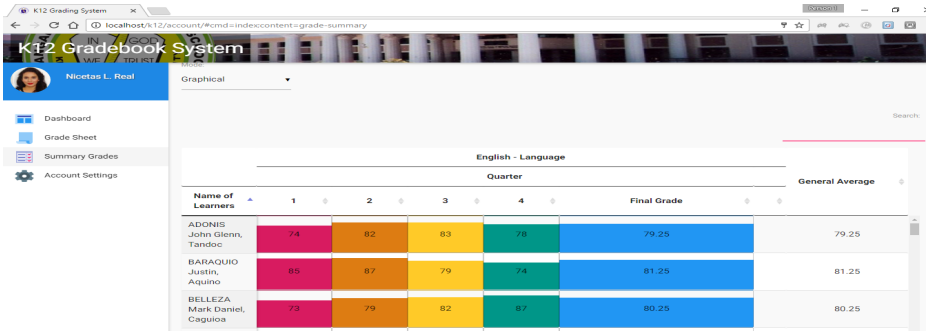


Plate 19. Progress Report in Every Quarter

The Plate 20 to 22 presented the sample print-outs of grade sheet or academic records, summary of grades and sample report card of every student.

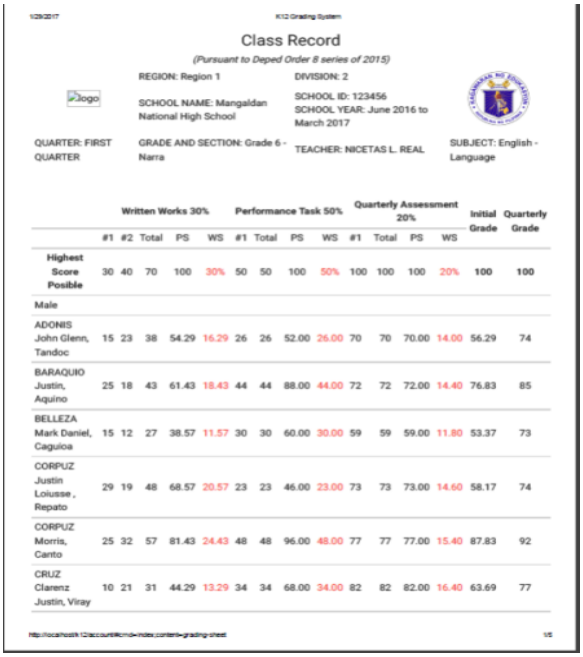
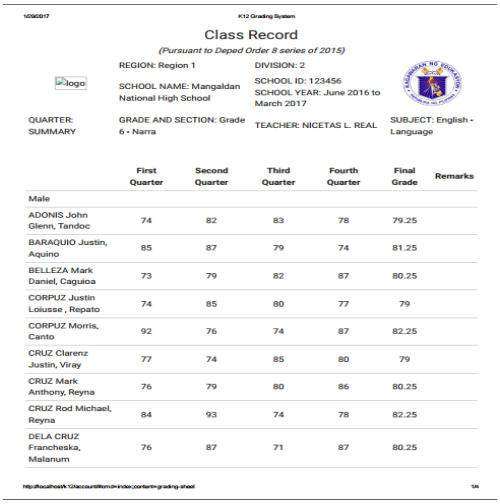


Plate 20. Sample Print-Outs of Academic Records



1/29/2017 K12 Grading System

Class Record

(Pursuant to Deped Order 8 series of 2015)

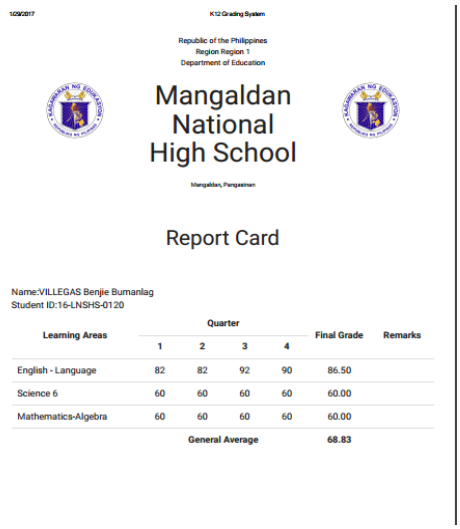
REGION: Region 1 DIVISION: 2

SCHOOL NAME: Mangaldan National High School SCHOOL ID: 123456 SCHOOL YEAR: June 2016 to March 2017

QUARTER: SUMMARY GRADE AND SECTION: Grade 6 - Narra TEACHER: NICETAS L. REAL SUBJECT: English - Language

	First Quarter	Second Quarter	Third Quarter	Fourth Quarter	Final Grade	Remarks
Male						
ADONIS John Glenn, Tandoc	74	82	83	78	79.25	
BARAQUIO Justin, Aquino	85	87	79	74	81.25	
BELLEZA Mark Daniel, Caguioa	73	79	82	87	80.25	
CORPUZ Justin Loiusse , Repato	74	85	80	77	79	
CORPUZ Morris, Canto	92	76	74	87	82.25	
CRUZ Clarenz Justin, Viray	77	74	85	80	79	
CRUZ Mark Anthony, Reyna	76	79	80	86	80.25	
CRUZ Rod Michael, Reyna	84	93	74	78	82.25	
DELA CRUZ Francheska, Malanum	76	87	71	87	80.25	

Plate 21. Sample Print-outs of Summary of Final Grades for the Whole Quarters



1/29/2017 K12 Grading System

Republic of the Philippines
Region Region 1
Department of Education

Mangaldan National High School

Mangaldan, Pangasinan

Report Card

Name:VILLEGAS Benjie Bumanlag
Student ID:16-LNSHS-0120

Learning Areas	Quarter				Final Grade	Remarks
	1	2	3	4		
English - Language	82	82	92	90	86.50	
Science 6	60	60	60	60	60.00	
Mathematics-Algebra	60	60	60	60	60.00	
			General Average		68.83	

Plate 22. Sample Print-outs of Report Card

The mobile application on Plate 23 to 26 provides access of academic records of students to teachers for viewing purposes only.

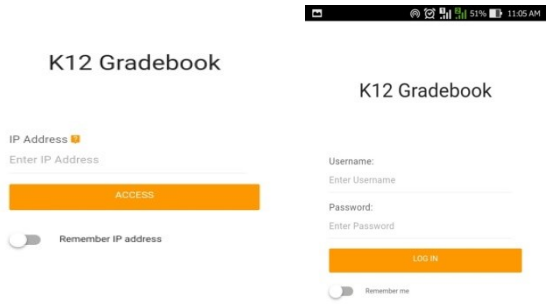


Plate 23. Entering IP Address of the Server and the Username and Password of Teacher

Plate 23 presented the entry of IP address and, username and password. To access the data from the server, the teacher must know its IP address. After successfully connecting to the server by entering the IP address, the teacher should log-in to his account through the application.

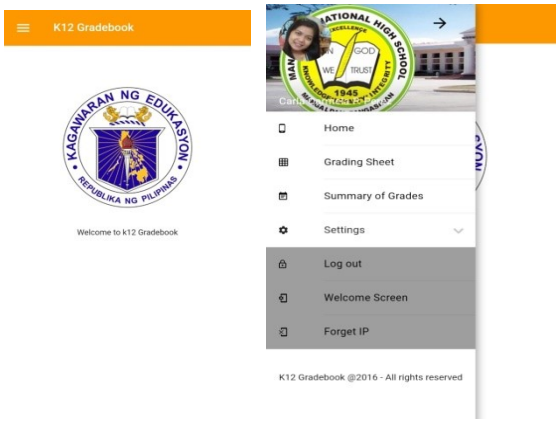


Plate 24. Home Page of Mobile App

Plate 24 depicts the Home Page of teacher's account in Mobile App with grading sheet, summary of grades and settings menus or tabs to access. Plate 25 shows the viewing of grading sheet with same process as in computer based system. The teacher can also view the scores and grades of the students from highest to lowest or lowest to highest for checking the rank of the students and for monitoring purposes.

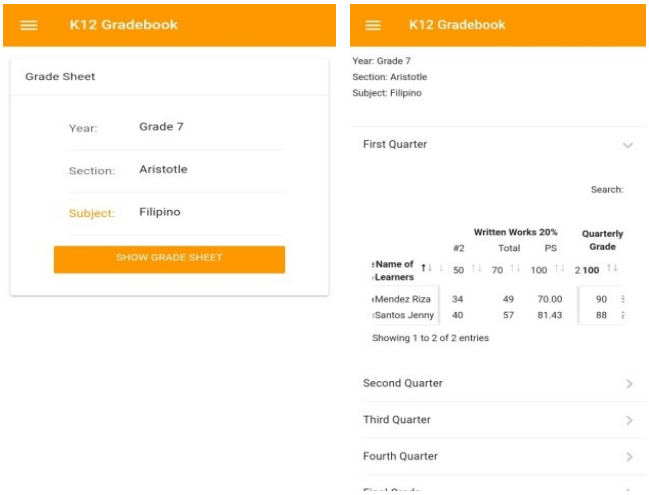


Plate 25. Viewing Grade Sheet through Mobile

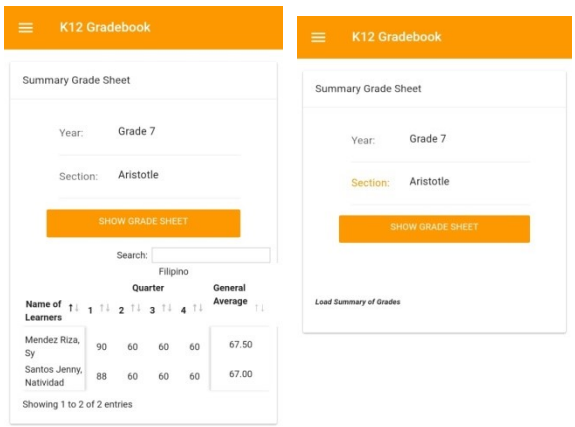


Plate 26. Viewing the Summary of Grades through Mobile

Teachers at the same time can view the summary of grades or the final grades for four quarters by selecting the year and section as displayed in Plate 26 above. This shows the quarterly grades and general average of the students in one section.

Transition

In this phase, the system was employed and tested for its usability and acceptability wherein it was evaluated and tested by 5 IT experts, 139 high school teachers, and 2 Division supervisors. The results were indicated in the level of usability and acceptability of the developed system on page 46. As stated by Burton (2009) system assessment of user satisfaction or appreciation thus serve as a diagnostic method of its implementation.

The following table represents the hardware and software minimum requirements that are needed for the implementation of the system to meet the best performance and to work it properly.

Table 2. Hardware and Software Requirements of the System

Hardware/Software Requirements	Specification
1. Desktop/ Laptop Computer	
Processor	Intel i3 processor or higher
Memory	2GB RAM
HDD	320 GB
Available Disk Space	1 GB
Operating System (OS)	Windows 7 or higher
Server Support	Apache Server 2.4.23, PHP 5.7.14, MySQL Client Version 5.6.25
Web Browser	Google Chrome
2. Mobile Devices	
Processor	Quad Core 1.2 GHz
Memory/RAM	1 GB
Operating System(OS)	Android 5.0

Usability and Acceptability of the Developed System

Usability of K-12 Multiplatform Gradebook Application

Usability measurement and testing of the developed system was conducted to ensure that the system is usable and working properly, efficiently and appropriately to the given requirements and helpful to the users. It was evaluated through a questionnaire based from SUMI focusing on efficiency, affect, helpfulness, control, and learnability. The questionnaire was distributed to 5 IT experts from different Institutions.

The Table 3 presents the mean of each indicator for usability of the developed system in terms of efficiency, affect, helpfulness, control and learnability. The learnability indicator garnered the highest mean at 4.95, while the lowest mean at 4.78 was computed for the helpfulness indicator. With a mean of 4.88, it can be concluded that the developed system is **very usable** in terms of efficiency, affect, helpfulness, control and learnability. It only shows that it is performing and functioning well with a least waste of time and effort, satisfies the user, provides higher throughput, and easy to use and to learn. Albers and Still (2011) states that usability tests should indicate that everything about a system is working fine and end users are able to use the system to complete tasks successfully.

TABLE 3. Summary of the Usability of K-12 Gradebook Multiplatform Gradebook Application

Indicator	Mean	Descriptive Equivalent	Descriptive Interpretation
Efficiency	4.93	Fully Agree	Very Usable

Affect	4.83	Fully Agree	Very Usable
Helpfulness	4.78	Fully Agree	Very Usable
Control	4.93	Fully Agree	Very Usable
Learnability	4.95	Fully Agree	Very Usable
Mean	4.88	Fully Agree	Very Usable

Acceptability of K-12 Multiplatform Gradebook Application

In this phase, the developed system was measured and tested its acceptability. Acceptability measurement was conducted to ensure that the system performs accurately and appropriately to the given requirements and satisfies the users' need.

It was evaluated through a questionnaire based from ISO 9126-1 focusing on functionality, reliability, usability, efficiency, maintainability, and portability. The questionnaire was distributed to 139 faculty members of Mangaldan National High School, Mangaldan, Pangasinan that was selected as the respondents and obliged to be the user of the system. Additionally, 2 supervisors were also selected as one of the respondents of the system, 1 supervisor from DepEd Regional Office I and 1 supervisor from DepEd Division Pangasinan I.

The Table 4 presents the mean of each indicator for acceptability of the developed system in terms of functionality, reliability, usability, efficiency, maintainability, and portability. The functionality indicator garnered the highest mean at 4.55, while the lowest mean at 4.40 was computed for the reliability indicator. With a grand mean of 4.50, it can be concluded that the developed system is acceptable in terms of functionality, reliability, usability, efficiency, maintainability, and portability.

TABLE 4. Summary of the Acceptability of K-12 Multiplatform Gradebook Application

Indicator	Mean	Descriptive Equivalent	Descriptive Interpretation
Functionality	4.55	Excellent	Acceptable
Reliability	4.40	Excellent	Acceptable
Usability	4.55	Excellent	Acceptable
Efficiency	4.52	Excellent	Acceptable
Maintainability	4.43	Excellent	Acceptable
Portability	4.54	Excellent	Acceptable
Mean	4.50	Excellent	Acceptable

CONCLUSIONS

Based on the findings, the researchers arrived at the following conclusions:

1. Using iterative and incremental development model was resulting to well developed and well function system.
2. The developed system is very usable in terms of functionality, affect, helpfulness, control, and learnability and acceptable in terms functionality, reliability, usability, efficiency, maintainability, and portability which shows that the system functions well with commands easy to learn and can be implemented for grading process.

RECOMMENDATIONS

Based on the conclusions, the following are hereby recommended:

1. The K-12 grading system is recommended to be reviewed by the end-users before using the developed system.

2. Usability and acceptability evaluation of a system is recommended to apply by the future researchers for good implementation of their developed system.

3. The K-12 Multiplatform Gradebook Application is recommended to be fully implemented in all DepEd Schools in the Region 1.

ACKNOWLEDGMENT

Grateful acknowledgement is expressed to our God, the Almighty One, who served as a guide and gave knowledge, strength, and all the blessings to the researchers including those who helped them in the completion of this research study. And to all those who have become a big part of the researchers' life, who served as an inspiration and motivation in doing this study.

The researchers would also like to express their warmest gratitude to Don Mariano Marcos Memorial State Univeristy, Mid La Union Campus, College of Information Technology for the encouragements and concern in doing this study.

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SEAWEED DRIPPINGS FOR LETTUCE (LACTUCA SATIVA) GROWN UNDER PROTECTED AND CONVENTIONAL CULTIVATION SYSTEMS

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ABSTRACT

One of the important challenges to the local vegetable industry is to develop production system that would adequately meet the need for year-round production of safe and high quality produce. It is difficult to meet this need with conventional field production of crops because of seasonal climatic changes, which bring about many biotic and abiotic stresses to plants causing fluctuation of supply and prices of vegetable commodities in the market. Marine resources as well like seaweed have been found to contain nutrient elements required by plants same as what is found in dry organic fertilizers. The study was conducted to assess the performance and profitability of lettuce grown under protected and conventional cultivation systems with seaweed drippings foliar supplementation. Lettuce under protected cultivation performed better as shown by highest percent head formation, and yield than open field grown lettuce. Field grown lettuce with supplementation of seaweed drippings matured earlier, and had higher percent head formation and yield than no supplementation. Protective structured was more profitable than open field condition due to the higher marketable yield obtained under the system. Application of seaweed drippings provides a higher net income than no supplementation.

Keywords: lettuce, seaweed drippings, protected and conventional cultivation

INTRODUCTION

Lettuce (Lactuca sativa L.) which belongs to Asteraceae family is one of the important high valued vegetable crops in the country. Lettuce is usually grown in areas in which the mean temperature range is 10-20°C (50 - 60°F). Adequate moisture and cool temperatures are necessary at the time of heading. Lettuce is considered as a high valued vegetable and is grown mostly in temperate regions, it can be planted in our locality because some varieties have been developed to adapt to warmer temperatures such as President and General varieties. Another factor that affects the growth of lettuce is nutrition. Fertilizers are used to correct known plant nutrient deficiencies, provide high levels of nutrition which aids plants in withstanding stress, maintain optimum soil fertility and improve crop quality.

Many Filipino farmers would like to use organic fertilizer, but the production of organic fertilizer is beset by constraints such as high cost. It is also difficult to collect and process farm manure and crop residues. To combat such problem, manufacturers then tried to produce liquid organic fertilizers.

Foliar application of fertilizers in crops is becoming an important practice especially when conditions of nutrient fixation by the soil exists, and in the correction of deficiencies of essential elements which tend to be immobilized in the soil. When mineral ions in the solution are directly sprayed to the leaves of plants, these ions may slowly penetrate through the stomates and the cuticles and reach the interior of the leaf, thus, becoming available for absorption by the mesophyll cells (Epstein, 1972).

Marine resources as well like seaweed have been found to contain nutrient elements required by plants same as what is found in dry organic fertilizers (Trono, 1997).They are good sources of phycocolloids. The phycocolloids (e.g. agar, algin, carageenan), derived from different species of seaweeds, are utilized in food and pharmaceutical products. They contain inherent stickers, natural hormones, amino acids, vitamins, proteins, carbohydrates, and minerals important to plant growth (Pamphlet – Freegrow Fertilizer, as cited by Caballero et al., 2007).

One of the important challenges to the local vegetable industry is to develop production system that would adequately meet the need for year-round production of safe and high quality produce. It is difficult to meet this need with conventional field production of crops because of seasonal climatic changes, which bring about many biotic and abiotic stresses to plants causing fluctuation of supply and prices of vegetable commodities in the market. This is particularly true to regions where off-season production constraints are more severe (Type IV rainfall pattern). Such rainfall pattern is characterized by the occurrence of rainfall throughout the year, with a major portion of the year experiencing heavy downpour. Thus, production system that would regulate or provide physical barriers to unfavorable climatic and biological influences known generally as protected cultivation is the best means to free the crops from biotic and abiotic stresses in the field. Specially designed greenhouses particularly for lowland tropics have made it possible to increase vegetable yield by more than 50% relative to that in the open and caused a major reduction in pesticide use (Hemming and Waijenberg, 2005).

This study was conducted to evaluate the potential of seaweed drippings as foliar fertilizer supplement for the productivity of lettuce under protected and conventional cultivation systems.

OBJECTIVES OF THE STUDY

1. To assess the performance of lettuce grown under protected (tunnel type) and conventional cultivation systems;

2. To evaluate the yield of two lettuce varieties as affected by different levels of seaweed drippings foliar supplementation;

3. To determine the optimum rate of seaweed drippings as organic foliar fertilizer supplementation on lettuce;

4. To assess the profitability of growing lettuce with seaweed drippings foliar fertilizer supplementation under protected and conventional cultivation systems.

METHODOLOGY

Seedling Production and Transplanting

Lettuce seeds were sown in a propagation tray and stayed in the individual cell for 2 weeks under structure with transparent plastic roofing for protection from rain and direct sunlight. To assure proper growth and development of plant and to attain the maximum yield of the area, proper spacing in planting based on the recommendation for lettuce was followed. The seedlings were transplanted at a distance of 30 x 30cm.

Source of seaweed drippings foliar fertilizer

The study used bottled product of seaweed drippings obtained from a series of processes. The processing steps were as follows: seaweed harvested at 45 days was brought to a designed platform built on the shore. Containerized seaweeds were exposed to direct sunlight for three days. This was followed by collection of seaweed drippings inside the container and ready for use or for storage.

Protected Cultivation

Protected cultivation system of tunnel type was used in the study with a dimension of 1.5 m wide, 1.5 m high, and with a length of 17 m. The dimension as to the width, length and height of the system was based on the number of plots and its size planted with lettuce and for proper aeration, respectively. For cost efficiency, the structure was made of bamboo, then covered with fine nets and was installed right after planting.

Treatments

Three factor experiment was used in the study with cultivation system as factor 1 (open/conventional, protected/tunnel type), lettuce varieties as factor 2 (President, General), and rates of seaweed drippings as fac-

factor 3 (control, Recommended Rate (RR) 120-60-60 kg/ha N, P2O5, K2O, RR + 5 % of seaweed drippings, RR +10% of seaweed drippings, RR +15% of seaweed drippings, RR +20% of seaweed drippings). All treatments were replicated three times. Preliminary study was conducted to determine the rate of seaweed drippings for lettuce. It was found out that at higher rate than 20% will caused burning in the leaves of lettuce.

Harvesting

Harvesting was done by cutting the base of the plant with a sharp knife when the plants attained its marketable size and right maturity (30-35 days from transplanting). Sorting was done to separate the marketable from non marketable lettuce. Marketable are those free from diseases and insect damage.

Growth Performance of Lettuce

Days after Transplanting (DAT) to Heading and DAT to Harvesting and Percent Head Formed

Effect of cultivation system and performance of two lettuce varieties were comparable as to the number of days from transplanting to heading and harvesting. However, seaweed drippings foliar supplemented lettuce formed head significantly earlier of about 2 days than control. Plants applied with seaweed drippings foliar fertilizer in a concentration of 5%, 10%, 15% and 20% formed head at about 25 days after transplanting while plants with no foliar supplementation, heading was observed only about 27 DAT (Table 1). On the other hand, number of days after transplanting to harvesting of field grown lettuce was not significantly influenced by different cultivation systems and supplementation of seaweed drippings foliar fertilizer. Field grown lettuce was harvested at about 32 days after transplanting. On the different interaction effects on the time of heading and time of harvesting, no significant differences were observed among treatments.

The result of this study implies that supplementation of seaweed drippings foliar fertilizer improved head formation of lettuce. The earlier head formation of about 2 days of seaweed drippings supplemented plants than control may be attributed to the effect of seaweed drippings foliar fertilizer. Yield increases in seaweed -treated plants are thought to be associated with the hormonal substances present in the extracts, especially cytokinins. Cytokinins in vegetative plant organs are associated with nutrient partitioning, whereas in reproductive organs, high levels of cytokinins may be linked with nutrient mobilization (Nelson and Van Staden, 1984). In addition, from their work with greenhouse cucumbers (Cucumis sativus L.), seaweed concentrate applied as a root soak at transplant and as a weekly foliar spray increased overall plant dry mass and root growth. The favorable effect of seaweed drippings is due to its valuable components like macronutrients (N, P, K), micronutrients (Ca, Mg, Zn) and plant hormone such as cytokinin particularly the 6-Benzylaminopurine. 6-Benzylaminopurine or BAP is a first generation synthetic cytokinin which elicits plant growth and development responses, setting blossoms and stimulating fruit richness by stimulating cell division. It is also an inhibitor of respiratory kinase in plants, and increase postharvest life of green vegetables (en.wikipedia.org/wiki/6-Benzylaminopurine).

The percentage head formed of field grown lettuce was also affected by cultivation systems and supplementation of seaweed drippings foliar fertilizer but not by the varieties used (Table 1). Lettuce grown under protected structures had significantly greater number of heads formed than lettuce planted in open field condition with a percentage mean of 68.29 % and 55.82%, respectively. The environmental condition during the conduct of the study affected the percent head formation of lettuce grown in open field. There was much heavy rainfall during the conduct of the study and therefore the benefits that the plants derived from protected structure were manifested.

Likewise, supplementation of seaweed drippings foliar fertilizer in lettuce significantly generated higher percentage of head formation than control. Among seaweed drippings supplemented plants, those applied with 20 % obtained the highest percentage head formation but statistically the same with plants supplemented with lower concentrations of seaweed drippings. Moreover, significant results were observed in the interaction effects between cultivation systems and fertilizer treatments. Plants supplemented with seaweed

drippings planted under protected structures consistently showed higher percentage of head formed than open field grown plants (Table 2). Plants supplemented with higher concentration of seaweed drippings at 15% and 20% grown under protected structures significantly had higher number of heads formed among treatments with a percentage mean of about 75%.

