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**A FRAMEWORK FOR AN ICT-BASED DEVELOPMENT
PROGRAM FOR SCIENCE TEACHERS IN STATE
UNIVERSITIES AND COLLEGES IN REGION VI:
DESIGN AND IMPLEMENTATION**

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RATIONALE:

Colleges and universities invest billions of dollars per year for the acquisition of instructional technology through ICT and other ICT tools.

Today, everyone needs a basic understanding of ICT and how to make productive use of it, just to be good teacher, students and citizens. Teaching people how to be competent basic users of ICT technologies is an important role of ICT education, so they will be successful in their academic and work careers, especially in teaching and learning and so they can efficiently participate in modern technical society.

The widespread belief that ICTs can and will empower teachers and learners, transforming teaching and learning processes from being highly teacher-dominated to student-centered, and that this transformation will result in increased learning gains for students, creating and allowing for opportunities for learners to develop their creativity, problem-solving abilities, informational reasoning skills, communication skills, and other higher-order thinking skills.

However, the performance of ICT utilization in higher education is not expressly evident. Although most teachers may have considerable skills in ICT, they cannot integrate ICT into regular teaching effectively. This phenomenon has been the concern of the present researcher and has put forward worthy outcome and consideration to solve this problem.

In the premise of this research study, the researcher wished to understand the framework for an ICT-based development program for science teachers in state universities and colleges in Region VI, more specifically, the ICT attitudes, skills, utilization and barriers in the teaching learning process of science teachers and to determine possible development framework suited to their individual needs.

SETTINGS OF THE STUDY:

This research study was conducted at state universities and colleges in Region VI. It covered 11 SUC's which offer Science Education programs. There were 139 science teachers teaching in different Science courses, 11 Vice President for Academic Affairs and 6 deans and their representatives. They were evaluated according to their ICT attitudes, skills, utilizations and barriers in the teaching learning process to develop a framework training program that suits to their different needs.

STATEMENT OF THE STUDY:

The main purpose of this research study was to develop a framework for an ICT-Based development program for Science teachers in State Universities and Colleges in Region VI. This study was performed with the guidance of the following research questions:

1. What was the extent of ICT attitudes, skills, utilization, and barriers of Science teachers of SUCs in Region VI regarding ICT?
2. What actions had been taken by the State Universities and Colleges (SUC's) in Region VI to integrate ICT into teaching and learning in science curriculum?
3. What programs had been introduced by the SUC's in Region VI to provide professional development for science professors to employ ICT in their classes?

4. What are the professional development needs of science teachers in Region VI regarding ICT use in science curriculum?
5. How did the science teachers' ICT attitudes, skills, utilization, and barriers, regarding ICT differ in terms of:
 - A. Age
 - B. Gender
 - C. Highest education attainment
 - D. Length of service
 - E. School location; and
 - F. Home location?
6. What prototype professional framework is proposed based on the results of the research study?