Table 1. Days from transplanting to heading and harvesting and percent head formation of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatments	No. of days from transplanting to		Percent head formation
	heading	harvesting	
Cultivation System			
Open/ Conventional	25.89	31.91	55.82[b]
Protected/ tunnel type	25.07	31.92	68.29[a]
Lettuce Varieties			
President	25.60	32.09	62.87
General	25.35	31.74	61.24
Seaweed Drippings			
control (RR)	26.52[a]	32.09	52.15[b]
RR + 5 % seaweed drippings	25.13[b]	31.54	63.14[a]
RR +10% seaweed drippings	25.27[b]	31.90	64.74[a]
RR +15% seaweed drippings	25.21[b]	32.01	61.69[a]
RR +20% seaweed drippings	25.26[b]	32.03	55.82[b]
CV (%)	3.05	2.23	3.15

Means in column within a factor followed by the same letters and those without letters are not significantly different from each other based on 5% level of significance in ANOVA and LSD.

Table 2. Percentage head formation of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatments	Percentage head formation	
	Conventional	Protected
control (RR)	41.67[c]	62.64[b]
RR + 5 % seaweed extract	62.93[b]	63.34[b]
RR +10% seaweed extract	64.28[b]	65.19[b]
RR +15% seaweed extract	48.84[c]	74.55[a]
RR +20% seaweed extract	61.38[b]	75.72[a]

Head Size

Lettuce under protected cultivation had significantly bigger head (polar and equatorial) than those planted in the open field condition (Table 3). The two varieties had the same head size. On the other hand, seaweed drippings foliar supplementation influenced the head size of lettuce. In the case of equatorial size of head, seaweed drippings supplemented lettuce of different concentrations was significantly bigger than control. However, no significant differences were observed on the equatorial head size among plants supplemented with 5%, 10%, 15% and 20% or at any concentrations. In terms of polar diameter, lettuce applied with recommended rate alone (control) had the least. As of interaction effects on the different factors, no significant differences were observed.

Rain shelters are primarily intended to protect the crops grown beneath them from damage by heavy rain. AVRDC (1993) reported that certain cultural practices such as use of raised bed and rain shelter improved survival following a period of intense rain and release the root system from flooding and presumably anoxic condition, leading to enhanced crop growth, vigor and fruit yields. Baudoin and Nisen (1990) also revealed that protective structures affect the quality, yield and time of production. In addition, plastic low tunnels provide the best way for off season cultivation of cucurbitaceous vegetables during winter season by modifying the microclimate around the plants.

Table 3. Head size and compactness of head of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatments	Head size (cm)	
	Polar	Equatorial
Cultivation System		
Open (conventional)	13.40[b]	14.45[b]
Protected (tunnel type)	14.36[a]	15.97[a]
Lettuce Varieties		
President	13.76	15.02
General	13.99	15.39
Seaweed Drippings		
control (RR)	12.90[c]	13.61[b]
RR + 5 % seaweed drippings	13.69[abc]	15.48[a]
RR +10% seaweed drippings	14.70[a]	15.89[a]
RR +15% seaweed drippings	13.53[bc]	15.19[a]
RR +20% seaweed drippings	14.55[ab]	15.86[a]
CV (%)	9.52	9.82

Yield of Lettuce

Weight per Plant (g) and Yield per Plot (kg)

The data on the weight per plant and yield per plot of field grown lettuce as influenced by cultivation system and fertilizer treatments is shown in Table 4. Results of the study revealed that field grown lettuce was significantly affected by cultivation system and fertilizer treatments. Field grown lettuce under protected cultivation and regardless of the variety significantly obtained higher yield than open field grown lettuce with a mean yield per plant of 246.79 and 203.05 g or equivalent yield in plot of 6.65 and 5.50 kg, respectively (Table 4). On the other hand, plants with seaweed drippings foliar fertilizer supplementation obtained a better yield than control. Seaweed drippings supplemented plants reached a yield ranging from 225 – 238 g per plant or 6.06 – 6.45 kg per plot while 193.34 g per plant or 5.22 kg per plot in plants with recommended rate alone (control). No statistical differences were observed on the different interaction effects on the study.

The higher yield of lettuce grown under protected cultivation and with seaweed drippings supplementation again may be related to the presence of significant effects on parameters such as time of heading initiation, percent head formation, and head size as discussed earlier (Tables 1 & 3). As observed, lettuce that formed head was generally heavier than those which did not form heads. Thus, protected grown plants and with seaweed drippings supplementation generated higher yield since size of head and percent head formation were significantly higher than open field grown plants and with no supplementation.

Table 4. Weight per plant, yield per plot and length of roots of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatments	Weight per plant (g)	Yield per plot of 3 m^2 (kg)
Cultivation System		
Open (conventional)	203.05 [b]	5.50 [b]
Protected (tunnel type)	246.79 [a]	6.65 [a]
Lettuce Varieties		
President	224.11	6.07
General	225.73	6.08
Seaweed Drippings		
control (RR)	193.34 [b]	5.22 [b]
RR + 5 % seaweed drippings	229.63 [a]	6.23 [a]
RR +10% seaweed drippings	225.68 [a]	6.06 [a]
RR +15% seaweed drippings	237.78 [a]	6.42 [a]
RR +20% seaweed drippings	238.15 [a]	6.45 [a]
CV (%)	10.22	10.54

Means in column within a factor followed by the same letters and those without letters are not significantly different from each other based on 5% level of significance in ANOVA and LSD.

The protective structure allows optimum growth and development of crops because they minimize abiotic and biotic stresses (Baudoin and Nissen, 1990). Growing vegetable under plastic cover in the lowlands provides protection against heavy rain and making vegetable production more profitable during rainy season.

On the other hand, the influence of seaweed drippings on the increased yield of lettuce was due to valuable macronutrients, micronutrients and hormone (6-BAP) that involve in cell division thereby influencing earlier formation of heads, more number of plants that formed head and bigger head size resulting to increase in yield. This finding on the effect of seaweed drippings supplementation is consistent with previous studies. The study of Rathore et al. (2008) showed that foliar applications of seaweed extract prepared from *Kappaphycus alvarezii* significantly enhanced yield parameters of soybean (*Glycine max*). The highest grain yield of soybean was recorded with applications of 15% seaweed extract, followed by 12.5% seaweed extract that resulted in 57% and 46% increases, respectively, compared to the control. In okra, yield and nutrition quality significantly increase to 20.47% at 2.5 % spray of liquid seaweed fertilizer (Zodape et al., 2008). Similar results were recorded by Blunden and Wildgoose (1977) as cited by Thirumaran et al. (2009) that seaweed extract induces maximum growth of *Cajanuscajan*. Moreover, spraying seaweed extract on the foliage of rice significantly influenced the growth, yield attributes and grain yield. Spraying of seaweed extract at 0.3 % twice at 50 % flowering and at milk stages recorded significantly higher growth and yield attributes. Grain yield increased to 26% (6055 kg ha^{-1}) when compared to control (4432 kg ha^{-1}) (Kavitha et al., 2008).

Leaf Chlorophyll Content

The results of the study showed that leaf chlorophyll content of lettuce increased as plant matures (Table 5). The chlorophyll content of the two lettuce varieties, president and general, before the application of fertilizer treatments were 27.7 and 24.5 in open field grown plants while 22.6 and 22.4 under protected cultivation. At 16 days after transplanting, leaf chlorophyll contents of lettuce grown in open field and with protective structures were about 29.08 and 28.78, respectively, and reached to 32.38 and 32.61 at 23 days after transplanting. However, statistical analysis revealed that leaf chlorophyll content of lettuce grown in pro-

protected and open field conditions did not differ significantly at 16 and 23 days after transplanting. For fertilizer treatments, leaf chlorophyll content of seaweed drippings supplemented lettuce was significantly higher than recommended rate alone (control). At 23 days after transplanting, leaf chlorophyll content of seaweed drippings supplemented lettuce reached to a range of 32.14 to 33.58 while control obtained a leaf chlorophyll content of 30.36. On the other hand, no significant differences were observed on any of the interaction effects of any factors in the study. This result evidently shows that the response of two lettuce varieties to seaweed drippings in terms of leaf chlorophyll content was the same whether grown with protected structures or open field condition.

Table 5. Leaf chlorophyll content of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatments	Leaf Chlorophyll Content	
	DAT	
	16	23
Cultivation System		
Open (conventional)	29.08	32.38
Protected (tunnel type)	28.78	32.61
Lettuce Varieties		
President	28.63	32.53
General	29.22	32.47
Seaweed Drippings		
control (RR)	26.56[b]	30.36[b]
RR + 5% seaweed drippings	29.75[a]	32.14[a]
RR + 10% seaweed drippings	28.58[a]	33.58[a]
RR + 15% seaweed drippings	30.34[a]	33.26[a]
RR + 20% seaweed drippings	29.41[a]	33.16[a]
CV (%)	8.04	5.36

The significant increase in the chlorophyll content of lettuce applied with foliar fertilizer than control was attributed by the seaweed drippings and is believed to affect the photosynthetic activity of the plant resulting to improved yield. This result is consistent with the findings of the study of Jothinayagi and Anbazhagan (2009) that seaweed liquid fertilizer (*S. wightii*) promoted the chlorophyll content of *A. esculentus* up to 20% when compared to control.

Profitability

Cost and Return Analysis

This was determined by recording all the expenses throughout the conduct of the study and income realized from the crops. Gross income was calculated by multiplying the total weight of marketable plants by the prevailing market price of lettuce per kilogram. The difference between the gross income and the expenses represents the net income.

The over-all economic analysis of the study revealed that cost of protected cultivation was higher of only PhP268.00 than in open field. The higher cost of production incurred in the protected cultivation system was due to the cost of net, labor in the preparation and construction of the structure and other materials needed in the structure. Despite of the higher cost of production under protected structure, results revealed that protected system is more profitable than open field condition due to the higher marketable yield obtained under the system compared with open field. Net income under protected cultivation was higher than open condition of PhP 3,211 (Table 6).

On the other hand, comparable economic analysis was observed on the two varieties of lettuce used in the study. Application of seaweed drippings increased the yield of lettuce than no supplementation or control which in turn provided a higher net income than control plants. Among the seaweed drippings treated plants, lettuce applied with 15% seaweed drippings obtained the highest net income of PhP 4,837 while the lowest net income of PhP 4,451 was observed in lettuce applied with 10% seaweed drippings.

Table 6. Over-all cost and return analysis of two lettuce varieties with varying levels of seaweed drippings foliar fertilizer grown under different cultivation systems.

Treatment	**Marketable Yield (kg)/3m^2 plot**	**Total Gross Income (PhP)**	**Cost of Production (PhP)**	**Net Income (PhP)**
Cultivation System				
Open (conventional)	5.49 = 164.7	16,470	6,693	9,777
Protected (tunnel type)	6.65 = 199.5	19,950	6,961	12,988
Lettuce Varieties				
President	6.07 = 182.1	18,210	6,852	11,358
General	6.08 = 182.4	18,240	6,802	11,438
Seaweed Drippings				
control (RR)	5.22 = 62.64	6,264	2,731	3,533
RR + 5 % seaweed dripping	6.23 = 74.76	7,476	2,776	4,700
RR +10% seaweed dripping	6.06 = 72.72	7,272	2,821	4,451
RR +15% seaweed dripping	6.42 = 77.04	7,704	2,866	4,837
RR +20% seaweed dripping	6.45 = 77.40	7,740	2,911	4,829

Price per kilogram = PhP 100.00

CONCLUSION

1. The two lettuce varieties under protective structure had higher yield, percent head formation and bigger head size than those grown in open field.

2. Yield performance of the two lettuce varieties as influenced by seaweed drippings as foliar supplementation was the same.

3. Optimum rate of seaweed drippings as foliar supplementation for lettuce is at 5%.

4. Protected cultivation is profitable than open field condition.

RECOMMENDATIONS

1. To increase yield and profitability in lettuce, protected cultivation can be used.
2. Any of the two lettuce varieties can be applied with seaweed drippings as foliar supplementation at an optimum rate of 5%.

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CLIMATE CHANGE MITIGATION AND ADAPTATION INITIATIVES IN HEI's in BOHOL: AWARENESS, PARTICIPATION AND IMPLEMENTATION OF THE PERSONNEL

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ABSTRACT

Climate change is an area that is currently in dire need of a wide range of publicity and other measures in order to mitigate its effect on the society. This is more so in the sense that informed public will make wiser and more accurate decisions and response to climate change issues. This study examined the level of climate change awareness among HEIs of Bohol. Three research objectives were created to guide the study. A self designed questionnaire titled "Climate Change Mitigation and Adaptation Initiatives in HEIs in Bohol" was administered on a sample of 64 instructors. Frequency distribution was used to illustrate the level of awareness on the basic of climate change , among teachers of the HEI's while population t-test was employed to analyze the significant difference of the level of awareness of the teachers on their basic knowledge of climate change issue. Weighted mean was used also to get the level of HEIs' implementation of their climate change initiatives and policies. Findings indicated that the level of climate change awareness was high generally among teachers and the initiatives were created and highly implemented.

*Keywords: Climate change, awareness, information, climate change initiati**ves***

INTRODUCTION

Climate change is often used to describe any kind of change in climate that may be natural or human- induced. It is defined as any long-term change in the patterns of average weather of a specific region or the earth as a whole (Ekpoh,2009). It is an abnormal variation in the earth's climate that usually occurs over durations ranging from decades to millions of years.

Climate change phenomenon has serious deleterious consequences for the earth in the form of significant variations in regional climates, recurrent droughts, excessive heat waves, windstorms, killer floods, and so on. Noticeable consequences of climate change such as intense thunderstorms, widespread floods and incessant droughts pose great dangers with consequences such as desertification, sea level rise, flooding, water salination, among others. These impacts could manifest in food security challenges, damage to infrastructure and social dislocation. Additional impacts include threat to health as rising temperature could bring about diseases such as chronic heat rashes, Cerebra-Spinal Meningitis (CSM), stroke, malaria and other related diseases. Climate change indeed will affect every citizen, every part of the environment and natural resources, and thus practically every aspect of human lives, the economy, the urban and sub-urban development patterns (Ekpoh 2009)

These devastating impacts of climate change posses significant challenges to societies worldwide. This global concern has emphasized the need for creating awareness and building community capacity for adaptation strategies to mitigate the effects of climate change. There is an immediate need to make people sensitive towards nature through a strong programme of climate change awareness. Thus, every government now is faced by how to make its citizenry adapt to the ever-changing conditions and impacts of global change and climate.

On the other hand, the Philippines, in response to the call of action has established an institutional mechanism, to facilitate convergence among government agencies in responding to the impact of climate change.

By the virtue of Republic Act 9729 or Climate Change Act of 2009, the Commission on Climate Change (CCC) was created.

The CCC was tasked to establish a National Framework Strategies on Climate Change for years 2010- 2022 and the creation of a National Climate Change Action Plan (NCCAP). The framework serves as the roadmap in creating a risk-resilient Philippines, with the general goal of building the country's adaptive capacity and increasing the resilience of natural ecosystems to climate change and optimizing mitigation opportunities (NCCAP,2011).

Moreover, Republic Act No. 9512 known as "*Environmental Awareness Education Act*", states that The Department of Education (DepEd), the Commission on Higher Education (CHED), the Technical Education and Skills Development Authority (TESDA), the Department of Social Welfare and Development (DSWD), in coordination with the Department of Environment and Natural Resources (DENR), the Department of Science and Technology (DOST) and other relevant agencies, shall integrate environmental education in its school curricula at all levels, whether public or private, including in barangay daycare, preschool, non-formal, technical vocational, professional level, indigenous learning and out-of-school youth courses or programs. Environmental education shall encompass environmental concepts and principles, environmental laws, the state of international and local environment, local environmental best practices, the threats of environmental degradation and its impact on human well-being, the responsibility of the citizenry to the environment and the value of conservation, protection and rehabilitation of natural resources and the environment in the context of sustainable development.

RA 9512 commissioned the different agencies to integrate environmental education in its operation and design priority programs , projects, and activities geared towards addressing the urgent and immediate environmental needs and concerns to all sectors of the community where they served.

The academe with its mission to create change towards sustainable futures may play a major role in terms of information and education campaigns to the community to make them understand on the climate change issues particularly on coping mechanism towards Disaster Risk Reduction (DDR) and Climate Change Adaptation (CCA) and sustainability of livelihood programs within this era. Timely communication of climate information may help improve public awareness on the issue , particularly on the frequency and seriousness of these extreme climatic events. Climate information awareness may help the public in initiating favorable actions that may lessen or prevent economic setbacks and humanitarian disasters that can result from climate extremes and long term climate change.

The role of the academe will go a long way in achieving this purpose. It has the responsibility to use its knowledge and independence to work towards positive change in the human condition.

Fundamental changes to the way of life are required due to global threats like climate change. The academe has the role to create transition towards a sustainable human development. The academe should not be purely 'academic', it should be applied towards creating a better world.

The academe can provide a vital link in the delivery of environmental knowledge, its associated problems and solution. Further, the academe may also be of great help in promoting the process of social change and instituting the society's capacity to organize human energies and productive resources in order to meet the challenges and opportunities that life presents to society in all times (Kant, Nimbrain & Mahidnra, 2013).

It is therefore the aim of this study to assess the Higher Education Institutions(HEI's) of the province of Bohol with its climate-change related activity plan that may help promote environmental advocacy to sectors of community. Specifically, it will try to identify the HEIs initiatives that includes among others livelihood development and research driven initiatives and programs that in some ways will make gradual changes in the protection of the environment , that are likely to have a much greater impact on the community in the future.

Further, this is to evaluate the level of awareness of HEIs regarding the government plans and programs in relation to climate change mitigation and adaptation that will make sustainable changes in the adaptation and protection of the environment.

Results may be used in formulating more integrated set of initiatives for the academe, that may enable the

community to cooperate in preparing and instituting actions to forestall or minimize damages brought about by climatic changes.

OBJECTIVES

Hence, the goal of the study was to assess how the Higher Education Institutions (HEI's) of the province of Bohol, help in giving out the correct message about climate change so as to mitigate and alleviate its effects. Specifically, this study wanted to : 1) assess the HEI's level of awareness to climate change related facts (science of climate change, causes and effects), 2) assess the HEI's participation on the implementation of the government's mitigation and adaptation measures through activities like information dissemination, researches and other related projects, and lastly, 3) to assess the level of the implementation of their own climate change initiatives and policies 4) be able to propose extension activities that may reinforce social awareness on climate change and its impact and become more responsive to the call of action.

METHODOLOGY

The study was conducted in the 12 HEI's of the province of Bohol namely Bohol Island State University (BISU) Main Campus, BISU Balilihan Campus, . A descriptive survey design method was adopted. The population employed for the study comprised of 64 instructors/personnel in the study area, the number and the individual/s were chosen purposely by the school heads to answer the questionnaires. The respondents were selected using the purposive sampling and Sloven's Formula. The instrument used in the study was a self developed questionnaire composed of three parts. The first part measured the extent and degree of climate change awareness of HEIs, the second part measured the participation of the HEIs in the mitigation and adaptation measures created by the government and the third part assessed the HEI's level of implementation on their own climate change initiatives and policies. To collect data for the study, the researchers personally visited the sampled schools in May to June of 2016, where teachers were met individually so as to explain the purpose of study. This measure ensured that the sampled subjects completed the questionnaire, and a 100 percent return rate achieved. Data obtained were subjected to statistical analysis using the Frequency Distribution , Weighted Mean and Population T-Test to illustrate the level of awareness among the teachers, to get the level of implementation of HEI's initiatives and to find the significant difference on the level of awareness of the teachers' on their basic knowledge of climate change.

RESULTS AND DISCUSSION

Climate change awareness involves creating knowledge, understanding and values, attitude, skills and abilities among individuals and social groups towards the issues of climate change for attaining a better quality environment. Climate change specialists have repeatedly pointed out that a solution to climate change problem will require climate change awareness and its proper understanding.

Figure 1
Teachers' Comparative Level of Awareness on Climate Change Related Laws and Policies
N = 64.

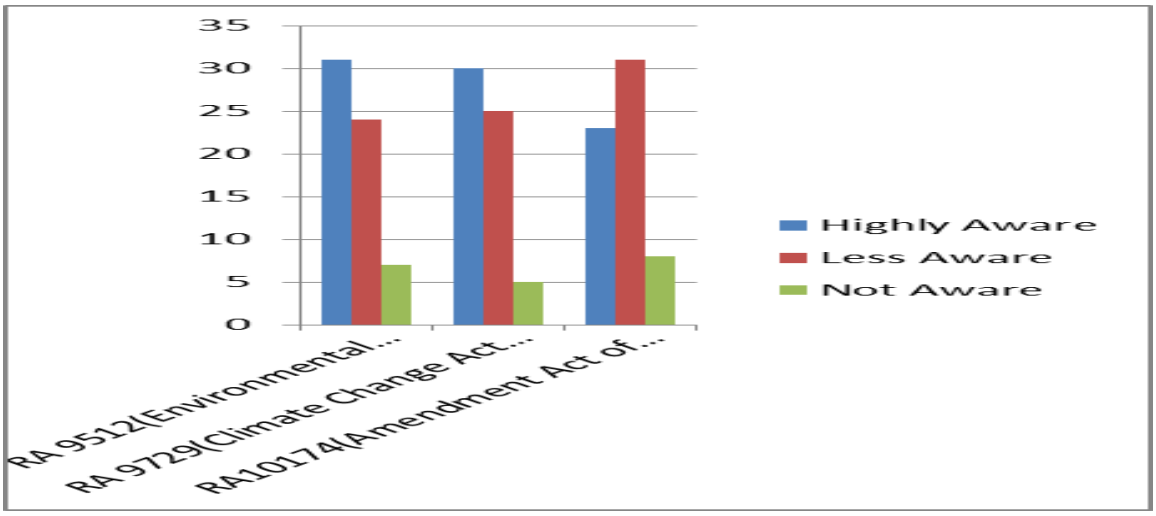


Figure 1 showed a comparative data on the level of awareness of the respondents in regards to some laws and policies about climate change. Most of the respondents were aware of the laws but it is worth noting that a significant number was also less aware or not aware at all. As these people were from the academe, an institution geared to create social changes for the betterment of the community, it is not good that they were so naive on the laws that formed the foundation of the national framework strategies on climate change.

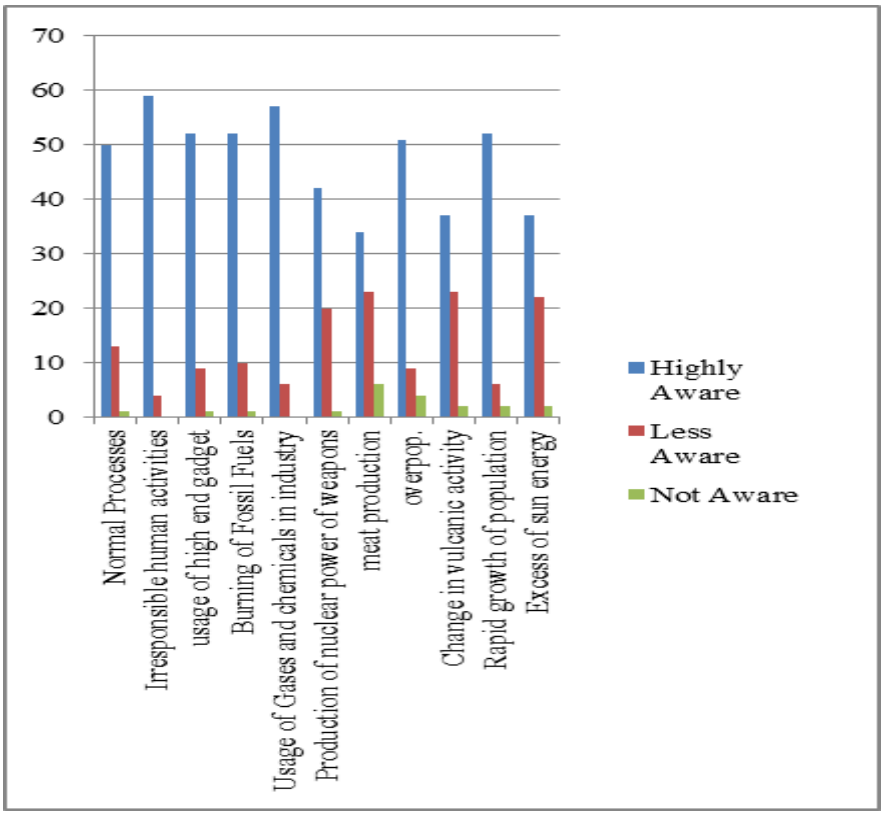
On the other hand, Table 1 shows that the level of climate change awareness among HEIs is not significantly high. The result reveals that the calculated t-value of -0.927 is found to be lower than the critical t-value of 2.201 at 0.05 level of significance and 11 degrees of freedom. This result means that the level of awareness of the teachers on laws and policies is not significantly high. Furthermore, a statistical comparison of the observed mean (x=2.68) and the expected mean value of 5.17 using population t-test gives a negative t-value. This implies that teachers level of awareness of climate change is significantly low.

Table 1
Population T-Test
Teachers' Level of Awareness on Climate Change Related Laws and Policies
N = 64

Variable	Expected Mean	Observed Mean	T-Computed	T-Tabular
Level of Awareness of laws and policies	5.17	2.68	-0.927	2.201

Level of Significance 0.05; df=11

Figure 2
Teachers' Comparative Level of Awareness on the Causes of Climate Change
N = 64.



With Figure 2, teachers appear to be largely aware of the causes of climate change. Irresponsible human activities , uses of gases and chemicals in the industry, use of high end gadgets, rapid growth of population and burning of fossil fuels got higher numbers and excess of sun energy and change in volcanic activity were chosen by few only, thus implicating that most teachers believed that human beings are responsible for climate change. But worth noting again is that there were still teachers who had little or no knowledge at all on the possible causes of climate change. As a medium for change, these people showed that there is a great need for HEIs to orient its people about climate change in general , for them to become effective agents of climate change programs.

Table 2
Population T-Test
Teachers' Level of Awareness on the Causes of Climate Change
N = 64.

Variable	Expected Mean	Observed Mean	T-Computed	T-Tabular
Level of Awareness of laws and policies	5.17	2.68	0.82	2.201

Level of Significance 0.05; df=11

Most of the teachers may have the knowledge on the causes of climate change, however Table 2 shows that the level of awareness on the causes of climate change awareness among HEIs is not significantly high. The result reveals that the calculated t-value of 0.82 is found to be lower than the critical t- value of 2.201 at 0.05 level of significance and 11 degrees of freedom. This result means that the level of awareness of the teachers on the causes of climate change is not significantly high.

Figure 3
Teachers' Comparative Level of Awareness on the Effects of Climate Change
N = 64.

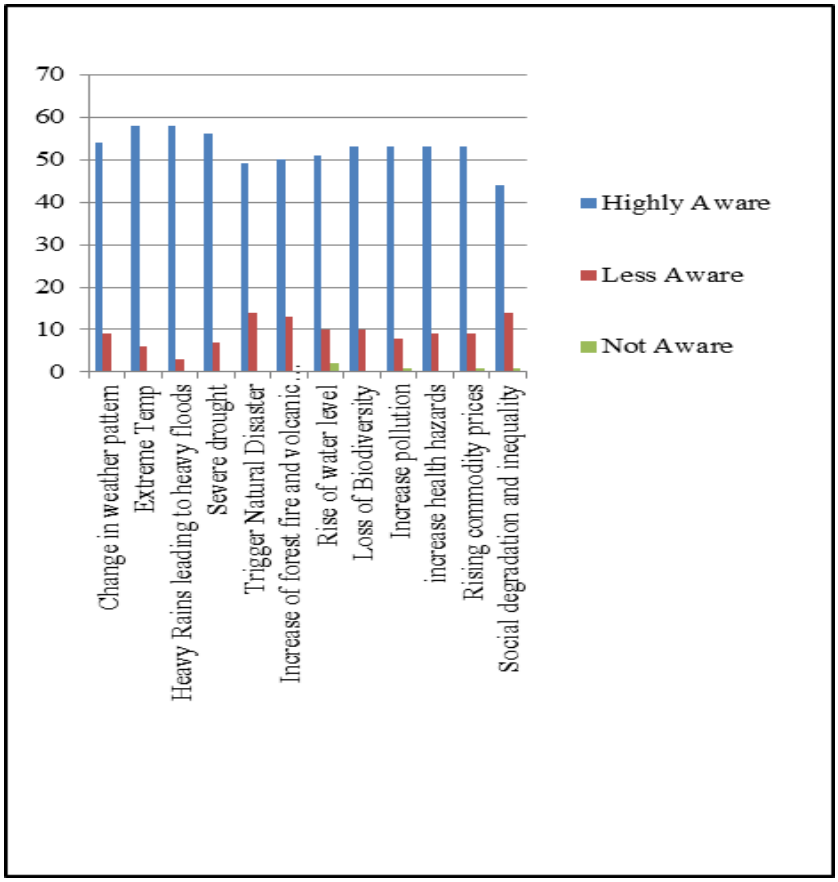


Figure 3 showed that most teachers are aware of the effects of climate change. Extreme temperature and heavy rains or heavy floods were greatly associated as effects of the climate change. But still a significant percentage of these teachers were less aware of these effects. These signified that HEIs lacked the drive to perform information dissemination even in its own perimeter.

Table 3
Population T-Test
Teachers' Level of Awareness on the Effects of Climate Change
N = 64.

Variable	Expected Mean	Observed Mean	T-Computed	T-Tabular
Level of Awareness of laws and policies	5.17	2.68	0.77	2.201

Level of Significance 0.05; df=**11**

Figure 3 shows that a great number of the teachers were highly aware of the effects of climate change. However, Table 3 shows that the level of awareness on the effects of climate change among HEIs is not significantly high. The result reveals that the calculated t-value of 0.77 is found to be lower than the critical t- value of 2.201 at 0.05 level of significance and 11 degrees of freedom. This result means that the level of awareness of the teachers on the effects of climate change is not significantly high.

Table 4
Level of Participation on Mitigation and Adaptation Measures of the Governement
N = 64.

Mitigation Measures	Weighted Mean	Description
Renewable Energy Sources/Use (Solar Photovoltaic (PV), Wind Turbines, Biomass Energy, Hydropower, Geothermal Energy)	2.93	Highly Participated
Improving energy efficiency in industries	2.52	Highly Participated
Cleaner fossil technology	2.44	Highly Participated
Improvement of transportation (Use of improved rapid public transportation, Use of hybrid/electric cars, Improvement of non-motorized transport system: use of bicycles)	2.51	Highly Participated
Efficient energy use (Home appliances, Industrial and office appliances, Attitudinal changes: reduced water use, reduced energy consumption)	2.75	Highly Participated
Promotion of Forest conservation and restoration, Afforestation and reforestation activities and Reduced deforestation and improvement of forest management	2.79	Highly Participated
AVERAGE WEIGHTED MEAN	**2.66**	**Highly Participated**

Adaptation Measures		
1.Agriculture : use of tolerant/resistant crop and livestock varieties, irrigation, improved drainage, food storage, land management	2.63	Highly Participated
Water supply : Water conservation	2.80	Highly Participated
Health sector : improvement of living standard, increase hygiene awareness, vaccination and development of health infrastructure	2.73	Highly Participated
Capacity building : Human resources development and information, Technology transfer	2.59	Highly Participated
Arid and semi-arid : improved crop, grassland and livestock management, dissemination of improved crop varieties and breeds, community grain storage for food distribution and, water harvesting and storage	1.95	Less Participated
Humid : Change to dam and infrastructure specifications, storm and the flood resilient building codes, river defences, watershed management, restricting development in high risk	2.38	Highly Participated
Coastal and islands; Construction of coastal defences: hard defences ± revetments, embankments; soft defences ± mangroves, coral reefs. Wetland conservation, restoration of beach vegetation, prevention of soil erosion, relocation of settlements and infrastructure,	2.46	Highly Participated
AVERAGE WEIGHTED MEAN	**2.51**	**Highly Participated**

Table 4 revels that most HEIs had actively and greatly participated in the government's drive to inform the public about the mitigation and adaptation measures for climate change. HEI's had intensified this drive by propagating information caravan, researches and other related projects. This implies that HEIs had made great effort in reaching out the community to become responsive to the government's call of action in order to alleviate impacts of the climate change.

Table 5
Different Initiatives & Policies made by HEIs
N = 64.

Different initiatives and policies made by HEI's to sustain its implementation on climate change	Weighted Mean	Description
Promote Greening University	2.42	Highly Implemented
Conduct symposium on climate change to the students.	2.62	Highly Implemented

Integration of climate change topic into the different subjects in the curriculum	2.53	Highly Implemented
Involvement to research related to climate change	2.34	Highly Implemented
Conduct seminars in relation to climate change	2.46	Highly Implemented
Propagation of Extension activities or School Projects related to climate change	2.37	Highly Implemented
A model for environmental responsibility in their communities	2.41	Highly Implemented
Promote low environmental impact from environmental-certified providers.	2.21	Less Implemented
Coordination or collaboration of the local government unit, NGO's to address vulnerability to climate change	2.47	Highly Implemented
Constant assessment on the policies and the people assigned related to climate change	2.19	Less Implemented
AVERAGE WEIGHTED MEAN	2.4	Highly Implemented

More so, Table 5 shows that most HEIs had drawn and created its own initiatives and policies to sustain the implementation of climate change related programs of the government. Most HEIs highly implemented these initiatives and policies within their respective campuses. As one of the key sectors in charge of the implementation of climate change mitigation and adaptation programs for sustainable development, most HEIs created inspiring initiatives and implemented good practices developed over time. This means that HEIs had implemented integrated set of initiatives to foster cooperation in preparing and instituting actions to forestall or minimize damages from potential natural disasters brought about by climatic changes.

CONCLUSIONS

Based on the findings of the study conclusions were drawn:

1. That although most HEI's were highly aware of the basic of climate change, results revealed that awareness among its members, particularly on the law, causes and effects of climate change are significantly low.

2. However, with its long history of influencing the development of science and society as well as policy, HEI's of Bohol had significantly played its role in shaping and providing knowledge and learning to the community.

3. There is an ongoing efforts of HEI's in redesigning systems of knowledge in the context of accelerating environmental changes, including associated risks and disasters, as well as new social dynamics and technological advancements.

4. Thus, extension activities are essential to reinforce social awareness on the impact of climate change.

RECOMMENDATIONS

Based on the conclusions above, the following are recommended:

1. HEI's should include in their annual calendar of activities on the orientation of teachers/employees who have low awareness and low participation towards climate change to assign them on specific task regarding climate change.

2. Propose the following extension activities: tree planting program, recycling proper waste disposal.

ACKNOWLEDGEMENT

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FOOD CONNECT: A MOBILE RECOMMENDER APP FOR RESTAURANTS AND CAFES

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ABSTRACT

Mobile applications tend to be the medium for many businessmen for easier promotion and marketing incentive. This study aimed to develop Food Connect: A Mobile Recommender App for Restaurants and Cafes. Specifically, it determined the preferences of consumers in choosing Restaurants and Cafes; developed the mobile application and determined its level of usability in terms of Effectiveness, Efficiency, Satisfaction, Learnability, Memorability, Errors and Cognitive load. Descriptive and developmental methods were used through online survey questionnaires and RUP model. Respondents consisted of 1000 head count for determining consumer's preference in choosing Restaurants and Cafes and 83 respondents in determining the Food Connect level of usability. The result of the online survey was used as the basis for overall rating, Rational Unified Process (RUP) model was used for the development of Food Connect; and the developed system was evaluated as very highly usable.

Keywords- Mobile App; Recommender App; Reservation; Email; SMS

INTRODUCTION

Over the fast-growing development of technology in the modern age, there are many mobile applications (apps) that are introduced which capture the society. As more people embrace the smartphone age, the number of consumers online continues to multiply each day. Unlike their counterparts on desktops and laptops, the average smartphone user has gradually bid farewell to the traditional browser and they now favor mobile apps. According to Moth (2013), a report from Compuware suggests that 85% of the consumer is strongly in favor and prefers apps that are ahead of mobile sites. The most common reason for this is that apps are seen to be 55% more convenient, 48% are faster and 40% are easier to browse. Because of this, owners of restaurants, cafes and other food businesses are considering mobile apps that would help put the business in customer's pockets. After all, in the article of Perez (2014) cited the reports from Flurry which states that in 2014, 86% of times spent online via smartphones are spent using apps.

One of the advantages of the mobile applications is the in-app search and app store. TechTarget (2016) define an app store (application store) as an online portal through which software programs are made available for procurement and download. Businessmen and stakeholders know that mobile apps make the business easily accessible to clients. Other than the ease of use that an app promises, it also allows clients to access to an online space frequented by younger users: the app store. Whether on iOS or Android, app stores allow people to stumble on your business when they are using that store's search. Sefferman (2013) quotes two studies in Moz blog—one by Nielsen and one by Forrester— which show that around 61% of consumers find apps through the app store search. App store listings also appear as separate entries on Google's search rankings, allowing more people to see your business. Also, an In-app search provides substantial results.

Indeed, mobile apps have many impacts to the society and in the business industry. According to the article of Bezerra, Bock, Candelon, Chai, Choi and Corwin (2015) entitled, "The Mobile Revolution: How Mobile Technologies Drive a Trillion-Dollar Impact," the fastest-growing small and medium-sized businesses are those that continually adopt advanced mobile technologies. Small and medium-sized enterprises (SMEs) that use mobile services more intensively account for 25% of the market, with their revenues growing up to two times faster than their competitors.

Realization that mobile as medium for many businessmen makes it easier to issue promotions and marketing incentive to the user in the industries and commerce. Also, such mobile apps are used to lessen the burden of the clients in searching to address curiosity or queries relative to their needs and the user can keep the virtual information with and carry it around till the time needs arises. Most of the clients cannot count the times they have sat waiting for computers to take over one minute to boot up and have found their patie-

nce tested. Mobile Apps take the "wait" out of mobile. In fact, mobile apps are becoming so functional and popular among consumers because of its speed, volume of information and advertising. In connection, businesses like restaurants and cafes are popular nowadays, and there are many mobile applications used in the industry to have smooth progress of the gap between these concerns residing within clients and restaurants and cafes.

In line with this growing development in the society, La Union is a province in the Philippines located in the Ilocos Region in the island of Luzon. Its capital is the City of San Fernando, which also serves as the regional center of the whole Ilocos Region. The province covers a total area of 1, 497.70 square kilometres (578.27 sq. mi) occupying the central-southern section of the Ilocos Region in Luzon. There are 19 municipalities and 1 component city, all which are organized into two legislative districts.

La Union in terms of economy is known for its soft broom industry and offers major products such as handwoven blankets, baskets, pottery, rice wine, sugarcane wine, and vinegar, wood and bamboo crafts, rice cakes, antique-finish furniture, dried fish, coconuts, sea urchins, malunggay and pebble stones. Aside from the diversified service, manufacturing and agricultural industry of the province, as years goes by, there are geared with growth and development when it comes to tourism and showcasing local food of the province. The province was entitled as "The Surfing Capital of the North," which leads the place to be known all over the country. These days, food and delicacies were exposed and blossomed in many places and municipalities of the province. La Union is lucky to have an association that assists stakeholders in line with tourists and food establishments, namely La Union Hotel, Resort and Restaurant Association (LUHRRA), an internationally recognized association of Hotels and Resorts in the Province of La Union. The association consists of the top hotels and resorts, which caters to all types of newcomers, from the business man just staying for the night, or an entire family having a weekend getaway. And nowadays, tourist and province locals is facing with several food choices each day and make decisions on what food to eat based on several criteria and restaurants and cafes in the place. It became hard for the consumers and tourist to choose a place where to eat, especially for those who are not familiar with the geographic area of the province. Also, consumers are increasingly careful about what they eat, and, on the supply side, restaurants and cafes are adopting strategies aimed at satisfying new market demands connected to food products. Indeed, environmental recommendations are gradually assuming a more important role, affecting consumer behavior regarding food choices at the present time. And, in order to help users find relevant information, a system could be built to filter out irrelevant or uninteresting information based on what the system believes the user likes. For example, the scene in a large city that a consumer has never visited, trying to find a good place to eat. There would be lots of options. To reduce the number of options it would certainly help to ask a friend who lives in the city for recommendations, or to consult a magazine for restaurant reviews. In this regard, recommender systems are another approach to information filtering, which is extensively used in several domains, such as media, products and services that are worth detail viewing. Recommender systems do the information filtering by predicting whether a user will like or dislike an item. This prediction is based on the user's explicit and implicit ratings/preferences, other users' ratings, and user and item attributes. Also, it directly interacts with consumers, helping them find products they will like to purchase and answer questions like what the consumer prefer to buy now or where the consumer wants to eat.

Consequently, it is very important for the restaurants and cafes in La Union to have a dependable automated computer-based system or application that will gratify the raised concerns in terms of food choices and need of strategies to catch the fancy of consumers and will result highly visited and rated restaurant and cafes with increase in profits for the managers and owners of the said field. La Union at this time has no specific mobile application and or even automated computer-based system focusing on reviews, sentiments and feedbacks of stakeholders which can lead and help owners for the betterment of their services and business itself. Automated computer-based system or mobile applications would facilitate the situation of the scenario and would benefit the restaurants and cafes and the clients. At the moment, there were many applications deployed and even social media was used to promote the province and places to dine-in.

Also, the province is currently improving the tourist attractions of the place and keeps on accepting investors to put up further hotels, restaurants and cafes in the place. Based on the sentiments of the consumers gathered through aspect star-rating, which identify subjective or emotional indicators in the 5-star rank in creating ratings of food, environment and services of the restaurants and cafes, there are many things to consider in improving the province in terms of food and place preference in this era. The ability to quickly understand consumer attitudes and react accordingly is something that can assist owner of Restaurants and Cafes in La Union.

They took advantage of it especially if there are positive or negative feedbacks. Overall, assessing the consumer preference will help them to review and measure the things related to their business as they continue to improve and excel to obtain better services. Hence, Food Connect: A Mobile Recommender App for Restaurants and Cafes was aspired to endow with the solution on the meagerness of the presently promotion of tourism to be accessed online with the use of application or through the use of a browser.

STATEMENT OF OBJECTIVES

The main objective of this study is to develop the Food Connect: A Mobile Recommender App for Restaurants and Cafes that identifies the consumer preference through location-based marketing.

Specifically, the study addressed the following objectives:

1. To determine preferences of consumers in choosing restaurants and cafes;
2. To develop an application that generates list of recommended restaurants based on the rated given by the consumers; and
3. To determine the level of usability of Food Connect: A Mobile Recommender App for Restaurants and Cafes in terms of:
   - **A.** *Effectiveness*;
   - **B.** *Efficiency*;
   - **C.** *Satisfaction*;
   - **D.** *Learnability*;
   - **E.** *Memorability*;
   - **F.** *Errors/Error-free/Accuracy;* and
   - **G.** *Cognitive load.*

METHODOLOGY

This study used descriptive and developmental types of research.

Descriptive research design fits this study in determining consumer preference in choosing Restaurants and Cafes and to determine the level of usability of Food Connect: A Mobile Recommender App for Restaurants and Cafes. Further, the researcher used traditional and online survey questionnaires to gather information and to determine the level of usability of the mobile application.

On the other hand, development research design was used to develop the Food Connect: A Mobile Recommender App for Restaurants and Cafes using Rational Unified Process.

Fig. 1 shows the Rational Unified Process model used by the researcher in developing the mobile application. **Rational Unified Process (RUP)** provides a disciplined approach to assigning tasks and responsibilities within a development organization. During the *inception phase*, case is to be established for the system and delimit the project scope. The *elaboration phase* involves analyzing the problem domain, establish a sound architectural foundation, and eliminate the highest risk elements of the project.

During the *construction phase*, the stage prototype will be developing into an actual working system. The final phase is the *transition phase* wherein, it transitions the system to the user community.

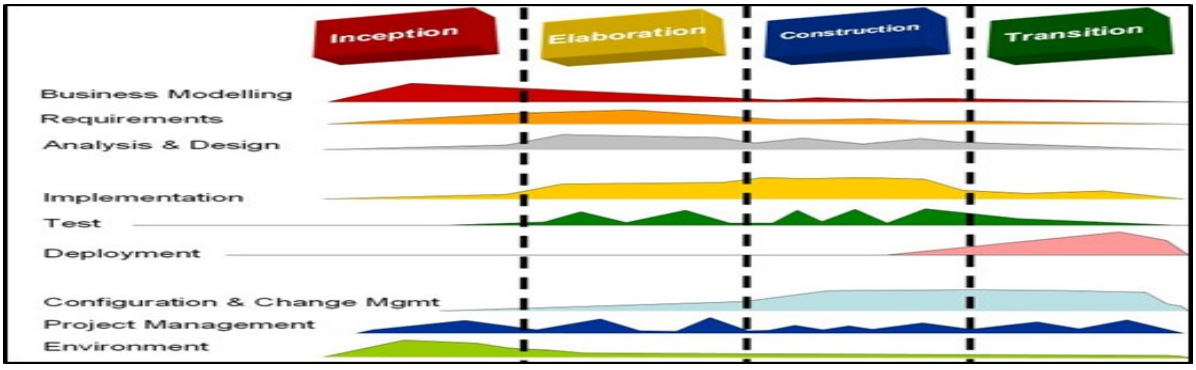

Fig. 1. Rational Unified Process

This study utilized survey questionnaires and 5-star rating to derive information about the determination of consumer preference in choosing Restaurants and Cafes and to determine the level of usability.

Purposive sampling was used in determining the preference of consumer in choosing restaurant and cafes. This comprise of 1000 respondents or consumer of restaurants and cafés as approved by the panel members. The survey questionnaire based on surveymonkey.com by Frances Sun was executed using Google Forms.

For the determination on the level of usability of Food Connect: A Mobile Recommender App for Restaurants and Cafes, seven (7) officers of the LUHRRA or the owner of the restaurants and cafés are part of the respondents and based on the table from www.idatassist.com for determining a sample size for a certain study with a huge number of population which is for the 8% precision with a population proportion of at least 15% in at the 95% confidence level, the table shows that about 76 respondents or consumer of the restaurants and cafés required and the for that La Union locale are the target respondents. A total of 83 respondents in all.

TABLE 1. Distribution of Respondents of Food Connect: A Mobile Recommender App for Restaurants And Cafes

Respondents	Sample
Preference of Consumer	1000
Owner of Restaurants and Cafes	7
Consumer of Restaurants and Cafes	76
Total	1083

Also, the level of usability of the developed mobile application was evaluated via People At the Centre of Mobile Application Development (PACMAD) instrument or the usability test questionnaire. Each of the factors has an impact on the overall usability of the mobile application. In addition to the many factors considered by the PACMAD model, it also considers the **user**, the **task** the user is trying to complete and the **context of use** which refers to the environment in which the user will use the application. Each of these factors will impact the final design of the interface for the mobile application.

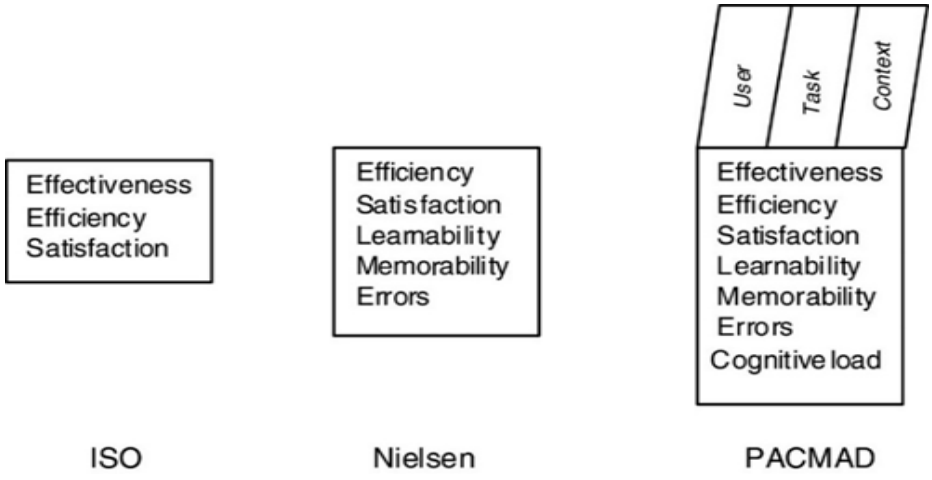

Fig. 2 PACMAD Model

Moreover, according to Marcus (2016), PACMAD usability model aims to address some shortcomings of existing usability models when applied to mobile apps. The PACMAD model identifies seven attributes used to define metrics for usability evaluation in mobile apps.

Effectiveness is the ability of a user to complete task in a specified context. *Efficiency* is the ability of the user to complete their task with speed and accuracy. *Errors* are how well the user can complete the desired tasks without errors. *Learnability* is the ease with which the user can gain proficiency with an application. *Memorability* is the ability of the user to retain how to use an application effectively. *Cognitive Load* analyzes the impact that using the mobile device will have on the user performance. *Satisfaction* is the perceived level of comfort and pleasantness afforded to the user through the use if the software.

The PACMAD model would be much more efficient as a usability model as it has many more factors and attributes to consider and is appropriate to be use in determining the level of usability of Food Connect.

On the other hand, the researcher used various data analyses based on the objectives set for this study.

The results from the survey questionnaire on determining preference on consumer in choosing Restaurants and Cafes that accounts access for consumers were analyzed by using weighted mean. The item with mean were treated with the highest star value and favorably preferred by the customer in choosing Restaurants and Cafes.

Also, the results from the survey questionnaire was embedded in the app to ensure the intended system requirements of the development of the Food Connect: A Mobile Recommender App for Restaurants and Cafes. The item with the highest mean indicates that the mobile application is functioning and the response will give a face-value impression.

The frequency count and mean were used for the treatment of data taken in the level of usability of application based from a study pertaining to use PACMAD model for usability evaluation (Saleh, A., Ismail R., and Binti, N., 2015). The statistical range of the study which was inferred using the following Likert scale (Saleh, A., Ismail R., and Binti, N., 2015):

Numeric Equivalent	Statistical Range	Descriptive Equivalent Rating	Descriptive Interpretation
5	4.20-5.00	Strongly Agree	Very Highly Usable
4	3.40-4.19	Agree	Very Usable
3	2.60-3.39	Neutral	Usable
2	1.80-2.59	Disagree	Moderately Usable
1	1.00-1.79	Strongly Disagree	Not Usable

REVIEW OF LITERATURE

The existing studies, theories and technologies has been considered in order to gather related information for this study and to develop the mobile application.