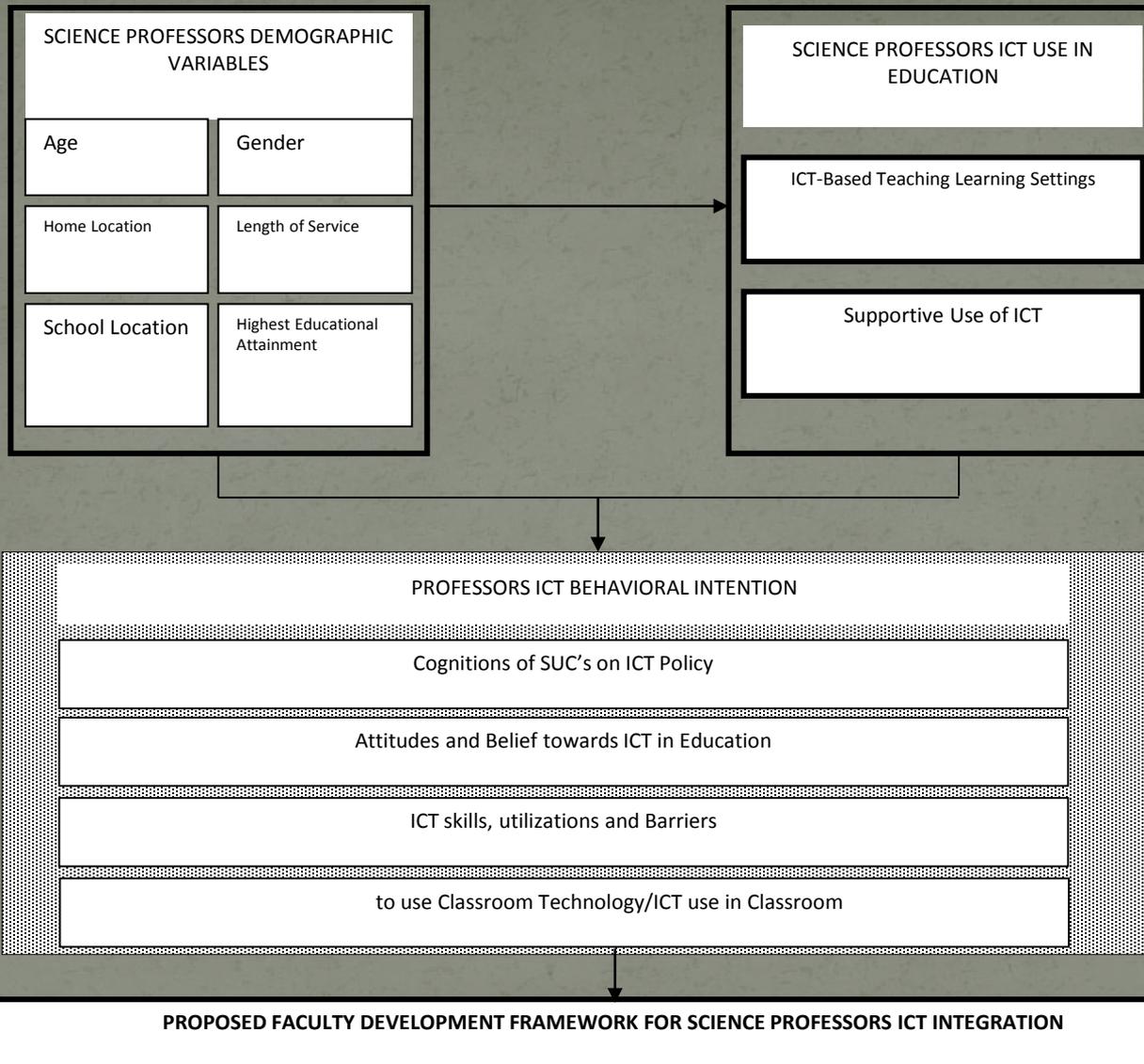
THEORETICAL/PARADIGM OF THE STUDY:

The framework of the study that was developed from the review of literature about the features' impact on utilization of ICT in teaching learning settings of science professors in SUC's Region VI, the interactive effects of variables and contextualized methodologies. Following this paradigm, the impact of information and communication technology (ICT) was examined in science teaching learning process.

The outcomes were some observable attributes that characterize the effect of ICT in teaching learning settings of the science teachers. The ultimate outcomes of the educational innovations were the teachers' cognition and development framework to enhance their ICT utilization in their teaching learning settings.

ICT utilization was mediated by a complex interaction of the skills, attitudes, capabilities, practices and barriers among the science professors in SUC's Region VI.

The research framework used Venkatesh's (2012) UTAUT construct to modify a most appropriate model on this study. There are two dependent variables of interest: current use of emerging classroom technologies science teachers in education and the science teachers' behavioral intention to use these technologies in the future. Hence, following the research model, the antecedents of Cognitions of SUC's on ICT Policy, Attitudes and Belief towards ICT in Education, ICT skills, utilizations and Barriers, and Intention to use Classroom Technology/ICT use in Classroom were identified as key constructs in the model, while extending it to the higher education context. The science teachers' demographic variables such as age, gender, length of service, highest educational attainment and their home and school location were also included and modeled as moderators as suggested by Information Systems (IS) adoption literature.