Relationship of Information Technology and Economic Growth in Hospitality Industry

According to Cavusoglu, M. (2015) as he cited the study of Sledzik (2013) and Tichy (2011), stating that Schumpeter's main contribution to economics was showing the role of technological innovation in economic growth. As a result of that study, Schumpeter (1939) concluded that one of the most important reasons for economic upswings is technological innovation. Further, Leung and Law (2013), states that information technology is playing a crucial role as one of the most important tools in the hospitality industry. And was supported by Cobanoglu and Collins (2008) claiming that information technology is an inseparable part of the hospitality industry.

Moreover, Cavusoglu, M. (2015) also cited the statement of Kimes (2008) which points out that the benefits of technology in hospitality industry include: shortening time spent in the ordering process, enhancing processing in food production, speeding up the service time, providing faster payment, shortening seat turnover or turnaround time (e.g., near field communications and/or table, and decreasing labor cost. In 21 addition to these benefits, other improvements that technology may provide competitive advantage, enhanced productivity, higher profitability (Kasavana, 2011), and cost minimization (Thompson, Ekman, Selby, and Whitaker, 2014), better employee management and customization of customer preferences in the restaurant industry (Ansel and Dyer, 1999).

Mobile Applications

Techopedia, Inc. (2015) defines mobile applications as a move away from the integrated software systems generally found on PCs. Instead, each app provides limited and isolated functionality such as a game, calculator or mobile Web browsing. Although applications may have avoided multitasking because of the limited hardware resources of the early mobile devices, their specificity is now part of their desirability because they allow consumers to hand-pick what their devices are able to do.

According to Meier, C. (2017), having a website doesn't mean the restaurant owner don't also need a mobile app because as consumers switch to using mobile devices more than desktops, the approach to digital marketing needs to evolve. And the website remains an important tool for discovery, with the mobile app serving as a way to market more effectively to customers with a known interest in the restaurant. Growing the restaurant isn't only about attracting new customers, but also about increasing support from the existing customers.

With the abovementioned existing theories and study of mobile application and business related concerns, the researcher has able to apply the concept of inverting and immerging the software development into an android system applications for the trends that might affects the latest and most in demand structure nowadays.

FINDINGS

A. Determining preferences of consumers in choosing Restaurants and Cafes

There are a lot of factors to be considered in choosing restaurant and cafes nowadays, however, based on the online survey conducted to 1000 respondents, only six factors are considered and they are as follows: Restaurant Concept, Dining Environment, Food Quality, Service, Price and Convenience.

As shown in Figure 1, the six factors can be identified with the color of the bar from the most considered factor to the least considered factor in choosing a restaurant and café. The price of the food they ordered is the determining factor in which 395 consumers ranked it as number 1 which is color blue bar, followed by restaurant concept with 261 consumers rated it as number 2 with the color red bar. Then, the third considered factor is dining environment with 232 consumers with the color orange bar and trailed with convenience having 365 consumers graded it as the fourth considered preference in choosing restaurant and café with the color green bar. While the fifth considered preference is service in which was presented as the color violet bar with 355 consumers and the color sky blue bar, the least considered factor by the consumer in choosing restaurants and cafés is the food quality with 357 consumers.

Fig. 3 also shows the rank of the factors from most considered to the least considered before the number of consumers where indicated.

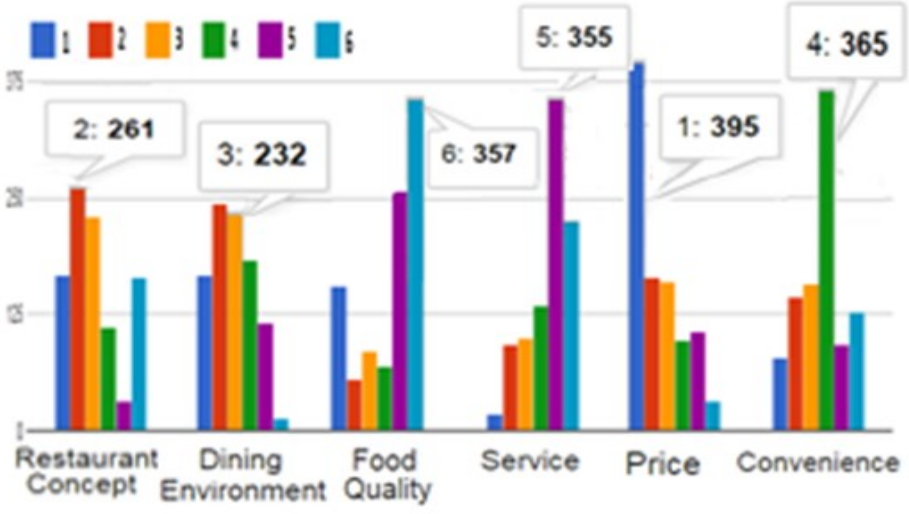

Fig. 3 Factors to be consider in choosing restaurants and cafes

Also, National Restaurant Association (2015), fortified the results of the online questionnaire in which also states seven factors consumers take into account when choosing a restaurant. First were the h**ealthier options** wherein more diners are looking for healthful options when they dine out, and restaurants are responding to that demand. Secondly, the e**co-friendly dining.** It is when consumers choose a restaurant, many consumers are thinking about the earth as much as their palates. Thirdly, as we are in the new era, consumers considered t**echnology, in which t**he number of consumers who say technology options like smartphone apps or self-service kiosks are an important factor in choosing restaurants is on the rise, up to about 25 percent from roughly 20 percent a year ago. The increase spans generations, with older and younger customers alike expanding their use. Also, **Quality innovative food, Local Foods and Ethnic cuisines were considered, these other three factors show that consumers have individual differences in choosing the type of restaurants they want to go. Lastly, Mobile options, where consumers are looking way forward that their restaurants have food track or at least can be located easily or just nearby.**

The finding of this study, therefore, is to respond for an integration of restaurants and cafes' information and data in a mobile application where it is like putting all in the pocket. This means that consumers are in need of an application that can help them to lessen their dilemma in choosing the restaurants and cafes considering their preferences. As people are now entering in a more hi-tech challenges in the economic competencies among restaurants and cafes in the country, both consumers and restaurants owners must embraced changes and join the raise to the more advanced business ventures.

B. Food Connect: A Mobile Recommender App For Restaurants And Cafés

The results of the determination of preferences of consumers were embedded into the development of the system through creating a model that would fit to the preference of consumers in choosing restaurants and cafes. Also, with the use of star rating, the recommender adapts to preferences of consumers

Further, it was developed using the Rational Unified Process (RUP) Model by the Rational Software for software development. It divides the development process which involves business modeling, analysis, design, implementation, testing and deployment. It uses Java Script, PHP, HTML, WAMP, PhoneGap and iFramework7. The developed system provided the functionalities of the online reservation, mobile application restaurants and cafes advertisements, computerized viewing, adding, editing, deleting and turn-over of process as well as uploading of data of restaurants and cafes in the mobile application.

The Food Connect is mobile apps intended for the use of everyone to help them choose a restaurant and café that fits their personality and preference. The dilemma of knowing where the best places to dine, were given a solution through the recommender app. The Food Connect allows consumers to navigate search filter which can narrow down their choices and their type of restaurant and cafes based on the preference, location and 5-star rating reviews as rated by other consumers.

And also for the restaurant and cafés owners to aid them in advertising their business as well as increase the number of consumers to visit their place.

Plate 1 shows the home page of Food Connect and the FoodConnect APK for the user of the mobile application

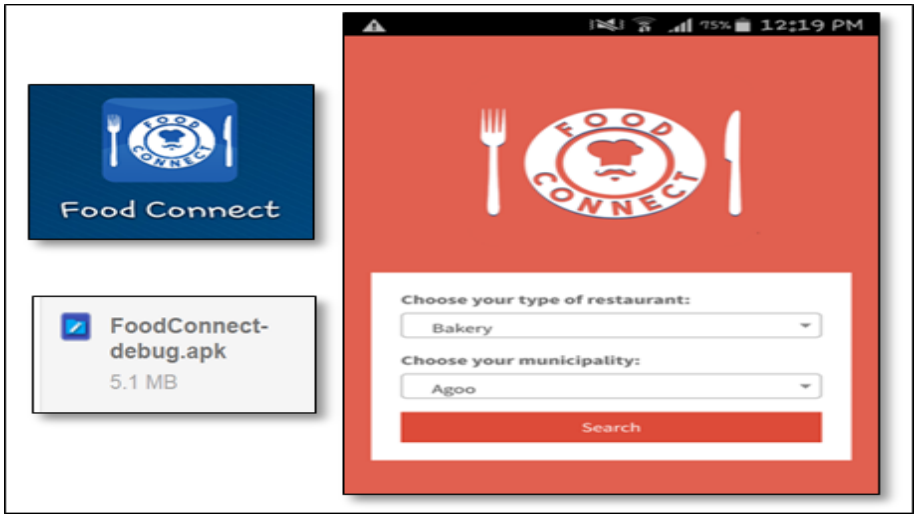

Plate 1. Mobile Application

Plate 2 shows the recommended restaurants based on the preference and a by the rated consumers using the 5 star rating.

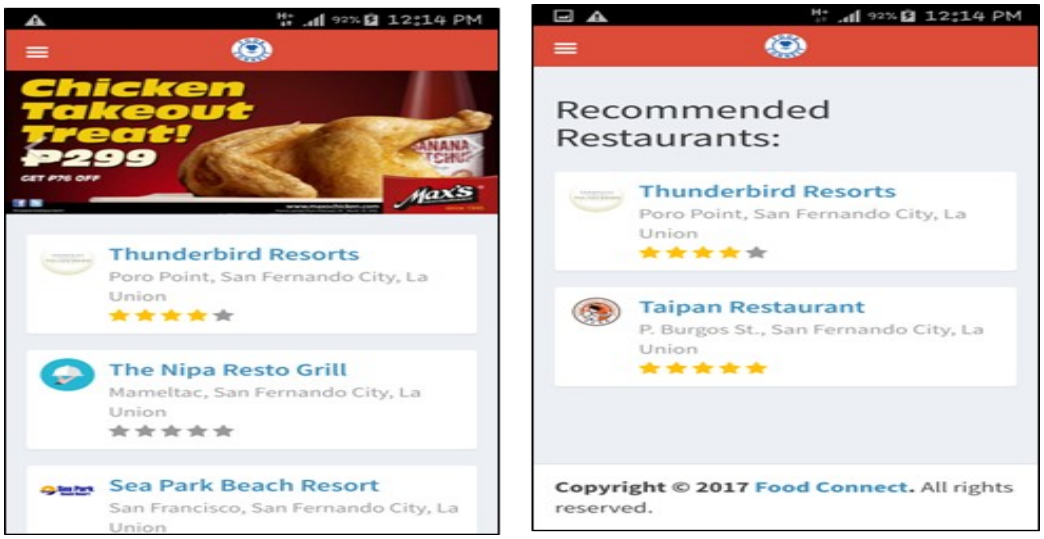

Plate 2. Recommended Restaurants as shown in the Mobile Application

Plate 3 shows how to add restaurant details that can be included in the list of restaurants and cafes in the mobile application

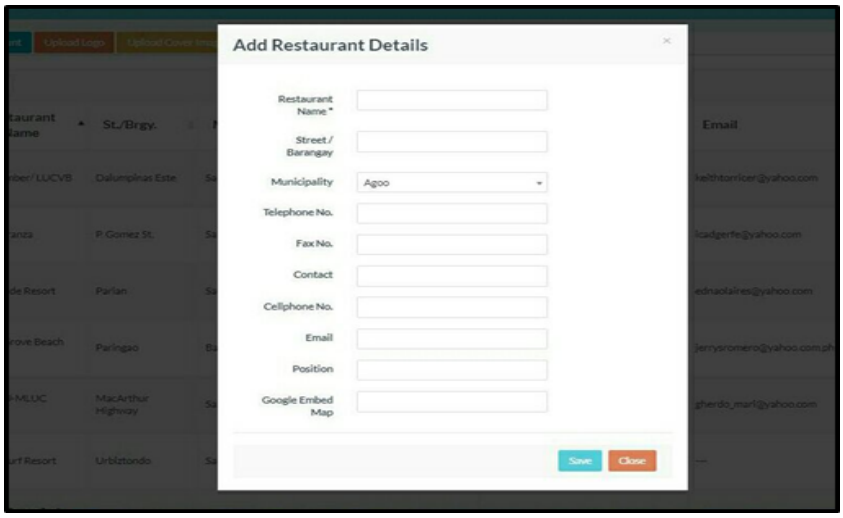

Plate 3. Add restaurant details.

C. Level Of Usability of Food Connect: A Mobile Recommender App For Restaurants And Cafés

TABLE II. The Level of Usability of Food Connect

Indicators	Mean	Descriptive Equivalent Rating	Descriptive Interpretation
1. Effectiveness	4.62	Strongly Agree	Very Highly Usable
2. Efficiency	4.70	Strongly Agree	Very Highly Usable
3. Satisfaction	4.64	Strongly Agree	Very Highly Usable

4. Learnability	4.72	Strongly Agree	Very Highly Usable
5. Memorability	4.71	Strongly Agree	Very Highly Usable
6. Error-free	4.69	Strongly Agree	Very Highly Usable
7. Cognitive Load	4.71	Strongly Agree	Very Highly Usable
Mean rating	**4.69**	**Strongly Agree**	**Very Highly Usable**

Table II sums up the level of usability of Food Connect: A Mobile Recommender App for Restaurants and Cafés. Over all, the respondents strongly agreed that the mobile application is Very Highly Usable along the PACMAD instrument as evidence by the grand mean of 4.69. In which all the indicators were rated and described as Very Highly Usable.

The general findings of this study, therefore, are strengthened by the statement of Ford (2013) supports the findings where in the phrase "there's an app for that" can be applied to just about any personal or business activity. With a relatively low cost of entry and tremendous ease of use, it's no wonder that businesses of all kinds have embraced apps and mobile technology as a way to stay competitive, growing, and profitable. And, like so many operations, restaurants thrive on efficiency and guest satisfaction. So it should come as no surprise that more and more restaurants are eyeing apps as an alternative or supplement to traditional guest paging, server paging, and table management systems. Further, regardless of how the technology evolves — and there is no question that it will evolve — it will continue to be a win-win for both restaurant operators and their guests.

This shows that the respondents generally perceived the level of usability of the Food Connect is effectively and efficient to use, satisfactory in nature, easy to learn and understand, error free and can handle several processes. The respondents hit upon the comparison between manual searching of information about the restaurants and cafés and the developed mobile application wherein it became beneficial not only to the stakeholders but also to the owners of the restaurants and cafés and make the transaction in reservation and other processes fast, accurate and efficient. Therefore, Food Connect: A Mobile Recommender App for Restaurants and Cafés is indeed Very Highly Usable.

The significant findings of this study were as follows:

1. The result of the online survey questionnaire, price has been the general determining factor of consumers in choosing the restaurant and cafés however the other factors are also considered by some. In this regard, a recommender app which is an approach to information filtering, extensively used in several domains, such as media, products and services that are worth detail viewing has come into an impression.

2. The Food Connect was developed using the Rational Unified Process (RUP) Model by the Rational Software for software development. It divides the development process which involves business modeling, analysis, design, implementation, testing and deployment. It uses Java Script, PHP, HTML, WAMP, PhoneGap and iFramework7. The developed system provided the functionalities of the online reservation, mobile application restaurants and cafes advertisements, computerized viewing, adding, editing, deleting and turn-over of process as well as uploading of data of restaurants and cafes in the mobile application.

3. In terms of level of usability, the system has been evaluated as Very Highly Usable with the rating of 4.69.

CONCLUSION

Based from the above findings, the following conclusions were drawn:

1. Price is the most considered factor by the consumers in choosing restaurant and cafés. Hence, the restaurants owners better off keep the acceptable level of other factors while keeping the price low as possible.

2. The developed system was viable with its development and deployment using the RUP model.

3. The developed Food Connect in terms of the level of usability can help consumers to find the restaurant and cafes based on their preference and as recommended via 5 star-rating.

RECOMMENDATION

Based on the formulated conclusions drawn, the researcher thereby recommends the following:

1. Consumers must also consider others factors as their preference in choosing restaurants and cafés.
2. Owners must provide improvements such as adopting new technology for the advancement of the restaurants and cafes to a computer-based operation, preferably a mobile application to render the best service that they can offer to the consumers.
3. The RUP model can be used in the development of related projects and/or systems as it is the finest that fits the development of the Food Connect.
4. LUHRRA may adopt and deploy the developed Food Connect in order to have an interactive, fast, and reliable transaction in terms of reservation and advertising their services.
5. The users of the developed system must undergo training for them to be able to fully operate the mobile application.
6. The LUHRRA must advertise the mobile application to the stakeholders and for wide dissemination of information and usability of the system.
7. There is a need for additional equipment to maximize the use of the developed system such as additional computers and mobile phone.
8. The mobile application should be compatible in both Android and IOS.

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THE MATHEMATICAL STRUCTURE OF THE PATTERNS OF HABLON ILONGGO

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ABSTRACT

With the hope to uplift the century-old tradition of hablon weaving and provide a contribution to the literature of ethnomathematics, this study was conducted to find out the mathematical structure and patterns of the various weaving designs of Hablon Ilonggo. To gather the data needed for this research, the researchers utilized the hablon designs of Brgy. Indag-an Multipurpose Cooperative, Miagao, Iloilo. Taking of pictures and videos, actual observations, and personal interviews with the weavers were done in order to find out the mathematical model that can best explain the different weaving designs. The result showed that Frieze Group is a mathematical model that best represents the various classifications of the hablon weaving designs. Mostly of the frieze groups were found in patadyong and gown. The seven frieze groups observed were: F_1–translation only, F_2–translation and glide reflection, F_3–translation, horizontal line reflection, and glide reflection, F_4–translation and vertical line reflection, F_5 –translation and 180° rotation, F_6–translation, 180° rotation, vertical line reflection, and glide reflection, and F_7–translation, 180° rotation, horizontal line reflection, vertical line reflection, and glide reflection. The hablon weaving designs do not only reflect the Ilonggos' ingenuity and artistry but also their mathematical prowess. Thus, for future studies to be conducted, combinations of the seven functions of frieze groups in hablon can be considered in order to form a new design. Other mathematical concepts may be further studied in order to better explain the classifications of the hablon weaving designs.

Keywords: Ilonggo, Hablon, Mathematics, Structure, Weaving Design

INTRODUCTION

"Hablon" is the local term for any hand-woven textile made from natural fibers such as cotton, banana, pineapple, and other indigenous materials that create attractive colors. It is used in an array of products ranging from coin purses, bags, placemats, pillowcases, patadyongs, barongs, gowns, skirts, shawls, kerchiefs, school uniforms, and other household items (mosquito nets, blankets, table runners, etc.) and many more. These products are admired for their unique material and craftsmanship. Hablon fabric is emerging into a versatile and unique textile, currently making waves in the Philippine and international haute couture. It also shows great potentials in the global market.

The weaving industry in Miag-ao, Iloilo boasts of a long history that date back to the later part of the Spanish era, and was formerly known as "habol" or "hinabol" made only of fibrous natural materials. The weavers made innovations by combining them with man-made fibers introduced in the early 1920's, and started to produce colorful textiles known as, "hablon". Hablon has evolved to become a major player in the Philippine textile industry, with its heyday in the 1950's up to the 1970's.

The time-consuming manual process of weaving hablon has remained unchanged for hundreds of years. Looms have been used for centuries to make cloth. They come in all sorts of shapes and sizes.

In order to raise the technical and artistic standards of loom weaving in Iloilo, the Iloilo Producers Association (IPA) has tapped the skills of popular local artisans who have acquired their expertise in handloom weaving through several generations. The culture and art of this time-honored tradition are mirrored in exquisite native products vibrant with traditional colors and designs or subtly muted in rural hues.

Weaving follows a pattern depending on the design one wants but usually it has square or rectangular shapes with colorful threads used. Designs indicate social status and are used on different occasions. The prices vary considerably according to the fineness or coarseness of the texture and the greater or lesser amount of mixture. It also depends on the amount of embroidery work found on the cloth. Furthermore, ac-

cording to Marin (2006), designs go bolder, with dramatic and theatrical pieces by combining rich colors of the fabric with embellishments of ethnic prints. According to Morano (2011), the Multi-purpose cooperative's weavers of hablon make about seven types of patadyong: pinalang-palang, linibat, rinadyo-radyo, pinutian, Venus Sky, balintawak and tresgarilles. The designs were copied from the weavers' great grandparents, which are variations of squares colored red, yellow, white and black that are geometrically arranged.

With the increasing demands for hablon and availability of resources, "hablon" industry may serve as a source of income to thousands of Filipino households especially in the community of Miag-ao, Iloilo. The well-crafted and long lasting "hablon", people keep buying it for it has various significant uses. Hence, proper attention and continuous innovations on the decorative and artistic side of the product is needed. Understanding the in-depth information about the historical evolution of hablon weaving designs and patterns through its mathematical structure using a suitable mathematical model motivated the researchers to conduct this study.

This study is one of the practical applications of mathematical models in the cultural aspects of our society. This will also contribute to the expanding literature on Ethnomathematics. Specifically, this will help the weavers not only to enhance the appearance of the fabric but also to add to its glamour through the use of high quality threads and colors. However, other designs may be invented to meet the needs of the present fashion industry. But in the final analysis, whether old or new, patrons of hablon fabrics invariably cherish their uniqueness and their cultural implications. Moreover, hablon designs provide us the rich heritage of our forefathers in the fields of Mathematics. The design enables us to further clarify and gain a much deeper insights into the mathematics practice by the early Ilonggos. The designs in hablon fabrics reflect not only the Ilonggos' ingenuity and artistry but also their mathematical prowess. Thus, a thorough inspection of these designs will contribute not only to the literature of ethnomathematics but will also pave the way to the development of new and novel fabric designs that will improve the quality and marketability of hablon fabrics.

This study was conducted to find out the mathematical structure and patterns of the various weaving designs of Hablon Ilonggo weavers of Barangay Indag-an Multi-purpose Cooperative, Miag-ao, Iloilo.

OBJECTIVE OF THE STUDY

1. Determine what mathematical structural models can best explain the weaving designs of Hablon Ilonggo.

Methodology

This study is focused in classifying the weaving designs used in the hablon products made by the hablon weavers of Barangay Indag-an Multi-purpose Cooperative, Miag-ao, Iloilo.

The descriptive research was employed in the study. According to Gay (1992), descriptive research study, determines and describes the way things are. Survey research is discussed in some detail for two major reasons. First, a high percentage of research studies rely on surveys for data, as a result, are descriptive in nature. Second, the survey method is useful in investigating a variety of educational problems and issues.

The participants of the study were the ten purposively selected weavers of the Primary Multipurpose Cooperative of Brgy. Indag–an, Miag-ao Iloilo.

To gather the data needed for this research, the researchers utilized the hablon products provided by the hablon weavers of Brgy. Indag-an Multipurpose Cooperative, Miagao, Iloilo. Documentations like video and taking of pictures of the hablon products were done. Observations on the actual weaving and personal interviews with the weavers were also conducted. After all these processes, the researchers analyzed the designs present in the hablon products based on its color of the warp and weft, texture and usage using the Symmetric Groups specifically the Frieze Groups, a mathematical model that can best explain the weaving designs. The warp represents the colors of the threads used vertically, while the weft represents the colors

of the threads used horizontally found in the hablon products.

The analyses for the data gathered were based on the following mathematical concepts:
Algebraic Structure (Group).Let ° be an operation which takes two elements *a* and *b* of a set S and forms the element *a*° *b*.

Property 1. Associativity

(*a*° *b*)° *c* = (*a*° *b*)° *c*

Property 2.Identity Element, e = identity element

a ° e = *a* = e ° *a*

Property 3.Inverses, *b* = inverse of *a*

a° *b* = e = *b*° *a*.

Property 4.Commutativity (for Abelian Groups)

a ° *b* = *b* ° *a*

Thus, the classification leaves us with six types of functions:

I - the identity where $\mathbf{I(r_1, r_2) = (r_1, r_2)}$.

$\mathbf{T_a}$ - a translation where $\mathbf{T_a(r_1, r_2) = (r_1 + a, r_2)}$.

$\mathbf{G_a}$ - a glide-reflection where $\mathbf{T_a(r_1, r_2) = (r_1 + a, - r_2)}$.

H - a reflection through the horizontal line $\mathcal{L}$, where $\mathbf{H(r_1, r_2) = (r_1, - r_2)}$.

$\mathbf{V_p}$ - a reflection through a line perpendicular to $\mathcal{L}$ through the point **(p, 0)** where $\mathbf{V_p(r_1, r_2) = (2p - r_1, r_2)}$.

$\mathbf{R_m}$ - a rotation of 180 degrees around the point **(m, 0)** where $\mathbf{R_m(r_1, r_2) = (2m - r_1, - r_2)}$. Note that $\mathbf{T_0 = I}$, and $\mathbf{G_0 = H}$.

*Translations***.**A translation slides all the points in the plane the same distance in the same direction. This has no effect on the sense of figures in the plane. There are no invariant points (points that map onto themselves) under a translation.