Paradigm of the Study

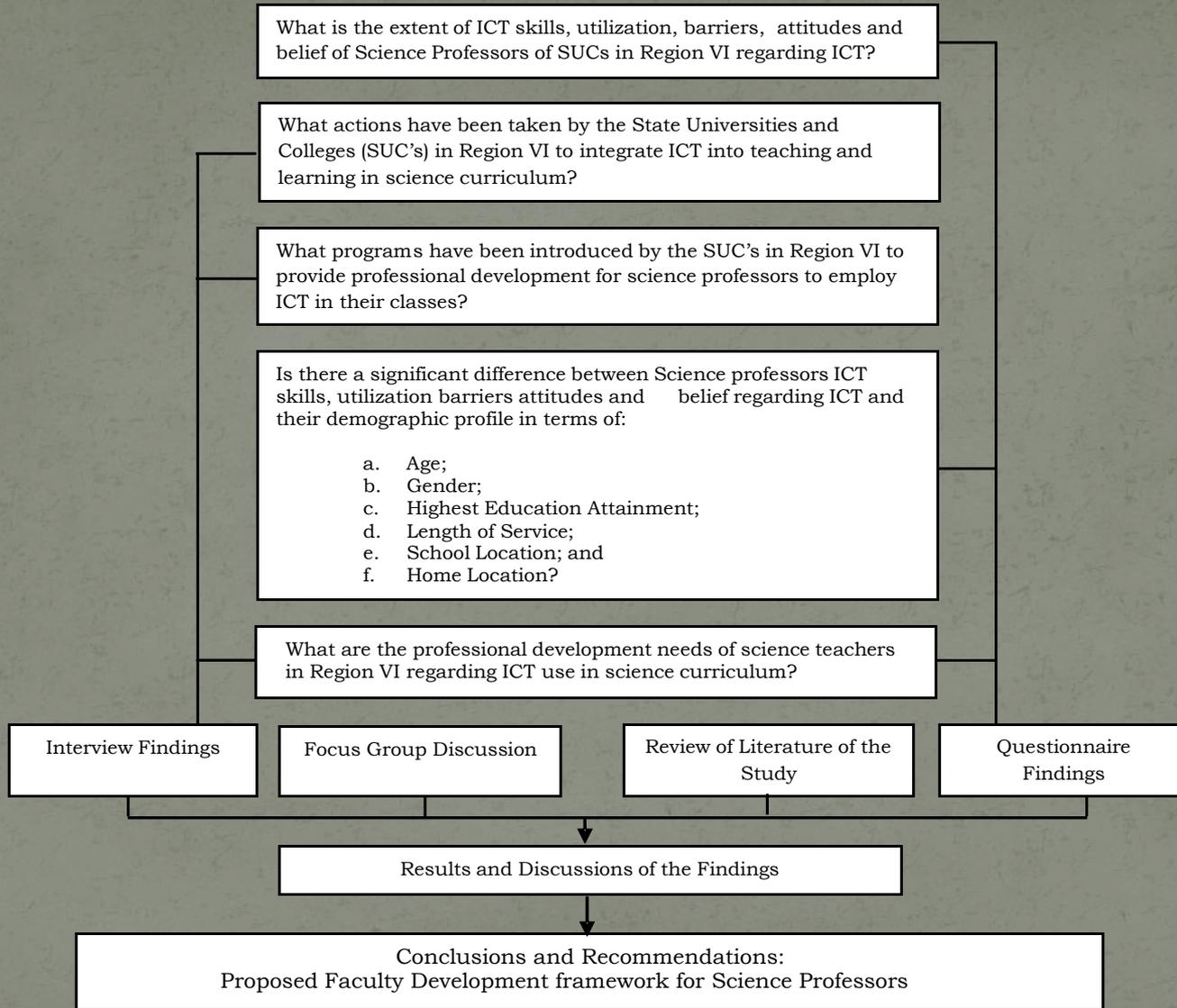
RESEARCH DESIGN:

For this study, a research strategy integrating different methods is likely to produce better results in terms of quality and scope. The research design selected for this study is a “triangulation mixed methods” approach that can better inform the study, increase the quality of the final results and provide a more comprehensive understanding of analyzed phenomena. A triangulation mixed method approach can therefore extend the analysis, findings, and conclusions for this study to better inform its results and create a stronger path towards a critical evaluation of ICT integration into the SUC’s science curriculum, and therefore becomes more useful and accountable to a wider audience.