Glide reflections.A glide reflection translates the plane and then reflects it across a mirror parallel to the direction of the translations. A glide reflection changes the sense of figures in the plane. There are no invariant points (points that map onto themselves) under a glide reflection.

Reflections.A reflection flips all the points in the plane over a line, which is called the mirror. A reflection changes the sense of figures in the plane. All the points in the mirror contain all the invariant points (points that map onto themselves) under a reflection.

Rotations. A rotation turns all the points in the plane around one point, which is called the center of rotation. A rotation does not change the sense of figures in the plane. The center of rotation is the only invariant point (point that maps onto itself) under a rotation. A rotation of 180 degrees is called a half turn. A rotation of 90 degrees is called a quarter turn.

Translations only. (HOP)This group is singly generated, with a generator being a translation by the smallest distance over which the pattern is periodic. Consequently the group is isomorphic to Z, the group of integers.

Glide-reflections and translations. (STEP) This group is generated by a single glide reflection, with translations being obtained by combining two glide reflections. Consequently, this group is also isomorphic to Z.

A Reflection in a vertical axis. (SIDLE) It is the same as translations and reflections across certain vertical lines. The elements in this group correspond to isometries (or equivalently, bijective (affine transformations) of the set of integers. The group is generated by a translation and the non-trivial group in the one-dimensional case.

Translations and 180° rotations. (SPINNING HOP) Again, the transformations in this group correspond to isometries of the set of integers, and so the group is isomorphic to a semidirect product of Z and C_2. The group is generated by a translation and a 180° rotation.

Reflections across certain vertical lines, glide-reflections, translations and rotations (SPINNING SIDLE).

The translations here arise from the glide reflections, so this group is generated by a glide reflection and a rotation. It is isomorphic to a semi-direct product of Z and C_2.

Translations, the reflection in the horizontal axis and glide reflections.(JUMP) This group is isomorphic to the direct product $Z \times C_2$, and is generated by a translation and the reflection in the horizontal axis.

Translations, glide reflections, reflections in both axes and 180° rotations. (SPINNING JUMP) This group is the "largest" frieze group and requires three generators, with one generating set consisting of a translation, the reflection in the horizontal axis and a reflection across a vertical axis. It is isomorphic to $C_2 \times$ (a semidirect product of Z and C_2).

RESULTS AND DISCUSSIONS

The seven frieze patterns were observed in the eighteen Hablon Ilonggo designs. The hop, step, sidle, spinning hop, spinning sidle, jump, and spinning jump.

IMAGE 1 shows the vertical mirror symmetries spaced half the translation length.

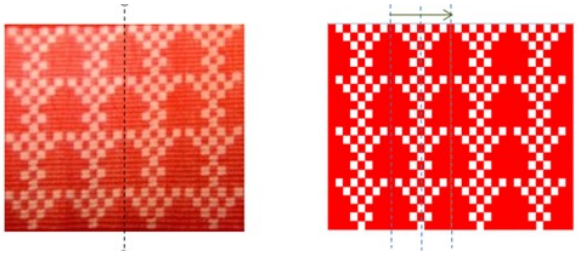


IMAGE 2 shows the translation, vertical reflection along a broken line, and rotation along a point.

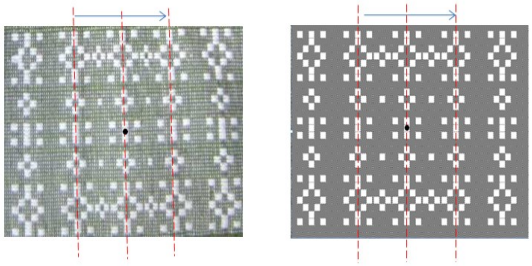


IMAGE 3 shows a translation and a reflection across certain vertical broken line.

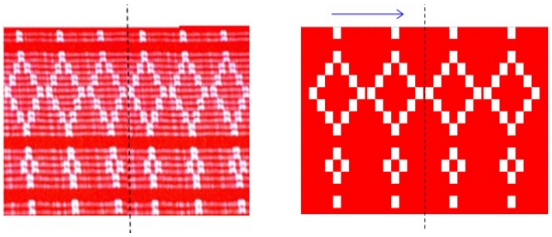


IMAGE 4 illustrates translation, vertical reflection, horizontal reflection in both axes, glide reflection, and 180° rotation along a point.

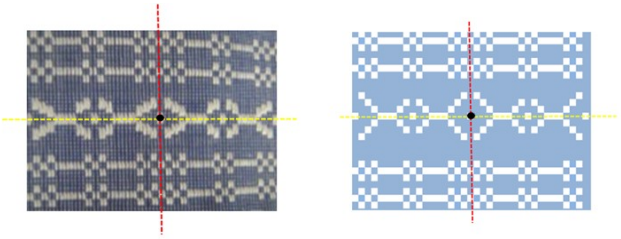


IMAGE 5shows translation, glide reflection, vertical reflection along the red broken line, and horizontal reflection in yellow broken line, and 180° rotation along the intersection of reflection.

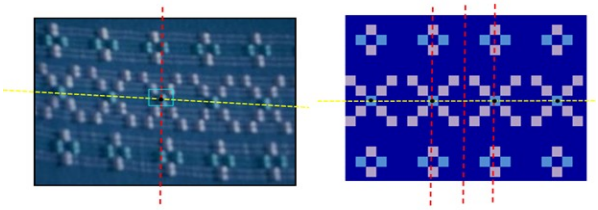


IMAGE 6 demonstrates translation, vertical reflection along the red broken line, horizontal reflection along the yellow broken line, and 180° rotation along the intersection of reflection.

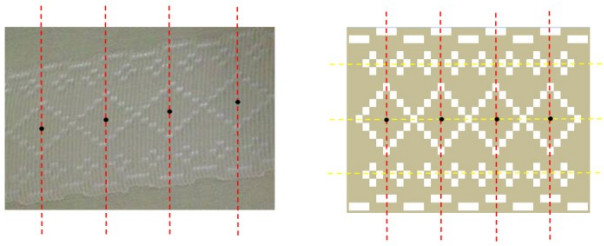


IMAGE 7 shows the translation and vertical reflection.

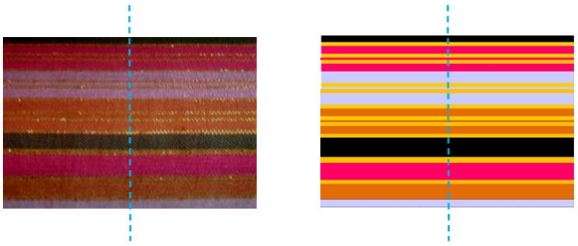
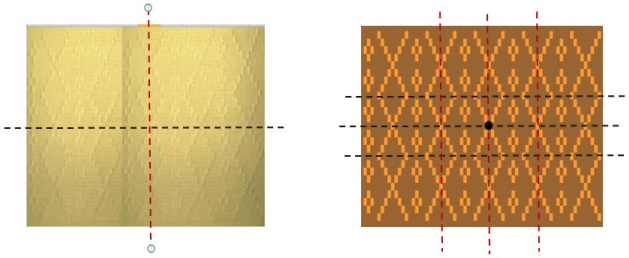


IMAGE 8 illustrates translation, vertical reflection along the red broken line, horizontal reflection along the black broken line, 180° rotation along the point of intersection of reflection, and glide reflection.



Given the whole design IMAGE 9, it shows the existence of a translation symmetry, vertical reflection along the red broken lines, horizontal reflection along the black broken line, 180° rotation along the intersection of black and red line, and a glide rotation.

Given design (A) inside a box, there is a translation symmetry, vertical reflection, horizontal reflection along the blue broken line, 180° rotation along the intersection of red and blue broken line and glide reflection.

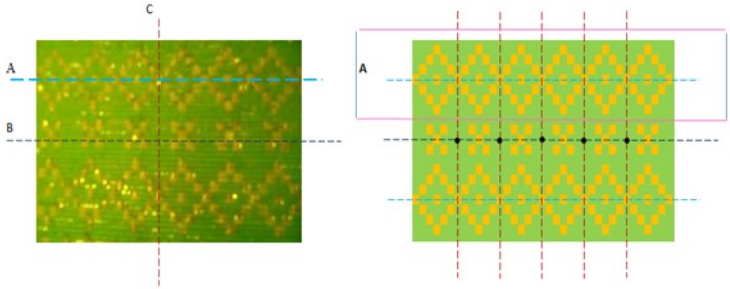


IMAGE 10 shows a blue arrow line representing a translation and vertical reflection along the broken line.

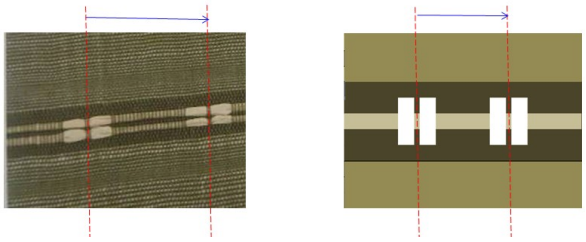


IMAGE 11 illustrates symmetry of translation, vertical reflection and horizontal reflection, glide reflection and 180° rotation along the point of intersection of reflection.

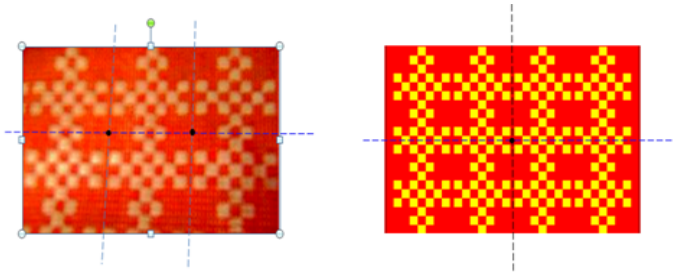


IMAGE 12shows the symmetry of translations represented by the arrow. It reflects horizontally and vertically, a 180° rotation along the point and glide reflection.

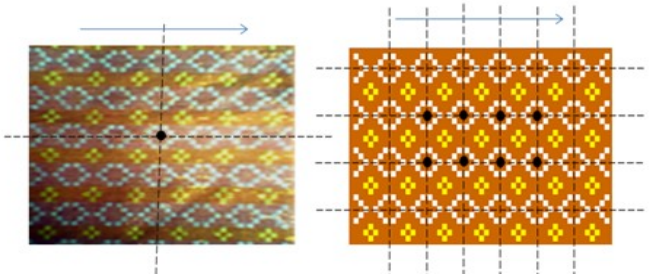


IMAGE 13 demonstates translation, vertical reflection, horizontal reflection and glide Reflection, and 180º rotation along a point of the intersection.

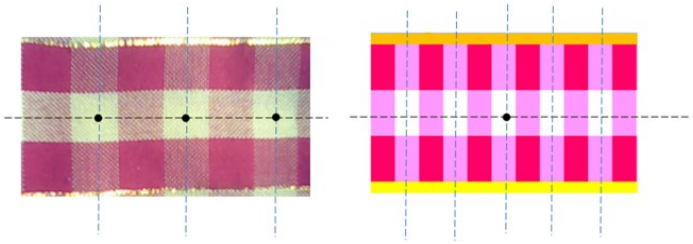


IMAGE 14 shows the translation and vertical reflection along the red broken line.

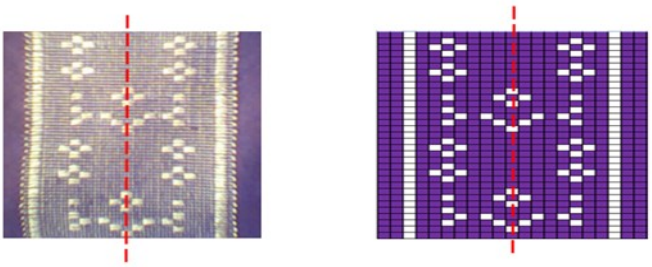


IMAGE 15shows the translations, glide reflections, reflections in both axes and 180° rotations along a point.

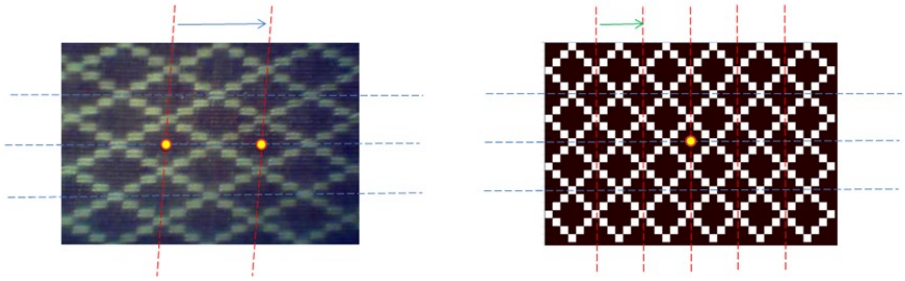


IMAGE 16 illustrates translations shown by an arrow and glide reflections, reflections in both axes and 180° rotations along the point intersection of reflection.

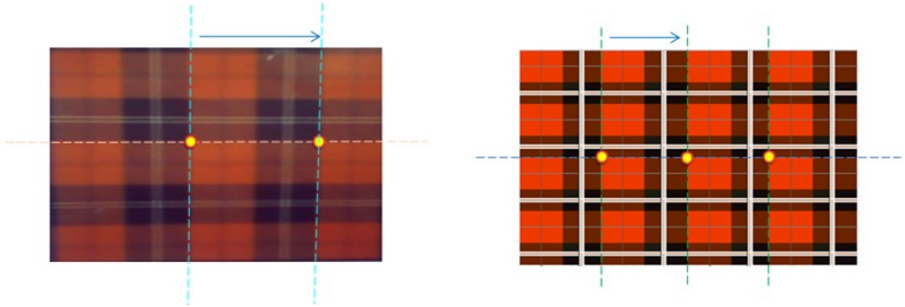


IMAGE 17 shows translations and glide reflections, reflections in both axes and 180° rotations along the point of intersection of reflection.

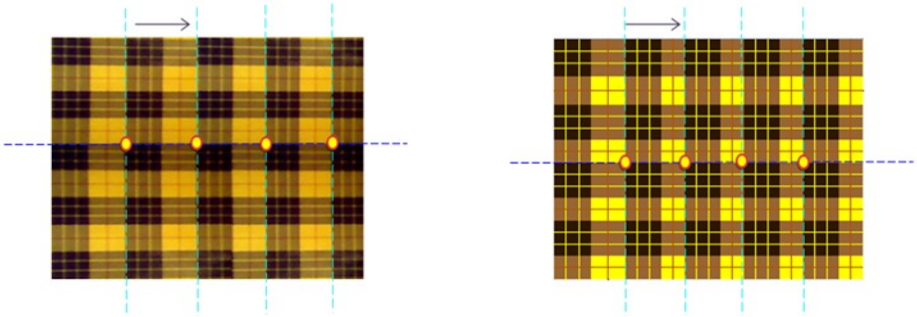
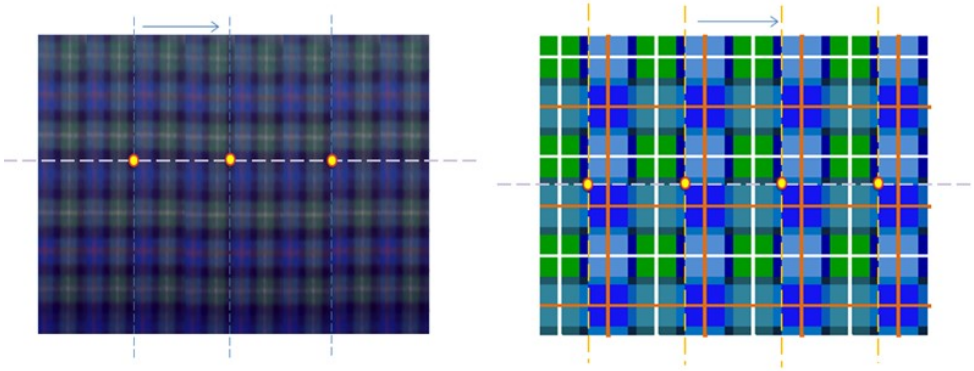


IMAGE 18 illustrates translations, glide reflections, reflections in both axes, and 180° rotations along the point of intersection of reflection.



Aslaksen and Poh (2002) was able to find all the seven types of frieze patterns on the Blue and White Porcelains of the Ming Dynasty. Of the seven, vertical reflection only appeared most frequent while horizontal reflection only is a rare pattern that has only appeared once. The frequency of the rest of the patterns seems to be quite even showing that the decorators of the porcelains frequently use these frieze patterns without obvious preference. In the case of the Peranakan Porcelain only six out of the seven classes of frieze patterns was observed. The vertical reflection only still appeared as most frequent while reflection in the vertical axis was never observed.

CONCLUSIONS

Frieze Group was used in the classification of the hablon weaving designs; however, not all the seven functions of Frieze group were applicable in certain design. Mostly of the frieze groups are found in patadyong and gown. The seven frieze groups observed were: F_1–translation only, F_2–translation and glide reflection, F_3 –translation, horizontal line reflection, and glide reflection, F_4–translation and vertical line reflection, F_5 – translation and 180° rotation, F_6–translation, 180° rotation, vertical line reflection, and glide reflection, and F_7–translation, 180° rotation, horizontal line reflection, vertical line reflection, and glide reflection.
Hence, Frieze Group is a mathematical model that best represent the various classifications of the hablon weaving designs.

RECOMMENDATIONS

For future studies to be conducted, combinations of the seven functions of Frieze Group in hablon can be considered in order to form a new design. Other mathematical concepts may be further studied in order to better explain the classifications of the hablon weaving designs.

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ESTIMATING AND FORECASTING DOMESTIC WATER DEMAND IN BONTOC, MOUNTAIN PROVINCE: A CATALYST TO WATER DEMAND MANAGEMENT

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ABSTRACT

This study estimated the domestic water demand of a person in Bontoc, Mountain Province, Philippines. It uncovered the different household approaches on collecting and using water in the light of water scarcity. Forecasting future domestic water supply and demand leads to the determination of optimal future levels of water use and supply and hence to the design of an effective water demand management program. Frequency distribution was used to describe the data gathered; Analysis of Variance was used to test the mean differences in domestic water consumption; and multiple regression analysis was used to define the domestic water demand equation, estimate, and forecast. This study found out that the two main sources of water managed by the Bontoc Water Unit discharged an average of 28 liters per second. The average domestic water consumption of a resident in Bontoc, Mountain Province, Philippines is 90.09 liters per day on activities such as personal hygiene (44%), sanitary services (30%), cooking (16%), laundry (8%), and drinking (2%). Multiple regression analysis reveals that as household income increases and the household head educational attainment advances, per capita domestic water demand increases. However, as household size increases, per capita water demand decreases. From the forecasted data of domestic water supply and demand, there is an undersupply of water of 101,054 liters per day on 2016 with an annual 30% average increase.

Keywords: Domestic water, multiple regression analysis, household size, household income, Bontoc.

INTRODUCTION

Water is essential for the sustenance of man on earth - health, food, energy, transportation, nature, leisure, and all the products being used today is dependent on water. There is now a conflicting water demand for use in domestic, agricultural and industrial purposes in the face of water scarcity.

Water shortage is a persistent problem in urban and rural areas in the Philippines despite the abundance of water bodies. In Bontoc, Mountain Province, a second class municipality and the center of commerce in the province, water shortage had been the subject of protests and complaints by the residents since 1973. Manochon (2010) mentioned in her research that among the problems that beset the Bontoc General Water Services include: a) the unequal distribution of water in the community; b) lack of water supply to the houses at the tail end of the town which the local water management failed to address; c) inequitable or unfair payment of water fees for residential and business establishments; d) installation or connection of individual household water pipes without the consent of the Bontoc Water Services; e) issues pertaining to the safety of the water for drinking or for home use. Most distribution pipes and fittings of the Bontoc water system have worn out causing leaks and increased frictional loses. According to Funabashi and Miyaoka (1984), 20-40 % of all the water in distribution systems is lost through leakage.

In May 2014, the municipal officials of Bontoc declared its four central barangays in a state of calamity due to dire and widespread shortage of domestic water (Doga-ong, 2014).

The three major existing water sources are Sullong water source, Baybay water source, and the Balabag water source. Water from the three sources are collected through gravity flow system and directed to the 25,000 gallon capacity –main tank before it is distributed. In the case of small urban systems designed by LWUA, water is first fed by gravity to a tank and from there released to the distribution system (Hebert and Yniguez, 1986).

This study examines the domestic water management in Bontoc, Mountain Province. It gathers information on the different domestic end uses of water and the flow patterns of the discharges of water from the sources. It connects the per capita water consumption of a person to the key factors that influence his domestic water consumption as basis for estimating and forecasting the domestic water demand per person

per day. Knowledge of the water supply situation; domestic end uses of water; factors affecting domestic water consumption; and domestic water demand and supply forecasts become the driving forces in coming up with an effective water demand management program for Bontoc.

Empirical studies show that household water demand is largely determined by the household income. Demand for water moves in the same direction as household income. A study in Urban Kathmandu Valley reveals that higher economic class (class I) with 11% of the total population consume 149 lpcd, Class II (33% of total population) consume 109 lpcd, Class III (42% of the total population) consume 55 lpcd and Class IV (14% of total population) consume 31 lpcd (Joshi, Shrestha, & Shresta, 2003). This finding is consistent with the study of Javier, Inocencio, & Padilla (1999) which reveals that average water consumption (for all household activities) increases as incomes increase as shown by the 48 liters per capita per day (l/c/d) consumption of the Metro Manila poor and 108 l/c/d of the rich. Dagnew (2012) claimed in his study that the source of household water affects the water consumption apart from income. Amin, Bamdad, Kamgar, Haghighi, Keshavarzi, Keshtkar, & Sharifzadeh (2006) reported that the low level of education of elders regarding environmental matters lead them to consume more water than do younger people. By contrast, Fan et al. (2013) showed in their study that older people tended to use less water because of traditional practices of water usage (washing hands, showering, and sharing water among family members) and their unfamiliarity with water appliances.

Water consumption is also affected by the number of people staying in a house or household size. As the household size increases, the average consumption of a member of a family decreases (Fan, et al., 2013). The decrease in per capita consumption as the number of household members increases is attributed to the sharing of water needs in cooking and washing clothes, dishes, and cars.

Studies also show that the educational attainment of the household head influences the household water consumption. Madebwe (2011) revealed in his research that household heads with primary education and below demonstrate greater potential to save water and use it more efficiently while households with heads possessing secondary education and above consume water lavishly.

For this study, the estimated domestic water demand is a function of household income, household size, household head age, household head educational attainment, and household source of water. Price is constant at 50.00 pesos monthly charge per household. The relationship of domestic water demand and the factors affecting it in Bontoc, Mountain Province is defined in the equation below:

$$D_{wD} = f(I, S, A, E, R)$$

$$D_{wD} = \beta_0 + \beta_1 I + \beta_2 S + \beta_3 E + \beta_4 A + \beta_5 R$$

Where:

D_{wD} = Water demand per person per day

(dependent variable)

β_0 = Constant water consumption at zero household income; constant household size, household head age, and household source of water; and no educational attainment of the household head.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ = Coefficients that represent the effect in water consumption for every change in income, household size, household head educational attainment, household head age, and

household source of water.

I = household income (independent variable)

S = household size (independent variable)

E = Educational Attainment of the household

head (independent variable)

A = household head age (independent variable)

R = Source of water (independent variable)

OBJECTIVES OF THE STUDY

This study estimates and forecasts the domestic water demand and supply in Bontoc, Mountain Province. Specifically, it intends to answer the following questions:

1. What is the volume of water discharged from each source per collection period?

2. Is there significant difference on the volume of water discharged per collection period?

3. What is the profile of the household according to age of household head, educational attainment of household head, household monthly income, household size, source of domestic water per household.

4. What is the estimated volume of domestic water demand per person per day on the following activities that cuts across household income, household size, age and educational attainment of household head, and household source of water?

Drinking

Personal Hygiene

Sanitation Services

Cooking and other Kitchen Activities

Laundry?

5. Does the profile of a household significantly influence the average domestic water demand of a household member?

6. Is there a significant difference on the water demand of each person as to drinking, personal hygiene, sanitation services, cooking and other kitchen activities, and laundry?

7. What are the domestic water demand and supply forecasts?

Hypotheses

1. There is no significant difference on the average discharge/flow of water from the sources on the four gathering dates.

2. The profile of a household does not significantly influence the average domestic water demand of a household member.

3. There is no significant difference on the water demand of each person as to drinking, personal hygiene, sanitation services, cooking and other kitchen activities, and laundry.

Methodology

The study was conducted in Bontoc, Mountain Province. Bontoc is a second class municipality located 396 km north of the National Capital Region, and 146 km north of Baguio City. It has a mountainous terrain. Bontoc has a total land area of 39,610 hectares, representing 17 percent of the total land area of Mountain Province. The municipality sits beside the CHICO River, a main river system of Northern Luzon, that is fed by tributaries from the town barangays (ELA Bontoc, 2013). Bontoc has 16 barangays. Initial interviews with Barangay officials revealed that domestic water is not a problem among the 12 barangays. Only the four central barangays of Bontoc – Poblacion, Samoki, Caluttit, and Bontoc Ili experience severe water crisis because these barangays house the center of commerce in the municipality, national and local government offices, private and public secondary and tertiary schools, and the only hospital in the municipality. The focus of this study then is on these four central barangays.

This study made use of quantitative and qualitative methods to examine the domestic water management of households in Bontoc, Mountain Province. Data collection methods included archival research, informal interviews, and randomly sampled household surveys. Observational method was used in measuring the discharges of the water from the sources and the approaches of households in collecting and using water.

The local residents of Bontoc, Mountain Province are the primary respondents in this study. The household heads or representatives were the subject of oral and written interviews. A total of 351 questionnaires were randomly distributed to different households but only 336 were retrieved which accounts for about 96% retrieval. Secondary data were gathered from books and files of the different offices involved in this water system.

With the big number of household respondents, the researcher made use of sample sizes to represent the number of households for each barangay. Random sampling was used and the sample size of the population was determined through the Slovin's equation at a 95% confidence level. Stratified random sampling was utilized where the total number of households was grouped into four strata based on the four central barangays of Bontoc. The table below shows the population, number of households and sample size for each Barangay.

Table 1: Sample Sizes of the Households

Barangay	Population	Number of Households	Sample Size
Bontoc Ili	4791	1105	134
Poblacion	3168	648	78
Samoki	2946	699	84
Caluttit	2071	452	55
Total	12976	2904	351

The data gathering on water discharges from the 2 sources took place on the first week of May 2014 when severe drought was experienced by the residents prompting the local government to declare the central barangays of Bontoc under the state of calamity. The next measures were done on August 2014 during the rainy season, then on December 2014 and March 2015 for the dry seasons. A container of known volume was filled with water flowing from the intake tanks and timed as it is filled. These activities were repeated 5 times on each source depending on the consistency of the acquired data. The researcher, together with the head of the Bontoc Water Unit (BWU) and some utility personnel, conducted the measurements on the four gathering dates per source.

The data were subjected to descriptive and inferential statistics. The data on discharges of water were tabulated and the means were computed to determine the average actual performance of the water sources. Analysis of Variance was used to compare the result of the mean discharges collected during the four collection dates on the sources of water. Multiple regression analysis was used to test the significance of the factors affecting domestic water consumption and to estimate the domestic water demand per person per day.

FINDINGS OF THE STUDY

Volume of Water Discharged from Sources

The average volume of water being collected per day from the Balabag source is 1, 883, 096.64 liters while 388, 454.4 liters from the Sullong source.

The study shows that there is a significant difference in the discharges of water from the two sources per measurement period.

Household Profile

Age of Household Head

The average age of the head of a family in Bontoc is 48 years, the minimum age is 25 and the maximum age is 77. The head of the family represents the one who makes decisions for the family and the main breadwinner in the family. In Bontoc, it usually is the father. This data was included in the study to determine if the age of the head of the family influences the water demand of the household.

Household Head Educational Attainment

The educational attainment of the household head was included too on the same reason as age. It was found out on this study that the people of Bontoc generally are literate. Fifty eight percent of the household heads are college graduates while 13% stepped college. Seventeen percent are high school graduates only, 10% are elementary graduates only, and only 2% did not go to school. This high percentage of college graduates can be attributed to the fact that the municipality hosts the lone state college in the province that charges low tuition fees. Despite the affordable school fees, students enjoy different scholarships from the Local Government Units and other funding agencies.

Household Monthly Income

Some studies on household water demand identified household income as a factor in influencing the water demand of a household. It was then included to determine if such finding applies to the people of Bontoc. The average household income in Bontoc is on a range of 20,000.00 to 29,999.00 pesos. The minimum household income is less than Php 10,000.00 while the maximum income is Php 69,000.00.

Household Size

The average size of a household in the Philippines is six (Inocencio, Padilla, Javier, 1999) which is also true in Baguio (Mason, 2012). In Bontoc, the average is five, as shown by the mean, median, and mode of the household size. This finding validates the information provided by the RHU (2014) report that the average number of family members in a household in Bontoc is five.

Sources of Domestic Water

The four central Barangays of Bontoc, the Province' Central Business District, have only two sources of water being operated by the Bontoc Water Unit (BWU). The sources are the Balabag source that has a mean discharge of 22 liters per second and the Sullong source with a mean discharge of 4.26 liters per second. These two sources supply barangays Bontoc Ili, Poblacion, Caluttit, and Samoki. However, many households tapped small springs to augment the water coming from the BWU or it was tapped as the main source of their domestic water. There are 14 additional springs that supply barangay Bontoc Ili, six for Poblacion, 12 for Caluttit, and 10 springs supply Samoki (BWU Report, 2014). These springs are mostly privately owned that charge monthly water fees from 400 pesos to 1000 pesos depending on the duration of water collection. Households underserved by BWU and private springs have resorted to private delivery trucks from which they could order water. Although these truck owners charge rates approximately 10 times higher than BWU, they provided many households with relief from the physical labor and time spent transporting water from springs, or using water from spring and river sources.

Fifty six percent of the respondents claimed that they are connected with the Bontoc Water Unit but about 17% of them do not collect much from the pipes because there are only trickles of water coming out from the faucets especially during dry season. They claimed that those trickles cannot even fill a pail during the scheduled collection time. They instead resort to spring collection or water delivery.

The respondents are still hopeful, though, that they would still soon be rationed with water from BWU when problems are fixed so they still maintain the pipes while others have already cut their pipes because of frustration due to the long wait.

This data accounts for 40% active connection from the BWU. This result supports the BWU (2014) report that 1244 out of 2904 households or 43% are being served by the Bontoc Water Unit. About 80% of the residents in Bontoc source out their drinking water from water refilling stations.

As for water collection, most of the households have installed big water tanks in their houses. Household heads that were interviewed revealed that they use six to 10 drums of water in a week.

Some household heads commented that for a two-hour collection schedule, they collect only for an hour or sometimes more than two hours therefore it is not strictly confined to two hours duration. Use of water pumps to obtain more water during collection period depriving other households to collect on the same schedule was also observed. Others would leave their faucets open during collection period and let the excess water run off the drain when their tanks are full while their neighbors who do not have big tanks cannot collect any.

Volume of Domestic Water Demand per Person per Day

The domestic water demand of a household per day was gathered in liters then divided by the household size to get the demand per person per day on activities such as, drinking, personal hygiene, sanitary services, cooking and kitchen activities, and laundry. Personal hygiene includes activities such as, taking a bath, washing hands, feet, and face, and brushing teeth. Sanitation services involve activities such as, toilet flushing, cleaning the house, cleaning the bathroom and comfort room, washing cars, and bathing pets. Cooking and other kitchen activities comprise food preparation and dish washing.

The average domestic water demand of a person in Bontoc is 90.09 liters per day. The minimum demand is 24 liters per day and the maximum is 147 liters per day. The average water demand is way below the estimated standard of LWUA for Filipinos with a household size of 6 that is 140 liters per person per day (Hebert & Yniguez, 1986). It is, however, within the estimated basic water requirement range of 15.54 –

246.78 liters/capita per day in the Philippines (Javier, et al., 1999). The water demand was computed from activities such as drinking (1.9 liters), personal hygiene (39.9 liters), sanitary services (27.1 liters), cooking and other kitchen activities (14.1 liters), and laundry (7.1 liters).

The largest part of the pie is attributed to personal hygiene. This result corroborates earlier studies that personal hygiene accounts for 30% to 40% of the water demand of a person (Borg, 2013; Dagnew, 2012; Lu, 2007; Innocencio, 1999). Taking a bath is the largest water consumer in this area (personal hygiene) at 85%. Majority of the residents make use of a pail and dipper to minimize water use. Others, usually under higher income brackets, use showers at an average flow of 10 seconds per liter. This study also shows an average shower time of six minutes for men and eight minutes for women. In the U.S., the average shower time is 6.3 minutes with an average shower flow of six seconds per liter (DeOreo and Mayer, 2012) while in UK, it is eight minutes (Kinver, 2011).

Sanitation services take the next larger slice. This activity, however, is the leading water user in giant countries because of the flush (DeOreo & Mayer, 2012; Nelson, 1999; Brandon, 1984). Each flush drains about 16 to 24 liters (Gleick, 1996) so one flush is almost equivalent to four flushes in Bontoc, Mountain Province. Most toilets in Bontoc, Mountain Province are flushed manually using a dipper. This, according to the respondents, is a way of conserving water. One dipper of water is about one liter. Bontoc people use one liter to flush urine and use about four liters for solid waste. The average number of flushes per person per day is four which is also the average in the United States and Canada (DeOreo & Mayer, 2012). As an acquired practice, Bontoc residents grey water from laundry to flush toilets, clean bathrooms, comfort rooms, and houses thereby, minimizing the use of water.

Cooking and kitchen activities get 16% of the per capita domestic water demand per day taking the 3rd largest component. This result is consistent with the update study of the residential end uses of water in the United States and Canada in 2012 which shows that 16% of the total average daily use is for cooking and kitchen services (DeOreo and Mayer, 2012).

It is noticeable that water demand in laundry activities account only for 8% as compared to the 12.5% in Manila (Innocencio, et.al., 1999). This can be attributed to the age-old practice of Bontoc residents that during week-ends, they bring their dirty clothes to the nearby river to wash clothes at the same time spend the week-end swimming and having a family picnic. Two percent of the per capita water demand goes to drinking water, a little lower than Manila and Pangasinan at 3% (Innocencio, et.al., 1999).

Figure one below shows the distribution of domestic water consumption in percentage form among the different household activities.

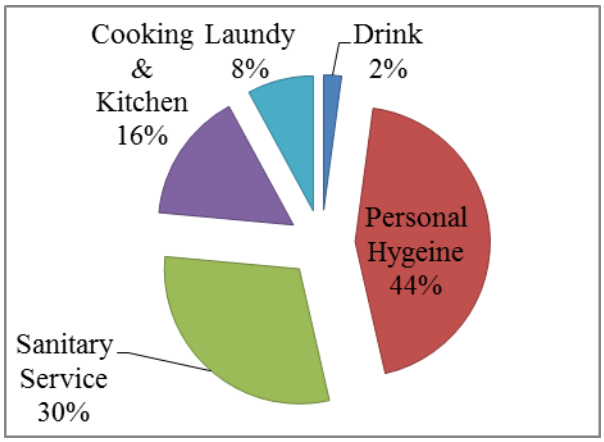


Fig. 1. Average water consumption/ person

Estimating Domestic Water Demand

Domestic water demand is estimated from the result of multiple regression. The equation $D_{wD} = \beta_0 + \beta_1 I + \beta_2 S + \beta_3 E$ denotes the relationship of the domestic water demand(D_{wD}) as the dependent variable with income(I), household size(S), and household head educational attainment(E) as the independent variables. With the coefficients computed from the multiple regression analysis, the final equation to estimate the do-

mestic water demand of a person per day is represented by

$$D_{wD} = \beta_0 + \beta_1 I + \beta_2 S + \beta_3 E$$

$$D_{wD} = 63.755823 + 9.6284609\ (I) - 5.488522\ (S) + 6.9919622\ €$$

Where:

I = Household income

S = Household size

E = Household head educational attainment.

D_{wD} = Domestic water demand/ person/ day

Using the mean values of the household income, household size, and household head educational attainment yields a domestic water demand that is equivalent to the average domestic water demand of 90.09 liters per person per day.

A constant domestic water demand of 63.76 liters means that regardless of the factors influencing water demand, a resident in Bontoc still consumes 63.76 liters per day.

Influence of Household Profile on the Average Domestic Water Demand

Multiple regression analysis in this study shows that household head age and source of domestic water do not significantly influence the water demand of a household with p-values higher than 0.05 at a 95% confidence level. Household income and household size significantly influence the water demand with p-values way lower than 0.05 with 95% confidence level. With a p-value of 0.06, the house hold head educational attainment is significant at 94% confidence level such that it was still included in the second run of multiple regression analysis together with household income and household size. The result of the second run with only three independent variable show a more fitting regression with p- values lower than 0.05 at 95% confidence level.

It is observed from the output that average domestic water demand per day increases as educational attainment advances. It also increases as household income increases. This finding on income was also found true by a study of Mason (2014) in Baguio. The household size effects a negative progression on the average domestic water demand of a person because as household size increases, it decreases. These findings are supported by the study of Lu (2007) in Harbin China, claiming that the average volume of water demand of a person per day decreases as household size increases (Amin et al., 2006; Fan et al., 2013).

Difference on the Water Demand of a Person as to the End Uses of Water

To determine if there is a significant difference on the domestic water demand as to the different household activities, Analysis of Variance was used. With an F observed value (806.5419) greater than the F critical value (2.37724), the null hypothesis was rejected such that there is a significant difference on the average water demand as to activities such as, drinking, personal hygiene, sanitation services, cooking and other kitchen activities, and laundry.

Analysis of Domestic Water Supply and Demand Forecasts

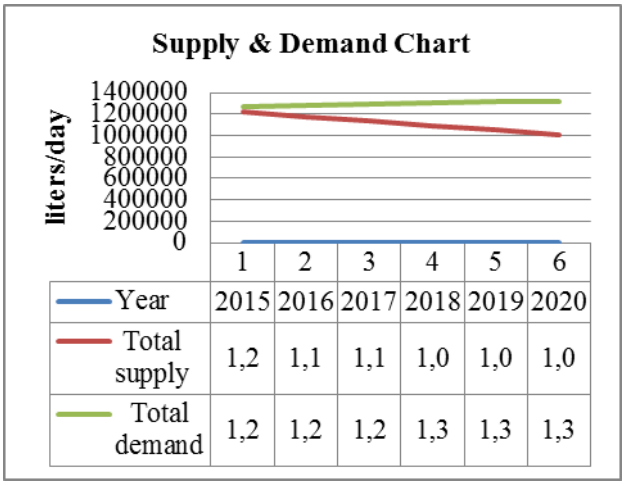
Domestic Water Demand Forecast

This study made use of the projected growth rate estimated by the National Statistics Office (NSO) to project the population. At an average domestic water demand of 90.09 liters per person per day, the forecasted domestic water demand per day is computed using the forecasted population.

Domestic Water Supply Forecasts

The forecasts of water supply from the sources is presented in liters per day. The actual measured discharges of water per day is shown less than the 36.4% leakage allotment and the 7.3 % annual average decrease rate of surface water (Manohar & Mohan Kumar, 2014). The study reveals that about 800, 000 liters of water per day is lost due to leaks in the distribution pipes. This is an alarming situation in localities that are experiencing severe water shortage.

Projections of water supply and demand until year 2020 is shown in the chart below.



	1	2	3	4	5	6
Year	2015	2016	2017	2018	2019	2020
Total supply	1,2	1,1	1,1	1,0	1,0	1,0
Total demand	1,2	1,2	1,2	1,3	1,3	1,3

Figure 3. Domestic Water Supply and Demand

The chart shows that there is an undersupply of domestic water from year 2016 to 2020. The 101,054 liters per day deficit on 2016 accounts for about 1,122 residents not rationed, a minimal deficit that does not warrant an intervention of sourcing out for another water source even until 2020. Considering that at present, there is only about 43% active household connection then water is drained somewhere along the way. The chart clearly shows that with time, supply decreases while demand increases making the gap between the supply and demand wider as years go by.

CONCLUSION

1. The average volume of water being discharged by the Balabag source is 1,883,096 liters per day while it is 388, 454 liters per day in Sullong.

2. There is a significant difference on the volume of water collected from the sources per collection period.

3. A household hold head in Bontoc, Mountain Province, Philippines is 48 years old, college graduate, and leads a household of 5. The household monthly income is on the range of Php 20,000.00 to 29,000.00. There is 40% active connection with the Bontoc Water Unit. Eighty percent of the households source their drinking water from refilling stations.

4. The average domestic water demand of a household member is 90.09 liters per day on activities such as personal hygiene (44%), sanitary services (30%), cooking (16%), laundry (8%), and drinking (2%).

5. The educational attainment of a household head, household monthly income, and household size significantly influence the average domestic water demand of each household member. The average domestic water demand of a person per day increases as educational attainment of a household progress and the per capita domestic water demand per day increases. However, as household size increases, domestic water demand of a person per day decreases.

6. There is a significant difference on the water demand of each person as to drinking, personal hygiene, sanitation services, cooking and kitchen activities, and laundry.

7. The domestic water demand forecast in liters per day on 2016, 2017, 2018, 2019, 2020 are 1,276,404; 1,288,185; 1,300,074; 1,312,073; and 1,312,184, respectively, while the domestic water supply are 1,175,351; 1,131,863; 1,089,984; 1,049,654; and 1,010,817, respectively. From the forecasted data of domestic water supply and demand, there is an undersupply of water of 101,054 liters per day on 2016 with an annual 30% average increase. The deficit in supply by 2016 accounts for a 1,122 underserved residents.

RECOMMENDATIONS

1. Distribution pipes should be repaired to recover the 36.4% loses due to leaks. Water from the sources should all be directed to the intake tank before it is distributed for fair distribution. Since water access is a human right, all households should be connected to the Bontoc Water Unit but a clear cut policy on availing of water connection should be imposed. Metering of water demand should be imposed to, Met-

Metering of water demand should be imposed to regulate water use such that households shall pay only what they use. Fair rationing of water should be the main concern of those in charge in the water distribution.

2. Rehabilitation of the dams at the sources should be done so as to maximize the surface water catch.

3. Though many households are keen on conserving water, some young family members are not that concerned, so proper education on water conservation should be introduced by the Bontoc Water District.

4. Water conservation should be observed especially by those who have higher income and with higher educational attainment to decrease the average water demand.

5. Households should use water efficient appliances to minimize water demand.

6. Water recycling should be observed by the household members.

7. The Bontoc Water Unit should come up with a domestic water demand management program as a practical strategy to improve the equitable, efficient and sustainable use of water. Involvement of all sectors is paramount to successful programs of water scarcity alleviation. Forecast of demand and supply of domestic water is vital in the management of water resources so it should always form part of the water demand management program.

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COMPUTER LITERACY OF ALTERNATIVE LEARNING SYSTEM (ALS) ENROLLEES IN THE MUNICIPALITIES OF CLUSTER 1 IN THE PROVINCE OF BOHOL

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ABSTRACT

Computer is considered an integral part of the society. Almost everything is run by computers from simple activity to a complex one. Skills in manipulating computer help even to students both in classroom and prepare them in workplace settings. This study was conducted to assess the computer literacy of the Alternative Learning System (ALS) Enrollees in the municipalities of cluster 1 in the Province of Bohol for the academic year 2016-2017. It further aimed to answer the problems on the level of computer literacy of Alternative Learning System enrollees, the problems encountered in using computer and willingness of the respondents to improve computer literacy skills. The study used the average weighted mean in the statistical treatment of data. The respondents of the study were the 250 Alternative Learning System Enrollees in the Municipalities of Cluster 1 which is composed of Antequera, Alburquerque, Baclayon, Balilihan, Corella, Cortes, Maribojoc, Panglao, Dauis and Sikatuna. Based on the results of the study, most of the ALS enrollees have limited computer literacy skills. They claimed that some problems were sometimes felt in using the computer. Furthermore, ALS enrollees are interested in enhancing their computer skills but in lesser extent.
Keywords: Computer, Literacy, Alternative Learning System, Bohol

INTRODUCTION

Nelson Mandela said, "Education is the most powerful weapon which can be used to change the world". It has been part of human development to equip man with the ability and capability to deal successfully with the fast-paced and dynamic world. Throughout the ages, humans give importance to education for it affects the life of every individual in the unending process of learning (Barrueco, 2013).

When the advent of digital age, computers play a big role in education especially in developing countries like the Philippines for it has been widely used as an easy access to different fields of work in schools and in different offices. It is used by the students for school related activities by executives for their office works and even by the kids in playing games. Computers are really gaining more popularity as time goes, that's why people must adapt so that they will not be left behind.

According to Casiano (2007) computer has developed the capability of administrative and managerial users. With the knowledge in operating computers and adapting to new technologies, it shows that computers recognize of their relevance to make the world a better place to live in. To enhance skills on computer use, there is a need to explore on new ideas. These are those who know how to operate the computers but differ in the application level.

Today, throughout the whole world, computer literacy is the first step for an individual who wants to work on the computer. In the educational system, computer literacy plays a great role. It draws the attention of millions of people because virtually all human terrains now require the knowledge and skills of computers.

Computer literacy has a great contribution in order to develop one's skills through computer technology. Many people have a misleading impression on capabilities of out-of-school youths. It is generally assumed that this group needs to learn, re-do and re-learn the basic literacy skills. However, out-of-school youths have some experiences of learning within the formal system. This leads to the development of a program known as Alternative Learning System (ALS).

In the country, one of the learning opportunities include the Alternative Learning System (ALS) a free education program implemented by the Department of Education which benefits those who cannot afford formal schooling and follows their available schedule. The program provides a viable alternative with the ex-

isting formal instruction, encompassing both the non-formal and informal sources of knowledge and skills.

At present many successful examinees of A&E enroll in college since Higher Education Institutions (HEI's) are now accepting enrollees from the passers of ALS. However, in HEI's, whatever course they will take, part of every curriculum is the basic computer subject. Thus, most of them find hard in coping up basic computer subject in tertiary level since during their ALS class, the curriculum only covers Sciences/ Mathematics, English, Filipino , Social Studies and Kabuhayan at Likas na Yaman subjects. There is no computer subject unlike with those students from formal education where during high schools they were able to take basic computer lesson as part of their TLE subject.

This above concept highlights the importance of responding the needs of this group of learners. Hence, the researchers ventured into conducting a study on "Computer Literacy of ALS enrollees in the Municipalities of Cluster 1 in the Province of Bohol". This sought to determine the learning concerns and the level of knowledge in manipulating computers. This result of the study would be the basis in the development of computer literacy program.

Literature Background

Knowing how to use certain software applications is not enough. One needs to understand how to apply ones knowledge of computers and digital technology to real-life problems. According to Baldauf and Stair (2009), computer literacy is a working understanding of the fundamentals of computers and their uses. Originally, computer literacy focused on desktop computer skills. Typical computing experience extends far beyond the desktop to numerous mobile and network devices. Today, people interact with a wide range of devices from many locations.

Being a computer literate has a significant role as humans explore more learning about computer. According to Tapper (1997) the teaching of computer literacy to the students is of increasing importance as the increase in the use of computer has come to the point that it is used for a range of learning tasks as a basic learning skill, as much as taking notes or reading texts. For the present generation, computer insight will not limit to what had been learned nowadays. The more it expands, the more computer applications can be explored.

Mason and McMorrow (2006) suggested that there are two distinct components in computer literacy awareness and competence. Awareness requires that a person has understanding on how computers create impact to their day-to-day life as well as the larger society. Competence expects a person to be able to exhibit a hands-on expertise with software applications. These components are very important and should be considered in assessing the computer literacy of the youths. They must be aware in handling the computers, be able to execute the proper home keys and be able to manipulate software application such as word processing and e-mail. The essence of learning the computer is for learners to gain knowledge and to develop their skills.

Computer literacy is taught because they lay the foundations for developing a critical understanding of the Information Age. These skills help students make effective use computers, both in classroom and workplace settings (Corbel 2007)

Nowadays, computers are considered an integral part of the society. Almost everything is run by computers from simple activity to a complex one. Many of its uses are evident everywhere especially in the area of education. Schools and offices have adopted the use of computers as part of their daily undertakings.

The study is anchored on some theories. One is Social Cognitive Theory by Albert Bandura, (2007) which states that people learn by watching what others do and that human thought processes are central to understanding personality. Social Cognitive Theory revolves around the motion that learning correlates to the observations of role models. This theory provides a framework for understanding, predicting and changing human behavior.

This theory relates to this study because people are influenced by many factors such as environment, behavior, and their psychological processes. This means that people are easily affected by those with whom they interact with. In education, for example, teachers play as role models in child's learning acquisition. It explains that in every life, different strategies in dealing with different situations are learned and applied.

Another theory is, the Self-determination Theory by Edward Deci and Richard Ryan, (2002) which states that all individuals have natural, innate and constructive tendencies to develop and even more collaborated and unified sense of self. That is, people have primary propensity to forge interconnections among aspects of their own psyches as well as with other individuals and groups in their social worlds.

In this theory, offering positive encouragement and feedback on a person's performance on a task can increase intrinsic motivation because such feedback helps people feel competent, one of the key needs for personal growth. People become self-determined and are able to be intrinsically motivated to pursue the things that interest them.

According to Maslow's Humanistic Psychology, if a man's self-esteemed is satisfied he gained self-confidence and this confidence will boost this performance. Thus man's self-esteem can be achieved if he is provided the right enumeration and recognition. Ones these needs are satisfied it is innate in other words, satisfaction is a motivation to do better.

This research is anchored in some legal basis, Article XIV Section 12 and Section 10 of the 1987 Philippine Constitution states that, "The state shall regulate the transfer and promote the adaptation of technology from all sources for the National benefit. It shall encourage the widest participation of private groups, local governments, and community based organizations in the generation and utilization of Science and Technology."

Science and technology are essential for national development and progress. The state shall give priority to research and development, invention, innovation, and their utilization, and to science and technology education, training, and services. It shall support indigenous, appropriate, and self-reliant scientific and technological capabilities, and their application to the country's productive system and national life.

Science and Technology facilities the changes in the society . Through inventions and innovations, life becomes easier. Thus, the state encourage every citizen to develop and utilize the resources found in the country. Therefore, integrating technology is a great help for the development of the country. This is also to remind every citizen to contribute towards development and innovation.