The triangulation mixed method approach uses qualitative and quantitative analyses: qualitative research as a means for exploring and understanding the meaning ascribed to a problem, and quantitative research through the collection of data, and then testing objective theories by examining the relationship among the variables. The purpose of combining these arguably disparate approaches is to minimize the weaknesses inherent in a singular method to gain a contextual understanding through collecting qualitative data, and a more rigorous approach through exploring quantitative data. Thus, two sample groups were selected to gather the requisite data for each type of analysis, the university administrators for the selected qualitative approach of interviews, and SUC's science teachers in Region VI for a large paper-based survey by questionnaire and focus group discussion.

As this is descriptive research, qualitative research is appropriate for gathering and interpreting data by using an open-ended semi-structured interview procedure from representatives from university administrators who can influence SUC's education policies.

Furthermore, this research requires specific data through quantitative analysis, in particular, descriptive analysis. A self-administered questionnaire, distributed to SUC's science teachers in Region VI, was constructed to determine the ICT awareness and usage in the science curriculum. And an additional focus group discussion will be conducted to give more viable response from the respondent science teachers.



RESULTS AND DISCUSSIONS:

Extent of ICT Attitudes and Belief, Skills, Utilization and Barriers of Science Teachers in SUC's Region VI

	Attitudes	Skills	Utilization	Barriers	Action Plans	Programs	Dev. Needs
Science Teachers	<ul style="list-style-type: none"> •Uncertain 	<ul style="list-style-type: none"> •Adaptation level or Science teachers were already familiar with the various applications and uses of ICT in their teaching learning process and use it occasionally to support their teaching process. 	<ul style="list-style-type: none"> •Almost Always 	<ul style="list-style-type: none"> •Somewhat Limits on Organizational, Technological and Policy Barriers. •Slightly Limits on Individual Barriers. 			<ul style="list-style-type: none"> • Skills Training • Provide ICT Equipment • Administrative Support • Viable ICT Plans and Programs

	Attitudes	Skills	Utilization	Barriers	Action Plans	Programs	Dev. Needs
Policy Makers				<ul style="list-style-type: none"> • Setting up the devices can be very troublesome; • Too expensive to afford; • Hard for teachers to use with a lack of experience in using ICT; • ICT literacy of faculty, costs, culture not attained to shifting; • Lack of ICT equipment; • No administrative support; and • Low funds allocation. 	SUC's develop ICT integration programs or action undertaken according to their needs, and timetable.	there were no specific science-based ICT programs have been introduced by the SUC's in Region VI to provide professional development for science professors to employ ICT in their classes.	<ul style="list-style-type: none"> • Policy makers also mentions the that the strategic plan of the University includes the improvement of ICT facilities to compliment the delivery of ICT teaching and to allocate more funds to augment the needs of securing more ICT infrastructure, facilities and resources for teachers use during their teaching learning process. • administrative support • revision of curriculums were in ICT integration should be mandatory to be implemented within the system • teachers' training

	Attitudes	Skills	Utilization	Barriers	Action Plans	Programs	Dev. Needs
FGD	<ul style="list-style-type: none"> • There is a Positive Attitudes as long as there is sufficient number of ICT equipments and facilities for their usage. 	<ul style="list-style-type: none"> • Moderate Skills (5-6 out of 10 Scale). 	Less utilization	<ul style="list-style-type: none"> • Funds allocation for the procurement of ICT infrastructures. • No concrete policy for ICT integration. • Low skills level of Teachers. 	<ul style="list-style-type: none"> • There is a project to computer or ICT facilities and infrastructures such as what our university is doing. However, due to lack of financial capacity and very expensive equipments, the insufficiency of such equipment is not being address. • At present, computer became available in school. However, the absence of internet and school wide network at school becomes a kind of shortage. 	<ul style="list-style-type: none"> • No concrete program. • SUC's are still on the planning stage. 	<ul style="list-style-type: none"> • School Support • More fund Sourcing • ICT Training • Procurement of ICT Equipment • Incentives