Another provision is Article XIV Section 2 of the 1987 Philippine Constitution provides that " The state shall provide adult citizens, the disabled and the out of school youth with training in civics, vocational efficiency and other skills.

This section emphasizes the plight of the youths who do not have the opportunity to study in the formal system and to provide them with special trainings that help build their competence for a brighter future. This is supported in Republic Act 9155 that stipulates the Alternative Learning System (ALS) as a free parallel learning system. This is a new idea in the Philippine educational system to prevent the increase increase of literacy rate in our country. This program aims to open more educational opportunities for Filipino citizens of different interests, capabilities, demographic, characteristics, socio economic origins and status.

Turkle (1984) writes that computers are tools as much as they are part of our social and psychological lives. She stresses how emerging technology, specifically computers affect the way people think and see themselves as humans.

Today's society thrives on information. People depend on computer-based-system to create, store, process, access, and distribute information.

Information is knowledge, and knowledge is power! This is true for all ages in all walks of the students use computers to research homework topics, communicate with friends, and acquire the latest music. Computers expedite and facilitate work in offices, especially those that have capacities and capabilities to acquire it. It becomes the most important tool in writing, computing, designing, searching, and researching, communicating, news importing, advertising and other similar activities.

Around the world, many children have been economically and socially deprived, who have suffered emotional and physical traumas or who have disabilities. Often these children are subject to child labor and other forms of exploitation.

Almost everybody agrees that education is important. Our political leaders are good at coming up with statements such as "the future of our nation lies in the minds of our children". However, there is less agreement on what constitutes an appropriate education and how to fund it.

Our educational system is a massive institution deeply rooted in the history and traditions of our nation, and thus, it is slow to change. It was not designed to deal with the rapid and continued pace of change in educational technology.

The result is that many students are not getting an education that adequately prepares them for adult life in the Information Age. Many teachers are working with archaic facilities where students learn archaic curriculum.

Information Age has challenged our educational system. Leaders in business and government have expressed concern that our educational system is falling to meet the needs of the changing world.

Therefore, the researchers hope to come up to help the ALS enrollees in the Municipalities of Cluster 1 in the Province of Bohol to increase their knowledge and enhance their skills and capabilities which they have gained over the years and to provide them access to challenging learning opportunities.

THE PROBLEM

Statement of the Problem

The main thrust of this study was to assess the computer literacy of Alternative Learning System (ALS) enrollees in the municipalities of Cluster 1 in the Province of Bohol. This will be conducted in the school year 2016-2017.

Specifically, it sought to answer the following questions:

1. What is level of computer literacy of ALS enrollees in the municipalities of Cluster 1 in the Province of Bohol?

2. What are the problems encountered by ALS enrollees in the municipalities of Cluster 1 in the Province of Bohol?

3. What is the level of willingness of the respondents to upgrade their computer literacy skills?

METHODOLOGY

Design

The descriptive method was used to address the need to gather and assess the data requirements of the variables investigated. The process of descriptive research is to go beyond more gathering of data. The main tools in gathering in gathering are questionnaires for determining the level of computer literacy skills of ALS enrollees in the municipalities of Cluster 1 in the Province of Bohol.

Environment and Participants

The study was conducted in the municipalities of cluster 1 in the Province of Bohol. Cluster 1 is composed of Balilihan, Corella, Catigbian, Sikatuna, Maribojoc, Cortes and Loon. They were chosen because of the accessibility of the place where the output of this research will be the basis on the implementation of an extension project in neighboring towns specifically towns under Cluster 1.

Stratified random sampling was used to determine the respondents considering the population of each town.

The respondents of the study were reflected on the table:

Municipalities under Cluster 1	No.of Implementers	Total Enrollees	Target Respondents
Antequera	2	88	26
Alburqueque	3	115	35
Baclayon	2	100	30
Balilihan	2	120	36
Corella	2	95	29
Cortes	1	95	29
Maribojoc	2	105	32
Panglao	2	125	38
Dauis	3	130	39
Sikatuna	2	95	29
		Total	323

Instruments

In gathering the data, the researchers used a self-made questionnaire that is made simple and clear so that it would be easy to understand by the respondents. Pilot testing was conducted to determine the reliability, validity and comprehensibility of the questionnaire. After finalizing, the questionnaires were distributed to the respondents.

The respondents rated their responses based on the specifications that follow.

Descriptions		Interpretations	Weighted Equivalent
A. Level of Computer Literacy			
Extensive Ability	(EA)	Operates the computer excellently	4
Sufficient Ability	(SA)	Operates the computer very satisfactorily	3
Limited Ability (LA)		Operates the computer in limited capacity	2
No Ability	(NA)	Cannot operate the computer at all	1

B. Problems Encountered in Using Computer

Extremely felt (EF) Problem is very much felt (4)
Fairly felt (FF) Problem is much felt (3)
Slightly felt (SF) Problems is felt sometimes (2)
Not felt (NF) Problem is not felt (1)

C. Willingness to Improve Computer Literacy

Very Willing (VW) Very interested of the literacy program to high extent (4)
Willing (W) Interested of the literacy program to a high extent (3)
Less Willing (LW) Interested in a lesser extent (2)
Unwilling (U) Not interested at all (1)

Statistical Treatment

The statistical treatment used to determine the level of computer literacy of the ALS enrollees and the level

level of computer literacy of the ALS enrollees and the level of their willingness to improve computer literacy the weighted mean was utilized.

RESULTS AND DISCUSSION

Table 1 shows the computer literacy skills of the ALS enrollees. It revealed that ALS enrollees got the highest weighted mean of 3.00 which is described as literate having an "extensive ability" in manipulating the mouse as a tool that drives the computer and which is also considered as direct connection into the computer. The respondents find it easy to manipulate it like remote control to a TV in home. However, opening more than one computer application and ejecting a piece of software got the lowest weighted mean of 1.47 described as "no ability". Certainly, computer users will understand first computer applications before they try other functions. As to access to social networking websites, ALS enrollees rated low on the "use of email" with "1.43" described as "no abilty". The advent of popular social media, however, has made email less popular among these younger people. Instead of sending short emails to each other, many are now sending short text messages or using messaging clients provided by Facebook or other popular platforms. On the other hand, electronic games have become increasingly popular to the respondents as reflected on the highest weighted mean of 2.64 described as "Extensive Ability".

Overall, the findings revealed that most of the ALS enrollees have limited computer literacy skills with the general weighted mean of 1.88. Therefore, based from the result, the respondents must learn basic computer skills necessary especially that learning computer has become increasingly important as companies have started to depend upon computerized technology to get work done. Indeed, this will prepare them in their future job.

A. Basic Manipulation of Computer	**WM**	**Description**
1. Switching on the computer	2.31	Limited Ability
2. Shutting down the computer	2.33	Limited Ability
3. Moving the mouse	3.00	Sufficient Abillity
4. Resizing a window	1.82	Limited Ability
5. Identifying icon on the screen	1.66	No ability
6. Minimizing/maximizing window	1.71	No ability
7. Identifying window desktop	1.53	No ability
8. Identifying taskbar	1.66	No ability
9. Launching an application	1.71	No ability
10. Creating a new folder	1.61	No ability
11. Creating text file using windows software	1.59	No ability
12. Saving a document in a specified location	1.9	Limited Ability
13. Retrieving saved files	1.67	No ability
14. Ejecting a piece of software	1.47	No ability
15. Opening more than one application	1.47	No ability
16. Copying a block of text with the mouse	2.12	Limited Ability
17. Switching from application to the another	1.56	No ability
18. Gaining access to the Internet	2.09	Limited Ability
19. Using Microsoft Word	1.68	No ability
20. Using Microsoft Excel	1.68	No ability
Average Weighted Mean	**1.83**	**Limited Ability**

B. Accessing Social Networking Websites		
1. E-mail	1.43	No Ability
2. News	2.05	Limited Ability
3. Youtube	1.63	No Ability
4. Google	1.62	No Ability
5. Electronic Games	2.64	Sufficient Ability
6. FB, Instragram	2.12	Limited Ability
Average Weighted Mean	**1.92**	**Limited Ability**
General Weighted Mean	**1.88**	**Limited Ability**

Table 2 shows the problems encountered in using computer. The findings revealed that lack of knowledge about computer , no computer literacy program and no available time to study are problems that are much felt by ALS enrollees with the weighted mean of 2.67, 2.72 and 2.67 respectively. These are considered as hindrances they encountered in manipulating the computer. It is interesting to note that ALS Program does not cover basic computer subject in their curriculum. Thus, most of them find hard in coping up basic computer applications since during their ALS class, the curriculum only covers Sciences/ Mathematics, English, Filipino , Social Studies and Kabuhayan at Likas na Yaman subjects. Evidently, no time allocated in learning computer applications during their sessions. On the other hand, the respondents regard "lack of encouragement from people" as not a hindrance in learning computer.

Table 2. Problems Encountered in using the Computer
N=250

Some Problems encountered in Using the Computer	**WM**	**Description**
1. Lack of knowledge about computer	2.67	Fairly Felt
3. No available time to study computer	2.67	Fairly Felt
4. Lack of trainings in computer use	2.49	Slightly Felt
5. No computer literacy program	2.72	Fairly Felt
6. Health condition of the person	2.62	Fairly Felt
7. Lack of encouragemenl interest in computers	1.46	Not Felt
Average Weighted Mean	**2.09**	**Slightly Felt**

Table 3 shows that ALS respondents are willing to explore new ideas about computers by tapping knowledgeable person to help them learn about computer application. In sum, ALS enrollees are interested in enhancing their computer skills but in lesser extent as shown in the average weighted of "2.40". Therefore, the learners must be given an idea on the importance of enhancing their knowledge and skills in computer that they could use for college education and even employment opportunities in the different workplaces that requires computer applications to increase their willingness in learning computer.

Table 3. Willingness to Improve Computer Literacy
N=250

Activities to Upgrade Computer Literacy	WM	Description
The ALS Enrollees are willing to:		
1. attend an enhancement program on computer	2.28	Less Willing
2. spend extra time and money to study the computer	2.2	Less Willing
3. apply your computer literacy to your work in the future	2.07	Less Willing
4. learn about the various programs and applications that you will encounter using the computer	2.19	Less Willing
5. explore new ideas about computers	2.58	Willing
6. find a person that can spare his/her time to teach you to teach you to upgrade your knowledge on computer	3.09	Willing
Average Weighted Mean	2.40	Less Willing

FINDINGS

1. Most of the ALS enrollees have limited computer literacy skills with the general weighted mean of 1.87.
2. Lack of knowledge about computer, no computer literacy program and no available time to study are problems that are much felt by ALS enrollees with the weighted mean of 2.67, 2.72 and 2.67 respectively.
3. ALS enrollees are interested in enhancing their computer skills but in lesser extent as shown in the average weighted of "2.40".

CONCLUSIONS

Based on the findings, the researchers concluded that most of the Alternative Learning System enrollees have limited ability in using the computer and they claimed that problems are felt sometimes. It also shows less willingness among ALS enrollees in enhancing computer literacy.

RECOMMENDATIONS

Based on the findings and conclusions, the researchers offer the following recommendations:

1. The Department of Education in coordination with the Local Government Unit (LGU) may develop and implement development plans on how to cope with the technological advances brought about by the fast-paced technologies with modern trends in instruction to fully enhance the computer literacy skills of the Alternative Learning System enrollees and to develop their knowledge and skills in manipulating the computer.

2. The Department of Education, Division of Bohol may appropriate funds for the Alternative Learning System Program to provide special trainings on the use of computer and its applications to enhance the computer literacy of Alternative Learning System enrollees.

3. The BISU Administration together with the Extension Unit may organize an extension project to help ALS Enrollees overcome the problem in using computer and to be able to respond to the present trends of technology in today's modern world.

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LEVEL OF GENDER MAINSTREAMING AT MOUNTAIN PROVINCE STATE POLYTECHNIC COLLEGE

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ABSTRACT

The purpose of the study was to determine the status of gender mainstreaming at Mountain Province State Polytechnic College. It primarily aimed to find the strength, developmental areas and weaknesses of Gender Mainstreaming efforts of the agency using the different entry points which are; policy, people, enabling mechanism, and Programs., Activities & Projects (PAPS). The descriptive research design was used in this study. The Gender Mainstreaming Evaluation Form (GMEF) organizational questionnaire was use to cove the holistic view of the respondents' mainstreaming process. The study revealed that Mountain Province State Polytechnic College was able to reach level 3 which is equivalent to GAD application in the policy entry point. Under this the institution was able to adopt GAD agenda and framework. Further, sectoral plans are with GAD perspective and specific sectoral GAD policies were formulated. However, there is a need to increase the level of mainstreaming in the institution by addressing the weaknesses identified in the study. Particularly there is a need to increase the involvement of the top management and different sectors in the mainstreaming of GAD.

Keywords-gender; mainstreaming; gender and development; gender concepts, gender mainstreaming

INTRODUCTION

According to UNESCO (2008) there is a need to dig deeper and analyze subnational level data to gain a better understanding of gender mainstreaming. Higher Education is the threshold where future decision-makers and policy makers generally receive training and are exposed to principles. (Turmaine, 2009). It is thus critical to focus attention on mainstreaming in the Education sector.

Gender mainstreaming is one of the major strategies in educating and informing various sectors of society on the need to recognize and respect rights of women and men.

Educating more women translate to addition socio-economic gains that benefit entire societies including increased economic productivity, higher family incomes, more informed members of society, and respect for the rights of women research has shown that investments in education facilitate the achievement of most other development goals including sustainable growth. (USAID)

Higher Education Institute are instrumental in the globalized knowledge economy, the initial and continuing training of professionals, national wealth creation, and innovations in science and technology. Higher Education Institutes are also a potent intermediary for the promotion of the core value of family and technology. (CMO#1,s.2015)

Republic Act 9710 or The Magna Carta of Women (MCW) Implementing Rules and Regulation (IRR) identified the Commission on Higher Education (CHED) as the agency to direct the institutionalization if the required policies, standards and guidelines to build its internal; capacities and those of its external clientele and stakeholders in mainstreaming Gender and Development (GAD) within
CHED and in the various function of the state to "exercise reasonable supervision and regulation of all educational institutions. (1987 Philippine Constitution, Article XIV)

Since the mainstreaming of gender into all activities of government has received endorsement at the highest political levels. The establishment and operation of Gender Management System requires an enabling environment. There are number of interrelated factors that determine the status to which Gender Mainstreaming

is set up where it affect or not affect effective gender mainstreaming. Thereby the study aims to assess the status of gender mainstreaming at Mountain Province State Polytechnic College in order to gather information for a base line data which will serve as basis for improvement in institutionalizing Gender and Development.

Mountain Province State Polytechnic College has undertaken various efforts in gender mainstreaming and development on policies, programs and strategies along with the four fold functions of the institution-instruction, research, extension and administration. It aims to respond to gender issues namely: marginalization, subordination, stereo typing, multiple burden and violence against women and children. As it continuous to materialize its Mission ; "A

Gender Responsive College along its fourfold function with the operative and equipped machinery", a five year GAD development program (2014-2018) was forged to serve as a map which serve as a guide in pursuing a Gender Responsive College.

STATEMENT OF THE PROBLEM

This study assessed the status of gender mainstreaming of public higher education in Mountain Province.

Specifically, it attempts to answer the following questions:

1. What is the level of Gender Mainstreaming in Public Higher Education in Mountain Province in terms of:

A. Policy
B. People
C. Enabling Mechanism
D. Project, Activities and Programs

2. What are the strength, developmental areas and weaknesses of Gender Mainstreaming efforts of the agency in the different entry points?

A. Policy
B. People
C. Enabling Mechanism
D. Project, Activities and Programs

Research Design
This study used descriptive research design, to describe the status of gender mainstreaming in the public higher education in Mountain Province.

Population and Local of the Study
The study will be conducted in Mountain Province particularly in the public higher education. Mountain Province State Polytechnic College (MPSPC) is the only Public Tertiary Education in Mountain Province. It is located in the Municipalities of Bontoc, Bauko, Tadian and Paracelis. The main campus of the College is in Bontoc. Respondents of the study are identified GAD Focal System,

Eight (8) respondents were from the Executive Committee which comprised of 2 Executive Dean, 6 unit heads. Four (4) from the GAD Focal Committee: Budget Officer, Director for Extension, Director for Research and Development and Director for GAD. Eight (8) from the GAD Technical Working Group: 6 faculty members and 2 administrative staff.

Data Gathering Instrument
For assessing the status of gender mainstreaming, the Gender Mainstreaming Evaluation Framework (GMEF) was utilized to cover holistic view of the respondents' mainstreaming process and to reveal what stage of gender mainstreaming the respondents are currently in. This tool will also assess the strengths and weaknesses and areas of improvement of Mountain Province State Polytechnic College (MPSPC) on gender mainstreaming. Respondents of this study were the members of the GAD Focal Point System.

Data Gathering Procedures

On assessing the status of gender mainstreaming, an orientation for the GAD Focal System was conducted where the Gender Mainstreaming Evaluation Framework (GMEF) was explained. The respondents were grouped as per entry points: People, Policy, Enabling Mechanism and Projects, Activities and Programs (PAPs). Each group of respondents answered the GMEF organizational assessment questionnaire.

Treatment of Statistical Data

Each item is marked with specific scores representing

(1) YES; (2) PARTLY YES; and (3) "NO" respondent will indicate a score in the appropriate column to signify the degree to which the organization has complied with the GAD element required.

Under the MOV/Remarks column, respondent will indicate/attach the means of verifications required or provide explanation in support to their response. Failure to provide appropriate MOVs could disregard/ invalidate the "partly yes" or "fully yes" scores of the organization.

All the scores per questionnaire will be transferred to the GMEF Score Sheet. To get the total score per entry point, the sub-total scores per questionnaire will be added and referred to the following legend of scores to determine level of GAD mainstreaming efforts. To get the overall level of GAD mainstreaming of the organization, all the scores per entry point will be added and referred to the following legend of scores to interpret the ratings.

TABLE 1. LEGEND OF SCORES PER ENTRY POINT

	Ranges	LEVEL DESCRIPTION
Level Per Entry Point	0-7.99 points	1: Foundation Formation
	8-14.99 points	2: Installation of Strategic Mechanism
	15-19.99 points	3: GAD Application
	20-23.99	4: Commitment Enhancement and Institutionalization
	24-25 points	5: Replication and Innovation

TABLE 1A. LEGEND OF SCORES TO DETERMINE OVERALL LEVEL OF GAD MAINSTREAMING

	Ranges	LEVEL DESCRIPTION
Over all Level	0-30 .99 points	1: Foundation Formation
	31 – 60.99 points	2: Installation of Strategic Mechanism
	61-80.99 points	3: GAD Application
	81- 95.99 points	4: Commitment Enhancement and Institutionalization
	96- 100 points	5: Replication and Innovation

REVIEW OF RELATED LITERATURE

Stages of Gender Mainstreaming

During each of these stages, a series of activities, tasks and decisions are made by the agencies. These are the descriptors that illustrate what stage a particular agency is in its mainstreaming effort. In some stages, decisions may be influenced by outside institutions or individuals such as the national government, the PCW or nongovernment organizations. In other stages, activities and tasks are a result of strategic and operational plans mapped out by GAD Focal Point or technical working groups (TWGs). Certain individuals may also act as either facilitators or inhibitors who may prove instrumental to the success or failure or GAD initiatives. The process of gender mainstreaming may move back and forth between the stages. Although, in the long run, the expected movement must be forward. (Applying the tool to assess gender mainstreaming, book 2)

Level 1: Foundation formation - The challenge at the onset of any change effort is getting people to understand, appreciate and imbue the need for change. Gender mainstreaming is no exception. So the first order of business is to set the foundation for it. An agency's decision to incorporate GAD is made usually to implement RA 7192 or the Women in Nation Building Act. It is during this initial stage that the agency's level of gender awareness is heightened. Moreover, this stage sets the tone for

appreciating the value added in committing to GAD as one of the priority. (Applying the tool to assess gender mainstreaming, book 2)

Level 2: Installation of strategic mechanisms – This stage marks the organizational transition of the agency toward gender mainstreaming. Put in place the key people, necessary policies, support structures, systems and mechanisms to facilitate and sustain gender mainstreaming and irregular application of GAD concepts and tools. (GMEF 2014)

Level 3: GAD Application – this is the period where GAD-related activities are consolidated for more impact. It actually happens after the GAD plan is mapped out and the institutional mechanisms are installed. Interventions to achieve gender mainstreaming cease to be sporadic and uncoordinated, but become more strategic in terms of number and quality. This is also the stage when the outcome of gender mainstreaming may be examined and compared with the agency's status before the change was introduced. It is possible to identify a period after implementation when the GAD interventions starts to have an impact on the behaviors and norms of the people within the agency and among its clientele. This is also true with regard to their effect on organizational structures, tradition operating practices, levels of productivity and morale or patterns of relationships among the targets of change. Through this identification and analysis, other agencies that still doubt the impact of gender mainstreaming can see bottom-line results that support its merit. (Applying the tool to assess gender mainstreaming, book 2)

Level 4: Commitment enhancement and institutionalization – this stage is the full realization and implementation of gender mainstreaming. At the same time, it is also challenges agencies to continuously evaluate and improve their efforts. After all, the long – term goal is to improve government' s ability to respond to gender issues and concerns. (Applying the tool to assess gender mainstreaming, book 2)

Level 5: Incorporate GAD in all aspects of the agency's operations, institutionalized GAD programs are replicated in other organizations (agencies and LGUs). Policies, people, enabling mechanisms and PAPs are further enhanced based on results of GAD M&E. (GMEF 2014)

Entry points of Gender Mainstreaming

There are four possible entry points in gender mainstreaming. These are policy, people, enabling mechanisms and programs and projects. They are not in any order of importance. The agency has the option on what entry point to use first. It may also adopt strategic that characterize more than one entry point.

Policy – This refers to the official statements and pronouncements of support for gender mainstreaming issued by the agency. These may be in the form of memoranda, executive orders or specific guidelines. The agency, through these issuances, has at least recognized and accepted gender mainstreaming as a critical and legitimate concern, even if in broad or general terms.

People – Agent to strengthen the GAD focal point system. Stakeholders are the people on whose shoulder fall the task of gender mainstreaming.

Enabling Mechanisms – The success of any gender mainstreaming effort depends to a large extent on the resources allocated to it. This refers to the systems and mechanisms installed in the agencies and the funds allocated for GAD activities and clearly reflect the GAD office in the organizational structure of the organization. The Philippine Council of Women sure that some funds are set aside for gender mainstreaming through a provision in the General Appropriations Act. More popularly known as the GAD Budget, this measure mandated all government entities to allocate a minimum of five percent of their total budget for each year for gender responsive programs, projects and activities.

Programs, Activities and Projects – Policy and top management support for gender mainstreaming is best reflected in the agency's programs, projects and activities.

The flagship programs of most agencies are usually strategic entry points for implementing a GAD initiative. The four fold function of the agency should have a clear GAD framework.

FINDINGS

TABLE 2: POLICY ENTRY POINT

Key Areas	Score
Policy	
1. Issuance of initial policies on GAD *(possible scores are 0,0.83 and 1.67)*	
1.1 Hastheorganization issuedpolicies articulating support to GAD Mandates and establishing the essential elements of GAD Planning and Budgeting"	1.67
1.2 Has the organization conducted a review of existing policies for consistency with emerging GAD issues and issuances accordingly?	0.83
1.3 Has the organization issued broad statements of intentions or aspirations reflecting its support for GAD?	1.67
Sub-total GMEF score (Level 1: Policy)	**4.17**
2. Issuance of policies to mainstream GAD in the organization *(possible scores are 0,0.83 and 1.67)*	
2.1 Has the organization issued policies reflecting its interest for gender?	1.67
2.2 Has the organization issued policies addressing the gender needs of the clients?(internal and external)	0.83
2.3 Has the organization used gender fair language and images in its policy issuances?	1.67
Sub-total GMEF score (Level 2: Policy)	**4.17**
3. Integration of GAD in the Organization's Policies *(possible scores are 0,0.83 and 1.67)*	
3.1 Has the organization adopted a GAD Agenda/Strategic Framework on GAD?	0.83
3.2 Has the organization integrated GAD perspective in its organization and/or national/sectoral plan/s?	1.67
3.3 Has the organization formulated specific organizational/national/sector policies on GAD?	0.83
Sub-total GMEF score (Level 3: Policy)	**3.33**
4. Updating and Continuous Enhancement of GAD Policies *(possible scores are 0,0.83 and 1.67)*	
4.1 Has the organization's GAD policy/ies resulted in bridging gender gaps of its clients (internal/external)	1.67
4.2 Has the organizations used the results of gender analysis in the development and/or enhancement of policies?	0.83
4.3 Has the organization integrated GAD perspective in its vision, mission, and goals?	1.67
Sub-total GMEF score (Level 4: Policy)	**4.17**
5. Model GAD Policy *(possible scores are 0, 2.5, 5)*	
5.1 Has the organization's GAD policies been used as model/standard by other organizations?	0
Sub-total GMEF score (Level 5: Policy)	0
Total GMEF score on Policy	**15.84**

As gleamed from table 1 the total GMEF score of MPSPC on policy entry point is 15.84 which is equivalent to level 3 or GAD Application. This indicates an area of strength of MPSPC through the issuances of the following: policies articulating support to GAD Mandates and establishing the essential elements of GAD Planning and Budgeting, broad statements of intentions or aspirations reflecting its support for GAD, policies reflecting its interest for gender, the organization used gender fair language and images in its policy issuances. In addition, the organization integrated GAD perspective in its organization and/or national/ sectoral plan/s. These policies bridged gender gaps of its clients (internal/external).