Difference among Teacher's Respondents Attitudes, Skills, Utilization and Barriers towards ICT according to Age

The largest age group for all respondents was between 51-60 years old, and they show low level skills and utilization compared to younger teachers.

This show that the dominance of the older age Science teachers shows a big factor exhibited a significant difference on their skills, utilization and identified individual barriers that impede them in the integration of ICT in their teaching learning settings.

Difference among Teacher's Respondents Attitudes, Skills, Utilization and Barriers towards ICT according to Gender

Even there were roughly unequal numbers of male and female science teachers in SUC's region VI, their perception as to their ICT attitudes, ICT skills, ICT utilization and perceived barriers were the same which shows no significant different.

Difference among Teacher's Respondents Attitudes, Skills, Utilization and Barriers towards ICT according to Educational Attainment

Even though that the great majority of science teachers in SUC's Region VI had a bachelor's degree with MA/MS units in science and other science related courses, and the smallest group had PhD/EdD degree in science and other science related courses, still there is no such significant difference implies to their attitudes, skills, utilization and perceived barriers in ICT.

Difference among Teacher's Respondents Attitudes, Skills, Utilization and Barriers towards ICT according to Length of Service

The demographic variable length of service shows a significant difference among science teachers' ICT attitudes, skills utilization and perceived individual barriers in their teaching learning process.

This is because teachers who have longer length of service were also represented by older science teachers which their attitudes, skills utilization and perceived individual barriers is also lower compare by younger teachers.

Difference among Teacher's Respondents Attitudes, Skills, Utilization and Barriers towards ICT according to their School Location and Home Location

The difference between science teachers' attitudes, skills and utilization towards information and communication technology in their teaching learning process according to demographic profile of school and home location demonstrate a non significant difference with their attitudes, skills, and utilization.

This implies that regardless of whether the schools and their home were located at rural or urban area, the respondents' attitudes, skills and utilization on ICT was not a factor on their integration of ICT in their teaching learning process.

Furthermore, the four factors of barriers towards ICT programmes were investigated, including barriers categories classified as organizational culture, individual, technological and policy barriers, which shows also a non significant difference as to school and home location were the science teachers are connected and living.

CONCLUSIONS:

The study conclusions were drawn from the findings. The fundamental issue that emerged from this study is that the integration of ICT into science curriculum of Science teachers in State Universities and Colleges (SUC's) in Region VI are impeded by structural and operational factors relating to the different SUC's programs and policies.

The role of the teacher in developing ICT use in different SUC's in Region VI is utterly critical, yet there are many obstacles to be faced, in addition to those already listed that emerged more generally. A primary barrier to teachers' readiness and confidence in using ICT – despite general enthusiasm and belief in benefits for learners – is their lack of training, either initially or in-service. This results in lack of proficiency in using ICT, and knowledge of all of the potential uses and roles of ICT in teaching and learning.

The discussion above highlighted several issues that appeared to influence on teacher utilization and integration of ICT in their profession. The three major Issues and findings of this study reveals that inadequate ICT resources, management of ICT integration, and teacher ICT training and attitudes skills, utilization and barriers were considered as a factor issues.

RECOMMENDATIONS:

The recommendations were drawn from the summary and conclusions of the study. The fundamental issue that emerges from this study is that the integration of ICT into science curriculum of science teachers' in region VI is impeded by structural and operational factors relating to the SUC's programs and policies.

1. A 5-year development plan in every state universities and colleges in region VI should be standardize which ICT integration program in the teaching learning process of science teachers be evident;
2. There should be a revision of curriculums were in ICT integration should be mandatory to be implemented within the system;
3. A training need analysis should be conducted for evaluation purposes of the skills and competencies of the teachers to attend trainings and seminars.
4. More funds should be allocated to augment the needs to improve the existing and securing more ICT infrastructure, facilities and resources.

5. Full financial support should be provided to augment the implementation and sustainability of such program either local funds or outsource funds from private or government partners.
6. An immediate need to change teachers' attitudes toward adoption of modern educational methodologies, such as cooperative and constructive learning process. For this, teachers need suitable training in ICT; this could be achieved by strong training programs to develop their occupational skills in the use of ICT, to remove psychological barriers, and to facilitate their use of ICT in the classroom.
7. Professional and material incentives should be given to encourage teachers to attend training programs to raise their occupational skills.

8. There should be proper monitoring and evaluation on the effect of the implementations of programs.
9. Subsequent research is recommended to explore in more depth and other contexts trends and constraints on ICT integration in the science curriculum in SUC's, and could include observational studies which were beyond the scope of this study. Finally, the theoretical issues in integrating ICT into the science curriculum and the teachers' enhanced role through professional development provide interesting pathways for further research.