On areas of improvement the College needs to conduct review of existing policies for consistency with emerging GAD issues and issuances accordingly, issue policies addressing the gender needs of the clients (internal and external), adapt a GAD Agenda/Strategic Framework on GAD, Integrate GAD in the Vision, Mission and Goals of the College, and use of the results of gender analysis in the development and/or enhancement of policies.

Lastly, areas of weaknesses are with 0 scores. GAD policies of the College has not been used as model/ standard by other organization.

As stated in the related literature level 3 on GAD mainstreaming is the period where GAD- related activities are consolidated for more impact. To support this the following issuances were issued: Creation of Gad Focal Point System (GFPS), Special Order (SO) for the Technical Working Group (TWG), Special Order for Committee on Decorum and Investigation (CODI), Issuance on inclusion of GAD concepts in the syllabus, BOT approved GAD program, approved BOT gender sensitive On the Job Training (OJT) manual, and Broad statement from the Office of the President to support GAD Activities (Participation to Women's Month, 18-Day Campaign, etc.)

TABLE 2A: PEOPLE ENTRY POINT

Key areas	Score
People	
1. On Establishing GFPS & GAD Champion/Advocates *(possible scores are 0,0.41, 0.83)*	
1.1 Has the organization designated people in strategic positions as members of its GAD Focal System (GFPS)?	0.41
1.2 Has the organization's GAD Focal Point System (GFPS) members attended appropriate and relevant trainings on GAD?	0.41
1.3 Has the organization's top management attended Basic GAD Orientation or Gender Sensitivity Training (GST)?	0.41
1.4 Has the organization's staff members been oriented on GAD?	0.41
1.5 Are the organization's top management and GAD Focal Point System (GFPS) members aware and conscious of GAD-related policies and mandates?	0.41
1.6 Does the organization's top management allow staff members to participate in GAD related activities?	0.83
Sub-total GMEF score (Level 1: People)	**2.88**
2. **On GAD Initiatives and Capacity Development Activities *(possible scores are 0,0.41, 0.83)***	

2.1 Does the organization's top management direct the implementation of the GAD Plan and Budget (GAD PB) of the organization?	0.41
2.2 Are program implementers trained on gender analysis (GA) and the use of gender analysis (GA) tools?	0
2.3 Are concerned staff members trained in the importance of collecting sex-disaggregated data (SDD) and gender statistics?	0.41
2.4 Are male employees involved and appreciative of the organization's GAD PAP's	0.41
2.5 Are the clients (internal and external) aware of the GAD efforts of the organization?	0.41
2.6 Are the clients (internal and external) able to articulate their gender needs/issues in the development of the organization's GAD efforts?	0.41
Sub-total GMEF score (Level 2: People)	**2.05**
3. GAD Sponsorship & Related Programs ***(possible scores are 0,0.41, 0.83)***	
3.1 Does the top management direct integration of GAD perspective in the organization's program/activities/projects (PAPs) and performance indicators?	0.41
3.2 Are the GFPS and program implementers able to integrate GAD perspective in the development of the organization's program/activities/projects (PAPs)?	0.41
3.3 Are the staff members able to utilize sex disaggregated data (SDD) and/or gender statistics for analysis for gender analysis (GA) to enhance the organization's GAD PAPs?	0.41
3.4 Does the top management support the appointment of qualified women staff members to leadership positions?	0.83
3.5 Do women assume critical assume critical roles and authority in the organization?	0.41
3.6 Are the clients (internal and external), able to participate in the planning and implementation of the organization's GAD efforts?	0.41
Sub-total GMEF score (Level 3: People)	**2.88**
4. GAD Champions as Program Implementers ***(possible scores are 0,0.41, 0.83)***	
4.1 Are the GAD Focal Point System (GFPS) members able to serve as GAD resource persons within the organization, including to its regional offices and attached agencies?	0.41
4.2 Does top management direct the monitoring of the organization's GAD efforts?	0.41
4.3 Are concerned staff members able to adjust GAD efforts to address emerging gender issues?	0.41
4.4 Do top management and concerned staff members reflect GAD functions in their performance contracts or terms of reference (TORs)?	0

As reflected in table 2A, MPSPC scored **11.09. which is equivalent to Level 2 or Installation of Strategic Mechanisms**. MPSPC has 2 areas of strength in People entry point. These are descriptors with the score of 0.83: Management allow staff members to participate in GAD related activities and top management support the appointment of qualified women staff members to leadership positions.

On the other hand, areas of improvement are descriptors with 0.41 scores. These are the following: designate people on strategic positions as members of its GAD Focal System(GFPS), GAD Focal Point System (GFPS) members attend appropriate and relevant training on GAD, top management to attend Basic GAD Orientation or Gender Sensitivity Training (GST), orientation of Staff members on GAD, awareness and consciousness of top

management and GAD Focal Point System (GFPS) members on GAD-related policies and mandates, top management to direct the implementation of GAD Plan and Budget (GAD PB) of the organization, staff members to be trained in the importance of sex disaggregated data (SDD) and gender statistics, involvement and appreciation of male employees of the organization of GAD PAPs, ability of clients (internal and external) to articulate their gender needs/issues in the development of the organization's GAD efforts, top management directs integration of GAD perspective in the organization's PAPs and performance indicators, GFPS and program implementers ability to integrate GAD perspective in the development of the organization's PAPs, ability of staff members to utilize sex disaggregated data (SDD) and or/gender statistics for analysis (GA) to enhance the organization's GAD PAPs, women assuming critical roles and authority in the organization, ability of clients (internal and external) to participate in the planning and implementation of the organization's GAD efforts, ability of

GAD Focal Point System to serve as GAD resource persons within the organization including to its regional offices and attached agencies, ability of staff to adjust GAD efforts to address emerging gender issues, and top management and staff to reflect GAD functions in their performance contracts of terms of reference.

Weakness on people entry point are descriptor with 0 score which includes: Training on program implementer on gender analysis (GA and the use of gender analysis (GA) tools and ability of staff members to develop tools and/or knowledge products (KPs) on GAD.

TABLE 2B: ENABLING MECHANISM ENTRY POINT

Key Areas	Score
Enabling Mechanism	
1. Setting-up of Essential GAD Mechanism *(possible scores are 0, 0.83, 1.67)*	
a. Has the organization created/ reconstituted its GAD Focal Point System (GFPS) in accordance with Magna Carta of Women Implementing Rules and Regulations (MCW IRR) Sec. 37-C and other pertinent policies issued by oversight agencies?	0.83
b. Has exploratory activities been initiated with the Philippine Commission on Women (PCW) or other agencies/LGUs, institutions and/or individuals to facilitate gender mainstreaming in the organization?	1.67
c. Has the organization collected information towards the establishment of sex-disaggregated database and enhancement of its M&E system?	0.83
Sub-total GMEF score (Level 1: Enabling Mechanism)	3.33
2. Functional GAD Mechanism *(possible scores are 0, 0.5, 1)*	
a. Does the organization have a functional GAD Focal Point System (GFPS) based on the provisions of guidelines issued by relevant oversight agencies? (e.g. PCW 2011-01 for NGAs, JMC 2013-01 for LGUs and CHED MO 2015-01 for SUCs)	0.5 0.5
b. Has the organization established other GAD mechanisms?	1.0
c. Has the organization utilized at least 5% of its budget (refers to the total GAA of NGAs and LGUs or COB for GOCCs) to implement GAD PAPs?	0.5
d. Has engagement with organizations such as PCW, LGUs and/or other agencies, and individuals been established towards the conduct of GAD-related activities for the organization?	0
e. Is the organization able to collect or generate sex- disaggregated data (SDD) and/or gender statistics?	
Sub-total GMEF score (Level 2: Enabling Mechanism)	2.50
3. Integration of GAD in the Organization's Mechanism *(possible scores are 0, 0.5, 1)*	
a. Does the organization's other GAD mechanisms coordinate, monitor and report progress of implementation of its functions?	0.5
b. Has the organization utilized 30% or more of its total budget (refers to the total GAA of NGAs and LGUs COB for GOCCs) to implement GAD PAPs?	0
c. Has the organization judiciously utilized its GAD budget to implement GAD activities based on its GAD Plan (GAD PB)?	0.5
Sub-total GMEF score (Level 1: Enabling Mechanism)	3.33
2. Functional GAD Mechanism *(possible scores are 0, 0.5, 1)*	
a. Does the organization have a functional GAD Focal Point System (GFPS) based on the provisions of guidelines issued by relevant oversight agencies? (e.g. PCW 2011-01 for NGAs, JMC 2013-01 for LGUs and CHED MO 2015-01 for SUCs)	0.5 0.5
b. Has the organization established other GAD mechanisms?	1.0
c. Has the organization utilized at least 5% of its budget (refers to the total GAA of NGAs and LGUs or COB for GOCCs) to implement GAD PAPs?	0.5
d. Has engagement with organizations such as PCW, LGUs and/or other agencies, and individuals been established towards the conduct of GAD-related activities for the organization?	0
e. Is the organization able to collect or generate sex- disaggregated data (SDD) and/or gender statistics?	
Sub-total GMEF score (Level 2: Enabling Mechanism)	2.50
3. Integration of GAD in the Organization's Mechanism *(possible scores are 0, 0.5, 1)*	
a. Does the organization's other GAD mechanisms coordinate, monitor and report progress of implementation of its functions?	0.5
b. Has the organization utilized 30% or more of its total budget (refers to the total GAA of NGAs and LGUs COB for GOCCs) to implement GAD PAPs?	0
c. Has the organization judiciously utilized its GAD budget to implement GAD activities based on its GAD Plan (GAD PB)?	0.5
d. Has the organization partnered with agencies/LGUs, institutions and/or individuals towards the strategic implementation of its GAD PAPs?	0.5
e. Is the organization utilizing sex-disaggregated data (SDD) and/or gender statistics in the development planning cycle (planning, implementation & management, and monitoring & evaluation)?	0
Sub-total GMEF score (Level 3: Enabling Mechanism)	1.50
4. Advanced GAD Structure Systems *(possible scores are 0, 0.5, 1)*	
a. Has the organization's other GAD mechanisms able to contribute towards the attainment of its desired impact/s?	0
b. Has the organization utilized 70% or more of its total budget to implement GAD PAPs?	0
c. Is the organization's database with sex-	

disaggregated data (SDD) and/or gender statistics able to generate sector-specific knowledge products (KPs) on GAD?	0
d. Is the organization's M & E system able to track the desired gender-related impacts of its GAD PAPs on clients (internal and external)?	0
e. Does the organization have a Knowledge Management (KM) System with GAD-related knowledge product (KPs)?	0
Sub-total GMEF score (Level 4: Enabling Mechanism)	0
5. Model GAD Structures and Systems *(possible scores are 0, 0.5, 1)*	
a. Has the organization's GAD Focal Point System (GFPS) been recognized or awarded as a model GAD mechanism by reputable local, national, and international organizations on gender mainstreaming?	0
b. Has the organization's other GAD mechanisms been recognized as models by other organizations?	0
c. Has the organization utilized 100% of its total budget to implement GAD PAPs?	0.5
d. Has the organization established a centralized database with disaggregated data (SDD) and/or gender statistics accessible to its regional offices and attached agencies, as well as external clients and partner organizations?	0
e. Is the Knowledge Management (KM) system of the organization integrated with GAD and replicated by other organizations?	0
Sub-total GMEF score (Level 5: Enabling Mechanism)	0.5
Total GMEF score on Enabling Mechanism	**7.83**

On enabling mechanism entry point, MPSPC scored 7.83 this is equivalent to level 1 or Foundation Formation. Under Formation. Under the setting up of enabling mechanism exploratory activities done by Philippine Commission on Women (PCW) or other agencies / LGUs, institutions and/or individuals to facilitate gender mainstreaming in the organization score 1.67. In addition, descriptors with 0.83 score are areas of improvement.

Under level 2, 3,4 and 5 on enabling mechanism entry point descriptors with 1.0 score are areas of strength; utilization of the 5% GAD budget (refers to the total GAA of NGAs and LGUs or COB for GOCCs) to implement GAD PAPs. Descriptors with 0.5 are areas of improvement; functional GAD Focal Point System (GFPS) based on the provisions of guidelines issued by relevant oversight agencies, establishment of other GAD mechanisms, engagement and establishment with organizations such as PCW, LGUs and/or other agencies, and the conduct of GAD related activities for the organization, coordination, monitoring, and reporting of progress of implementation of other GAD mechanism, judicious utilization of GAD Budget o implement GAD activities based on its GA Plan (GAD PB), partnership with agencies/LGUs, institution and/or individuals towards the strategic implementation of the organization's GAD PAPs, and 100% utilization of the organization's total GAD budget to implement GAD PAPs.

In addition, descriptors with 0 scores are MPSPC's area of weakness under enabling mechanism entry points: Collection and generation of sex-disaggregated data (SDD) and/or gender statistics, 30% or more utilization of the organization's budget to implement GAD PAPs, utilization of sex-disaggregated data (SDD) and/or gender statistics in the development planning cycle (planning implementation & management, and monitoring & evaluation), contribution of other GAD mechanism towards the attainment of its desired impact, utilization of 70% or more of its total budget to implement GAD PAPs, ability of the organization's data base with sex-disaggregated data (SDD) and/or gender statistics to generate sector-specific knowledge product (KPs) on GAD, ability of the organization's Monitoring and Evaluation (M&E) system with gender – related impacts of its GAD PAPs on clients (internal and external), MPSPCs Knowledge Management (KM) System with GAD related knowledge product (KPs) , recognition, award of GAD Focal Point System (GFPS) as a model GAD mechanism by reputable local, national, and international organizations on gender mainstreaming, recognition of the organization's other GAD mechanism as model by other organization, establishment of the organization's centralized data base with sex-disaggregated data (SDD) and/or gender statistics accessibility to its regional offices and attached agencies, as well as external clients and partner organization and integration of the Knowledge Management (KM) system of the organization integrated with GAD and replicated by other organizations.

Table 4: Programs, Activities and Projects (PAPs)

Key Areas	Score
Programs, Activities and Projects (PAPs)	
1. Initial Activities to Facilitate GAD Mainstreaming *(possible scores are 0, 0.41, 0.83)*	
a. Is the organization observing international/national\local GAD-related events?	0.83
b. Has the organization conducted Basis GAD Orientation of Gender Sensitivity Training (GST) for its clients (internal and external)?	0.83
c. Has the organization conducted consultation activities with clients (internal and external) to identify gender issues and corresponding strategies?	0
d. Has the organization consulted PCW and relevant organizations/individuals on its GAD mainstreaming?	0.41
e. Has the organization reviewed and revised existing Information/Education/Communication (IEC) materials and knowledge products (KPs) to ensure use of gender-fair language and images?	0
f. Has the organization set up a GAD corner?	
Sub-total GMEF score (Level 1: PAPs)	**2.49**
2. Establishing Commitment towards GAD Mainstreaming *(possible scores are 0, 0.31, 0.62)*	
a. Has the organization formulated GAD agenda or strategic framework on GAD?	0.62
and Budget (GAD PB) based on its GAD agenda, emerging gender issues, international/national GAD mandates or results of gender analysis?	0.62
c. Has the organization conducted deepening sessions on GAD based on the results of the Training Needs Assessment (TNA) or updated GAD policies and tools as part of the continuing capacity development of GAD Focal Point System (GFPS) and concerned staff members?	0
d. Has the organization used Gender Analysis (GA) tools and techniques in the review, enhancement or development of PAPs?	0
e. Does the organization have facilities and services that address the gender issues and concerns of its clients) internal and external)?	0
f. Has the organization developed orientation modules for new employees with gander sensitivity as a core competency?	0
g. Has the organization developed and disseminated new Information/Education/Communication (IEC) materials on GAD to clients (internal and external)?	0
Sub-total GMEF score (Level 2: PAPs)	**1.41**
3. GAD Application *(possible scores are 0, 0.35, 0.71)*	
a. Has the organization monitored the implementation of its GAD Program/Project/Activities (PAPs)?	0.35
b. Has the organization prepared and timely submitted its GAD Plan and Budget (GAD BP) and GAD Accomplishment Report (GAD AR)?	0.71
c. Has the organization conducted and sustained GAD capacity development for its clients (internal and external)?	0.35
d. Has the organization conducted GAD capacity development sessions for internal GAD experts?	0
e. Has the organization regularly applied Gender Analysis (GA) tools in the development planning cycle (Planning, implementation & management, and monitoring & evaluation)?	0
f. Has the organization regularly updated its GAD section in the website?	0
g. Has the organization set up Knowledge Management (KM) system as a mechanism to transfer knowledge on GAD?	
Sub-total GMEF score (Level 3: PAPs)	**1.41**
4. GAD Commitment and Institutionalization *(possible scores are 0, 0.5, 1)*	
a. Has the organization sustained implementation and monitoring of international, national and local GAD mandates in its programs?	0.5
b. Has the organization conducted organizational/sector specific capacity development sessions on GAD for clients (internal and external)?	0.5
c. Does the organization regularly apply gender analysis (GA) tools to assess gender-responsiveness of programs/activities/projects (PAPs) including Official Development Assistance (ODA) funded projects?	0
d. Has the organization developed a sustainability action plan for its GAD PAPs?	0.5
e. Has the organization conducted impact evaluation of its GAD PAPs?	
Sub-total GMEF score (Level 4: PAPs)	**1.50**

5. Model PAPs *(possible scores are 0, 0.62, 1.25)*	
a. Has the organization been recognized as a GAD learning hub for its notable GAD PAPs?	0
b. Has the organization's partnership with stakeholders resulted in a convergence model that is recognized and replicated by other organizations?	0 0
c. Has the organization's knowledge products (KPs) and Information, Education, Communication (IEC) materials on GAD used by other organizations?	0
d. Has the organization's existing award/incentive system been integrated with GAD perspective?	
Sub-total GMEF score (Level 5: PAPs)	0
Total GMEF score on PAPs	**6.72**

From table 4 or the Project, Activities and Program entry point, MPSPC scored 6.72 which is equivalent to Foundation Formation. Areas of strength on PAPs level 1 are descriptors with 0.83 scores these are the observance of International/national and local GAD related events.

(Women's Month, 18 Day Campaign to end VAWC) and conducted Basic GAD orientation and Gender Sensitivity Training (GST) for its clients (internal and external). On the other hand areas for improvement of MPSPC are descriptors with 0.41 scores; consultation with PCW and relevant organizations/individual on its GAD mainstreaming and review and revision of existing Information/ Education/Communication (IEC) materials and knowledge products (KPs) to ensure use of gender-fair language and images. Descriptors with 0 score are the areas of weaknesses; conduct of consultative activities with clients (internal and external) to identify gender issue and corresponding strategies and setting up of GAD corner.

For level 2 PAPs entry point or Establishing Commitment towards GAD Mainstreaming, areas of strength are descriptors with 0.62: formulation of GAD agenda or strategic framework on GAD and Development of GAD Plan and Budget (GAD PB) base on the organizations GAD agenda, emerging gender issues, international/national GAD mandates or results of gender analysis. In this level MPSPC has no areas for development. However, areas of weakness with 0 score is visible; no conduct of deepening session on GAD based on the results of the Training Needs Assessment (TNA) or updated GAD policies and tools as part of the continuing capacity development of GAD Focal Point System (GFPS) and concerned staff members, use of Gender Analysis (GA) tools and techniques in the review, enhancement or development of PAPs, facilities and services that address the gender issues and concern of its client (internal and external), development of orientation models for new employees for gender sensitivity as a core competency, development and dissemination of new Information/Education/ Communication (IE) materials on GAD to clients (internal and external) and creation of GAD section in the organization's website.

For level 3 entry point on PAPs or GAD application, MPSPCs area of strength is on the sustenance of GAD capacity development for the organizations client (internal and external) with the score of 0.71. Areas for development are descriptors with 0.35 score which are the monitoring of the implementation of GAD Program/Activities and Projects (PAPs) and conduct on GAD capacity development sessions for internal GAD experts. Meanwhile, descriptors with score of 0 are areas of Weaknesses; regular application of Gender Analysis (GA) tools in the development planning cycle (planning, implementation & management, and monitoring & evaluation), Update of GAD section in the website, and set up of Knowledge Management (KM) system as a mechanism to transfer knowledge on GAD.

On GAD Commitment and institutionalization or level 4 for PAPs entry point MPSPC have 3 areas for development with 0.5 score. As shown from table 4 these areas are; sustained implementation and monitoring of international, national and local GAD mandates in its programs, conduct of the organizational/sector specific capacity development sessions on GAD for clients (internal and external) and conduct of impact evaluation of its GAD PAPs. The descriptor with the score of 0, is the area of weakness of MPSPC. This is the development of sustainable action plan for its GAD PAPs.

TABLE 5: OVERALL SCORE OF MPSPC PER ENTY POINT

Key Areas	**Score**	**Level**
Policy	15.84	**Level 3** GAD Application
People	11.09	**Level 2** Installation of Strategic Mechanism
Enabling Mechanism	7.83	**Level 1** Foundation Formation
Programs Activities Projects	13.53	**Level 1** Foundation Formation
Grand Total	**48.29**	**LEVEL 2 INSTALLATION OF STRATEGIC MECHANISM**

As gleamed from table 5 MPSPC reached Level 3 in the Policy entry point. This is the highest level reached by the college, which also implies a strength. The top management issues policy/ies articulating GAD mainstreaming in the fourfold function of the institution. On the other hand, it reached level 2 in the people entry point this is an area of improvement that the college needs to work on particularly in the strengthening of GAD Focal Point System. Furthermore, on enabling mechanism and PAPs there is a need to exert more effort in addressing the need on these 2 particular entry point since this is where the weakness in mainstreaming revealed.

CONCLUSION

As a result of the exerted efforts of MPSPCs' gender mainstreaming, the College was able to reach level 2 in its overall mainstreaming which is equivalent to Installation of Strategic Mechanism. This conveys that from the data and information gathered, top management and GAD Focal Point System (GFPS) together with the GAD Technical Working Group (TWG) worked towards a gender responsive institution.

On policy entry point, MPSPC reached level 3. This is one strength of the College in its GAD Mainstreaming, GAD related policies were issued in order to articulate mainstreaming in its four fold functions.

On people entry point MPSPC is in level 2. The GAD Focal Point System was initially constituted where the Technical Working was constituted through Special Order (SO). Top management is supportive of the mainstreaming, but there is a need that the middle management and other sectors should articulate mainstreaming.

On enabling mechanism entry point MPSPC scored 7. 83 which is equivalent to level 1. This is a weak spot on their mainstreaming where the GAD mechanism is not fully functional, integration of GAD in the Organizational Mechanism is not yet visible and there is no clearly defined GAD structure system where it can clearly monitor, implement, evaluate its activities.

On Program, Activities and Projects (PAPs) MPSPC scored 6.81 which is equivalent to level 1. This is an area of weakness for the College. PAPs are not reflected in the sectoral/unit plans. The GAD office initiates PAPs but it needs to be cascaded in the different sectoral plans, thus addressing gender issues.

RECOMMENDATION

The researchers recommends the following in order to increase the level of gender mainstreaming in Mountain Province State Polytechnic College.

On Policy entry point

1. The institution should develop clear GAD Policy adopting the MPSPC GAD Program.
2. Develop and issuance of policies based on GAD related policies issued by MPSPC.
3. Integrate GAD in the Vision, Mission, Goals of the organization

On People entry point

1. Top management should direct integration of GAD perspective in the provided orientation on the Gender Analysis (GA) & Sex Desegregated Data (SDD)
2. Increase involvement of other units in the institution to infuse and respond to gender issues in their regular program.
3. Intensify male involvement in GAD efforts and initiatives within the institution.

On Enabling Mechanism entry point

1. Build network/partnership on GAD with other organization and individual experts.
2. Generate sex-desegregated data (SDD) and gender statistics, and utilize them in all stages of development cycle in order to generate sector-specific knowledge products (KPs).
3. Set up and Develop MPSPC's Knowledge Management system (KM) and integrate with GAD.
4. The institution should install a system to enforce and monitor the allocation of the 5% funds for gender mainstreaming

On Projects, Activities and Programs (PAPs)

1. The institution should conduct consultation activities with the involvement of clients (internal or external) to identify gender issues and devise strategies to address identified gender issues.
2. To better cater to the needs of the institution's client (internal and external) a GAD center should be established.
3. Training needs assessment should be conducted in order to identify training needs of staff like; Knowledge Management (KM), Gender Analysis (GA), Gender Monitoring Management System (GMMS)
4. Creation of GAD section in the organizations' website.
5. Gender Analysis(GA) should be applied and utilize in order to assess if programs, activities and projects (PAPs) are gender responsive and geared

to replication and innovation or level 5 of gender mainstreaming.

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