PROPOSED FACULTY DEVELOPMENT FRAMEWORK FOR SCIENCE PROFESSORS

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>LEADERSHIP/ ADMINISTRATION</p> <p>1. To develop the ICT Strategic Plan to ensure that is aligned with views of the school community and is referenced by the appropriate National, State and SUC's policies.</p> <p>2. To establish clear criteria for evaluating the effects of integrating ICT within teaching, learning and administration.</p> <p>3. To submit annual reports that document the progress towards the goals within the ICT Plan</p> <p>4. To create ICT Integration team</p>	<p>1. <i>The school has a clearly articulated shared vision for ICT in teaching, learning and administration, as a result of collaboratively consulting with key stakeholders and makes reference to the appropriate National, State and SUC's policies</i></p> <p>•To develop the ICT Strategic Plan to ensure that is aligned with views of the school community and is referenced by the appropriate National, State and SUC's policies.</p>	<p>1. Complete ICT Review Tool – survey of School Administrators, Director/chairman of ICT and all teachers</p> <p>2. Reference to National, State and SUC's policies</p> <p>3. Discuss criteria with Curriculum Committee</p> <p>4. Establish reliable methods of collecting data evaluating the effects of ICT within teaching, learning and administration</p>	<p>* ICT Directors/ Chairmen</p> <p>•SUC's Integration Team/ Committee</p>	<p>June- September, 2014</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>LEADERSHIP/ ADMINISTRATION</p> <p>5. Appropriate level of funding to achieve the goals for the integration of ICT.</p> <p>6. To continue current budget planning to ensure a steady spending pattern that will achieve the school's goals for ICT integration</p>	<p>* To establish clear criteria for evaluating the effects of integrating ICT within teaching, learning and administration.</p> <p>* To submit annual reports that document the progress towards the goals within the ICT Plan</p> <p><i>2. E-Learning leadership is distributed across the school to ensure the integration of ICT is a focus in planning.</i></p> <p>* To extend current ICT Integration team</p> <p><i>3. ICT resources are up-to-date and allow the school to respond to modern trends and rapidly take advantage of future improvements in ICT delivery and infrastructure.</i></p>	<p>5. Set up SUC's based collaborative teams for ICT integration</p> <p>6. SUC's coordinator becomes responsible for strategic leadership for ICT within their system</p> <p>7. Documentation of ICT integration strategies used in each subject area</p> <p>8. Maintain budget plans which are always forward-planned to the life of the current equipment.</p>		<p>June-September, 2014</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
LEADERSHIP/ ADMINISTRATION	<p>* To review the ICT levy to ensure an appropriate level of funding to achieve the goals for the integration of ICT.</p> <p>* To continue current budget planning to ensure a steady spending pattern that will achieve the school's goals for ICT integration</p>	<p>9. Review ICT priorities to adapt to current pedagogical trends and emerging technologies – conferences, professional learning, magazines, newspapers, online subscriptions, school visits, purchase of new software and hardware for testing.</p>		<p>June-September, 2014</p>		<p>Annual</p>
<p>ICT PROFESSIONAL LEARNING</p> <p>1. Prioritization of professional learning with ICT and about ICT:</p> <p>* To develop to a high priority within total Professional Learning program for Science Teachers</p>	<p><i>There is a high priority of professional learning with ICT and about ICT for science teachers.</i></p> <p><i>1. Professional learning with and about ICT allows teachers to:</i></p>	<p>1. Use TNA survey from the basis for understanding ICT PD needs of teachers and to assist in setting goals</p>	<ul style="list-style-type: none"> • ICT Directors/ Chairmen • VP-Administration • VP-Acad. Affairs • Curriculum Planning Officers • Prof. Dev't. Coordinator • SUC's Planning Officers 	<p>S.Y. 2014-2015</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>ICT PROFESSIONAL LEARNING</p> <ul style="list-style-type: none"> * To establish a formal process for developing and recording ICT skill development for the use of ICT and for the integration of ICT within teaching and learning. * To ensure that course writing includes specific integration of ICT for science teachers and for student use. * To provide more time and access for professional learning with ICT and about ICT * To maintain flexible delivery of ICT professional learning through face-to-face and online activities provided by in-house or pre-service trainings of colleagues or external experts * To provide time for more staff to support others in professional learning with ICT and about ICT <p>2. To develop Professional Learning Plans that:</p> <ul style="list-style-type: none"> * Are regularly audited 	<ul style="list-style-type: none"> * <i>Explore, understand and utilize ICT in teaching, communication, management and administration</i> * <i>Integrate ICT in ways that produce more effective and more efficient teaching and learning</i> * <i>Evaluate, create and share online learning resources with colleagues and students locally and globally</i> * To develop to a high priority within total Professional Learning program * To establish a formal process for recording ICT skill development and for the integration of ICT within teaching, learning and administration * To ensure that course writing includes specific integration of ICT for teachers and for student use * To provide more time and funding for professional learning with ICT and about ICT 	<ol style="list-style-type: none"> 2. Include ICT skill development report from TNA survey in Annual Review Meeting with the Administrators and Stakeholders 3. Set specific dates for ICT in-services and pre-service training for science teachers. 4. Develop a database for recording all professional learning 5. Establish a train-the-trainer model with time given to trainers to work with others 6. Employ ICT Coaches to assist integrate ICT in the classroom 7. Utilize emergency to cover teachers doing PD 8. Increased teacher PD to implement to ensure productive results in ICT integration process. 	<ul style="list-style-type: none"> • ICT Directors/ Chairmen • VP- Administration • VP-Acad. Affairs • Curriculum Planning Officers • Prof. Dev't. Coordinator • SUC's Planning Officers 	<p>S.Y. 2014-2015</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>ICT PROFESSIONAL LEARNING</p> <p>* Take into account individual, school and system needs and targets</p> <p>•Enable on-going access and flexible use of resources and facilities</p> <p>•To develop an online database to enable teachers and administrative staff record achievement of individual, school and system targets for the use of ICT</p> <p>•To share innovative practice</p>	<p>* To maintain flexible delivery of ICT professional learning through face-to-face and online activities provided by in-house colleagues or external experts</p> <p>2. <i>Staff members maintain Professional Learning Plans and the impact of ICT professional learning is constantly evaluated on the basis of meeting individual, school and system needs and targets.</i></p> <p>* To development of Professional Learning Plans that Are regularly audited</p> <p>* Take into account individual, school and system needs and targets</p> <p>* Enable on-going access and flexible use of resources</p> <p>* To develop an online database to enable teachers and administrative staff record achievement of individual, school and system targets for the use of ICT</p> <p>3. <i>Teachers use ICT tools to plan, access and share professional learning online within the school network and globally in timely, focused and practical ways.</i></p> <p>* Maintenance of KLA based sharing</p> <p>* Publishing of innovative practice online</p> <p>* Development of “experts” list to assist others learning specific practices</p>	<p>9. Development of ICT Integration Website for use by teachers</p> <p>10. Professional Learning Plan template developed</p> <p>11. Online database developed to allow entry of information on all aspects and allow auditing</p> <p>12. Subscription of teachers to online groups</p> <p>13. Development of teacher blogs and forums</p> <p>14. Published list used to assist others to find people to help with specific ICT advice</p>	<ul style="list-style-type: none"> • ICT Directors/ Chairmen • VP- Administration • VP-Acad. Affairs • Curriculum Planning Officers • Prof. Dev’t. Coordinator • SUC’s Planning Officers 	<p>S.Y. 2014-2015</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>ICT INFRASTRUCTURE</p> <p>1. Network</p> <p>* To integrate and expand wireless access to cover all areas of the school to achieve successful implementation of ICT integration</p> <p>* To development and implement a Content Management System for 24/7 availability of resources</p> <p>* To improve internet connection for Science Teachers and students to achieve successful implementation of Integration.</p> <p>* To improve power supply and secure charging stations and storage to achieve successful implementation of Integration</p>	<p><i>1. The ICT infrastructure provides an integrated, efficient system for the full range of teaching, learning and administrative requirements</i></p> <p>* To integrate and expand wireless access to cover all areas of the school to achieve successful implementation of ICT integration</p> <p>* To development and implement a Content Management System for 24/7 availability of resources</p> <p>* To improve internet connection for science teachers and students to achieve successful implementation of ICT integration</p>	<p>1. Infrastructure Audit</p> <p>2. Upgrade wireless controller to 802.11n and purchase of more access points</p> <p>3. Install access points as required throughout school</p> <p>4. Plans developed as part of library, classroom and laboratory redevelopment Submission to College Board</p> <p>5. Purchase a mixture of laptops on trolleys and computer desktop systems</p> <p>6. Research Work</p> <p>7. Annual budget submitted to Business Manager and the College Board</p> <p>8. ICT Levy provides some income from parents</p> <p>9. Adjustments made as required</p>	<ul style="list-style-type: none"> • ICT Directors/ Chairmen • VP-Administration • VP-Acad. Affairs • Curriculum Planning Officers • Prof. Dev't. Coordinator • SUC's Planning Officers 	<p>S.Y. 2014-2015</p>		<p>Annual</p>

Goals / Objectives	Intended Outcomes	Key Implementation Strategies	Responsibility	Time Frame	Budget	Monitoring
<p>ICT INFRASTRUCTURE</p> <p>2. Hardware Delivery</p> <p>* To purchase computers and other ICT facilities for teachers and student use in classrooms and library, and science laboratories.</p> <p>* To complete data projector system installations to all classrooms, and laboratory rooms.</p> <p>* To install some Interactive White Boards if criteria for use are met</p> <p>* To develop video conferencing systems</p> <p>3. Software Delivery</p> <p>* To continue current arrangements with software delivery</p> <p>* Technical Support</p> <p>4. To continue current arrangements with technical support</p> <p>5. Budgeting of Resources</p> <p>* To continue current arrangements with budgeting</p>	<p><i>2. Hardware, software and network infrastructure is systematically and routinely monitored and upgraded in light of emerging technologies and future requirements in curriculum and administration.</i></p> <p>* To purchase computers and other ICT facilities for teachers and student use in classrooms, library, and science laboratories</p> <p>* To complete data projector system installations to all classrooms and laboratories</p> <p>* To install some Interactive White Boards if criteria for use are met</p> <p>* To develop video conferencing systems</p> <p><i>3. Technical support is readily available to minimize disruptions to learning, teaching and administration</i></p> <p><i>4. ICT budgeting provides for continual upgrading to allow the school to rapidly take advantage of future improvements in ICT delivery and infrastructure.</i></p>		<ul style="list-style-type: none"> • ICT Directors/ Chairmen • VP-Administration • VP-Acad. Affairs • Curriculum Planning Officers • Prof. Dev't. Coordinator • SUC's Planning Officers 	S.Y. 2014-2015		Annual

THANK YOU VERY MUCH!